Network Standard

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NW000-S0101 **NS177 11KV JOINTS (INCLUDING TRANSITION JOINTS) AND TERMINATIONS - POLYMERIC INSULATED CABLES**



ISSUE

For issue to all Ausgrid and Accredited Service Providers' staff involved with the high 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Where this Standard is issued as a controlled document replacing an earlier edition, remove and destroy the superseded document.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 Network Standard specifies the construction requirements, termination and joint kit details for the following 11kV termination and joints:

- ☐ terminations for single core and three core polymeric insulated cables
- ☐
- ☐ straight through joints for single core and three core polymeric insulated cables
- ☐ three-to-one joints for polymeric insulated cables
- ☐ tee joints for polymeric insulated cables
- ☐ stub tee joints for polymeric insulated cables
- ☐ pot ends for polymeric insulated cables
- ☐ transition joints
- ☐ transition tee joints
- ☐ transition stub tee joint.

Where to for more information?

Section 2.0

Responsibilities and Requirements

The details of this section identify the respective responsibilities of Clients, Accredited Service Providers (ASPs), and Ausgrid Representatives. In addition the following detail is included:

- ☐ All materials and equipment used for construction of Ausgrid's assets are to be free from asbestos
- ☐ All electrical works will be conducted in compliance with Ausgrid's Electrical Safety Rules
- ☐ Working in confined spaces,
- ☐ Admittance to Ausgrid premises
- ☐ Installers of products detailed in this standard must be trained and assessed as competent in the installation of each product they will be installing
- ☐ Some items are exempt from the product specific training requirement
- ☐ Contractors must only use approved products on the network. Alternative products should be submitted to Ausgrid for approval.

Where to for more information?

Section 7.0

Tools and Forms

n/a

Cable Preparation

Cable preparation requirements cover the following:

- ☐ Tools required.
- ☐ Procedures
- ☐ Safety implications

Where to for more information?

Section 9.0

Tools and Forms

n/a

Terminations, Joints & Pot Ends

Termination requirements covered are:

- ☐ Methods
- ☐ Termination kits
- ☐ Requirements
  Sect: 10.0

Joints requirements covered are.

- ☐ Joint kits
- ☐ Core connectors
- ☐ Earth continuity
- ☐ Requirements
  Sects: 11.0 to 17.0, 19.0 to 24.0

Pot Ends (live end seals) requirements covered are.

- ☐ Using pot ends (live end seals)
- ☐ Pot end kits
- ☐ Requirements
  Sect: 18.0

Where to for more information?

Section 10.0 to 24.0 (see above)

Tools and Forms

Various Figures and Tables as appropriate

Network Standard
NS177
11kV Joints (Including Transition Joints) and Terminations - Polymeric Insulated Cables

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1.0 PURPOSE

This Network Standard specifies Ausgrid's construction requirements for high voltage (11,000 volts) polymeric insulated cable joints, terminations, and Underground to Overhead (UGOH) connections. This Network Standard also specifies the requirements for transition joints from polymeric insulated cables to Paper Insulated Lead Covered (PILC) cables.

2.0 SCOPE

This Network Standard details the 11kV polymeric cable termination designs for underground to overhead (UGOH) connections, distribution transformers and switchgear found in Ausgrid's currently designed distribution substations.

This Network Standard also specifies the construction requirements and joint kit details for the following 11kV joints:-

- straight through joints for single core and three core polymeric insulated cables
- three-to-one joints for polymeric insulated cables
- tee joints for polymeric insulated cables
- stub tee joints polymeric insulated cables
- pot ends for polymeric insulated cables
- straight through transition joints (polymeric insulated cables to paper insulated cables) for single and three core cables
- transition three-to-one joints
- transition tee joints
- transition stub tee joints.

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

3.0 REFERENCES

3.1 General

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

3.2 Ausgrid documents

- Customer Installation Safety Plan
- Electrical Safety Rules
- Electricity Network Safety Management System Manual
- ES 4 Accredited Service Provider Authorisation
- NS001 Glossary of Terms
- NS100 Field Recording of Network Assets
- NS100 External Annexure C
- NS114 Electrical Design and Construction Standards for Chamber Type Substations
- NS130 Laying Underground Cables up to and Including 11kV
- NS161 Specification for Testing of Underground Cables
- NS181 Approval of Materials and Equipment and Network Standard Variations
- NS181 Approved Material List (AML)
- NS212 Integrated Support Requirements for Ausgrid Network Assets
- NS260 Sub-Transmission Feeder Earthing
- Public Electrical Safety Awareness Plan

3.3 Other standards and documents

- AS 2865 – Confined Spaces
- EA 18 - Guide to the Training of Personnel Working on or near Electricity Works
- ENA Doc 001-2008 National Electricity Network Safety Code
- ISSC 14 - Guide to Electrical Worker's Safety Equipment

3.4 Acts and regulations

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

4.0 DEFINITIONS

Refer to NS001 Glossary of Terms.

5.0 ASBESTOS

All materials and equipment used for construction of Ausgrid's assets are to be free from asbestos and or asbestos related products. Suppliers are expected to comply with the Work Health and Safety Act 2011 together with the Work Health and Safety Regulation 2017 and confirm in writing that all products supplied to Ausgrid contain no asbestos related materials, refer to NS211.

6.0 INTRODUCTION

The requirements of this Network Standard must always be adhered to. Any deviations from this Network 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 accredited contractors. Details of the accreditation procedure may be obtained from any of Ausgrid's Customer Supply centres.

Only personnel who have been trained and assessed as being competent in the installation of polymeric joints and terminations can install the joints and terminations mentioned in this Network Standard.

This Network Standard shall be read in conjunction with NS130 and NS100. A detailed cable nomenclature is shown in NS100 External Annexure C.

7.0 GENERAL INFORMATION AND REQUIREMENTS

7.1 Clients

It is the responsibility of clients to ensure that only appropriately accredited and authorised personnel are engaged on projects involving Ausgrid's transmission and distribution network.

7.2 Accredited service providers

Accredited Service Providers are responsible for ensuring the safety of their employees and the public in general whilst carrying out contestable work. It is essential that Authorised Work (as defined in ES4) is performed in a safe manner and to no less a standard than as specified in Ausgrid's:

- Customer Installation Safety Plan,
- Electrical Safety Rules,
- Electricity Network Safety Management System Manual,
- Public Electrical Safety Awareness Plan,

- Relevant Network Standards.

As well as any relevant Act, Regulation and SafeWork NSW requirements applicable at the time. The conditions stated as a requirement of accreditation under the NSW 'Accredited Service Provider Scheme' must be adhered to.

Other relevant safety guidelines include:

- ISSC 14 - Guide to Electrical Worker's Safety Equipment,
- EA 18 - Guide to the Training of Personnel Working on or near Electricity Works

Accredited Service Providers must also ensure that their employees' authorisations are current at all times.

7.3 Ausgrid representatives

A representative will be appointed by Ausgrid for each stage of the project as the single point of contact for all aspects of that stage. This representative will also be responsible for organising the necessary audits to ensure compliance with approved construction standards.

Audits will be carried out either progressively or at the completion of the work, depending on the specific requirements of each project.

7.4 Electrical safety rules

All authorised personnel will be required to be appropriately trained for the work concerned, and will need to have a thorough knowledge of the applicable parts of Ausgrid's Electrical Safety Rules. Level 1 Accredited Service Providers shall have a full understanding of the procedures and documentation associated with Equipping Permits and high and low voltage access permits before they commence work on any part of Ausgrid's reticulation system.

Ausgrid's Electrical Safety Rules are designed to ensure compliance with statutory requirements which apply to all works on high voltage and low voltage electrical apparatus or near exposed high voltage conductors. They apply to persons who enter electrical stations or generating stations. They also apply to people employed by electricity supply authorities, customers taking supply at high voltage, electrical contractors and Accredited Service Providers working on electrical apparatus, and to any other employee or person, including visitors.

The requirements of the relevant sections of Ausgrid's Electrical Safety Rules shall be applied when conducting works associated with this Network Standard.

7.5 Confined spaces

Entry to and work in a confined space must comply with the Work Health and Safety Regulation 2017 and the requirements of the Australian Standard AS 2865 –Confined Spaces.

Some examples (the list is not exhaustive) of confined spaces within Ausgrid are:

- underground substations with air intake grates in the vehicle carriageway
- a joint-hole with a cover or tarpaulin which is not open on more than one side
- roofed cable pits, cable vaults and tunnels
- jointing chambers where entry is through a manhole or door
- open-topped spaces which do not have good natural ventilation and where a person is working head and shoulders below ground level
- transformer tanks.

7.6 Admittance to Ausgrid premises

Admission to Ausgrid's premises is granted to Accredited Service Providers only under Ausgrid's supervision and at the Accredited Service Providers' cost under the following conditions:

- Ausgrid does not hold itself responsible to the Accredited Service Provider or anyone claiming through the Accredited Service Provider in respect of any loss, damage or injury which may be suffered or received during or arising from their presence upon Ausgrid's premises or any part thereof or any other premises or works connected therewith.
- The Accredited Service Provider accepts all risks involved in making any visit to the said premises and works whether there are concealed dangers or otherwise and whether such dangers are known to Ausgrid or not.
- Ausgrid does not guarantee that the premises or works are free from concealed dangers or risks.
- Ausgrid shall not be liable for or be bound by any of the liabilities or duties to or by which it would otherwise be liable or bound under the law relating to the liability and/or responsibility of an owner or occupier of premises to or in relation to licensees and/or invitees.
- Accredited Service Providers agree to safeguard any person who may accompany them or be under their control or direction and shall acquaint any such person with the terms upon which admission is granted by Ausgrid to its premises or work sites.

7.7 Commissioning of joints

Before commissioning of joints the requirements stated in NS130 must be met.

In addition, resin filled joints as detailed in Sections 19.2, 20.0, 21.0, 22.0, 23.0 and 24.0 of this Network Standard shall not be commissioned before the resin has set, which is typically a minimum of three hours.

All completed joints and associated cable installations shall be tested prior to commissioning in accordance with the requirements of NS161.

7.8 Field recording of network assets

Information regarding the construction, modification, repair, and/or retirement of Ausgrid's network assets must be recorded in accordance with NS100. These records must be submitted to the Data Maintenance team in accordance with NS100.

8.0 PRODUCT SPECIFIC TRAINING

Installation of product on Ausgrid's network by installers who have not been product specific trained and deemed competent is not permissible. It is a mandatory requirement that installers of products detailed in this Network Standard are trained, assessed and deemed competent in the installation of each product they will be installing. The training shall be product specific and be conducted by the product manufacturer, authorised product agent or a registered training organisation.

Product agents and registered training organisations not suitability qualified to deliver the training will not be acceptable. The training provider shall provide the installer with evidence that the training has been satisfactorily completed. Ausgrid may request installers to produce evidence of product specific training.

The following items are exempt from product specific training:

- TE Connectivity Insulating Bushing Boot Part No RCAB 4110, (stockcode 178421).
- TE Connectivity Insulating Bushing Boot Part No RCAB 4120, (stockcode 177136).
- ABB Inline Insulation Boot for ABB Safelink Part No TB-A-EA, (stockcode 180423).

9.0 TOOLS REQUIRED FOR CABLE PREPARATION

The following tools are required for cable preparation.



Cable Sheath Stripping Tool (Acculec Power Part No MSS-DSTRIPPER) Replacement Blade (Acculec Power Part No MSS-DSTRIPBLADE).



0.4mm Pirelli Insulation Screen Scoring Tool (stockcode 178198 or from Blackwoods Part No 0536 6992)



6mm Rat Tail File



Long Nose Pliers



XLPE Insulation Stripping Tool (Blackwoods Part No 02424327) Replacement Blade (Blackwoods Part No 0536 6958)



XLPE Insulation Splitting Tool (from NKT Australia Part No RKM 1055(4550.143.0)) used where there is insufficient room between cable cores to rotate the XLPE Insulation Stripping Tool

Figure 9-1 – Tools Required

A white pencil or approved paint marker is also required for marking. The paint marker currently approved by Ausgrid is the POSCA PC - 1 MR White.

This marker is available from Officeworks (Catalogue Number: MIPC1MRWH).

A suitable 3mm A/F hex wrench for use on earth screen wire connector shear-off bolts is available direct from Blackwoods (Part No 0624 9315).

Insulation Stripping String (Kevlar String) stockcode number 180501, for stripping Polymeric Insulated Cables. The TE Connectivity description is a Kevlar String: ARAMIDGARN 1670DT x 2 x 3, Length 2000mm (-/+ 20mm) Coloration Yellow. TE Connectivity Part No RM-0764.

Note: Tools used for the removal of insulation screen shall be dedicated to this particular task. Tooling that has been previously used for a task other than the removal of the insulation screen shall not be used.

10.0 INDOOR AND OUTDOOR TERMINATIONS

10.1 Introduction

This specification provides the requirements for terminating single core and three core polymeric insulated wire screened cables for indoor and outdoor applications.

10.2 Method of termination for three core cables

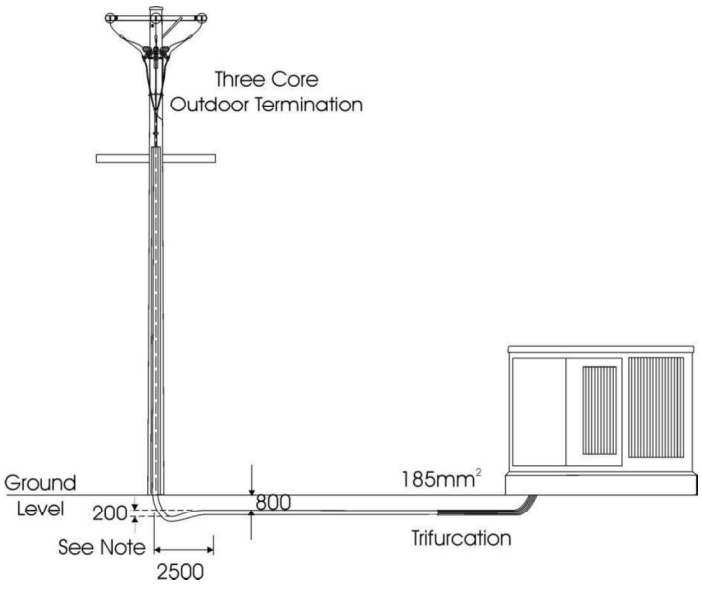
Table 1 below details the correct method for terminating three core cables. The specified method of termination is dictated by the minimum internal bending radius of the cable, electrical clearances in cable endboxes, and the practical aspects of cable laying. Where the trifurcation method is specified, a trifurcation kit (refer to Clause 10.4) and single core termination kit (refer to Clause 10.3) are required. Where a three-to-one joint is required, the size of the single core cables specified in Table 1 shall be adhered to.

Table 1 – Termination Method

Cable Size	Method of Indoor Termination	Method of Outdoor Termination (UGOH)
185mm^2 (Refer to Figure 10-1)	Trifurcation	Three core Termination
300mm^2 (Refer to Figure 10-2)	Trifurcation	Three-to-One Joint 300AL3 to 185Cu1
400mm^2 (Refer to Figure 10-3)	Three-to-One Joint 400AL3 to 300Cu1 (See Note 1.)	Three-to-One Joint 400AL3 to 300Cu1
500mm^2 (Refer to Figure 10-4)	Three-to-One Joint 500 AL3 to 300 Cu1	Three-to-One Joint 500AL3 to 300Cu1

Note 1. 185Cu1 can be used provided the underground portion from three-to-one joint to the termination is less than 12 metres and the change has been approved by Ausgrid.

For chamber type substations, if the conduit bend is less than the minimum internal bending radius of the cable then a three-to-one joint is required outside the substation.



Note: Trench depth at the base of the pole needs to be 1000mm minimum to ensure that the cable is not over bent.

Figure 10-1 – 185mm^2 Three Core Termination Method

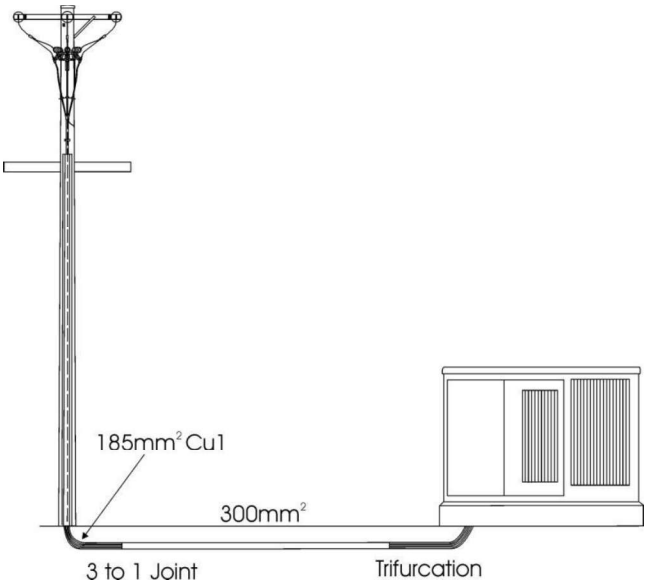
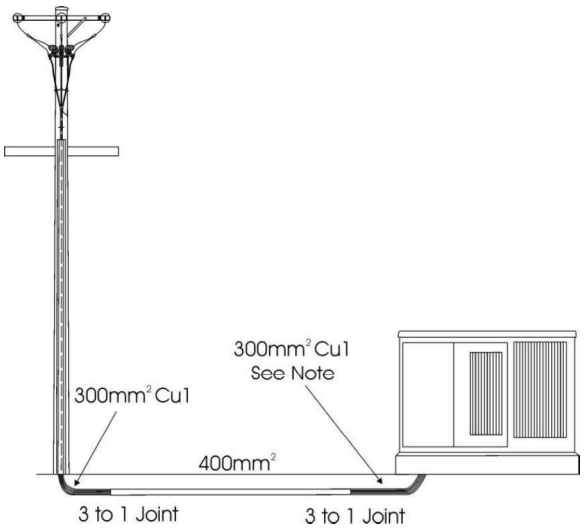


Figure 10-2: 300mm² Three Core Termination Method



Note: 185mm² Cu1 can be used provided the underground portion from the three-to-one joint to the termination is less than 12 metres and the change has been approved by Ausgrid.

Figure 10-3 – 400mm² Three Core Termination Method

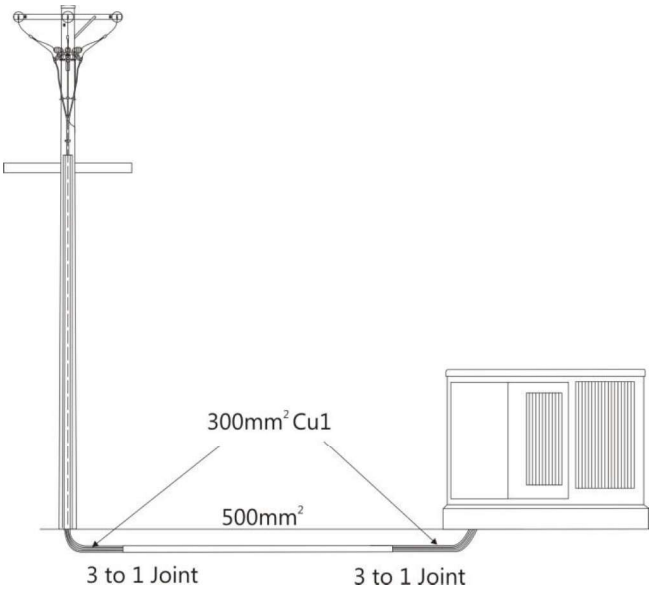


Figure 10-4 – 500mm² Three Core Termination Method

10.3 Approved termination kits

Ausgrid's stockcodes of approved terminations kits are provided in Table 2 below.

The termination kits listed below are not suitable for installation in petroleum based compound filled endboxes, or in environments subject to transformer oil or heavy transformer oil vapour contamination such as inside oil transformer tanks.

Table 2 – Termination Kits

Cable Range	Cable Type	Termination Type	Termination Kit Stockcode
35 – 95mm²	Single Core	Indoor Outdoor	177791 177770
185mm²	Single Core	Indoor Outdoor	177792 177801
300mm²	Single Core	Indoor Outdoor	177793 177802
630 – 800mm²	Single Core	Indoor Outdoor	177794 177803
1000mm²	Single Core	Indoor Outdoor	177795 177804
95 – 185mm²	Three Core	Indoor Outdoor	177769 177805

10.4 Trifurcating kits – termination

Trifurcating of three core cables into single core cables at the termination points is necessary where the minimum internal bending radius of the three core cable cannot be met. The minimum internal bending radius of a polymeric cable when set in position is typically 15D, where D is the overall diameter of the cable. For this reason, the minimum internal bending radius of the individual cores of a three core cable is less than half the minimum bending radius of the three core cable.

Ausgrid's stockcodes of approved trifurcating kits are provided in Table 3. The basic components of a kit are: glove, core rejacketing tube, sealing sleeves, mastic and installation instruction.

Table 3 – Trifurcation Kits

Cable Range	Trifurcating Kit – Termination Stockcode
95 – 185mm^2	177784
300 – 500mm^2	177785

If additional core rejacketing tubing is required, it may be obtained separately as detailed in Table 4.

Table 4 – Rejacketing Tubing

Cable Range	Length	Rejacketing Tubing Stockcode
95 – 185mm^2	12.5 m roll	60228
300 – 500mm^2	15 m roll	177730

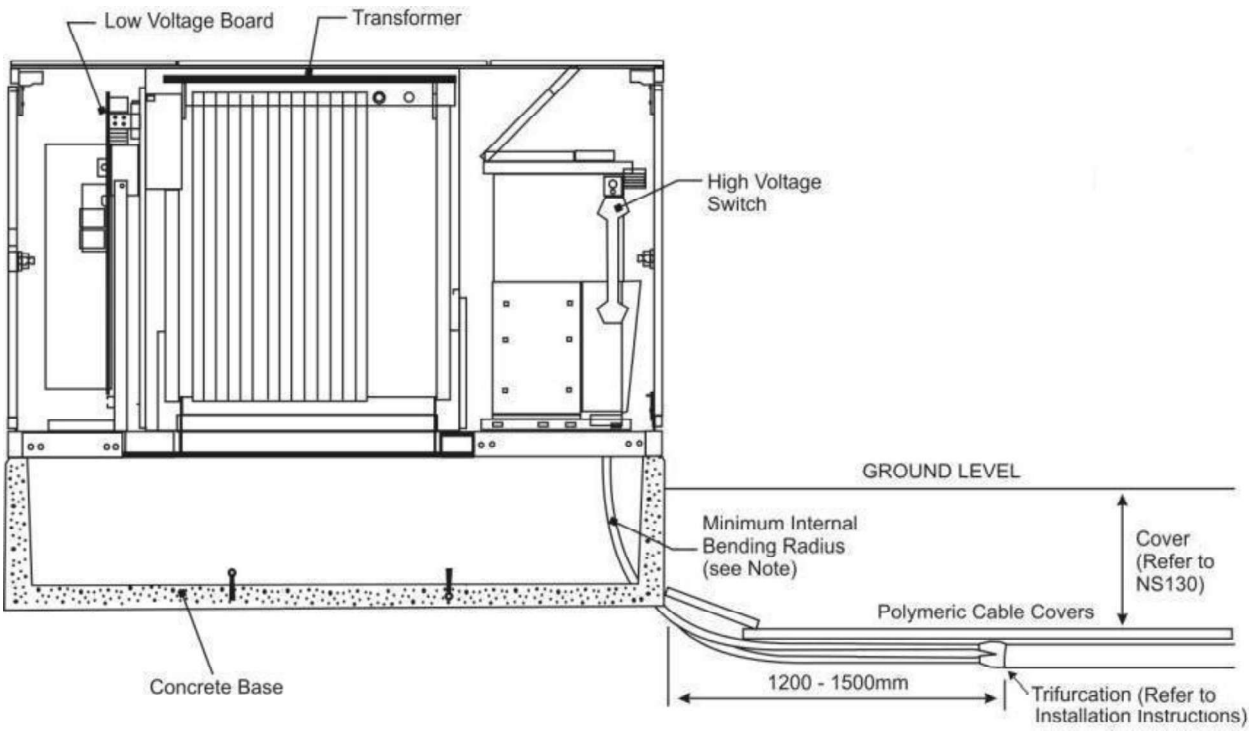


Figure 10-5 – Trifurcation Dimensions

Note: The minimum internal bending radius of each core of a three core cable after it has been trifurcated is equal to 15xD, where D is the diameter over the core and the rejacketing tubing.

10.5 Cable lugs

The lugs shall be of the compression type and must have sealed palms and barrels (except for the cable entry end). Compression lugs must be installed in strict compliance with the manufacturer's recommendations for crimping dies, and the number and position of crimps.

Ausgrid's stockcodes of approved lugs are provided in Table 5.

Table 5 – Crimp Lugs

Cable Size and Type	Stockcode Indoor Lugs	Stockcode Outdoor Lugs
35mm² Aluminium	H109553	H109553
70mm² Copper	H95851 178471 (See Note 1)	H95851
185mm² Copper	175532 (See Note 2)	90183
185mm² Aluminium	57927	57927
300mm² Copper	175534 (See Note 2)	57695
300mm² Aluminium	57687 (See Note 2)	57687

Notes:

1. This lug is suitable for the M16 stud located in the transformer cable endbox of Lucy Ring Main Circuit Breakers.
2. Lugs have reduced palms (36mm) suitable for use with ABB SDAF3 Switchgear.

10.6 Stainless steel bolts and set-screws – lubrication of threads

Before installation of each stainless steel bolt or set-screw, the thread shall be lubricated with specially formulated anti-seize grease containing nickel which is available on Ausgrid 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 the anti-seize grease from contaminating the interface of the electrical contact surfaces. Any excess of anti-seize grease shall be removed using a clean dry cloth after the bolt or set-screw has been installed.

10.7 Cable termination requirements

The following requirements must be satisfied when constructing cable terminations on polymeric cables:

- The cables must not be bent tighter than the manufacturer's specified minimum internal bending radii during the termination process or after they have been set in position.
- The termination shall be constructed in accordance with the installation instruction supplied in the termination kit.
- The termination kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the termination process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- 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. Cleaning must only be done using lint-free cloth.

- 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.
- PVC tape shall not be applied over the surface of the cable termination.
- The tinned copper wire at the base of the cable termination shall not be covered with PVC tape or heatshrink.
- Prior to bolting the cable termination to the switchgear bushing, the cables shall be aligned vertically below the connection point and positioned such that they do not impart any torsional force to the bushing while fastening the lugs into position.

10.8 Screen wire termination requirements

10.8.1 Requirements

The design information provided by Ausgrid will specify whether the earth screen wires are to be connected to the main earth or left unconnected.

If EFI CTs (Earth Fault Indicator Current Transformers) are required, a cable mounting bracket is installed on each of the single core cables, with the EFI CT resting on top of the mounting brackets. The following cable mounting brackets are available:

- 35mm^2 to 150mm^2 polymeric cables (stockcode 177066), and
- 185mm^2 to 300mm^2 polymeric cables (stockcode 177067).

EFI CTs must not be installed where the screen wires are not intended to be earthed.

Screen wires which are required to be earthed shall be bunched together as per the installation instruction included in the termination kit to form an earth lead, and covered with the following rejacketing tubing:

- Stockcode 177751 for all cables except 185mm^2 and 300mm^2 cables with 70mm^2 Cu wire screen, or
- Stockcode 90258 for 185mm^2 and 300mm^2 cables with 70mm^2 Cu wire screen

and terminated onto the earth bar using screen wire lugs.

Refer to Table 6 for the screen wire lugs stockcodes.

Table 6 – Screen Wire Lugs

Cable Size	Screen Wire Lug Range	Stockcode
185mm^2 and 300mm^2 cables with 70mm^2 Cu wire screen	-	H95851
185mm^2 Three Core Only	50mm² – 120mm²	177901
35mm² – 500mm²	Up to 35mm²	177741
630mm²	50mm² – 120mm²	177901 (See Note)

Note: The cross-sectional area of the screen wires on some existing 630mm^2 cables is 145mm^2 which falls outside the range of this connector. Contact the Ausgrid representative if you come across this cable.

10.8.2 Extending the Screen Wires

Where the screen wires need to exit the cable endbox to reach the earth bar, or for outdoor terminations where the screen wires may need to pass back through current transformers, the screen wires can be extended to reduce cable wastage.

For 185mm^2 and 300mm^2 cables with 70mm^2 Cu wire screen, the screen wires can be extended using a 70mm^2 PVC covered cable (stockcode 60111) and a screen wire connector (stockcode 180421).

For 630mm^2 cables with 120mm^2 Cu wire screen, the screen wires can be extended using a 120mm^2 PVC covered cable (stockcode 175281) and a screen wire connector (stockcode 57141).

Rejacketing tubing (MWTM 35/12 available in 1200mm lengths stockcode 60186) shall cover the screen wires from as close as possible to the tinned copper wire binder, covering the screen wire connector and then overlap onto the screen wire extension cable by 50mm.

10.8.3 Terminating screen wires that are not to be earthed

If the screen wires are not required to be earthed, gather the screen wires together as per the installation instruction to form an earth lead. Cut the screen wires a distance of 60mm from the copper wire binder applied around the cable core and shrink a length of rejacketing tubing over the bunched screen wires.

Refer to Figure 10-6.

The rejacketing tubing should extend 25mm past the end of the cut screen wires to ensure the screen wires will not contact the earth metal of the switchgear.

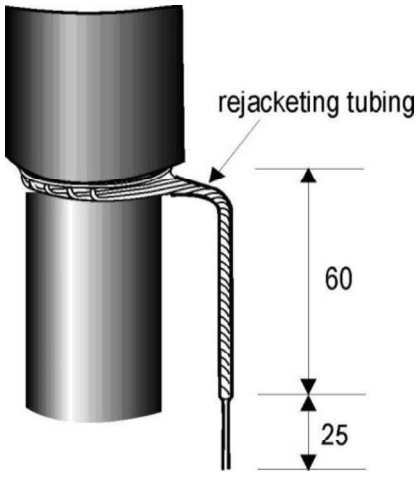


Figure 10-6 – Termination of Screen Wires when not required to be Earthed

10.9 Rayvolve inline bushing sleeve (RIBS) requirements

10.9.1 Rayvolve sleeves

Two different length Rayvolve sleeves exist on Ausgrid's network.

- The short sleeves, which are approximately 180mm long, were only used when terminating copper cores.
- The longer sleeves, approximately 260mm long, were used on both aluminium and copper cores.

Note: Only long Rayvolve Sleeves are available. The stockcode numbers for the longer Rayvolve sleeves are listed below:

Table 7 – Rayvolve Sleeves

Cable Range	Rayvolve Sleeve Stockcode
70mm^2	178725
95 – 185mm^2	177702
240 – 300mm^2	177703

10.9.2 Requirements

The Rayvolve sleeves shall be installed in accordance with the following TE Connectivity installation instructions:

- ESD-1992-AU-7/97 for 70mm^2 cable,
- ESD-3235-AU-6/02 for 95mm^2 to 185mm^2 cables, and
- ESD-3717-AU-5/08 for 240mm^2 to 300mm^2 cables.

10.10 Construction of underground to overhead (UGOH) cable termination

10.10.1 Requirements

This specification provides the requirements for the construction of 11kV underground-to-overhead (UGOH) polymeric insulated wire screened cable terminations. This specification should be read in conjunction with the installation instruction included in the outdoor termination kits. Screen wires shall be covered with rejacketing tubing prior to terminating at the earth point.

There are two types of 11kV underground-to-overhead (UGOH) cable terminations, they are the single core and three core, refer to Clause 10.2 for the termination method.

The construction of pole mounted 11kV underground-to-overhead (UGOH) cable terminations must be completed to the requirements of Ausgrid Drawing 160354 11kV Underground to Overhead (UGOH) Construction.

The cables must be erected on the side of the pole away from oncoming traffic (except where there are problems such as a driveway or underground obstructions).

Where the overhead conductors and underground cables are on opposite sides of the UGOH structure, the Alternative HV Overhead Arrangement detailed in Ausgrid Drawing 160354 shall be used. Where any other arrangement is proposed for specific site conditions, approval must be sought from Ausgrid. Approval may be given for the individual project if no alternative designs in accordance with Ausgrid Drawing 160354 are possible.

Under no circumstances shall the cable be wrapped 180° from one side of the pole to the other. Rotation from one face to another through 90° will only be allowed following approval from Ausgrid if no alternative options exist. This may require taller poles to ensure the minimum bending radius of the cable is not compromised.

The cable shall not be bent tighter than the manufacturer's specified minimum internal bending radius, while it is being set in position.

The erection and termination of the cable on the pole should be completed together wherever possible to minimise the number of outages required. Where it is intended to terminate the UGOH cable at a later date, the cable shall:

- Be cut long enough to allow construction of the termination at the correct height. This would normally require the cable to extend 300mm above the UGOH support bracket. Above ground joints on UGOH cables are not allowed.
- Be shorted and sealed in accordance with the requirements of NS130.
- Be securely saddled to the pole. The cable should not be coiled or excessively bent - refer to the manufacturer's specification for minimum internal bending radius.

- Be protected from physical damage or vandalism by installing two lengths of steel cable covers as per Ausgrid Drawing 160354.
- Have sufficient electrical clearance from the overhead mains if these mains are intended to be energised before the cable termination is completed.

Where the UGOH cable has been terminated onto the termination plate but is not to be immediately connected to the overhead mains, the UGOH cable must be short circuited and earthed. Insulated black cable of not less than 25mm^2 copper, lugged with M12 stud hole lugs is to be used. These connections are to be made between the top of the termination plates and the surge arrester earth bar.

Where an Earth Fault Indicator (EFI) is required to be installed on UGOH cable, the pole must be appropriately dressed to suit the Current Transformer (CT) before the cable is erected on the pole. Refer to Ausgrid Drawing 31318 for details on the installation of an EFI.

The earth down lead must be kept clear of all metalwork, braces, coach screws, etc, on the pole.

Where alterations to an existing UGOH pole construction is proposed as part of contestable design works, Ausgrid shall first be consulted to undertake a technical assessment to determine the suitability of the proposed UGOH alterations.

10.10.2 Animal proofing of UGOHs

Animal proofing of UGOHs shall be done in accordance with Ausgrid Drawing 160354. For old porcelain surge arresters without covers, a suitable cover is available on stockcode 176942.

10.10.3 Sub-transmission poles and UGOHs

11kV UGOHs must never be constructed on concrete or steel poles which also carry sub-transmission (i.e. 33kV, 66kV or 132kV) mains. This is due to the transferred voltage and earth potential rise hazards associated with faults on the sub-transmission mains which may affect the 11kV mains. Refer to Clause 7.6.2 of NS260 for requirements associated with timber poles. The requirements of Clause 7.6.2 also applies to 11kV UGOHs due to the interconnected nature of 11kV and LV earthing systems.

10.11 Pre-made transformer leads for kiosks

The following pre-made transformer leads for kiosks are 3 metres long and are supplied with a cable gland fitted at the heatshrink cable termination end of the lead which has the screen wire lead. They are available for use in situations where the existing transformer leads require replacing:

- Heatshrink cable termination and compression lug suitable for M12 stud at one end and a RTE load break separable connector at the other end (stockcode 147959).
- Heatshrink cable termination and compression lug suitable for M12 stud at one end and a 200A load break separable connector at the other end (stockcode 180081).
- Heatshrink cable termination and compression lug suitable for M12 stud at both ends (stockcode 179878).

10.12 Cable termination for ABB SDAF3 switchgear (HV1-50)

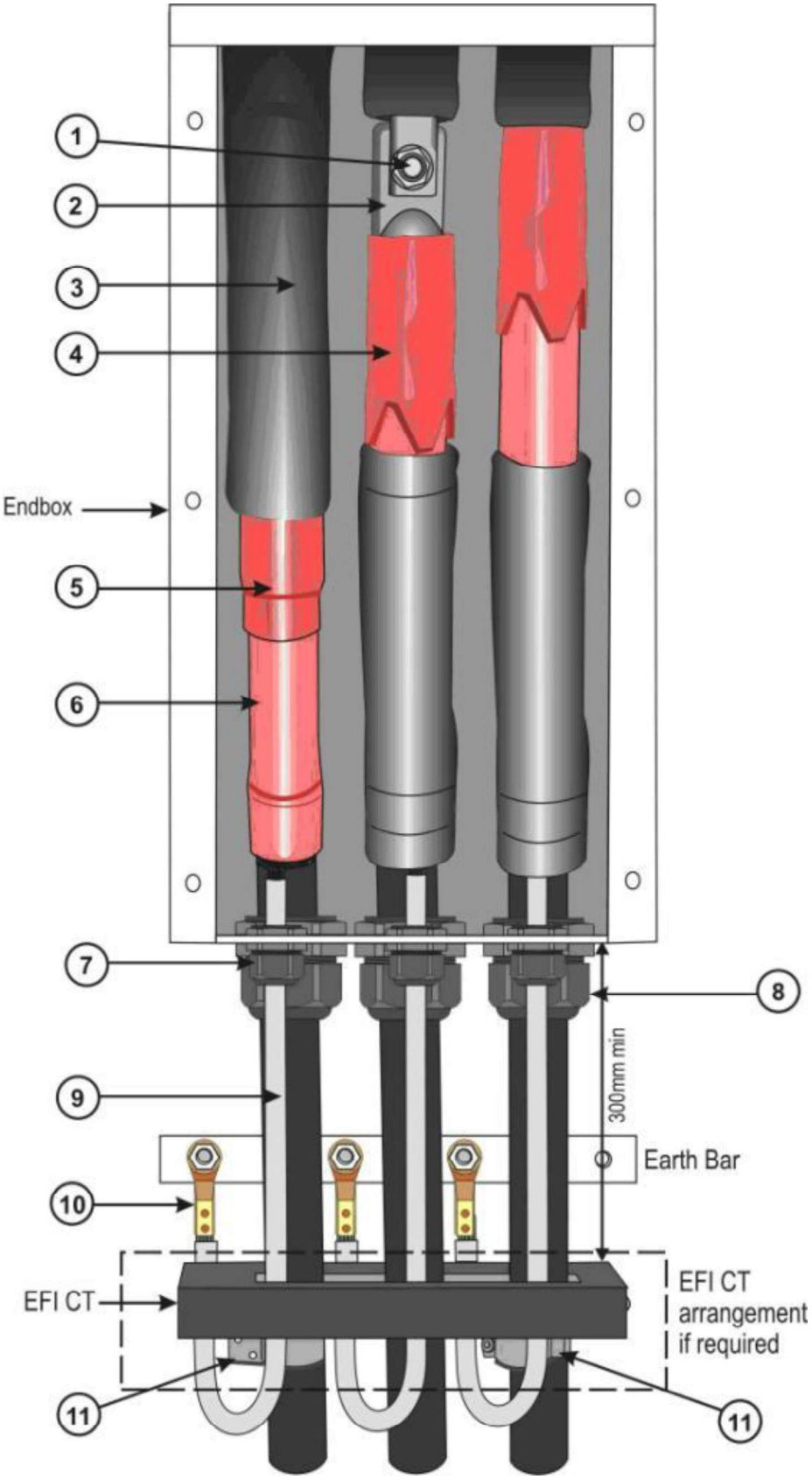


Figure 10-7 – Indoor Termination into ABB SDAF3 Switchgear

Table 8 – Material List for Indoor Termination into ABB SDAF3 Switchgear

Item	Description	Qty	Stockcode
1	M12 x 35mm stainless steel bolt M12 stainless steel nut M12 stainless steel flat washer M12 stainless steel spring washer	3 3 6 3	45021 8987 49429 143859
2	Phase core lugs	3	See Clause 10.5 See Note 2
3	Rayvolve sleeve		See Note 1
4	Crowned sleeve		See Note 1
5	Retaining sleeve		See Note 1
6	Termination kit	1	See Table 2
7	Cable glands – screen wire: For all cables except 185mm^2 and 300mm^2 single core polymeric cable with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cable with 70mm^2 Cu wire screen	 3 3	 177771 118091
8	Cable glands: For 185mm^2 to 300mm^2 phase core (See Note 4.) For 70mm^2 phase core (transformer tee-off)	 3 3	 118133 118125
9	Screen wire rejacketing tubing For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 Cut to length from 40 m roll Cut to length from 10m roll	 177751 90258
10	Screen wire lugs: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 3 3	 177741 H95851
11	CT mounting bracket for: For 185mm^2 to 300mm^2 cable	 2	 177067

Note 1. The crowned sleeve, Rayvolve sleeve and retaining sleeve are available as a kit (one kit per 3-phase cable termination), refer to Clause 10.9 for details.

Note 2. The palm width of the lug shall not exceed 36mm.

Note 3. Cable glands are to be installed before making the actual termination.

Note 4. For 300mm^2 single core polymeric cable with 70mm^2 Cu wire screen the outer composite sheath will need to be removed 120mm below the base of the gland plate to decrease the cable diameter to ensure the gland will fit correctly over the inner composite sheath. An 80mm length of rejacketing tube (stockcode 177730) is then shrunk centrally over the outer composite sheath cut.

10.12.1 Gland plate drilling details for ABB SDAF3 switchgear

Existing gland plates that do not have provision for screen wires, shall be drilled as detailed below.

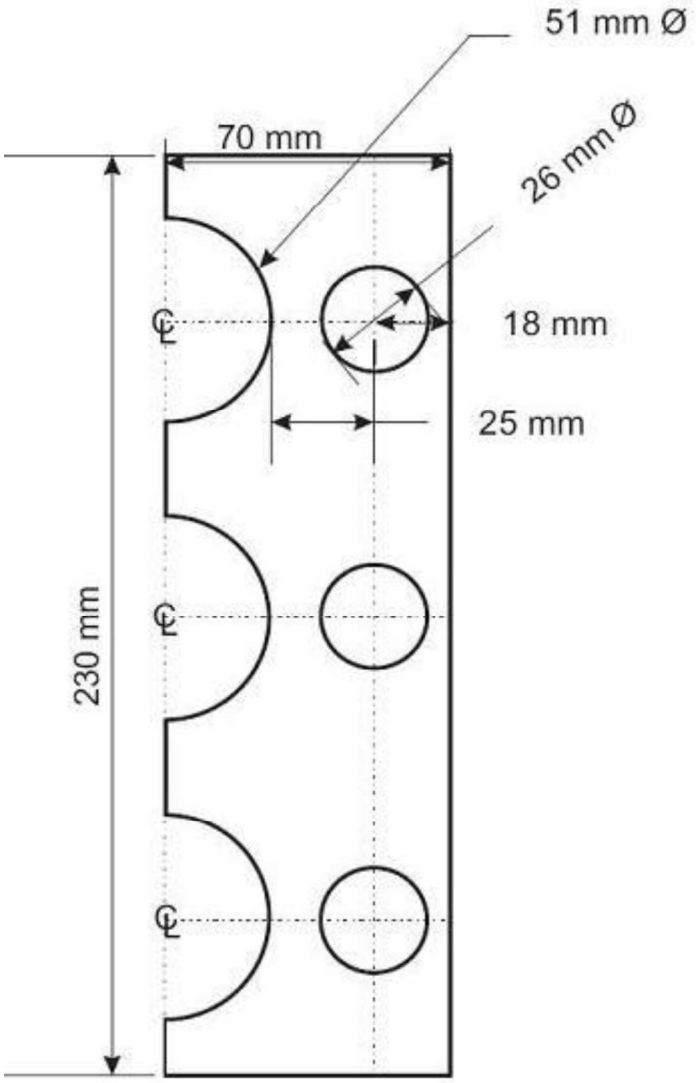


Figure 10-8 – Gland Plate Drilling Details

10.13 Cable termination for Lucy FRMU and EFS switchgear (HV1-51)

10.13.1 Feeder Cable Termination

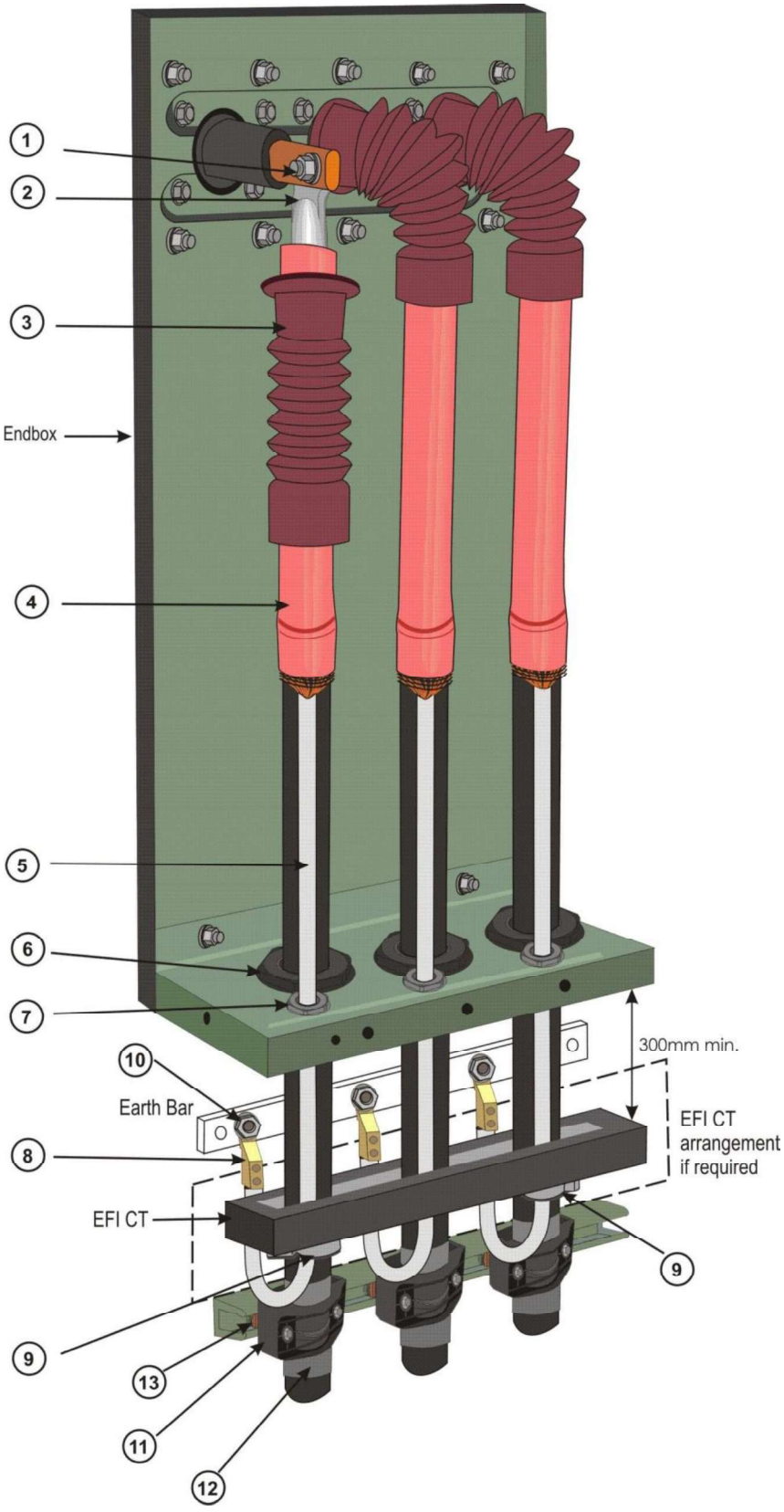


Figure 10-9 – Indoor Feeder Cable Termination

Table 9 – Material List for Indoor Feeder Cable Termination into Lucy FRMU & EFS Switchgear

Item	Description	Qty	Stockcode
1	M12 x 40mm stainless steel bolt M12 stainless steel nut M12 stainless steel flat washer M12 stainless steel spring washer	3 3 6 3	45146 8987 49429 143859
2	Phase core lugs	3	See Clause 10.5 and Note 1.
3	Insulating Sleeve (kit contains three sleeves) for: Feeder Cable Endbox	 1	 177136
4	Termination kit	1	See Table 2
5	Screen wire rejacketing tubing For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 Cut to length from 40 m roll Cut to length from 10 m roll	 177751 90258
6	Cable glands – phase core (See Note 4)	3	179132
7	Cable glands – screen wire	3	118091
8	Screen wire lugs: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 3 3	 177741 H95851
9	CT mounting bracket for: For 185mm^2 to 300mm^2 cable	 2	 177067
10	M12 x 30mm stainless steel bolt, M12 stainless steel nut, 2 x M12 stainless steel flat washers, M12 stainless steel spring washer	3	175911
11	Cable clamp for: 185mm^2 cables with Cu wire screen less than 70mm^2 185mm^2 and 300mm^2 cables with 70mm^2 Cu wire screen	 3 3	 180291 180350
12	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
13	Spring-loaded Nut	6	Unistrut Part No. P1010

Note 1. The palm width of the lug shall not exceed 36mm.

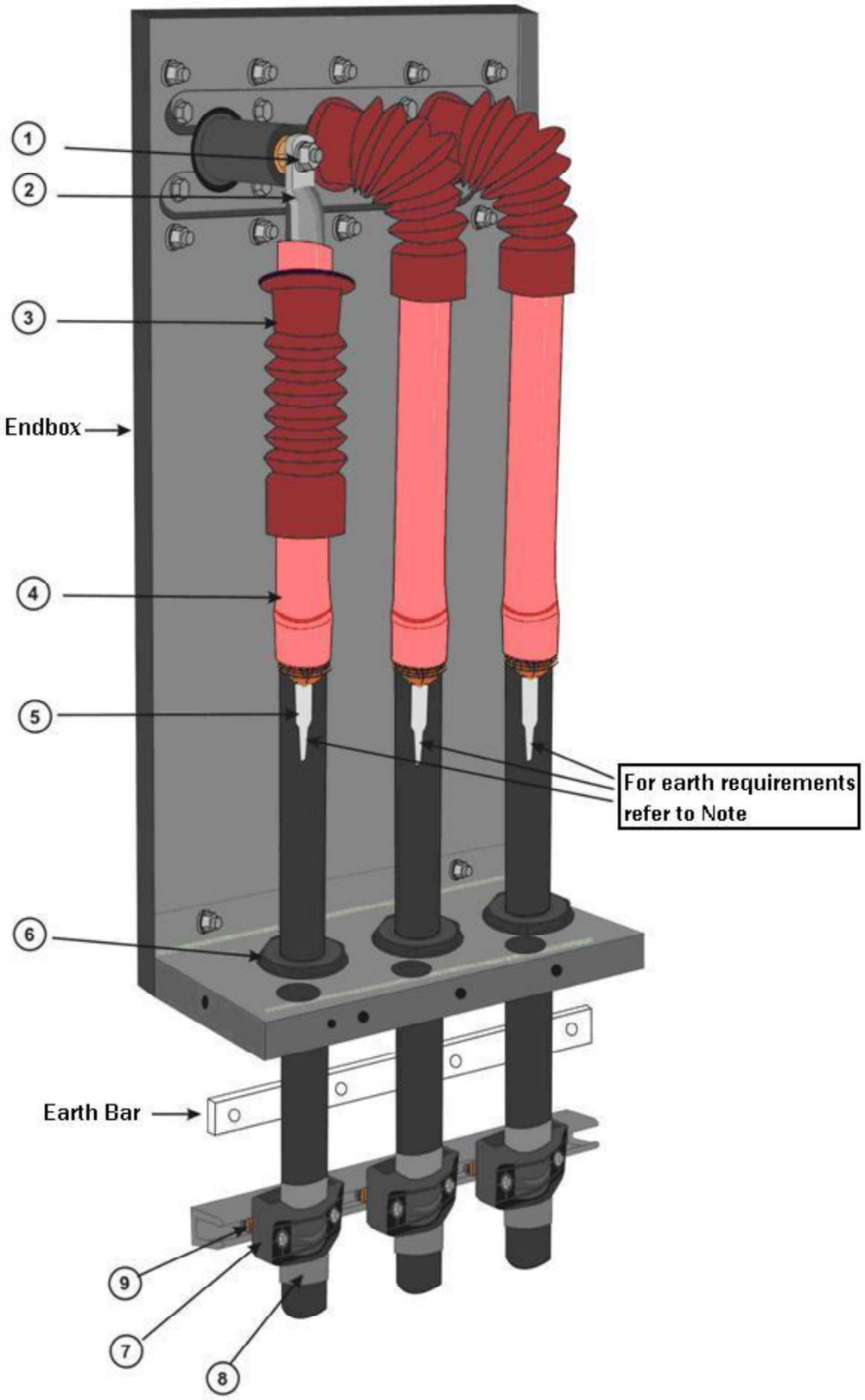
Note 2. Cable glands are to be installed before making the actual termination.

Note 3. Insulating sleeve shall be installed in accordance with the installation instruction supplied in the insulating sleeve kit.

Note 4. For 185mm^2 and 300mm^2 phase cores note the following:

- For 185mm^2 single core cables (including 185mm^2 cables with 70mm^2 Cu wire screen). two layers of WCSM 48/12 (stockcode 90274) tubing will be required in the area of the gland to increase the cable diameter to ensure the gland will secure in place.
- For 300mm^2 single core cables (including 300mm^2 cables with 70mm^2 Cu screen), a layer of WCSM 48/12 (stockcode 90274) tubing will be required in the area of the gland to increase the cable diameter to ensure the gland will secure in place.

10.13.2 Transformer tail cable termination



Note: For earthing requirements refer to Clause 10.23.

Figure 10-10– Indoor Transformer Tail Cable Termination

Table 10 – Material List for Indoor Transformer Tail Cable Termination into Lucy FRMU and EFS Switchgear

Item	Description	Qty	Stockcode
1	M12 stainless steel nut M12 stainless steel flat washer M12 stainless steel spring washer	3 3 3	8987 49429 143859
2	70mm^2 Copper lugs	3	H95851
3	Insulating Sleeve (kit contains three sleeves) for: Transformer Tail Cable Endbox	1	178421
4	70mm^2 Termination kit	1	177791
5	Screen wire rejacketing tubing	Cut to length from 40m roll	177751
6	Cable glands	3	118125
7	Cable clamp suitable for 70mm^2	3	180291
8	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
9	Spring-loaded Nut	6	Unistrut Part No. P1010

Note 1. Cable glands are to be installed before making the actual termination.

Note 2. Insulating sleeve shall be installed in accordance with the installation instruction supplied in the insulating sleeve kit.

10.14 Cable termination for Lucy VRN6a switchgear (HV1-53)

10.14.1 Feeder cable termination

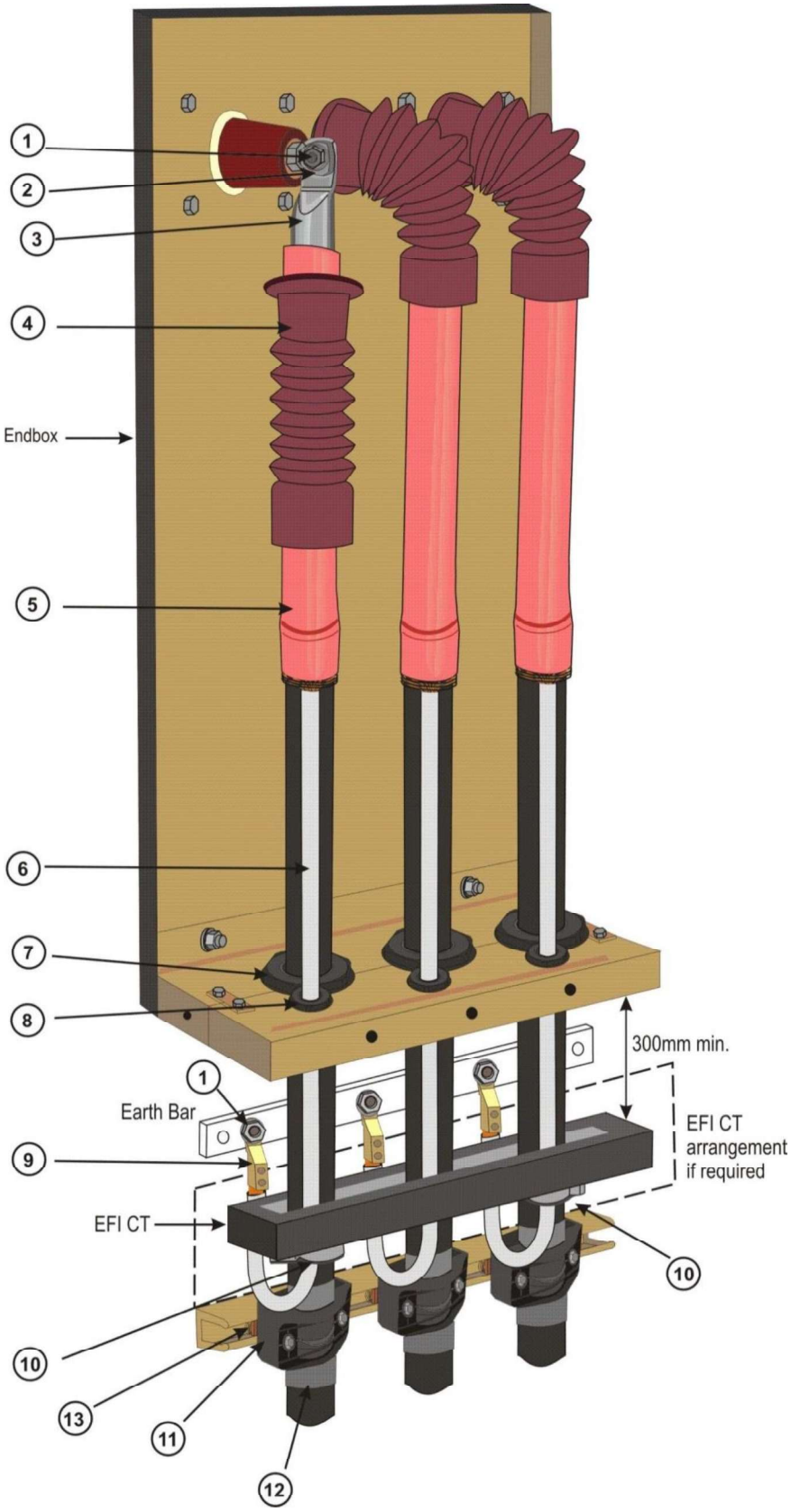


Figure 10-11 – Indoor Feeder Cable Termination

Table 11 – Material List for Indoor Feeder Cable Termination into Lucy VRN6a Switchgear

Item	Description	Qty	Stockcode
1	M12 x 30mm stainless steel bolt, M12 stainless steel nut, 2 x M12 stainless steel flat washers, M12 stainless steel spring washer	3	175911
2	Universal screw lug	3	180401
3	Phase core lugs	3	See Clause 10.5 See Note 1.
4	Insulating Sleeve (kit contains three sleeves) for: Feeder Cable Endbox	 1	 177136
5	Termination kit	1	See Table 2
6	Screen wire rejacketing tubing: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 Cut to length from 40 m roll Cut to length from 10 m roll	 177751 90258
7	Cable glands – phase core (See Note 6)	3	179132
8	Cable glands – screen wire	3	118091
9	Screen wire lugs: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 3 3	 177741 H95851
10	CT mounting bracket for: For 185mm^2 to 300mm^2 cable	 2	 177067
11	Cable clamp for: 185mm^2 cables with Cu wire screen less than 70mm^2 185mm^2 and 300mm^2 cable with 70mm^2 Cu wire screen	 3 3	 180291 180350
12	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
13	Spring-loaded Nut	6	Unistrut Part No. P1010

Note 1. The palm width of the lug shall not exceed 36mm.

Note 2. Cable glands are to be installed before making the actual termination.

Note 3. Universal screw lug to be installed only on feeder endboxes having a depth of 210mm. For all other endbox depths, do not install universal screw lug.

Note 4. Prior to terminating the feeder cables into the switch, ensure that the universal screw and lock nut that are fitted to the switchgear bushing are tight.

Note 5. Insulating sleeve shall be installed in accordance with the installation instruction supplied in the insulating sleeve kit.

Note 6. For 185 mm^2 and 300mm^2 phase cores note the following:

- For 185mm^2 single core cables (including 185mm^2 cables with 70mm^2 Cu wire screen), two layers of WCSM 48/12 (stockcode 90274) tubing will be required in the area of the gland to increase the cable diameter to ensure the gland will secure in place.
- For 300mm^2 single core cables (including 300mm^2 cables with 70mm^2 Cu screen), a layer of WCSM 48/12 (stockcode 90274) tubing will be required in the area of the gland to increase the cable diameter to ensure the gland will secure in place.

10.14.2 Transformer cable termination

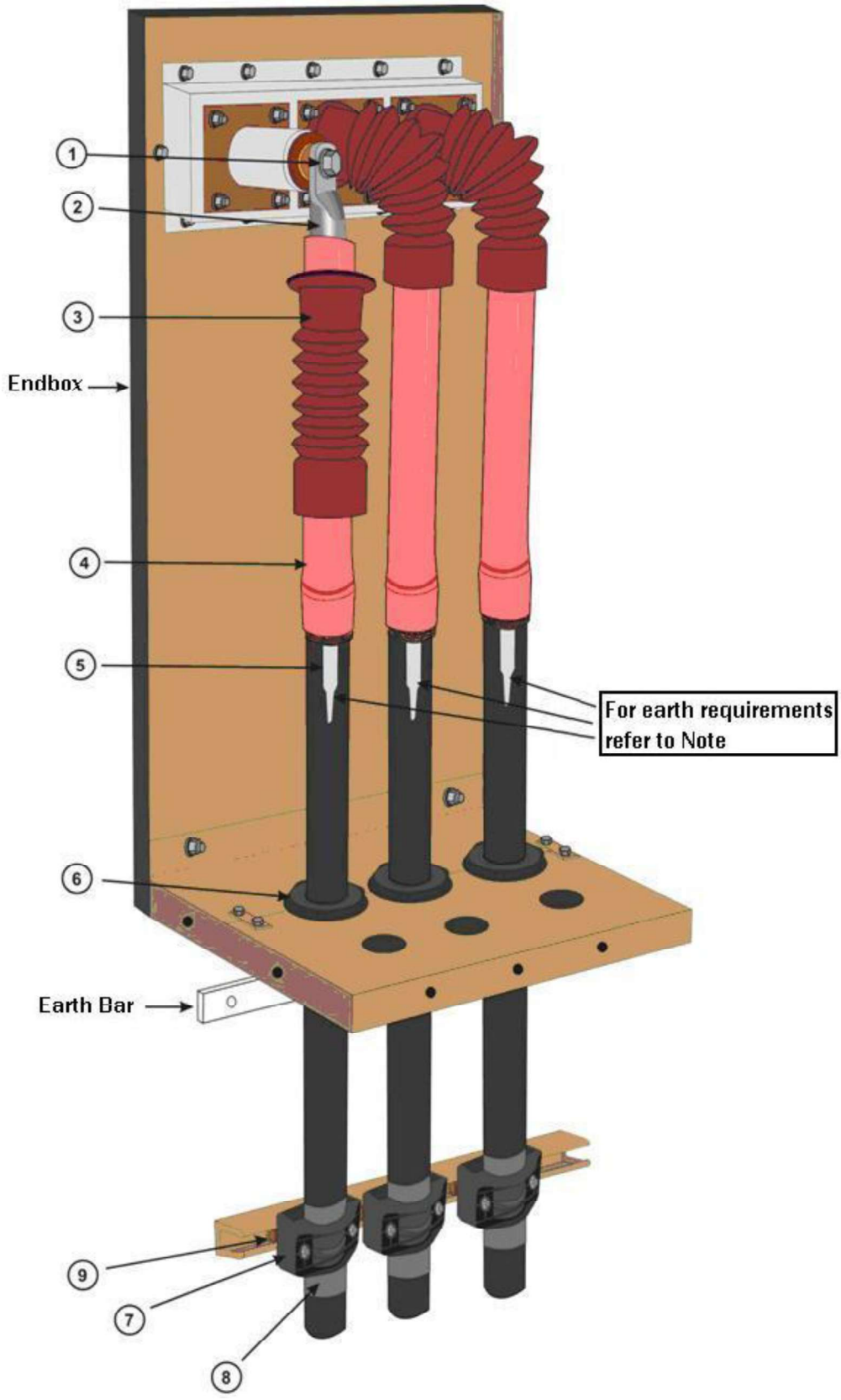


Figure 10-12 – Indoor Transformer Tail Cable Termination

Note: For earthing requirements see Clause 10.23.

Table 12 – Material List for Indoor Transformer Tail Cable Termination into Lucy VRN6a Switchgear

Item	Description	Qty	Stockcode
1	M12 x 30mm stainless steel bolt Flat washer Spring washer	3 3 3	H38528 49429 143859
2	70mm^2 Copper lugs	3	H95851
3	Insulating Sleeve (kit contains three sleeves) for: Transformer Tail Cable Endbox	1	177136
4	70mm^2 Termination kit	1	177791
5	Screen wire rejacketing tubing	Cut to length from 40 m roll	177751
6	Cable glands	3	118125
7	Cable clamp suitable for 70mm^2	3	180291
8	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
9	Spring-loaded Nut	6	Unistrut Part No. P1010

Note 1. Cable glands are to be installed before making the actual termination.

Note 2. Insulating sleeve shall be installed in accordance with the installation instruction supplied in the insulating sleeve kit.

10.15 Cable termination for RM6 switchgear (HV1-52)

10.15.1 Non arc chamber RM6 design

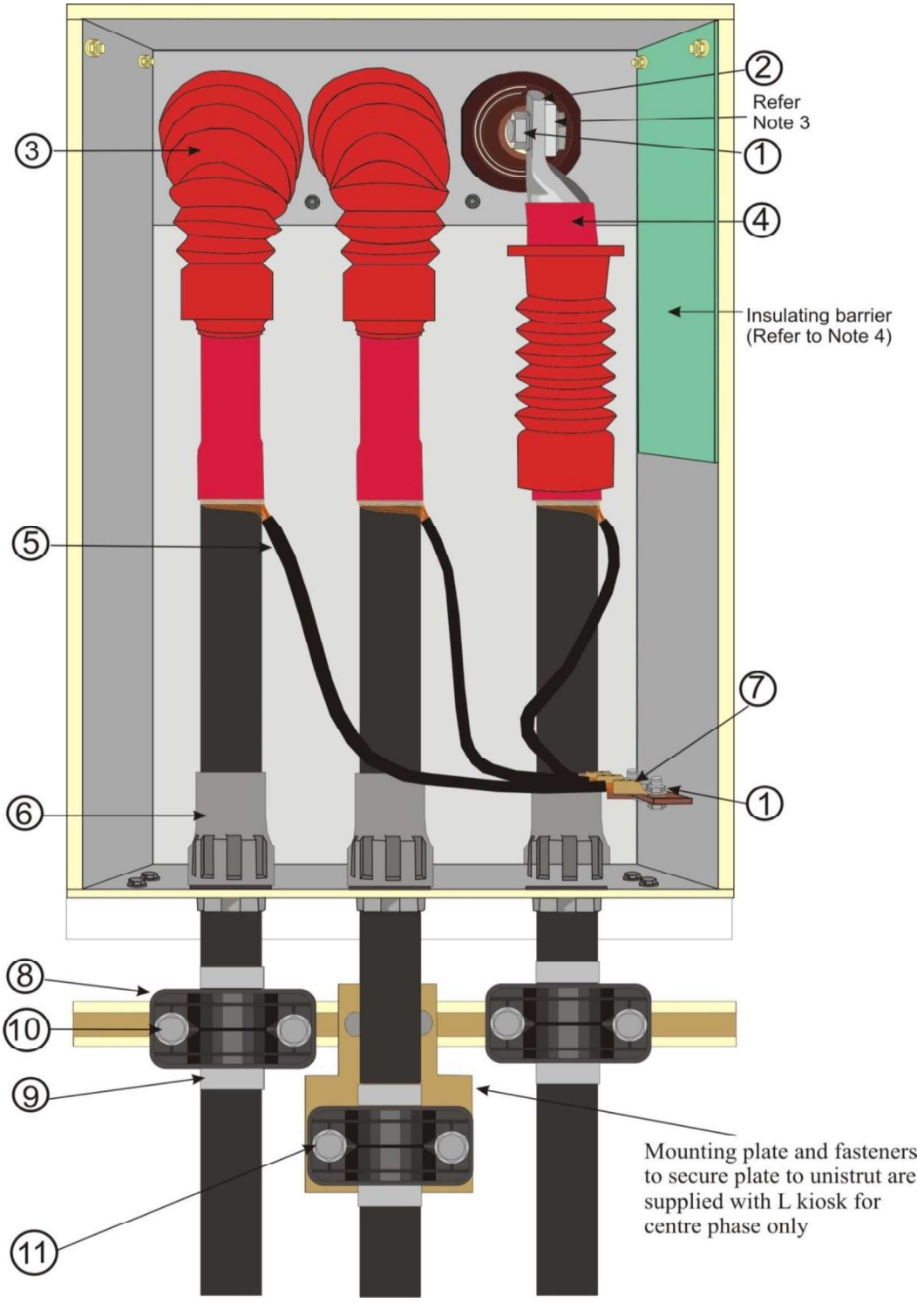


Figure 10-13 – Indoor Termination into Non Arc Chamber RM6 Switchgear (Left hand side feeder endbox shown)

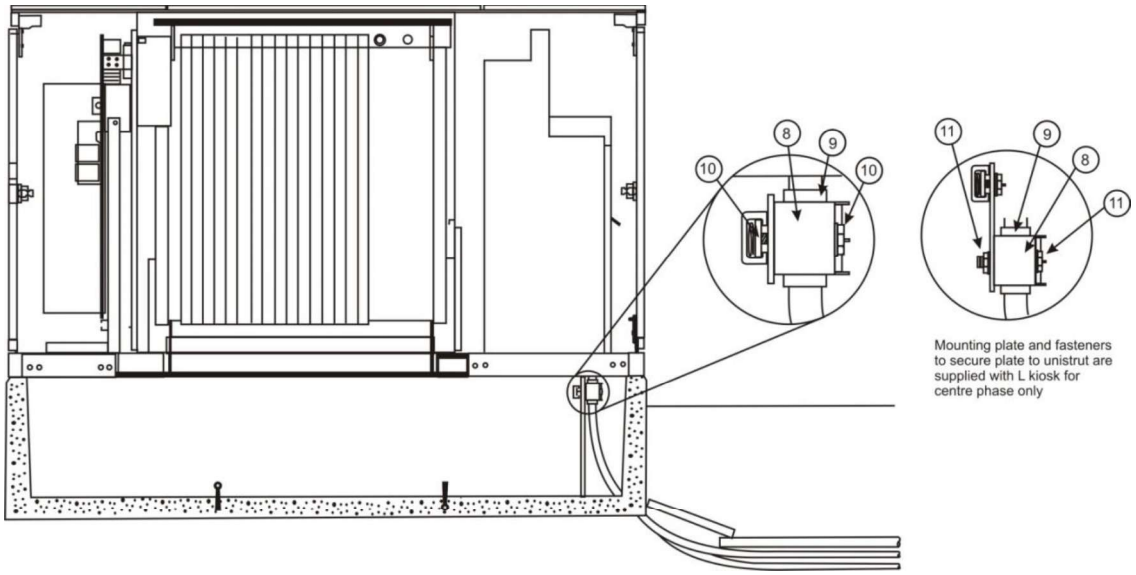


Figure 10-14 – Cable Clamping Details (side view)

Table 13 – Material List for Indoor Termination into Non Arc Chamber RM6 Switchgear

Item	Description	Qty	Stockcode
1	M12 x 30mm stainless steel bolt, M12 stainless steel nut, 2 x M12 stainless steel flat washers, M12 stainless steel spring washer	3	175911
2	Phase core lugs	3	See Clause 10.5 See Note 1.
3	Insulating Sleeve (kit contains three sleeves) for: Feeder Cable Endbox	1	177136
4	Termination kit	1	See Table 2
5	Screen wire rejacketing tubing For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	Cut to length from 40 m roll Cut to length from 10 m roll	177751 90258
6	Cable glands (See Note 6.)	3	177733
7	Screen wire lugs: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 3 3	 177741 H95851
8	Cable clamp for: 185mm^2 cables with Cu wire screen less than 70mm^2 185mm^2 and 300mm^2 cables with 70mm^2 Cu wire screen	 3 3	 180291 180350
9	Nitrile rubber liner	3 Cut to length from 300mm strip	179201
10	Spring-loaded nut M12 x 65mm Stainless steel set screw M12 x Stainless steel flat washer	4 4 4	Unistrut Part No. P4010 157099 49429

Item	Description	Qty	Stockcode
	Cleating arrangement on mounting plate (centre phase)		
11	M12 x 75mm Stainless steel set screw	2	Blackwoods Part No. 0059 6054
	M12 x Stainless steel spring washer	2	143859
	M12 x Stainless steel nut	2	8987
	M12 x Stainless steel flat washer	4	49429

Note 1. The palm width of the lug shall not exceed 36mm.

Note 2. Cable glands are to be installed before making the actual termination.

Note 3. Prior to terminating the feeder cables into the switch, ensure that the universal screw and lock nut are tight.

Note 4. Prior to terminating the cables ensure that the insulating barriers are fixed to the inside wall of each feeder endbox closest to the tee-off cable as shown. If the insulating barriers are missing, please contact Ausgrid.

Note 5. Insulating sleeve shall be installed in accordance with the installation instruction supplied in the insulating sleeve kit.

Note 6. For 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen the outer composite sheath will need to be removed 120mm below the base of the gland plate to decrease the cable diameter to ensure the gland will fit correctly over the inner composite sheath. A 80mm length of rejacketing tube (stockcode 177730) is then shrunk centrally over the outer composite sheath cut.

10.15.2 Arc chamber RM6 design

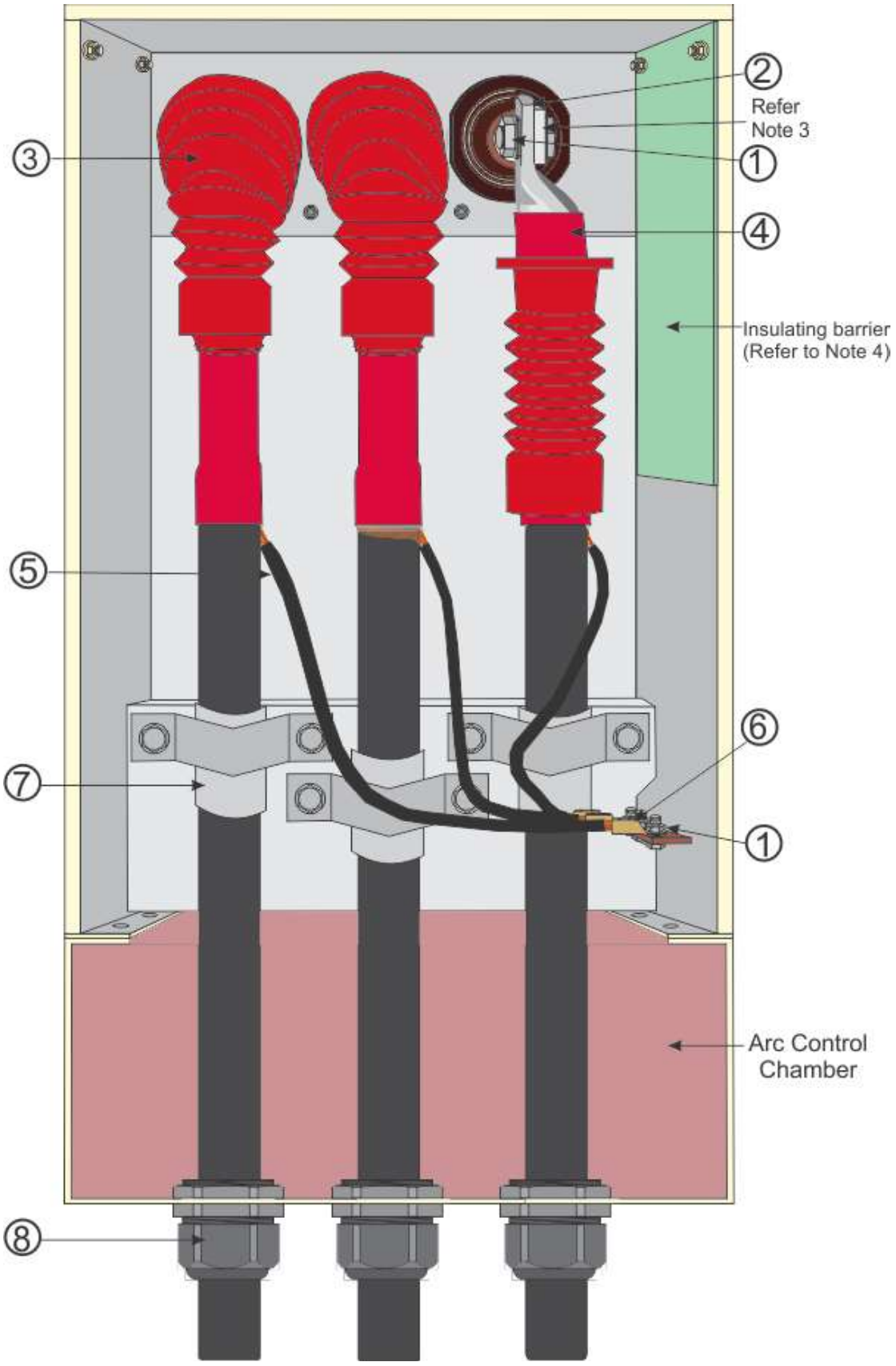


Figure 10-15 – Indoor Termination into Arc Chamber RM6 Switchgear (Left hand side feeder endbox shown)

Table 14 – Material List for Indoor Termination into Arc Chamber RM6 Switchgear

Item	Description	Qty	Stockcode
1	M12 x 30mm stainless steel bolt, M12 stainless steel nut, 2 x M12 stainless steel flat washers, M12 stainless steel spring washer	3	175911
2	Phase core lugs	3	See Clause 10.5 See Note 1.
3	Insulating Sleeve (kit contains three sleeves) for: Feeder Cable Endbox	1	177136
4	Termination kit	1	See Table 2
5	Screen wire rejacketing tubing For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	Cut to length from 40 m roll Cut to length from 10 m roll	177751 90258
6	Screen wire lugs: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	3 3	177741 H95851
7	Nitrile rubber liner	3 Cut to length from 300mm strip	179201
8	Cable glands (See Note 6)	3	179132

Note 1. The palm width of the lug shall not exceed 36mm.

Note 2. Cable glands are to be installed before making the actual termination.

Note 3. Prior to terminating the feeder cables into the switch, ensure that the universal screw and lock nut are tight.

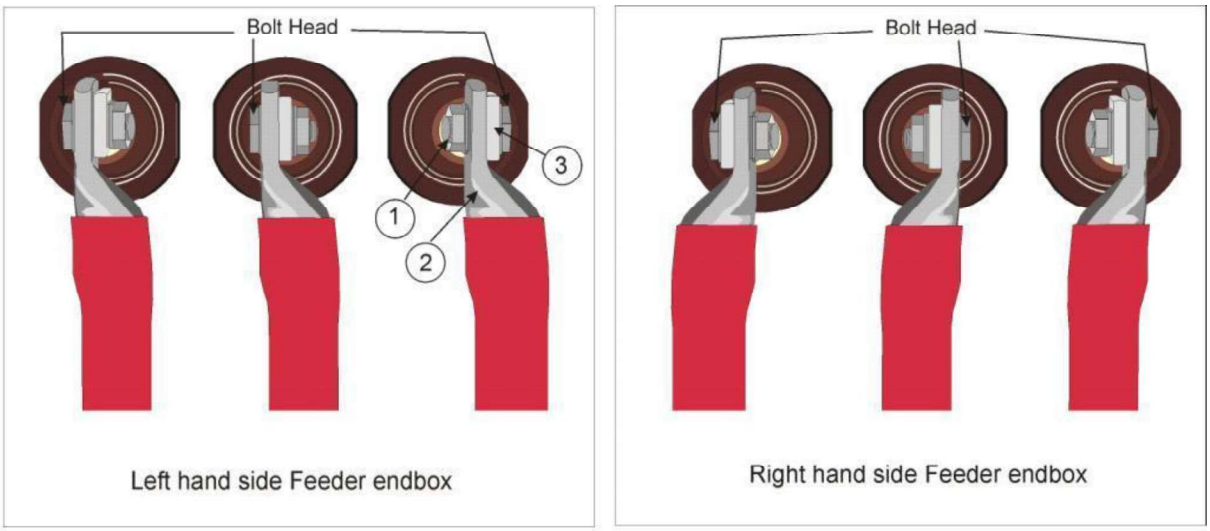
Note 4. Prior to terminating the cables ensure that the insulating barriers are fixed to the inside wall of each feeder endbox closest to the tee-off cable as shown. If the insulating barriers are missing, please contact Ausgrid.

Note 5. Insulating sleeve shall be installed in accordance with the installation instruction supplied in the insulating sleeve kit.

Note 6. For 185mm^2 and 300mm^2 phase cores note the following:

- For 185mm^2 single core cables (including 185mm^2 cables with 70mm^2 Cu wire screen), two layers of WCSM 48/12 (stockcode 90274) tubing will be required in the area of gland to increase the cable diameter to ensure the gland will secure in place
- For 300mm^2 single core cables (including 300mm^2 cables with 70mm^2 Cu screen), a layer of WCSM 48/12 (stockcode 90274) tubing will be required in the area of the gland to increase the cable diameter to ensure the gland will secure in place.

10.15.3 Orientation of Lugs and Bolts in Feeder Endbox

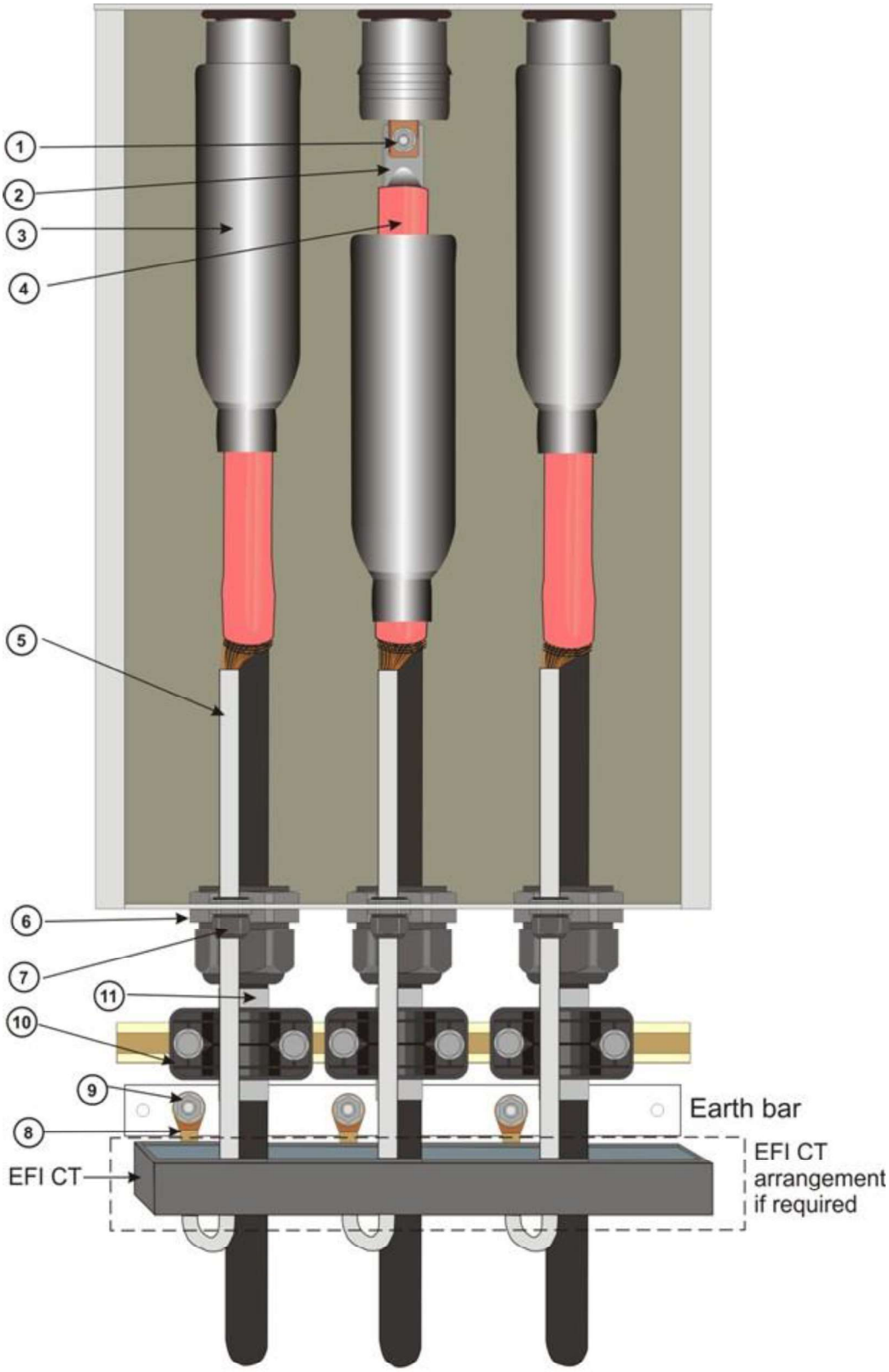


1. M12x30mm stainless steel bolt, nut, spring washer and flat washer
2. Phase core lugs
3. Universal screw

Note the orientation of the lug palm in relation to the universal screw for each phase.
Note the bolt head orientation for each phase. All bolt heads are not oriented in the same direction.

Figure 10-16 – Orientation of Lugs and Bolts in Feeder Endboxes

10.16 Cable termination for ABB Safelink switchgear (HV1-54)



Feeder Cable Termination in Chamber Substation with ABB Safelink or ABB Safelink 2 Switch

Figure 10-17 – Indoor Cable Termination (side view)

Table 15 – Material List for Indoor Cable Termination into ABB Safelink Switchgear

Item	Description	Qty	Stockcode
1	M12 x 35mm stainless steel bolt M12 stainless steel nut M12 stainless steel flat washer M12 stainless steel spring washer	3 3 6 3	45021 8987 49429 143859
2	Phase core lugs	3	See Clause 10.5 and Note 1 below
3	In-line Insulating sleeve (kit contains 3 sleeves): For Feeder cable endbox For Transformer tee-off endbox	 1 1	 180423 180423
4	Termination kit	1	See Table 2
5	Screen wire rejacketing tubing: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 Cut to length from 40 m roll Cut to length from 10m roll	 177751 90258
6	Cable glands: For 185mm^2 to 300mm^2 phase core (See Note 5.) For 70mm^2 phase core (transformer tee-off)	 3 3	 179132 118125
7	Cable glands – screen wire: For Feeder Cable endbox For Transformer tee-off endbox	 3 3	 118091 177771
8	Screen wire lugs: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 3 3	 177741 H95851
9	M12 x 30mm stainless steel bolt, M12 stainless steel nut, 2 x M12 stainless steel flat washers, M12 stainless steel spring washer	3	175911
10	Cable clamp for: 70 to 185mm^2 cables with Cu wire screen less than 70mm^2 185mm^2 and 300mm^2 cables with 70mm^2 Cu wire screen	 3 3	 180291 180350
11	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
12	Spring-loaded Nut	6	Unistrut Part No. P1010

Note 1. The palm width of the lug shall not exceed 36mm.

Note 2. Cable glands are to be installed before making the actual termination.

Note 3. The inline insulation sleeve shall be installed in accordance with the installation instruction supplied in the insulation sleeve kit.

Note 4. Lug orientation is critical in the feeder end boxes. Refer to Figures 10-18 and 10-19 for RHS and LHS feeder end box lug orientation.

Note 5. For 185mm^2 and 300mm^2 phase cores note the following:

- For 185mm^2 single core cables (including 185mm^2 cables with 70mm^2 Cu wire screen), two layers of WCSM 48/12 (stockcode 90274) tubing will be required in the area of gland to increase the cable diameter to ensure the gland will secure in place.
- For 300mm^2 single core cables (including 300mm^2 cables with 70mm^2 Cu screen), a layer of WCSM 48/12 (stockcode 90274) tubing will be required in the area of the gland to increase the cable diameter to ensure the gland will secure in place.

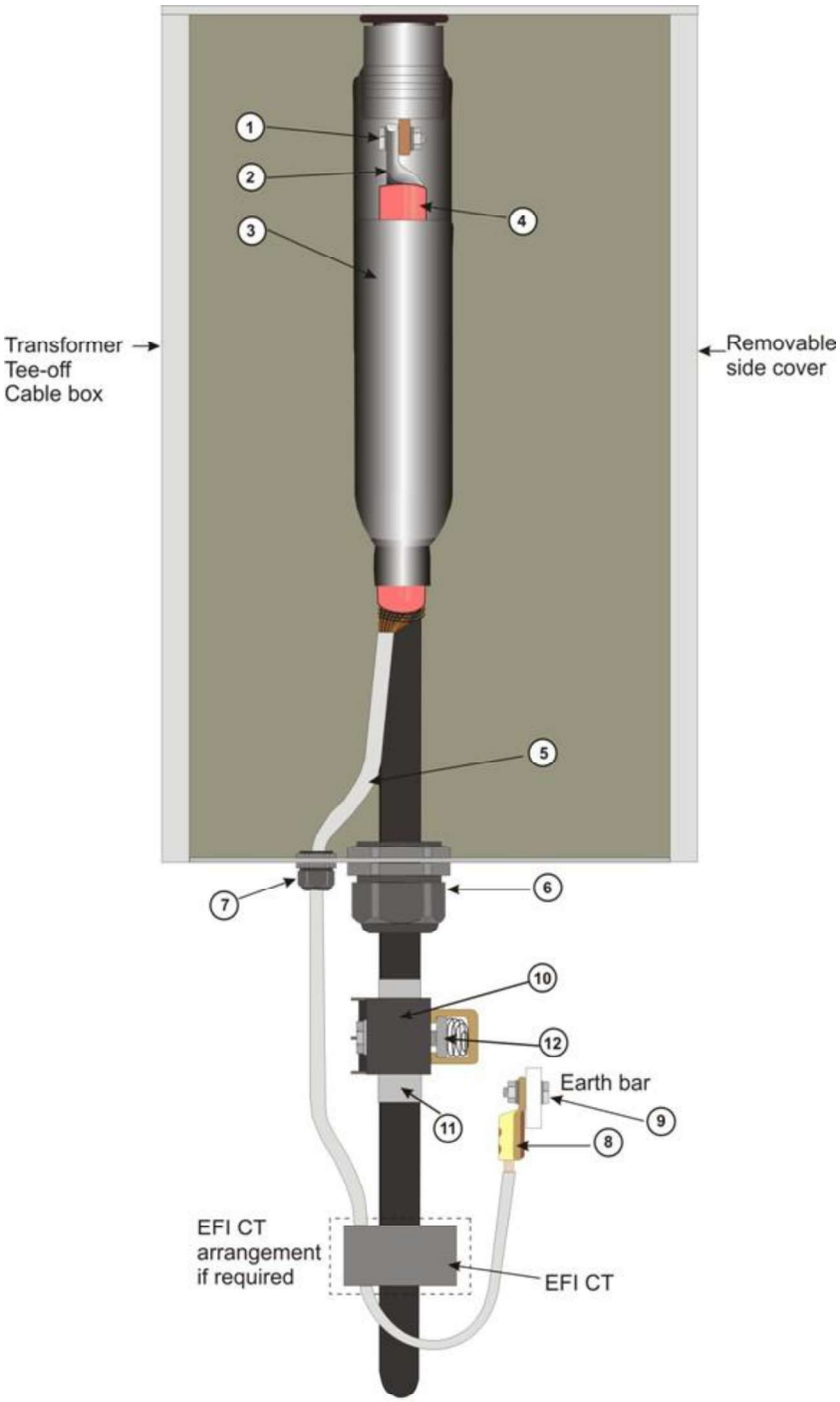


Figure 10-18 – Indoor Feeder Cable Termination (RHS endbox front view)

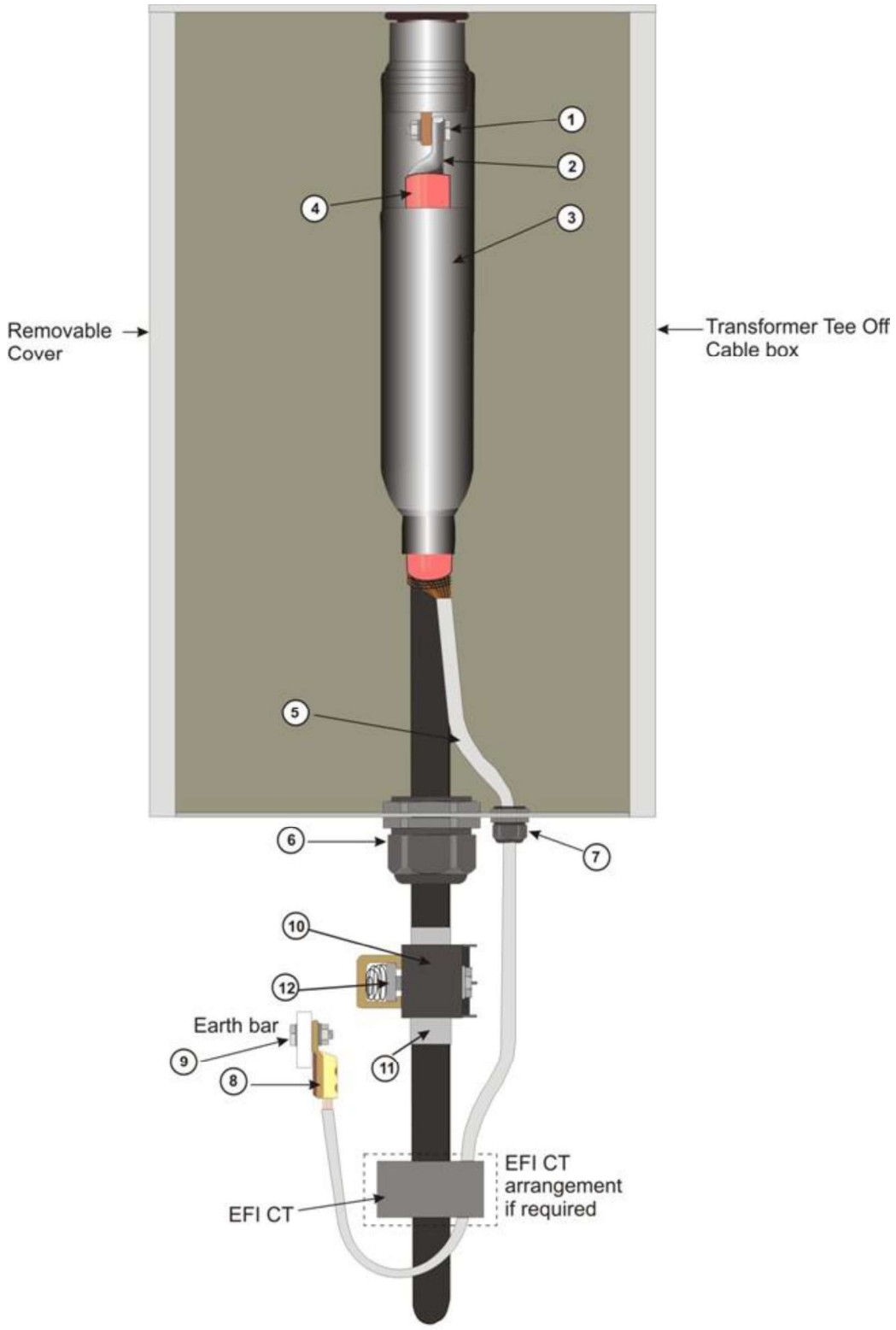


ABB Safelink or ABB Safelink 2 LHS Feeder Endbox in Chamber Substation

Figure 10-19 – Indoor Feeder Cable Termination (LHS endbox front view)

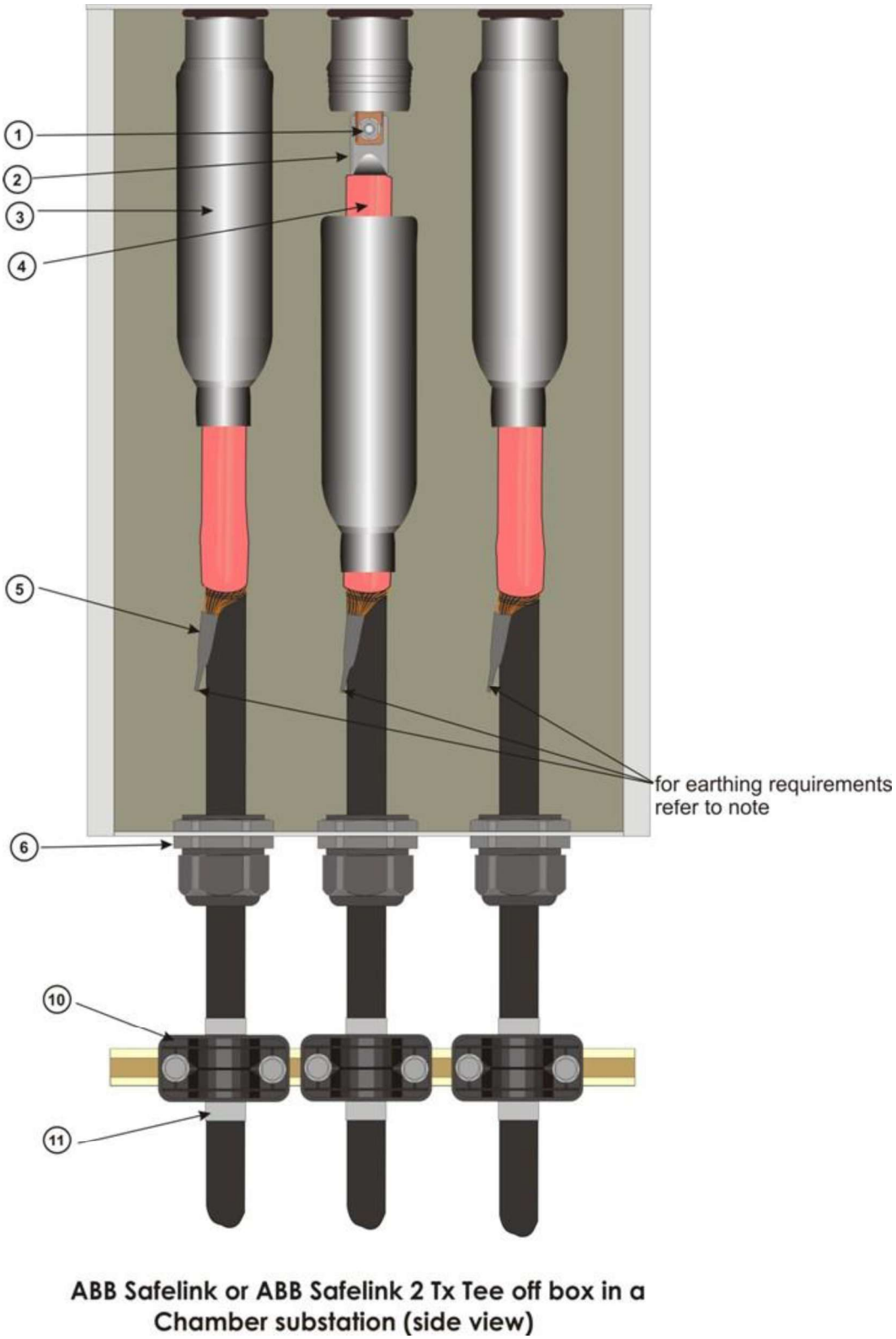
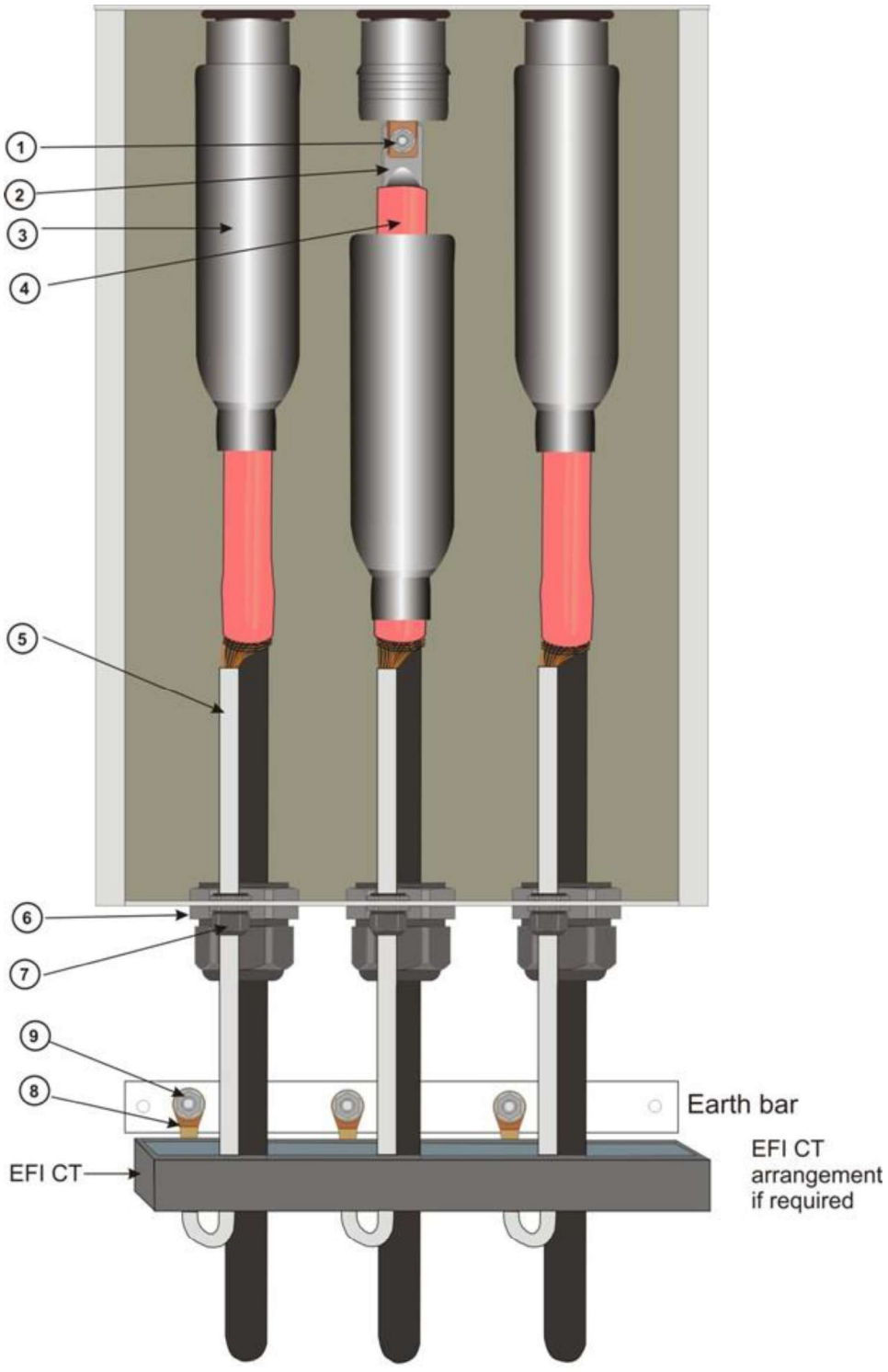


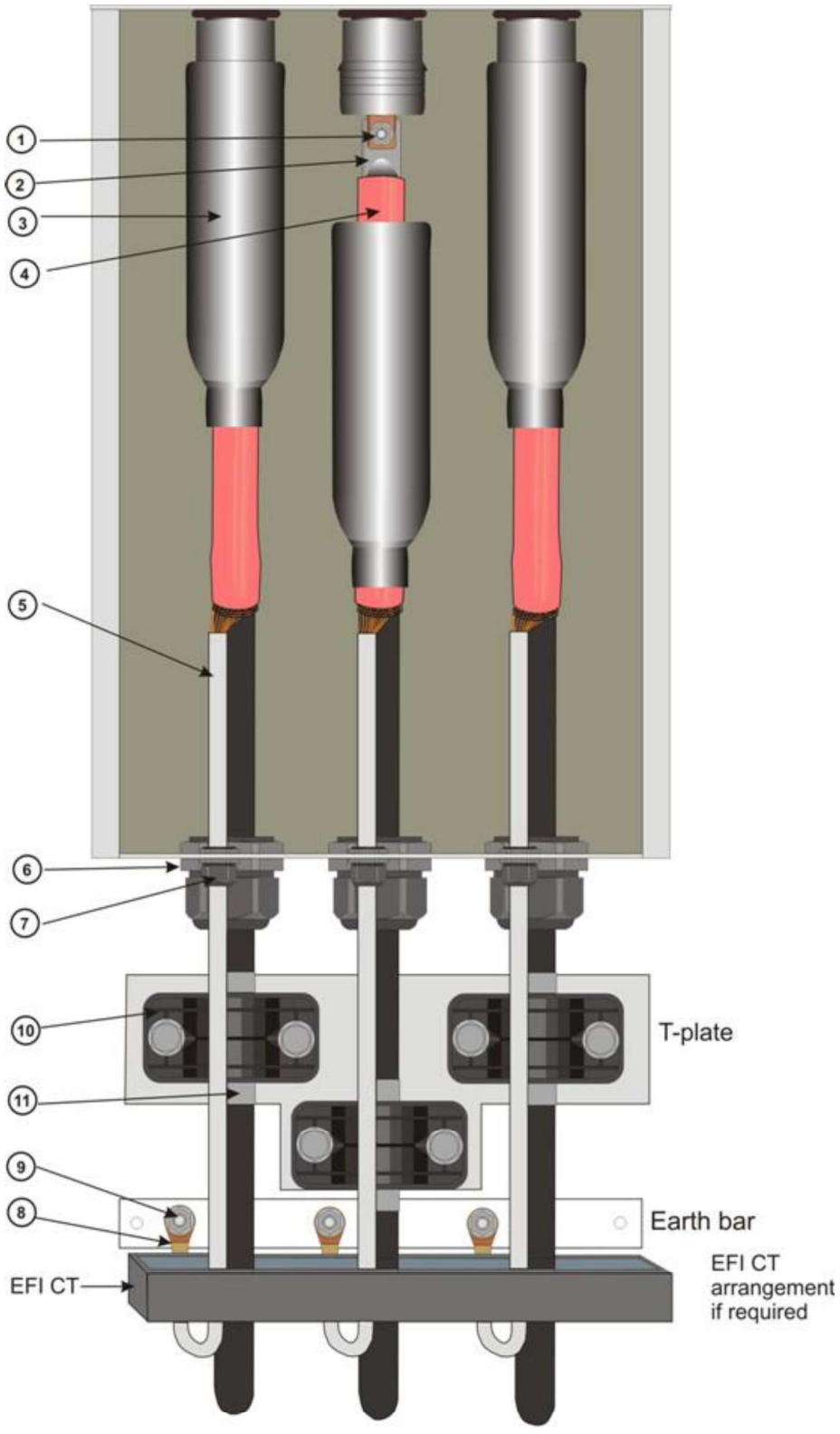
Figure 10-20 – Tx cable termination in a Chamber substation (side view)

Note: For earthing requirements see Clause 10.23.



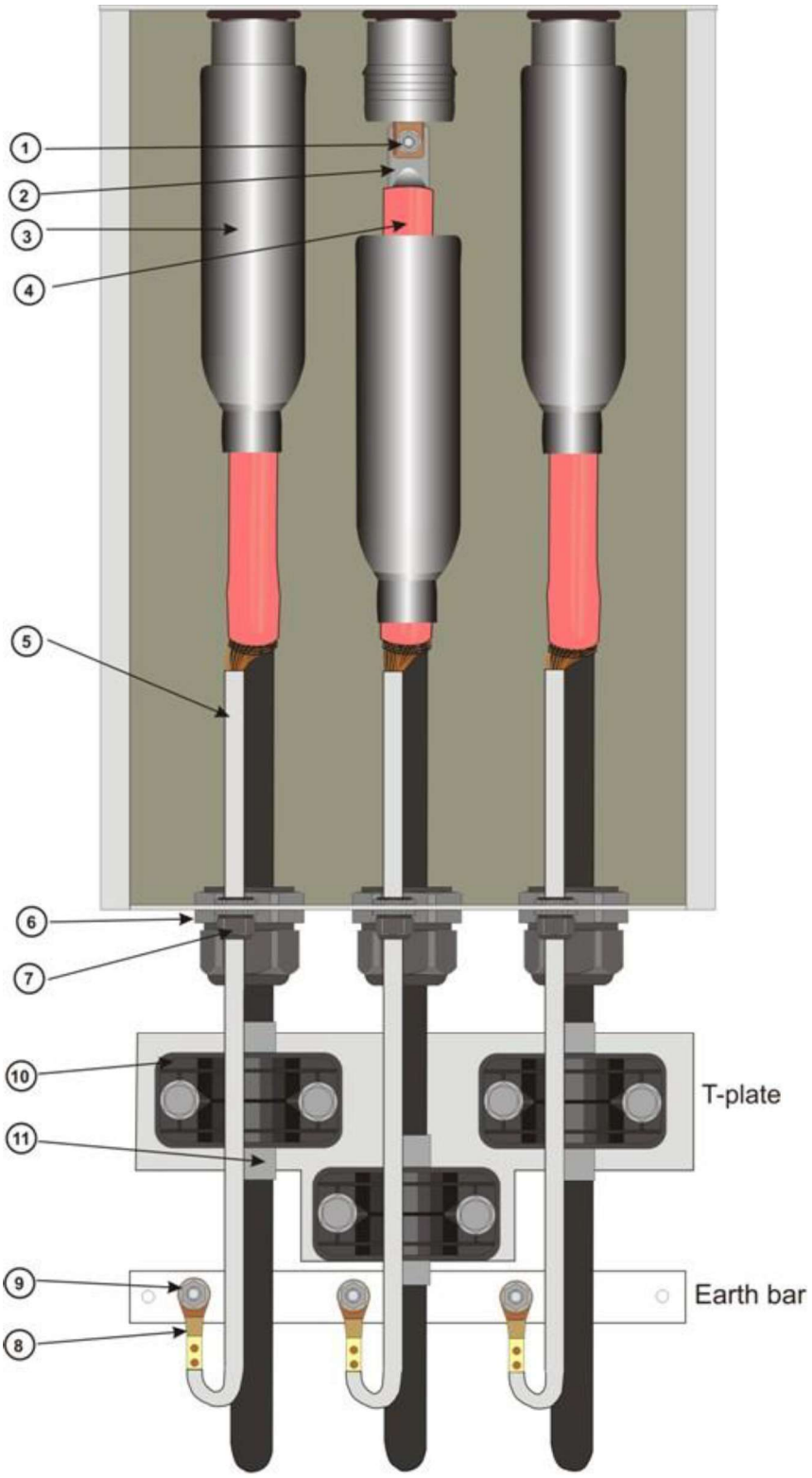
Feeder Cable Termination in Schneider J kiosk Substation with ABB Safelink or ABB Safelink 2 Switch

Figure 10-21 – Feeder cable termination in Schneider J kiosk substation



Feeder Cable Termination in Schneider L kiosk Substation with ABB Safelink Switch

Figure 10-22 – Feeder cable termination in Schneider L kiosk substation with ABB Safelink 1 switch



Feeder Cable Termination in Schneider L kiosk Substation with ABB Safelink 2 Switch

Note: Bushing CT incorporated in the feeder switches to connect the built in EFI (Horstmann).

Figure 10-23 – Feeder cable termination in Schneider L kiosk substation with ABB Safelink 2 switch

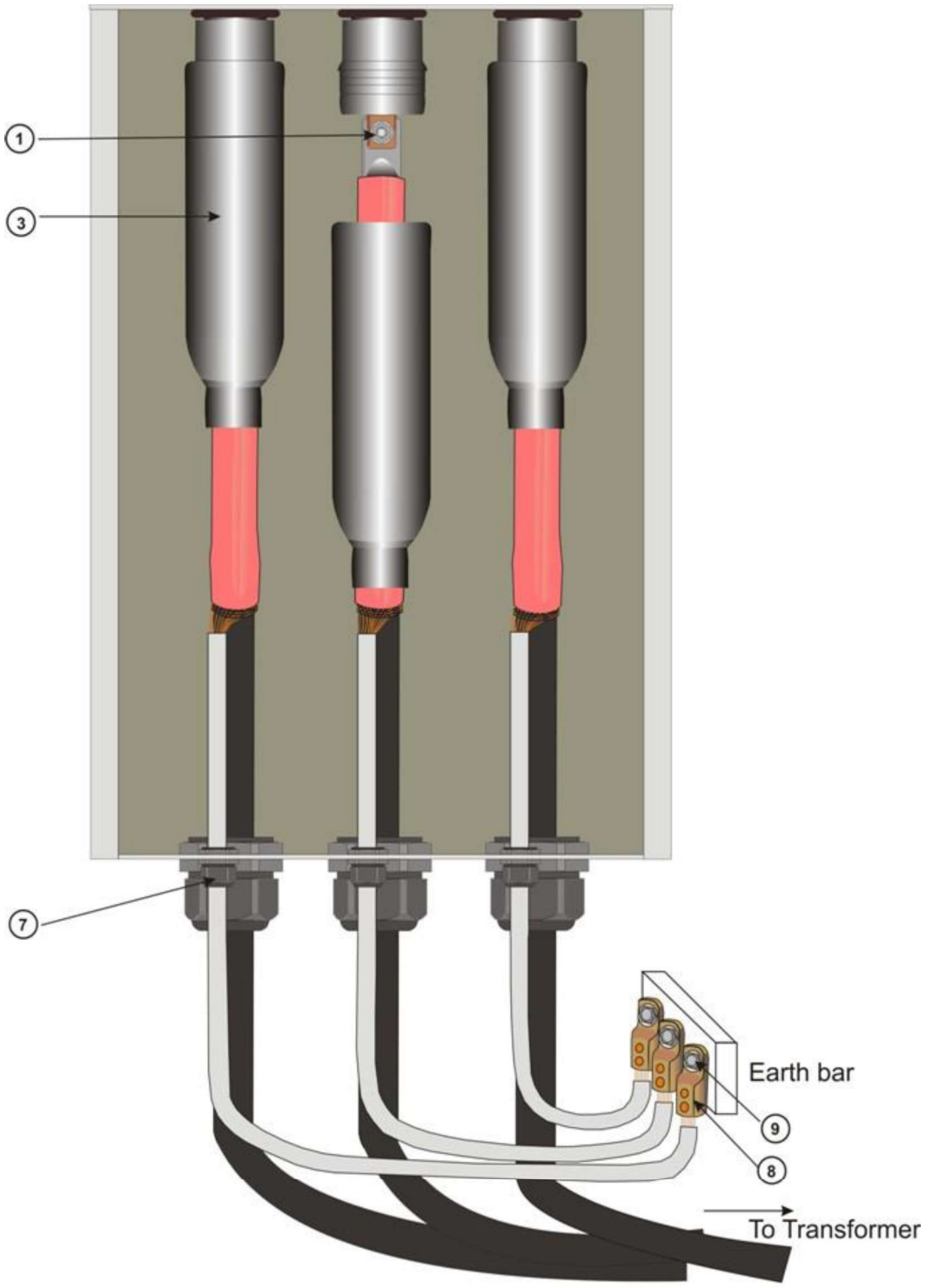
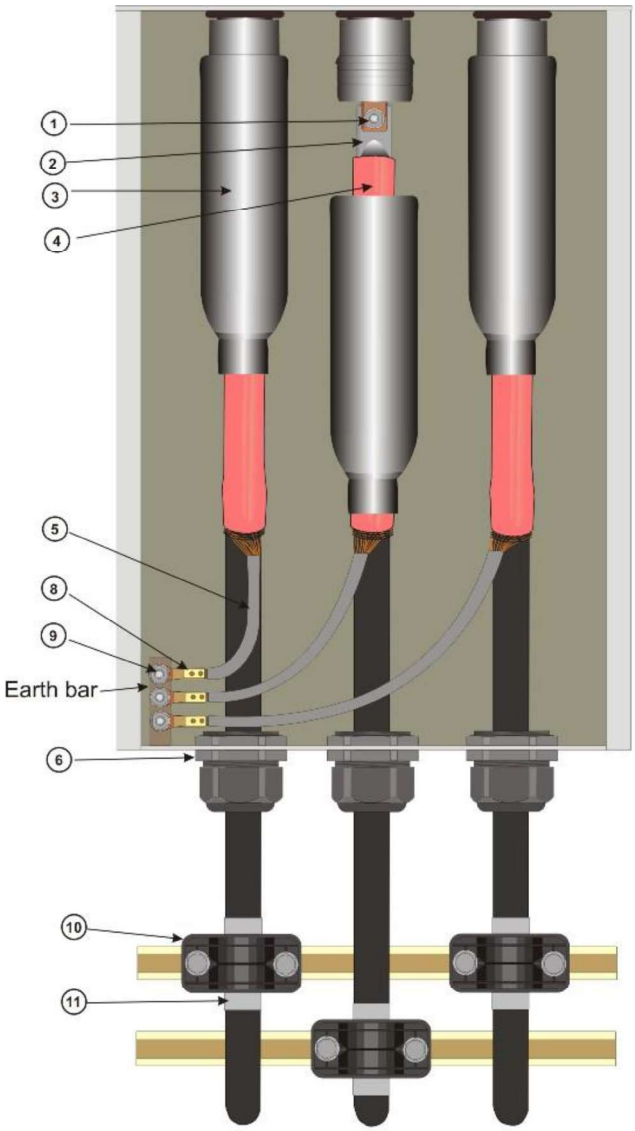


ABB Safelink Tx Tee-off Cable in Schneider Kiosk Substation

Note: Transformer lead sets are to be purchased from the kiosk manufacturer for any repair work.

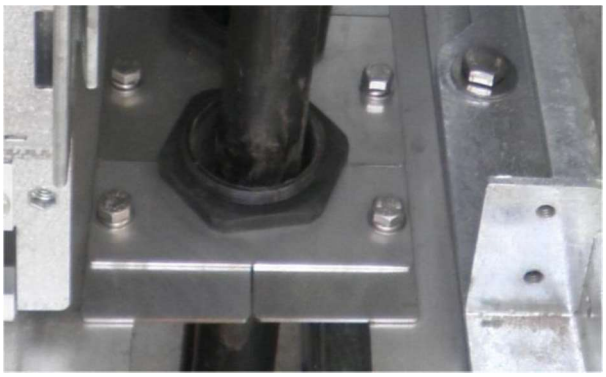
Figure 10-24 – Tx Cable termination in Schneider kiosk substation



Feeder Cable Termination in Wilson kiosk substation with ABB Safelink 2 Switch

Figure 10-25 – Feeder cable termination in Wilson Transformer kiosk substation

Note: Wilson Transformer kiosk endboxes have a double layer split gland plate arrangement.



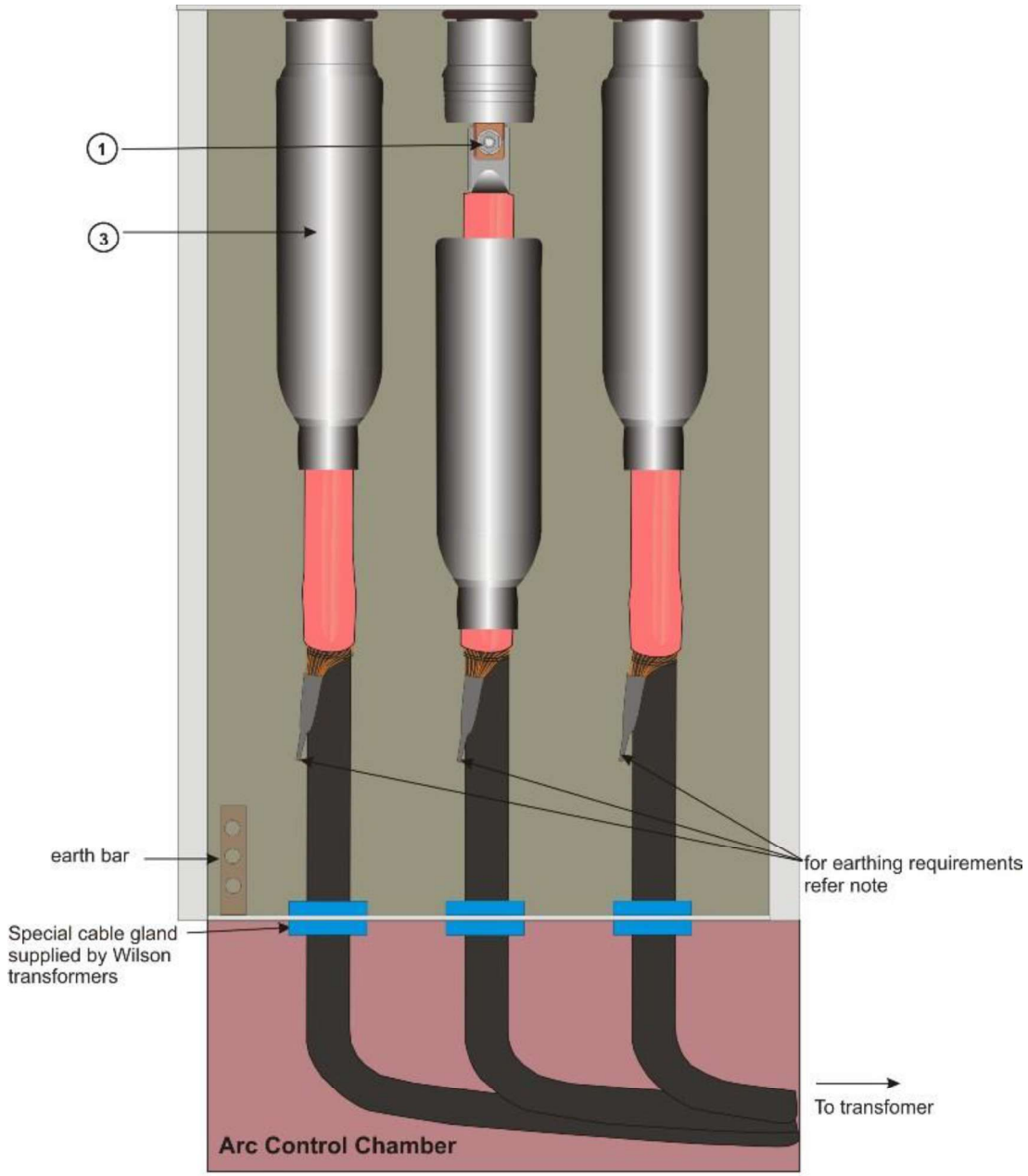


ABB Safelink 2 Tx Tee off box in Wilson kiosk substation (side view)

Note: For earthing requirements see Clause 10.23.

Transformer lead sets are to be purchased from the kiosk manufacturer for any repair work.

Figure 10-26 – Tx cable termination in Wilson Transformer kiosk substation

10.17 Cable termination for Siemens 8DJH switchgear (HV1-56)

10.17.1 Feeder Cable Termination – SF_6

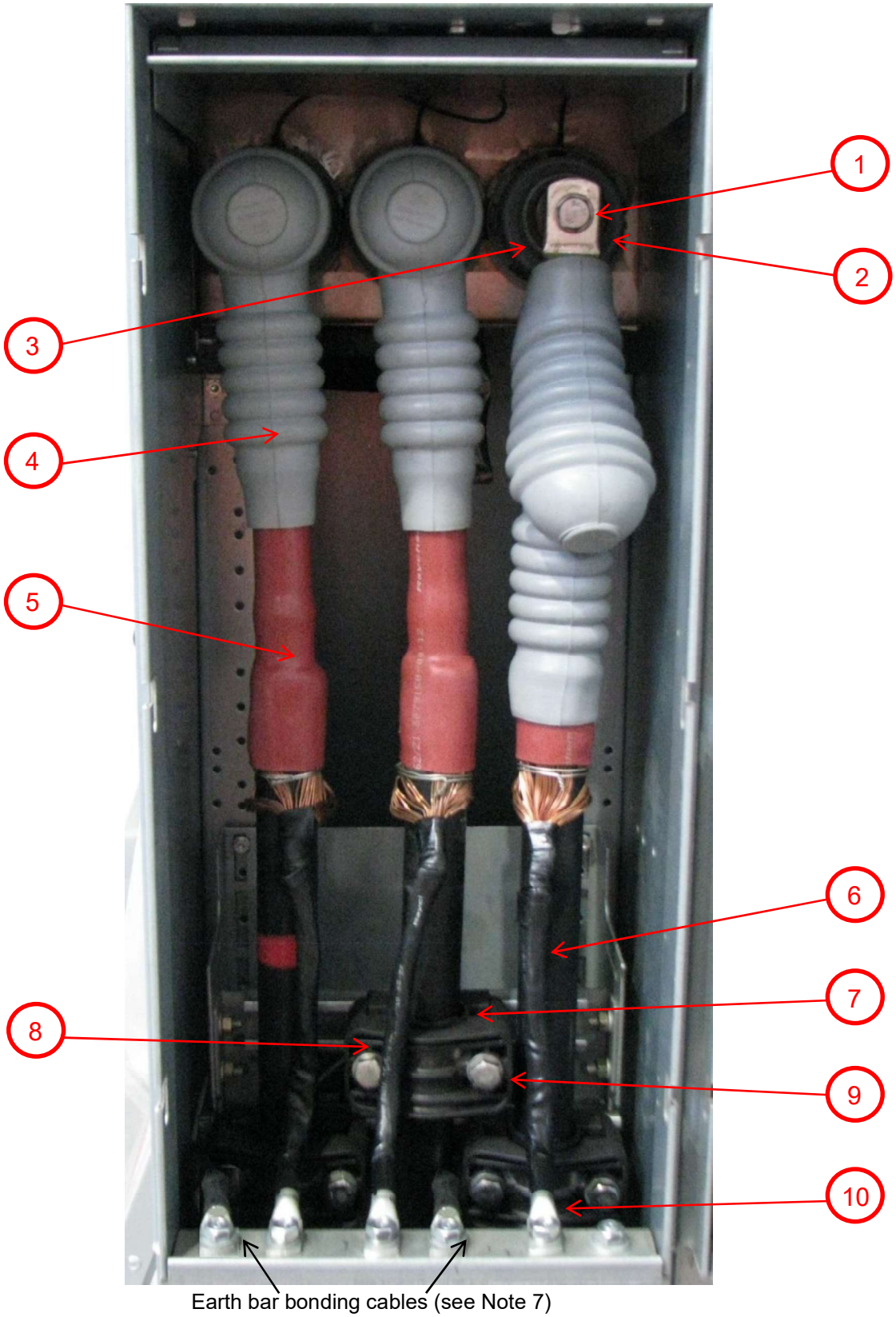


Figure 10-27 – Indoor Feeder Cable Termination (front view) – SF_6

Table 16 – Material List for Indoor Feeder Cable Termination – SF_6

Item	Description	Qty	Stockcode
1	M12 x 40mm stainless steel set screw M12 stainless steel flat washer M12 stainless steel spring washer	3 3 3	45146 49429 143859
2	Phase core lugs	3	See Clause 10.5 and Note 1 below
3	Insulating sleeve grommets (kit contains 6 grommets)	1	See Note 4 below
4	Insulating sleeve (kit contains 3 sleeves)	1	See Note 4 below
5	Termination kit	1	See Table 2
6	Screen wire rejacketing tubing: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 Cut to length from 40 m roll Cut to length from 10m roll	 177751 90258
7	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
8	Cable clamp for: 95 to 185mm^2 cables with Cu wire screen less than 70mm^2 185mm^2 and 300mm^2 cables with 70mm^2 Cu wire screen (see note 9)	 3 3	 180291 180350
9	M12 x 70mm Stainless steel set screw M12 x Stainless steel flat washer Spring-loaded nut (see note 9)	6 6 6	Blackwoods Part No. 0003 1331 49429 Unistrut Part No. P4010
10	Screen wire lugs: For all cables except 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen For 185mm^2 and 300mm^2 single core polymeric cables with 70mm^2 Cu wire screen	 3 3	 177741 H95851
	Cable glands (See Note 6)	3	179132

Note 1. The palm width of the lug shall not exceed 36mm.

Note 2. Cable glands are to be installed before making the actual termination.

Note 3. The tightening torque for the set screw (1) is 50Nm.

Note 4. The insulating sleeves and grommets are supplied with switchgear delivered to Ausgrid but NOT supplied in Tyree kiosks. Insulating sleeves (Part No. KS-300) are available as Stockcode 185501 – CABLEBOOTS KS300 FOR SIEMENS 8DJH SWITCH SET OF 3 BOOTS. Grommets (Schneider Electric Part No. 3728639).

Note 5. The insulating sleeve shall be installed in accordance with the installation instruction supplied in the insulating sleeve kit.

Note 6. For 185mm^2 and 300mm^2 phase cores note the following:

- For 185mm^2 single core cables (including 185mm^2 cables with 70mm^2 Cu wire screen), two layers of WCSM 48/12 (stockcode 90274) tubing will be required in the area of gland to increase the cable diameter to ensure the gland will secure in place.
- For 300mm^2 single core cables (including 300mm^2 cables with 70mm^2 Cu screen), a layer of WCSM 48/12 (stockcode 90274) tubing will be required in the area of the gland to increase the cable diameter to ensure the gland will secure in place.

Note 7. Two 70mm² earth bar bonding cables (stockcode 60111) are required to bond the main earth bar located inside the cable endbox to the screen wire earth bar located at the front of the cable endbox.

Note 8. Screened Elbow Connectors mentioned in 10.17.2 Table 17 can also be used for this termination. Remove thread reducer where required.

Note 9. The supplied cable clamp and set screws can be used if meeting specifications of items 8 and 9

10.17.2 Feeder Cable Termination – BlueGIS

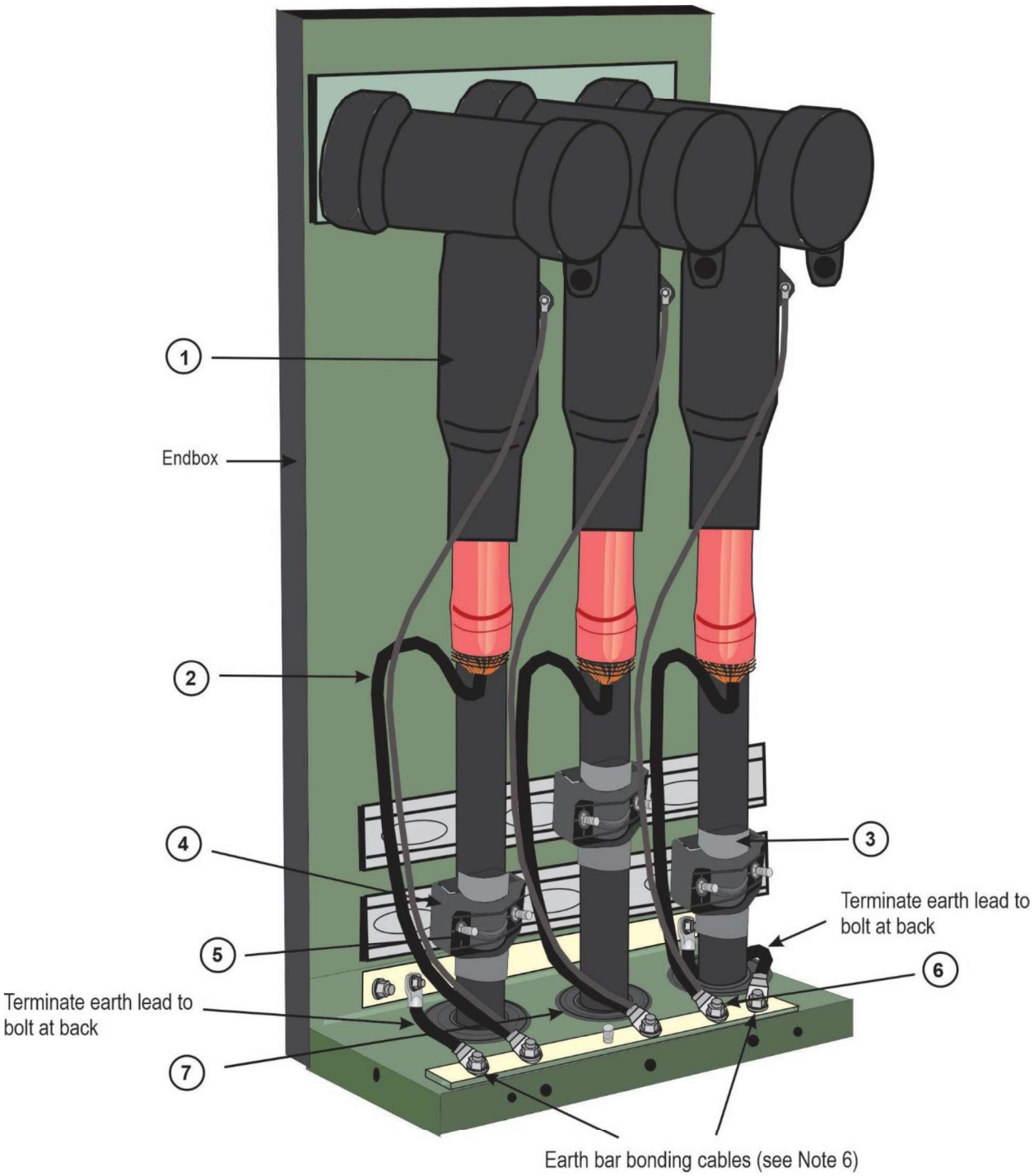


Figure 10-28 – Indoor Feeder Cable Termination (front view) – BlueGIS

Table 17 – Material List for Indoor Feeder Cable Termination – BlueGIS

Item	Description	Qty	Stockcode
1	Separable Connector (Elbow) kit For 185mm² single core polymeric cables with 70mm² Cu wire screen For 300mm² single core polymeric cables with 70mm² Cu wire screen	 1 1	 182621 182622
2	Screen wire rejacketing tubing: For 185mm² and 300mm² single core polymeric cables with 70mm² Cu wire screen	Cut to length from 10m roll	90258
3	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
4	Cable clamp for: 95 to 185mm² cables with Cu wire screen less than 70mm² 185mm² and 300mm² cables with 70mm² Cu wire screen (see note 5)	 3 3	 180291 180350
5	M12 x 70mm Stainless steel set screw M12 x Stainless steel flat washer Spring-loaded nut (see note 5)	6 6 6	Blackwoods Part No. 0003 1331 49429 Unistrut Part No. P4010
6	Screen wire lugs	3	H95851
7	Cable Grommets or Cable Glands (see note 2)	3 3	Schneider Electric Part No. 3728639 179132

Note 1. Cable glands are to be installed before making the actual termination.

Note 2. For 185mm² single core cables (including 185mm² cables with 70mm² Cu wire screen), a layer of WCSM 48/12 (stockcode 90274) tubing will be required in the area of gland to increase the cable diameter to ensure the gland will secure in place.

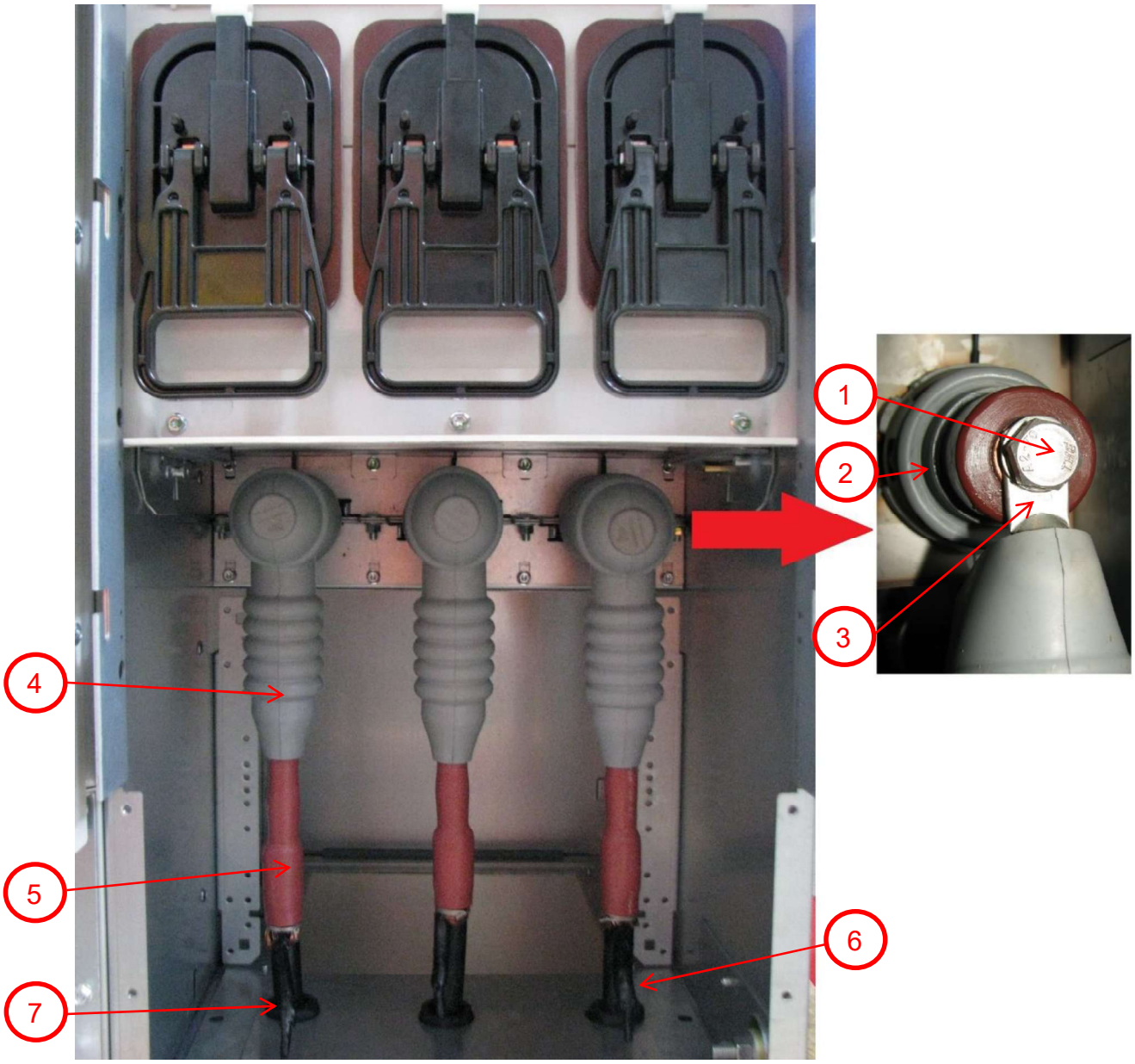
Note 3. The separable connector drain wires are to be terminated onto the earth bar by double banking with the cable screen wire.

Note 4. Cable screen length can be extended with 70mm² PVC insulated earth conductor (60111) and 70mm² screen wire connector (180421).

Note 5. The supplied cable clamp and set screws can be used if meeting specifications of items 4 and 5.

Note 6. Two 70mm² earth bar bonding cables (stockcode 60111) are required to bond the main earth bar located inside the cable endbox to the screen wire earth bar located at the front of the cable endbox.

10.17.3 Transformer Cable Termination – SF_6



Note: For earthing requirements see Clause 10.23.

Figure 10-29 – Indoor Transformer Tail Cable Termination (front view) – SF_6

Table 18 – Material List for Indoor Transformer Cable Termination – SF_6

Item	Description	Qty	Stockcode
1	M12 x 40mm stainless steel set screw M12 stainless steel flat washer M12 stainless steel spring washer	3 3 3	45146 49429 143859
2	Insulating sleeve grommets (kit contains 6 grommets)	1	See Note 4 below
3	70mm^2 Phase core lugs	3	H95851
4	Insulating sleeve (kit contains 3 sleeves)	1	See Note 4 below
5	70mm^2 Termination kit	1	177791
6	Screen wire rejacketing tubing	Cut to length from 40 m roll	177751
7	Cable glands	3	118125

Note 1. The palm width of the lug shall not exceed 36mm.

Note 2. Cable glands are to be installed before making the actual termination.

Note 3. The tightening torque for the set screw (1) is 50Nm.

Note 4. The insulating sleeves and grommets are supplied with the switchgear. Replacement insulating sleeves (Part No. KS-300) are available as Stockcode 185501 – CABLEBOOTS KS300 FOR SIEMENS 8DJH SWITCH SET OF 3 BOOTS.

Note 5. The insulating sleeve shall be installed in accordance with the installation instruction supplied in the insulating sleeve kit.

10.17.4 Transformer Cable Termination – BlueGIS

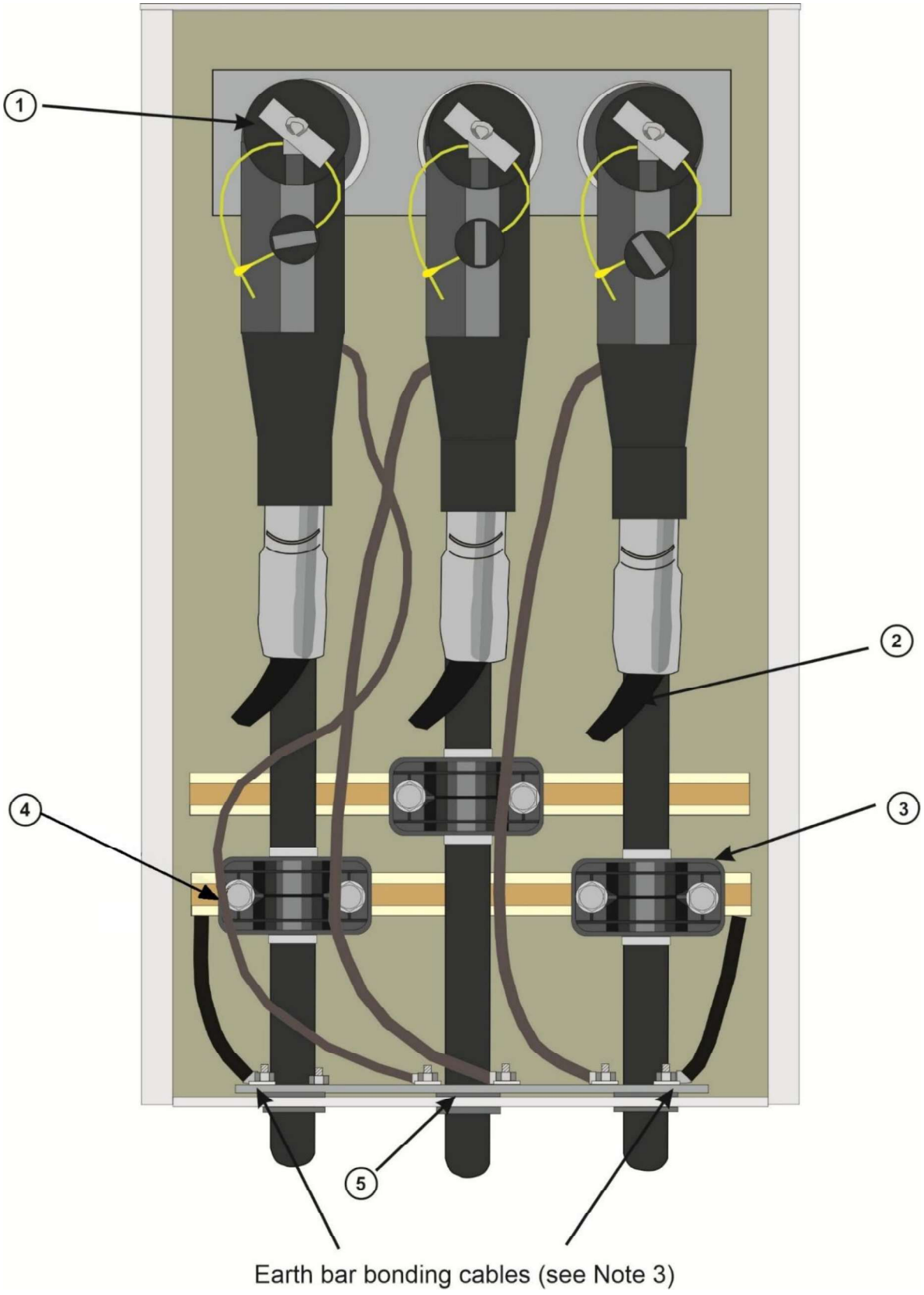


Figure **10-**30 **–** Indoor Transformer Tail Cable Termination (front view) **–** BlueGIS

Table 19 – Material List for Indoor Transformer Cable Termination - BlueGIS

Item	Description	Qty	Stockcode
1	Screened Separable Connector (Elbow) kit For 70mm² Cu single core polymeric cables wire screened cable	1	178258
2	Screen wire rejacketing tubing	Cut to length from 40 m roll	177751
3	Cable clamp suitable for 70mm²	3	180291
4	Spring-loaded Nut	6	Unistrut Part No. P1010
5	Cable Grommets or Cable glands (see note 1)	3 3	Schneider Electric Part No. 3728639 118125

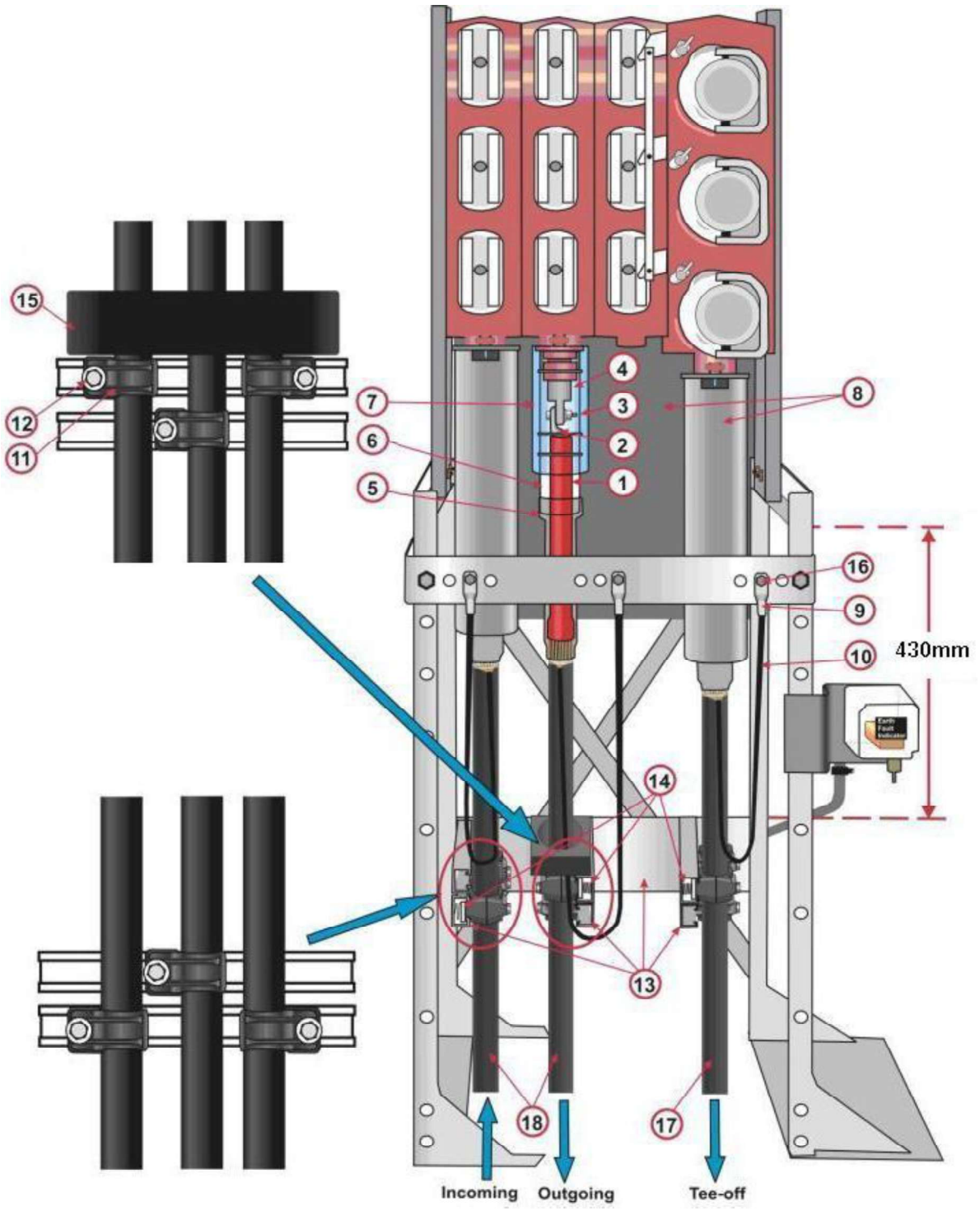
Note 1. Cable glands are to be installed before making the actual termination

Note 2. Two 70mm² earth bar bonding cables (stockcode 60111) are required to bond the main earth bar located inside the cable endbox to the screen wire earth bar located at the front of the cable endbox.

Note 3. Refer to Figure 10-33 (in clause 10.19) for transformer screen earthing terminations

10.18 Cable termination for Hazemeyer switchgear (HV1-55)

This specification provides the requirements for terminating 185mm^2 single-core polymeric insulated wire screened cables and 35mm^2 single core polymeric insulated transformer leads into Hazemeyer Switchgear.



Note: Only one cable per module shown for clarity.

Figure 10-31 – Indoor Cable Termination into Hazemeyer Switchgear

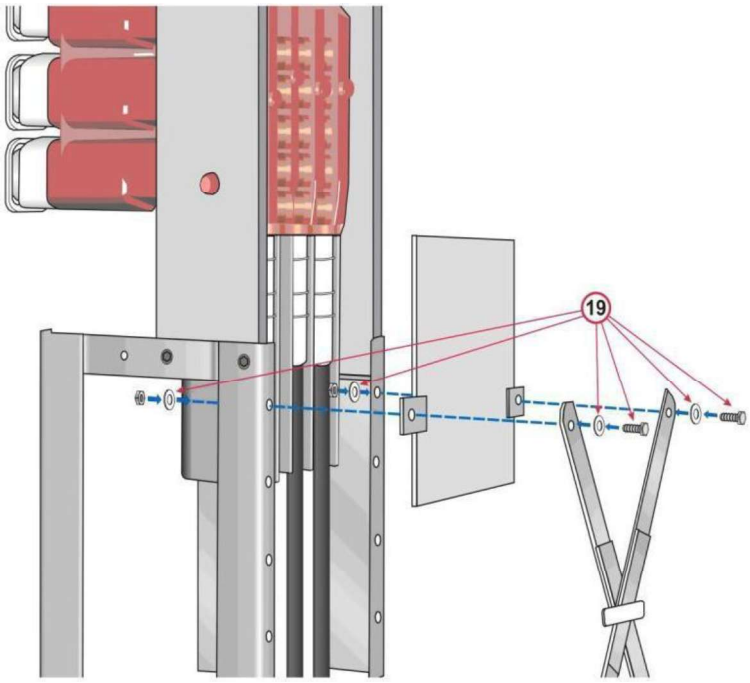


Figure 10-32 – Installation of the Rear Barrier using M5 × 25mm Set Screws and M5 Flat Washer

Table 20 - Material List for Indoor Cable Termination into Hazemeyer Switchgear

Note: The following material will be sufficient to complete one set of cable termination.

Item	Description	Qty	Stockcode
1	Termination kit	1	177792
2	Phase core lug	3	175532 and note 2 below
3	Hex head screw M12 ×32 Belleville Washer M12 Hex Nut M12	3	See note 1 below
4	Connector Adaptor	3	See note 1 below
5	Coldshrink seal	3	See note 1 below
6	Insulating tube	3	See note 1 below
7	Retainer half for tube	2	See note 1 below
8	Grey cable barrier and rear barrier	1	180222
9	Screen wire lugs:	3	H95851
10	Screen wire rejacketing tubing:	Cut to length from 10m roll	90258
11	Cable Clamp: 185mm^2 feeder cable Transformer cable	 3 3	 181882 181883
12	M10 × 60mm set screw and M10 flat washer	3	Buy-in
13	Cable support bracket	1	181913
14	Spring –loaded Nut	3	Unitstrut Part No.4008
15	EFI if required	1	
16	M12×30mm stainless steel bolt, M12 stainless steel nut, 2×M12 stainless steel flat washers, M12 stainless steel spring washer	3	175911

Item	Description	Qty	Stockcode
17	Pre-made transformer leads	1	Clause 10.11
18	11kV 185mm^2 single-core polymeric cable with 70mm^2 screen wires 11kV 185mm^2 Triplex cable	As Required	182311 181758
19	M5 × 25mm set screws and M5 flat washer	2	Buy-in

Note 1. Cable termination connection kit is available on stockcode 181881. The cable connection must be constructed in accordance with the installation instructions supplied in the kit.

Note 2. The palm width of the lug shall not exceed 36mm.

10.19 Screened separable connectors for indoor distribution transformers (200A pin type and 630A bolted type)

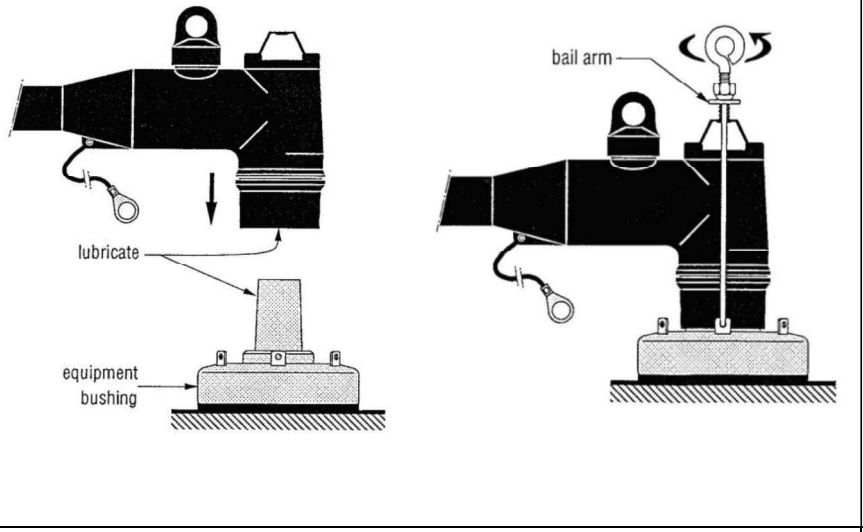
Old style distribution transformers suitable for polymeric cables were supplied with bushing wells and bushing well adaptors on the 11kV side of the transformer suitable for 200 ampere (A) pin type, screened deadbreak separable connectors.

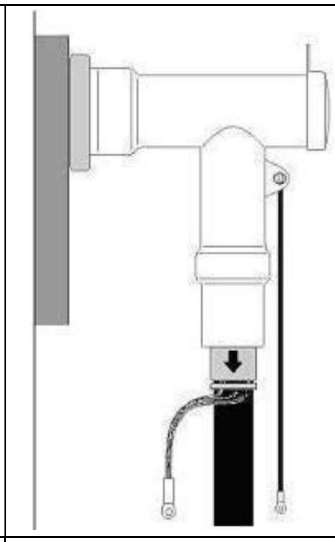
The current distribution transformers are supplied with 630A bushings on the 11kV side of the transformer, replacing the bushing wells and bushing well adaptors. The 630A bushing has a bolted connection to the screened separable connector, whereas the 200A bushing has a pin type connection. As a result of the bushing change to 630A, a different screened separable connector is required.

Both 200A and 630A screened separable connectors are approved for indoor use only. Outdoor use is not permitted.

Screened separable connectors are used to terminate polymeric insulated cables only.

The combined bushing well and bushing well adaptor (depicted as equipment bushing) provide an interface for the screened separable connector. 200A screened deadbreak separable connectors use a bail clamp to secure the screened deadbreak separable connector in place, whereas the 630A screened separable connectors are bolted into position and do not require a bail clamp.





200A installation	630A installation

(graphics for illustration purposes only)

Figure 10-33 – 200A and 630A Screened Separable Connectors

Table 21- Screened Separable Connectors for Indoor Distribution Transformers (200A pin type and 630A bolted type)

Current rating of 11kV bushing well adaptor / bushing interface.	Kit	Additional Items Required	
	Approved screened separable connectors. 3 phase kit to suit 11kV, 70mm², copper, single core, polymeric insulated, wire screened cable.	(3) x screen wire lugs will be required in addition to the screened separable connector kit. Unit of issue (each)	Approx. 4.5 metres of heatshrink screen wire rejacketing tube will be required in addition to the screened separable connector kit.
	Stockcode Number	Stockcode Number	Stockcode Number
200A	178258	177741	177751 (40m spool)
630A	180424 See Note below.	177741	181249 (50m spool)

Note: 800A screened separable connectors will be supplied in this kit. These 800A screened separable connectors are suitable for use on the 630A bushings that will be supplied on the transformers.

10.19.1 General work practices in areas where screened separable connectors are installed

The following work practice restrictions must be adhered to in areas where screened separable connectors are installed:

- Do not store equipment on top of screened separable connectors
- Do not rest ladders on screened separable connectors
- Do not water blast screened separable connectors
- Do not wash equipment with solvents, kerosene or other unapproved cleaning agents.

Even though the screened separable connector is manufactured and tested as touch safe, like any live electrical apparatus unnecessary contact should be avoided.

10.19.2 Specific requirements for 200A Kit / 200A bushing well adaptors

Note the following specific requirements for 200A kit / 200A bushing well adaptors:

- Hexagonal copper compression dies measuring 13.5mm across the flats (TE Connectivity Part No. 38-135Cu/1 or similar) must be used not the standard 70mm² copper dies.
- The termination shall be constructed in accordance with the installation instruction (178258-1003 for the Euromold K158LR kit supplied by Australmold Pty Ltd) supplied in the kit.
- When new transformers are supplied the bushing well adaptors are covered with a protective plastic cap. These protective caps should also be installed over bushing well adaptors on transformers that have been removed from service and stored for future use. These covers help prevent mechanical damage to the bushing interface and provide protection from UV.

10.19.3 Specific requirements for 630A kit / 630A bushings

Note the following specific requirements for 630A kit / 630A bushings:

- The termination shall be constructed in accordance with the installation instruction in the kit.
- When new transformers are supplied the 11kV bushings are covered with a protective plastic cap. These protective caps should also be installed over bushings on transformers that have been removed from service and stored for future use. These covers help prevent mechanical damage to the bushing interface and provide protection from UV.

10.19.4 Common requirements for both 200A and 630A kits

Note the following common requirements for 200A (stockcode 178258) and 630A (stockcode 180424) kits:

- To ensure correct protection operation, the installation instruction included in the kit details specific earthing requirements.
- Screened separable connectors should not be energised when disconnected from the apparatus nor should they be disconnected when alive.
- Contact with solvents, transformer oil, motor oil and similar substances will degrade the screened separable connector jacket conductivity and insulation level if not wiped off immediately. Only approved cleaning agents such as those supplied in the kit are to be used, in accordance with the installation instructions.

10.19.5 Screen earthing requirements for both 200A and 630A installations

10.19.5.1 Switchgear end of the cable

The cable screen must not be earthed at the switchgear end of the cable. However, for the termination at the switchgear end of the cable it is important that the copper wire screens remain exposed immediately at the base of the termination.

To achieve this, at the switchgear end of the cable:

1. Form the copper wire screens into a cable at the base of the termination.
2. Cut the formed screen wires leaving a tail of formed screen wires 60mm long.
3. Install heatshrink tube over the 60mm tail.

– Standard black heatshrink screen wire rejacketing tube (stockcode 177751) or yellow/green heatshrink screen wire rejacketing tube (stockcode 181249) shall be used.

– The heatshrink tube should extend 25mm past the end of the cut screen wires to ensure the screen wires will not contact earth.

4. Check to ensure the screen wires are well clear of earth in the switchgear cable endbox.

Note: At the switchgear end of the cable, the cable must enter the cable endbox via a non-metallic cable gland.

10.19.5.2 Transformer end of the cable

The cable screen wires shall be kept as short as possible and connected to the earth bar on the transformer. The earthing lead (drainage bond) of the screened separable connector is also to be connected to the earth bar on the transformer. Each connection to the earth bar shall be to a separately bolted connection.

Where protection current transformers are required to be installed, refer to NS114 for permitted locations for the installation of the current transformers. If, in accordance with NS114, the protection current transformers are mounted at the transformer, the 11 kV cable screen wires and the screened separable connector drainage bond **must not** be passed back down through the protection current transformer. Refer to Figure 10-34.

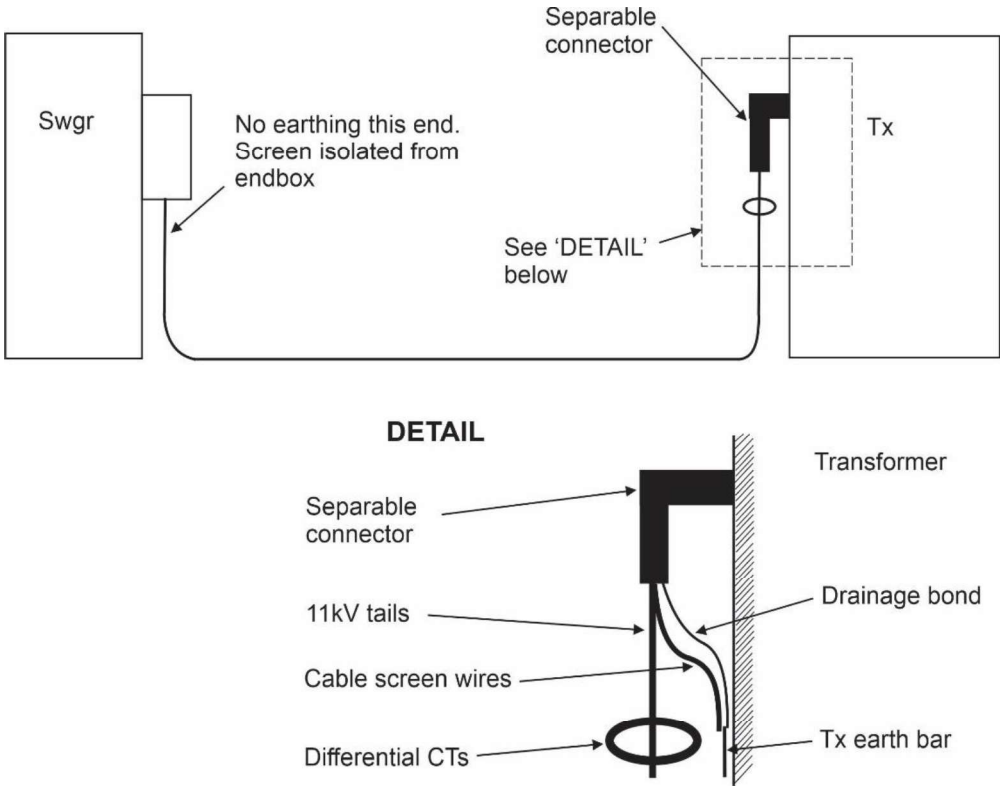


Figure 10-34 – Screened Separable Connector Drainage Bond

10.19.5.3 Extra requirements for frame leakage protection

It is essential to ensure that the cable screen wires are connected to the transformer earth bar above the frame leakage current transformer. Refer to Figure 10-35.

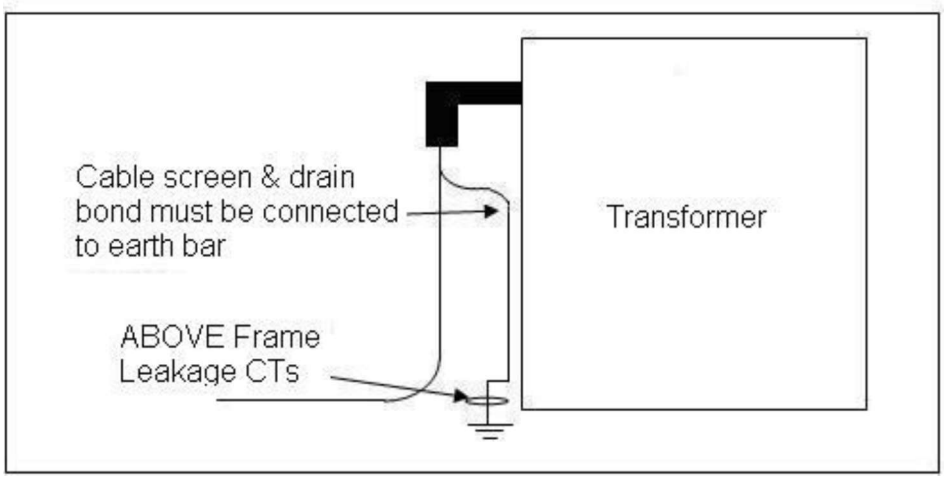
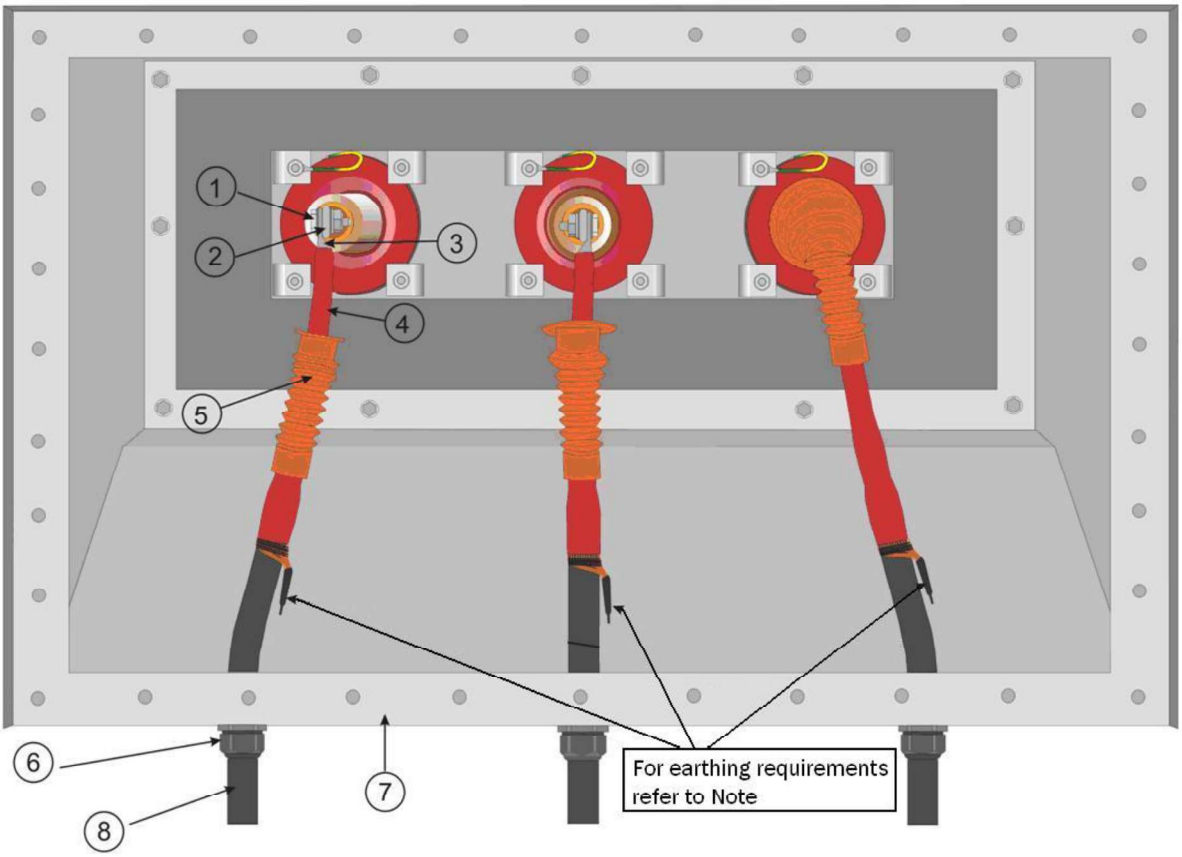


Figure 10-35 – Extra Requirements for Frame Leakage Protection

10.20 Cable termination for outdoor distribution transformer endbox



Note: For earthing requirements refer to Clause 10.23.

Figure 10-36 – Outdoor Distribution Transformer Cable Termination

Table 22 – Material List for Outdoor Distribution Transformer Endbox Cable Termination

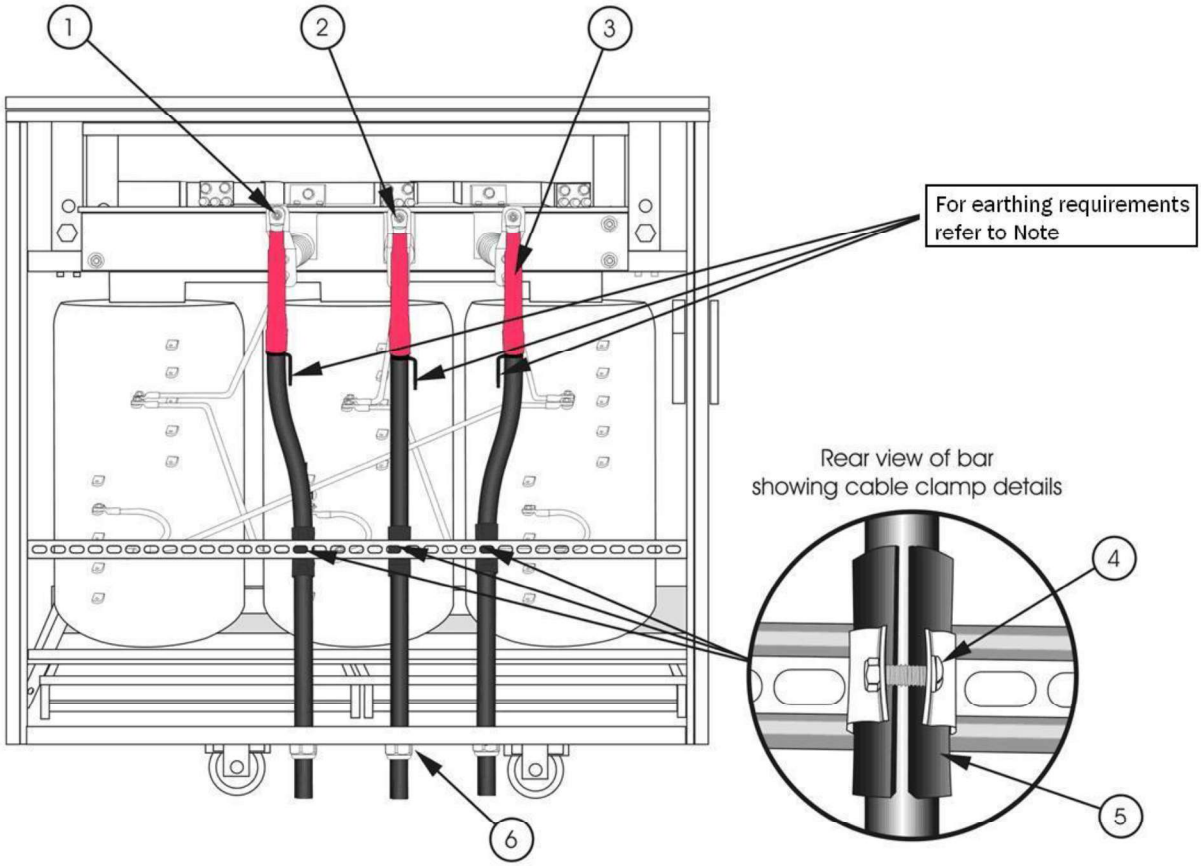
Item	Description	Qty	Stockcode
1	M12 x 30mm stainless steel bolt, M12 stainless steel nut, 2 x M12 stainless steel flat washers, M12 stainless steel spring washer	3	175911
2	Universal screw lug	3	180401
3	70mm^2 Phase core lug	3	H95851
4	70mm^2 Single Core Termination kit	1	177791
5	Insulating Sleeve (kit contains three sleeves)	1	177136
6	Cable glands	3	118125
7	Transformer endbox	1	181253
8	70mm^2 Single Core Polymeric cable		177568

Note 1. Cable glands are to be installed before making the actual termination.

Note 2. Insulating sleeve shall be installed in accordance with the installation instruction supplied in the insulating sleeve kit.

Note 3. Prior to terminating the transformer tails, ensure that the universal screw and locknut are tight.

10.21 Cable termination for ABB dry type transformers without cable endbox



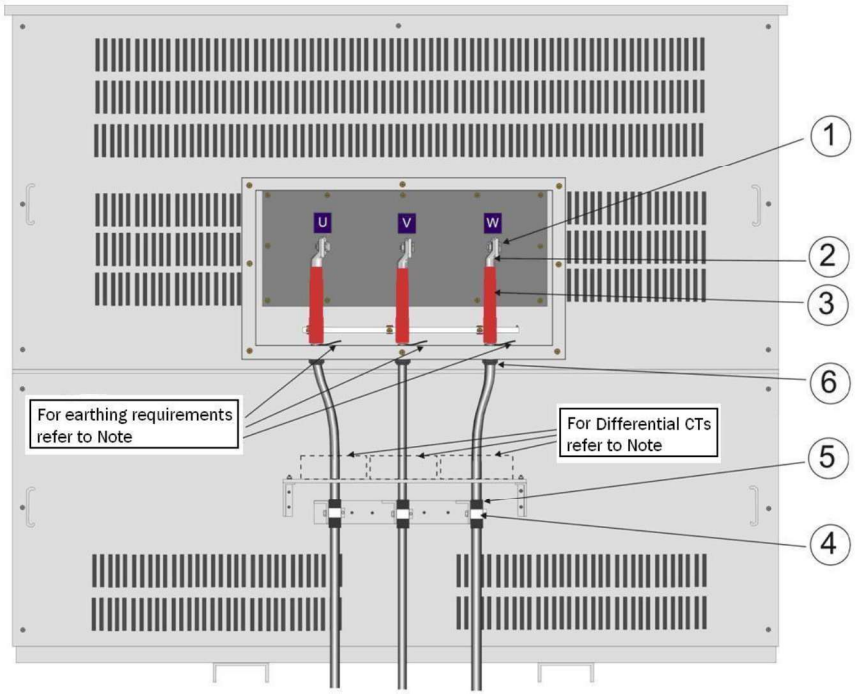
Note: For earthing requirements refer to Clause 10.23.

Figure 10-37 – Cable Termination for ABB Dry Type Transformers without Cable Endbox

Table 23 – Material List for Indoor Cable Termination into ABB Dry Type Transformers

Item	Description	Qty	Stockcode
1	M12 x 30mm stainless steel bolt, M12 stainless steel nut, 2 x M12 stainless steel flat washers, M12 stainless steel spring washer	3	175911
2	70mm^2 Phase core lugs	3	H95851
3	Termination kit	1	177791
4	Cable Clamp suitable for 70mm^2	3	179212
5	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
6	Cable glands	3	118125

10.22 Cable termination for ABB dry type transformers with cable endbox



Note: For earthing requirements and Differential CTs refer to Clause 10.23.

Figure 10-38 – Cable Termination for ABB Dry Type Transformers with Cable Endbox

Table 24 - Material List for Indoor Cable Termination into ABB Dry Type Transformer with Cable Endbox

Item	Description	Qty	Stockcode
1	M12 x 30mm stainless steel bolt, M12 stainless steel nut, 2 x M12 stainless steel flat washers, M12 stainless steel spring washer	3	175911
2	70mm^2 Phase core lugs	3	H95851
3	Termination kit	1	177791
4	Cable Clamp suitable for 70mm^2	3	180291
5	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
6	Cable glands	3	118125

10.23 Cable screen wire earthing requirements for chamber type substations

10.23.1 Introduction

Note: Where screened dead-break separable connectors (screened elbows) are used for 11kV transformer connections, refer to Clause 10.19.5 for the cable screen wire earthing requirements.

If there are protection current transformers to be installed for transformer differential protection, refer to NS114 for permitted locations for the installation of the differential current transformers. The cable screen wire earthing location will be dependent on the location of the current transformers, and must be installed in accordance with Clause 10.23.2 or 10.23.3 as applicable.

If there are no protection current transformers to be installed, then the cable screen wires shall be earthed at the switchgear end of the cable only. The cable screen wires at the transformer end of the cable must not be earthed, however it is important that the screen wires remain exposed immediately at the base of the termination. To achieve this, refer to Clause 10.8.2.

10.23.2 Differential current transformers located at the switchgear

The cable screen wires shall be connected to the earth bar at the switchgear end of the cable as indicated in the diagram below.

Note: The screen wires must be passed back down through the current transformer.

The cable screen wires at the transformer end of the cable must not be earthed, however it is important that the screen wires remain exposed immediately at the base of the termination. To achieve this, refer to Clause 10.8.2.

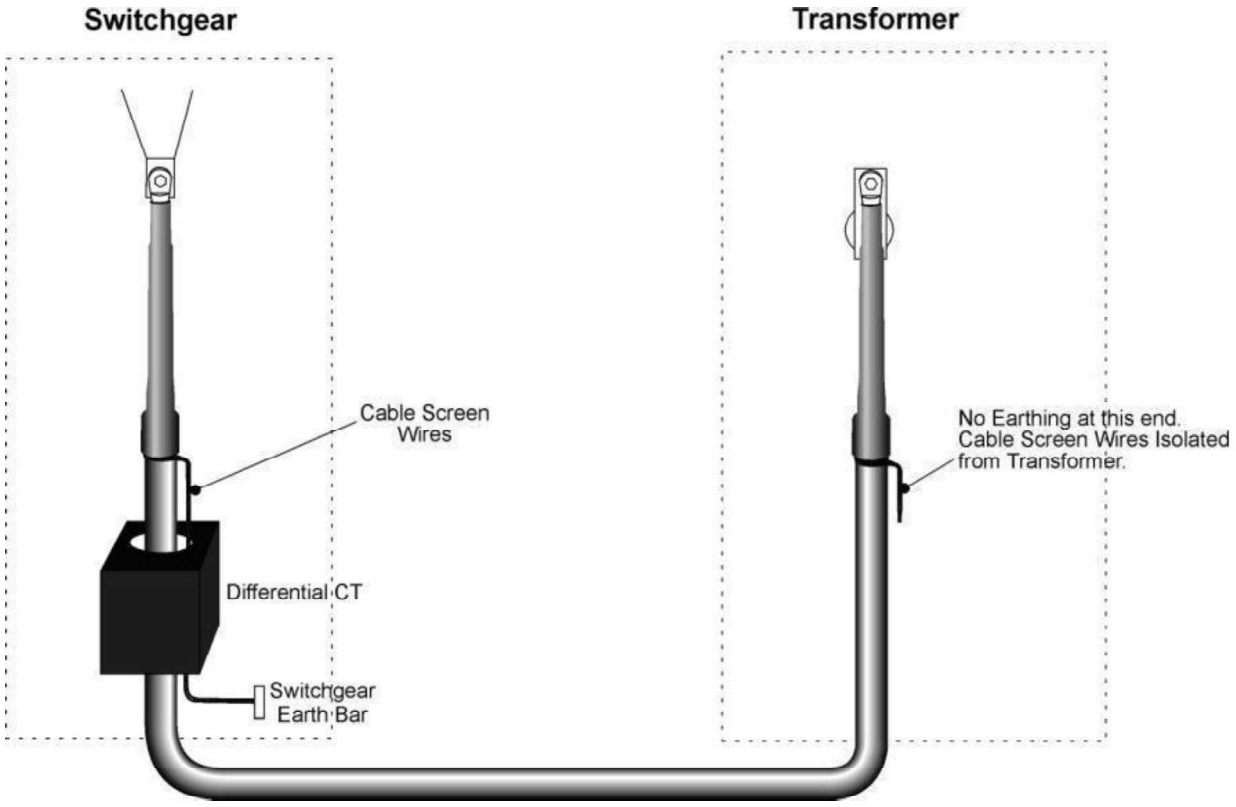


Figure 10-39 – Differential Current Transformers Located at the Switchgear

10.23.3 Differential current transformers located at the transformer

The cable screen wires shall be connected to the earth bar at the transformer end of the cable as indicated in the diagram below.

Note: The screen wires must not be passed back down through the current transformer.

The cable screen wires at the switchgear end of the cable must not be earthed, however it is important that the screen wires remain exposed immediately at the base of the termination. To achieve this, refer to Clause 10.8.2.

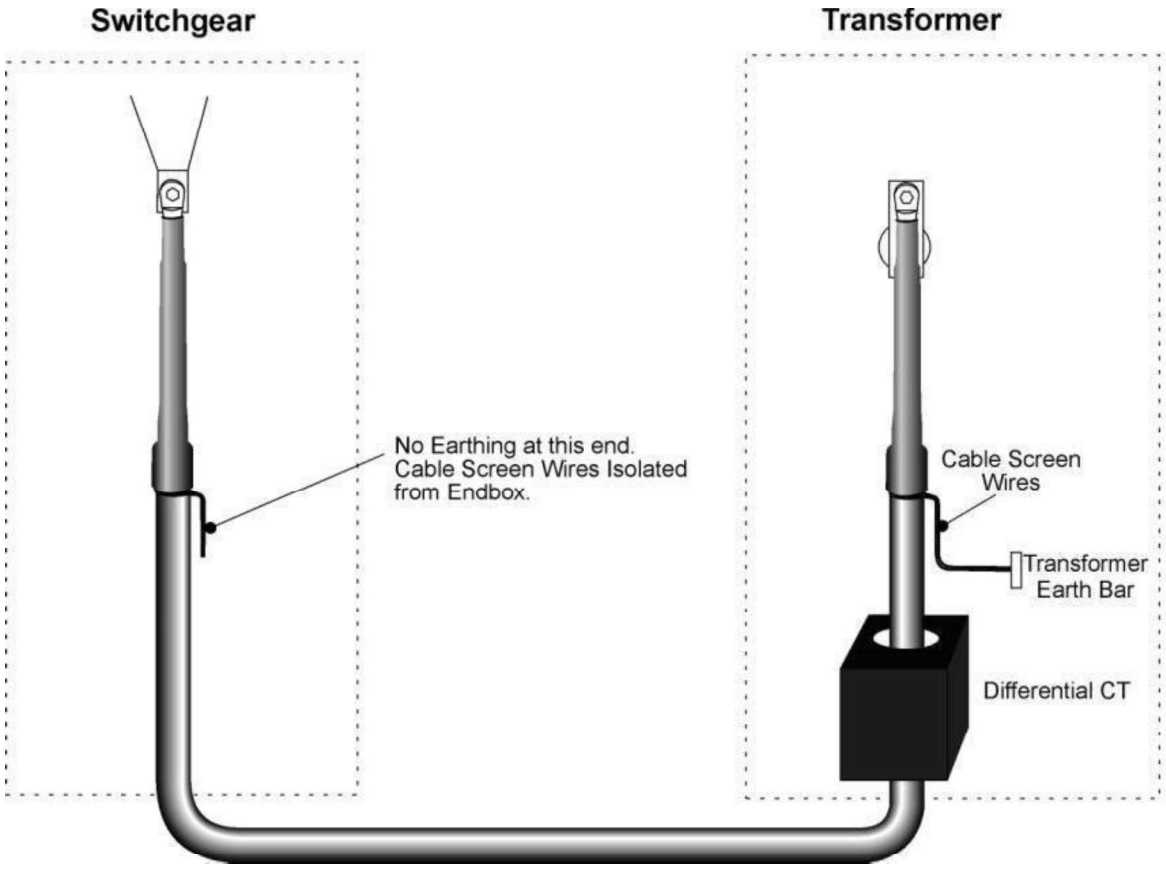


Figure 10-40 – Differential Current Transformers Located at the Transformer

10.24 Cable termination for EFACEC Fluofix switchgear (HV1-57)

This specification provides the requirements for terminating 185mm² and 300mm² single-core polymeric cables with 70mm² Cu wire screens into EFACEC Fluofix Switchgear.



Figure 10-41 - Indoor Feeder Cable Termination (Front View)

Table 25 – Material List for Indoor Feeder Cable Termination into EFACEC Fluofix Switchgear

Item	Description	Qty	Stockcode
1	Separable Connector (Elbow) kit For 185mm² single core polymeric cables with 70mm² Cu wire screen For 300mm² single core polymeric cables with 70mm² Cu wire screen	 1 1	 182621 182622
2	Screen wire rejacketing tubing: For 185mm² and 300mm² single core polymeric cables with 70mm² Cu wire screen	Cut to length from 10m roll	90258
3	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
4	Cable clamp (see note 6)	3	180350
5	M12 x 70mm Stainless steel set screw M12 x Stainless steel flat washer Spring-loaded nut (see note 6)	6 6 6	Blackwoods Part No. 0003 1331 49429 Unistrut Part No. P4010
6	Screen wire lugs	3	H95851
7	Cable glands (see note 2)	3	179132

Note 1. Cable glands are to be installed before making the actual termination.

Note 2. For 185mm² and 300mm² phase cores note the following:

- For 185mm² single core cables (including 185mm² cables with 70mm² Cu wire screen), two layers of WCSM 48/12 (stockcode 90274) tubing will be required in the area of gland to increase the cable diameter to ensure the gland will secure in place.
- For 300mm² single core cables (including 300mm² cables with 70mm² Cu screen), a layer of WCSM 48/12 (stockcode 90274) tubing will be required in the area of the gland to increase the cable diameter to ensure the gland will secure in place.

Note 3. The separable connector drain wires are to be terminated onto the earth bar by double banking with the cable screen wire.

Note 4. Cable screen length can be extended with 70mm² PVC insulated earth conductor (60111) and 70mm² screen wire connector (180421).

Note 5. Supplied split core CT's are to be properly closed around the cable so the core is not visible and the plastic housing meets together.

Note 6. The supplied cable clamp and set screws can be used if meeting specification of items 4 and 5.

10.25 Cable termination for Lucy AEGIS switchgear (HV1-58)

This specification provides the requirements for terminating 185mm² and 300mm² single-core polymeric cables with 70mm² Cu wire screens into Lucy AEGIS Switchgear.

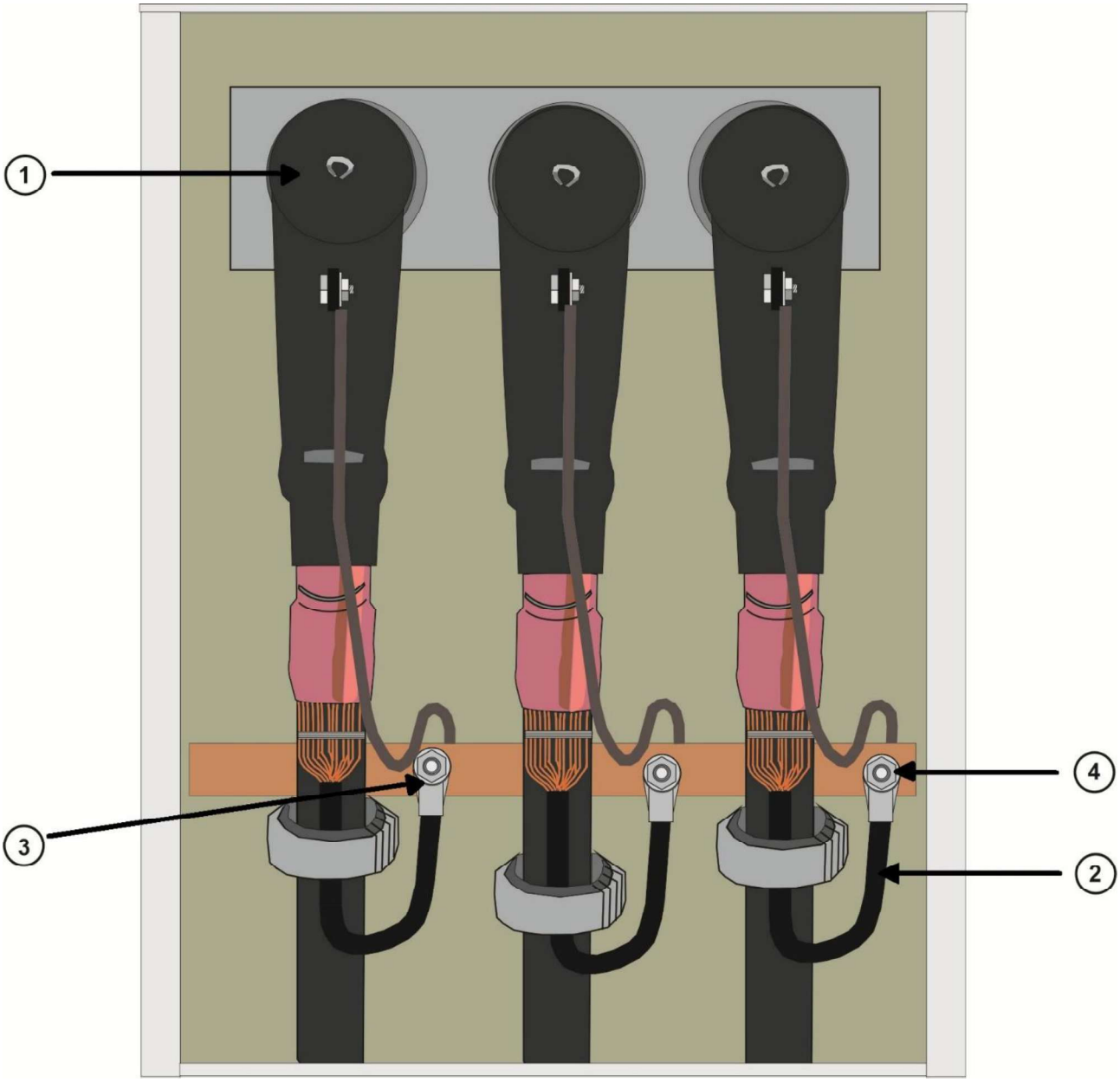


Figure 10-42 – Indoor Feeder Cable Termination (front view)



Figure 10-43 – Kiosk base cable clamp mounting (see note 6)

Table 26 – Material List for Indoor Feeder Cable Termination into Lucy AEGIS Switchgear

Item	Description	Qty	Stockcode
1	Separable Connector (Elbow) kit For 185mm² single core polymeric cables with 70mm² Cu wire screen For 300mm² single core polymeric cables with 70mm² Cu wire screen	 1 1	 182621 182622
2	Screen wire rejacketing tubing: For 185mm² and 300mm² single core polymeric cables with 70mm² Cu wire screen	Cut to length from 10m roll	90258
3	Screen wire lugs	3	H95851
4	M10 x 40mm Stainless steel Bolt M10 Stainless steel Nut M10 Stainless steel Washer (see note 3)	3 3 3	45096 H39401 49411
5	Cable glands (see note 2)	3	179132
6	Cable clamp for: 95 to 185mm² cables with Cu wire screen less than 70mm² 185mm² and 300mm² cables with 70mm² Cu wire screen (see note 6)	 3 3	 180291 180350
7	M12 x 70mm Stainless steel set screw M12 x Stainless steel flat washer Spring-loaded nut (see note 6)	6 6 6	Blackwoods Part No. 0003 1331 49429 Unistrut Part No. P4010

Note 1. Cable glands are to be installed before making the actual termination.

Note 2. For 185mm² and 300mm² phase cores note the following:

- For 185mm² single core cables (including 185mm² cables with 70mm² Cu wire screen), two layers of WCSM 48/12 (stockcode 90274) tubing will be required in the area of gland to increase the cable diameter to ensure the gland will secure in place.
- For 300mm² single core cables (including 300mm² cables with 70mm² Cu screen), a layer of WCSM 48/12 (stockcode 90274) tubing will be required in the area of the gland to increase the cable diameter to ensure the gland will secure in place.

Note 3. The separable connector drain wires are to be terminated onto the earth bar by double banking with the cable screen wire. A M10 nut, bolt and washer arrangement should be utilised with drain wire lug sitting on top of the screen wire lug.

Note 4. Cable screen length can be extended with 70mm^2 PVC insulated earth conductor (60111) and 70mm^2 screen wire connector (180421).

Note 5. Supplied split core CT's are to be properly closed around the cable so the core is not visible and the plastic housing meets together.

Note 6. For a Tyree KL kiosk installation, the cable cleat bar within the switch, if present, is to be removed. Utilise the Unistrut bracket in the kiosk base to mount cable clamps

10.26 Cable Termination for Schneider RMAirset (HV1-59)

10.26.1 Feeder and Transformer Cable Termination

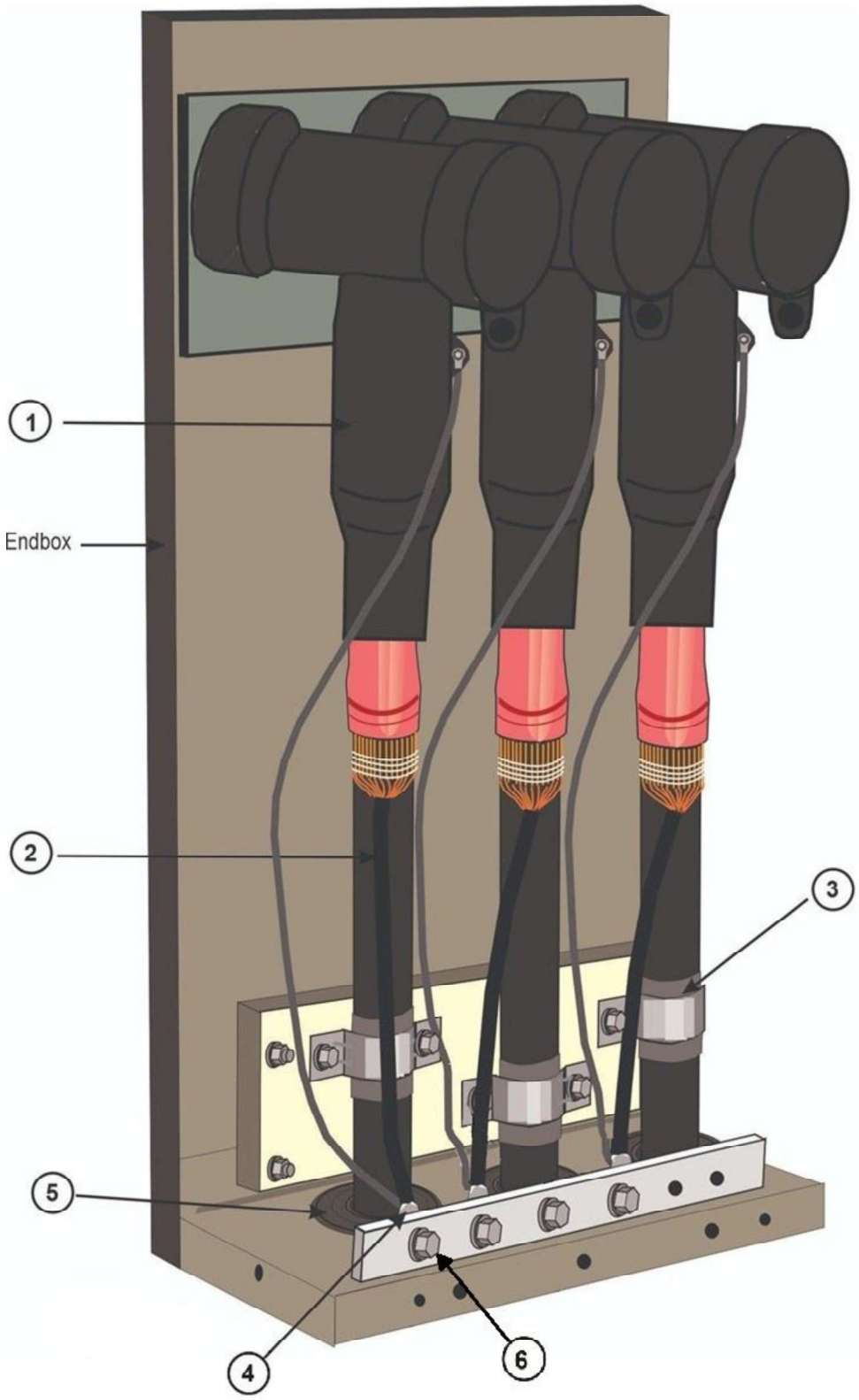


Figure 10-44 – Indoor Feeder Cable Termination (front view)

Table 27 – Material List for Indoor Feeder and Transformer Cable Termination into Schneider RMAirset

Item	Description	Qty	Stockcode
1	Separable Connector (Elbow) kit:		
	For 185mm² single core polymeric cables with 70mm² Cu wire screen	1	182621
	For 300mm² single core polymeric cables with 70mm² Cu wire screen	1	182622
	For 70mm² single core polymeric cables, wire screened cables	1	180424
2	Screen wire rejacketing tubing:		
	For 185mm² and 300mm² single core polymeric cables with 70mm² Cu wire screen	Cut to length from 10m roll	90258
	For 70mm² single core polymeric cables, wire screened cables	Cut to length from 40m roll	177751
3	Nitrile Rubber Liner	1 Cut to length from 300mm strip	179201
4	Screen wire lugs for feeder termination	3	H95851
5	70mm Grommets	3	Schneider Electric Part No. 3728639
6	M10 x 40mm Stainless steel Bolt	3	45096
	M10 Stainless steel Nut	3	H39401
	M10 Stainless steel Washer (see note 1)	3	49411

Note 1. The separable connector drain wires are to be terminated onto the earth bar by double banking with the cable screen wire. A M10 nut, bolt and washer arrangement should be utilised with drain wire lug sitting on top of the screen wire lug.

Note 2. Feeder cable screen length can be extended with 70mm² PVC insulated earth conductor (60111) and 70mm² screen wire connector (180421).

Note 3. Refer to Figure 10-33 (in Clause 10.19) for transformer screen earthing terminations

11.0 STRAIGHT THROUGH JOINT FOR SINGLE CORE CABLES (POLYMERIC TO POLYMERIC) HV2-21

11.1 Introduction

This specification provides the requirements for a straight through joint on single core polymeric insulated wire screened cables.

11.2 Approved joint kits

Ausgrid's stockcodes of approved straight through joint kits for single core cables are provided in the tables below.

Table 28 – Straight Through Joint Kits for Single Core Cables

Single Core Cable Sizes		Kit Stockcode
35mm^2 Al	35mm^2 Al	177812
70mm^2 Cu	70mm^2 Cu	177812
185mm^2 Cu	185mm^2 Cu	177813
185mm2 Cu	300mm2 Cu	177811
300mm^2 Cu	300mm^2 Cu	177811 (See Note)
630mm^2 Cu	630mm^2 Cu	178911
1000mm^2 Cu	1000mm^2 Cu	178913

Note: When constructing single core straight through joints between:

- 2 x 300mm^2 single core cables with 150mm^2 screen wires; or
- 300mm^2 single core cable with 150mm^2 screen wires and 300mm^2 single core cable with 70mm^2 screen wires;

an additional screen wire connector is required (stockcode 180421).

Table 29 – Joint Kit Cable Range

Cable Range	TE Connectivity Kit Number	Kit Stockcode
35mm^2 to 95mm^2 Aluminium 35mm^2 to 95mm^2 Copper	MXSU-SY137	177812
95mm^2 to 240mm^2 Aluminium 95mm^2 to 240mm^2 Copper	MXSU-SY138	177813
185mm^2 to 400mm^2 Aluminium 185mm^2 to 400mm^2 Copper	MXSU-SY139	177811

Note: The above kits include mechanical connectors for both the core conductors and screen wires.

11.3 Screen wire and core connectors

With the exception of the 630mm^2 and 1000mm^2 joints, the screen wire connector and the core connector are both mechanical connectors, and are supplied with the joint kit. The connectors shall be installed strictly in accordance with the manufacturer's installation instructions.

With the 630mm^2 and 1000mm^2 joints, the screen wire connector and the core connector are both compression connectors.

Note 1. Where compression connectors are used, the connector material shall match the conductor material on which they are used; ie for copper cables the connectors shall be copper.

Note 2. For size transition joints the compression connectors shall match both the transition sizes and the conductor materials.

Note 3. The compression connectors shall be installed strictly in accordance with the manufacturer's specification for crimping dies, number of crimps, and position of crimps.

11.4 Requirements

The following requirements must be satisfied when constructing a straight through joint on single core cables:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The joint shall be constructed in accordance with the installation instruction supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- All components involved in the joint (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.
- The completed joint must be allowed to cool down before applying mechanical load to it.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

12.0 STRAIGHT THROUGH JOINT FOR THREE CORE CABLES (POLYMERIC TO POLYMERIC) HV2-22

12.1 Introduction

This specification provides the requirements for a straight through joint on three core polymeric insulated wire screened cables.

12.2 Approved joint kits

Ausgrid's stockcodes of approved straight through joint kits for three core cables are provided in the tables below.

Table 30 – Straight Through Joint Kits for Three Core Cables

Three Core Cable Sizes		Kit Stockcode
95mm^2 Al	95mm^2 Al	177788
150mm^2 Cu	150mm^2 Cu	177789
185mm^2 Al	95mm^2 Al	177789
185mm^2 Al	185mm^2 Al	177789
300mm^2 Al	185mm^2 Al	177790
300mm^2 Al	300mm^2 Al	177790
400mm^2 Al	300mm^2 Al	177790
400mm^2 Al	400mm^2 Al	177790
500mm^2 Al or Cu	300mm^2 Al	181962
500mm^2 Al or Cu	400mm^2 Al	181962
500mm^2 Al or Cu	500mm^2 Al or Cu	181961

Table 31 – Joint Kit Cable Range

Cable Range	TE Connectivity Kit Number	Kit Stockcode
35mm^2 to 95mm^2 Aluminium 35mm^2 to 95mm^2 Copper	MXSU-SY141	177788
95mm^2 to 240mm^2 Aluminium 95mm^2 to 240mm^2 Copper	MXSU-SY142	177789
185mm^2 to 400mm^2 Aluminium 185mm^2 to 400mm^2 Copper	MXSU-SY143	177790
500mm^2 to 500mm^2 Aluminium 500mm^2 to 500mm^2 Copper	MXSU-SY208	181961

Cable Range		TE Connectivity Kit Number	Kit Stockcode
Cable 1	Cable 2		
500mm^2 Aluminium or 500mm^2 Copper	300mm^2 to 400mm^2 Aluminium or 300mm^2 to 400mm^2 Copper	MXSU-SY207	181962

Note: The above kits include mechanical connectors for both the core conductors and screen wires.

12.3 Requirements

The following requirements must be satisfied when constructing a straight through joint on three core cables:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The connectors shall be installed strictly in accordance with the manufacturer's installation instructions.
- The joint shall be constructed in accordance with the installation instruction supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- All components involved in the joint (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.
- The completed joint must be allowed to cool down before applying mechanical load to it.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

13.0 THREE-TO-ONE JOINT (POLYMERIC TO POLYMERIC) HV2-23

13.1 Introduction

This specification provides the requirements for a three-to-one joint from three core polymeric insulated wire screened cables to three single core polymeric insulated wire screened cables.

13.2 Approved joint kits

Ausgrid's stockcodes of approved three-to-one joint kits are provided in the tables below.

Table 32 – Three-to-One Joint Kits for Single Core Cables with 35mm² Screen Wires

Three-to-One Joint		Kit Stockcode
from three core	to single core	
95mm² Al	70mm² Cu (16mm² screen wires)	177788
300mm² Al	185mm² Cu	177790
300mm² Al	300mm² Cu	177790
400mm² Al	185mm² Cu	177790
400mm² Al	300mm² Cu	177790

Three-to-One Joint		Accessory Pack Stockcode	Base Kit Stockcode
from three core	to single core		
500mm² Al or Cu	185mm² Cu (35mm² screen wires)	182512	181966
500mm² Al or Cu	300mm² Cu (35mm² screen wires)	182512	181966

Table 33 – Joint Kit Cable Range

Cable Range	TE Connectivity Kit Number	Kit Stockcode
35mm² to 95mm² Aluminium 35mm² to 95mm² Copper	MXSU-SY141	177788
95mm² to 240mm² Aluminium 95mm² to 240mm² Copper	MXSU-SY142	177789
185mm² to 400mm² Aluminium 185mm² to 400mm² Copper	MXSU-SY143	177790

Note: The above kits include mechanical connectors for both the core conductors and the screen wires.

Table 34 – Three-to-One Joint Kits for Single Core Cables with 70mm² Screen Wires (Triplex Cables)

Three-to-One Joint		Kit Stockcode
from three core	to single core	
185mm² Al	185mm² Cu (70mm² screen wires)	181965
185mm² Al	300mm² Cu (70mm² screen wires)	181965
300mm² Al	185mm² Cu (70mm² screen wires)	181965
300mm² Al	300mm² Cu (70mm² screen wires)	181965
400mm² Al	185mm² Cu (70mm² screen wires)	181965
400mm² Al	300mm² Cu (70mm² screen wires)	181965
500mm² Al or Cu	185mm² Cu (70mm² screen wires)	181966
500mm² Al or Cu	300mm² Cu (70mm² screen wires)	181966

Table 35 – Joint Kit Cable Range

Cable Range		TE Connectivity Kit Number	Kit Stockcode
Three Core Cable	Single Core Cable		
185mm^2 to 400mm^2 Aluminium	185mm^2 Copper (70mm^2 screen) or 300mm^2 Copper (70mm^2 screen)	MXSU-SY210	181965
500mm^2 Aluminium or 500mm^2 Copper	185mm^2 Copper (70mm^2 screen) or 300mm^2 Copper (70mm^2 screen)	MXSU-SY206	181966

Note: The above kits include mechanical connectors for both the core conductors and the screen wires.

Table 36 – Three-to-One Joint Kits for Single Core Cables with 150mm^2 Screen Wires

Three-to-One Joint		Kit Stockcode
from three core	to single core	
300mm^2 Al	300mm^2 Cu (150mm^2 screen wires)	181963
400mm^2 Al	300mm^2 Cu (150mm^2 screen wires)	181963
500mm^2 Al or Cu	300mm^2 Cu (150mm^2 screen wires)	181964

Table 37 – Joint Kit Cable Range

Cable Range		TE Connectivity Kit Number	Kit Stockcode
Three Core Cable	Single Core Cable		
300mm^2 to 400mm^2 Aluminium	300mm^2 Copper (150mm^2 screen)	MXSU-SY212	181963
500mm^2 Aluminium or 500mm^2 Copper	300mm^2 Copper (150mm^2 screen)	MXSU-SY211	181964

Note: The above kits include mechanical connectors for the core conductors and compression connectors for the screen wires.

13.3 Screen wire and core connectors

Core connectors and screen wire connectors are of the mechanical type except for MXSU-SY211 and MXSU-SY212 which have compression connectors for the screen wires.

13.4 Jointing of 323 AL3 XQ H FE Z Cables

The following joint kit provides the requirements for a three-to-one joint from three core 0.5 inch² circular stranded aluminium conductors, XLPE insulated, copper tape screened, laid up inside a corrugated steel sheath, with a PVC oversheath cable (11kV 323 AL3 XQ H FE Z) to three single-core polymeric insulated wire screened cables.

Table 38 – Joint Kit Cable Range

Three-to-One Joint		TE Connectivity Kit Number	Connector
from three core	to single core		
11kV 323 AL3 XQ H FE Z	300mm² Cu (70mm² screen wires)	EPKJ-SY426	See Note 3

Note 1. The above kit does not include connectors.

Note 2. The joint kit EPKJ-SY426 is available direct from TE Connectivity.

Note 3. Buy in from TE Connectivity Part No BK323-300/1 or from Acculec Power Part No BLK322/300.

13.5 Requirements

The following requirements must be satisfied when constructing a three-to-one joint:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The connectors shall be installed strictly in accordance with the manufacturer's installation instructions.
- The joint shall be constructed in accordance with the installation instruction supplied in the joint kit:
- The joint kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- All components involved in the joint (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.
- The completed joint must be allowed to cool down before applying mechanical load to it.
- The completed joint, if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

14.0 TRANSITION STRAIGHT THROUGH JOINTS FOR SINGLE CORE CABLES (POLYMERIC TO PILC) HV2-24

14.1 Introduction

This specification provides the requirements for a transition straight through joint from single core polymeric insulated wire screened cables to single core, paper insulated, screened, metal sheathed, polymeric oversheathed cables.

14.2 Approved joint kits

Ausgrid's stockcodes of approved transition straight through joint kits for single core cables are provided in the tables below.

Table 39 – Transition Straight Through Joint Kits for Single Core Cables

Single Core Cable Sizes				Transition Joint	
Polymeric	Insulation Shim Kit	PILC	Insulation Shim Kit	Base Kit Stockcode	Connector Stockcode
70mm² Cu	N/A	50mm² Cu	N/A	177911	177765
70mm² Cu	N/A	95mm² Cu	N/A	177911	177787
70mm² Cu	177891	0.15 inch² (97mm²) Cu	N/A	177931	177787
70mm² Cu	177891	185mm² Cu	N/A	177931	See Note 3
185mm² Cu	N/A	95mm² Cu	N/A	177931	176517
185mm² Cu	N/A	0.15 inch² (97mm²) Cu	N/A	177931	176517
185mm² Cu	N/A	185mm² Cu	N/A	177931	150250
185mm² Cu	N/A	0.3 inch² (194mm²) Cu	N/A	177931	184561
185mm² Cu	N/A	300mm² Cu	N/A	177912	176518
185mm² Cu	N/A	0.5 inch² (323mm²) Cu	N/A	177912	See Note 4
300mm² Cu	N/A	0.15 inch² (97mm²) Cu	SMOE-SY275 See Note 5	177912	179881
300mm² Cu	N/A	185mm² Cu	N/A	177912	176518
300mm² Cu	N/A	0.3 inch² (194mm²) Cu	N/A	177912	See Note 6
300mm² Cu	N/A	300mm² Cu	N/A	177912	80929
300mm² Cu	N/A	0.5 inch² (323mm²) Cu	N/A	177912	184562
300mm² Cu	182588	500mm² Al	N/A	177913	152603
630mm² Cu	N/A	500mm² Cu	N/A	177913	See Note 7
630mm² Cu	N/A	630mm² Cu	N/A	177913	179022
630mm² Cu	N/A	1000mm² Cu	N/A	178742	179021
1000mm² Cu	N/A	1000mm² Cu	N/A	178742	179023

N/A – Not Applicable, means that insulation shims are not required for that particular cable size.

Note 1. The above kits do not include connectors.

Note 2. Insulation shim kits consist of tubings that are used to build up the diameter of the cable cores to suit the base kit.

Note 3. Buy in from TE Connectivity Part No CKR185-70/1 or from Legend Power Systems Part No CASR185/70.

Note 4. Buy in from TE Connectivity Part No CKR323-185/1 or from Acculec Power Part No CASR322/185.

Note 5. SMOE-SY275 is available direct from TE Connectivity.

Note 6. Buy in from TE Connectivity Part No CKR300-194/1 or from Acculec Power Part No CASR300/199.

Note 7. Buy in from TE Connectivity Part No CKR630-500/1 or from Acculec Power Part No CASR630/500.

Table 40 – Joint Kit Cable Range

Single Core Cable Range		TE Connectivity Base	
Polymeric	PILC	Kit Number	Kit Stockcode
70mm^2	50mm^2 to 95mm^2 Copper	EPKJ-SY144	177911
95mm^2 to 185mm^2	95mm^2 to 185mm^2	EPKJ-SY145	177931
185mm^2 to 300mm^2	185mm^2 to 300mm^2	EPKJ-SY146	177912
500mm^2 to 630mm^2 Copper	500mm^2 to 630mm^2 Copper	EPKJ-SY147	177913
630mm^2 to 1000mm^2 Copper	1000mm^2 Copper	EPKJ-SY180	178742

14.3 Core connectors

The core connectors used are of the compression type.

The connector material shall match the conductor material on which they are used (ie for copper cables the connectors shall be copper, and for aluminium cables the connectors shall be aluminium).

For transition joints from copper to aluminium, the connectors shall be of the bi-metal type.

For size transition joints the connectors shall match both the transition sizes and the conductor materials. The connectors shall be installed strictly in accordance with the manufacturer's specification for crimping dies, number of crimps, and position of crimps.

Installed connectors shall maintain the load current carrying capacity of the jointed cores.

14.4 Earth continuity

The metal sheath and the screen wires of the single core cables shall be made continuous by laying the screen wires across the joint and attaching to the metal sheath by wiping.

14.5 Requirements

The following requirements must be satisfied when constructing a transition straight through joint kit for single core cables:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The joint shall be constructed in accordance with the installation instruction supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- No jagged edges shall be left on the terminated screen papers.
- All metal sheaths terminations must be belled.

- All components involved in the joint (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.
- The completed joint must be allowed to cool down before applying mechanical load to it.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

15.0 TRANSITION STRAIGHT THROUGH JOINTS FOR THREE CORE CABLES (POLYMERIC TO PILC) HV2-25

15.1 Introduction

This specification provides the requirements for a transition straight through joint from three core polymeric insulated wire screened cables to three core, paper-insulated, screened or belted, metal sheathed, polymeric oversheathed, armoured and unarmoured cables.

15.2 Approved joint kits

Ausgrid's stockcodes of approved transition straight through joint kits for three core cables are provided in the tables below.

Table 41 – Transition Straight Through Joint Kits for Three Core Cables

Three Core Cable Sizes				Transition Joint	
Polymeric	Insulation Shim Kit	PILC	Insulation Shim Kit	Base Kit Stockcode	Connector Stockcode
95mm² Al	N/A	95mm² Al	N/A	177851	177738
95mm² Al	177893	240mm² Al	N/A	177852	177768
95mm² Al	177893	300mm² Al	N/A	177852	177763
150mm² Cu	N/A	185mm² Cu	N/A	177851	177764
150mm² Cu	177893	300mm² Cu	N/A	177852	179164
185mm² Al	N/A	95mm² Al	N/A	177851	177767
185mm² Al	N/A	240mm² Al	N/A	177852	177762
185mm² Al	N/A	300mm² Al	N/A	177852	177761
300mm² Al	N/A	0.2 inch² (129mm²) Cu	N/A	177852	See Note 3
300mm² Al	N/A	0.3 inch² (194mm²) Cu	N/A	177852	See Note 4
300mm² Al	N/A	0.4 inch² (258mm²) Cu	N/A	177852	See Note 5
300mm² Al	N/A	185mm² Cu	N/A	177852	56994
300mm² Al	N/A	240mm² Al	N/A	177852	177740
300mm² Al	N/A	240mm² Cu	N/A	177852	177735
300mm² Al	N/A	300mm² Al	N/A	177852	148320
300mm² Al	177854	500mm² Al	N/A	177853	177739
400mm² Al	177854	95mm² Cu	177892	177853	177902
400mm² Al	177854	0.15 inch² (97mm²) Cu	177892	177853	177902

Three Core Cable Sizes				Transition Joint	
Polymeric	Insulation Shim Kit	PILC	Insulation Shim Kit	Base Kit Stockcode	Connector Stockcode
400mm² Al	177854	0.2 inch² (129mm²) Cu	177892	177853	177903
400mm² Al	177854	150mm² Al	177892	177853	See Note 6
400mm² Al	177854	185mm² Cu	2 x 177894	177853	177729
400mm² Al	177854	0.3 inch² (194mm²) Cu	2 x 177894	177853	See Note 7
400mm² Al	177854	240mm² Al	177894	177853	See Note 8
400mm² Al	177854	240mm² Cu	177894	177853	177736
400mm² Al	177854	0.4 inch² (258mm²) Cu	177894	177853	See Note 9
400mm² Al	177854	300mm² Cu	177894	177853	177728
400mm² Al	177854	300mm² Al	177894	177853	177724
400mm² Al	177854	0.5 inch² (323mm²) Cu	177894	177853	See Note 10
400mm² Al	177854	500mm² Al	N/A	177853	177691
500mm² Al	N/A	150mm² Cu	177892	177853	See Note 11
500mm² Al	N/A	0.4 inch² (258mm²) Cu	177894	177853	See Note 12
500mm² Al	N/A	300mm² Al	177894	177853	177739
500mm² Al	N/A	300mm² Cu	177894	177853	152603
500mm² Al	N/A	0.5 inch² (323mm²) Cu	177894	177853	See Note 13
500mm² Al	N/A	500mm² Al	N/A	177853	176372

N/A – Not Applicable, means that insulation shims are not required for that particular cable size.

Note 1. The above kits do not include connectors.

Note 2. Insulation shim kits consist of tubings that are used to build up the diameter of the cable cores to suit the base kit.

Note 3. Buy in from TE Connectivity Part No BK300-129/1 or from Acculec Power Part No BLK300/120.

Note 4. Buy in from TE Connectivity Part No BK300-194/1 or from Acculec Power Part No BLK300/199.

Note 5. Buy in from TE Connectivity Part No BK300-258/1 or from Acculec Power Part No BLK300/262.

Note 6. Buy in from TE Connectivity Part No AKR400-150/1 or from Acculec Power Part No ALKR400/150.

Note 7. Buy in from TE Connectivity Part No BK400-194/1 or from Acculec Power Part No BLK400/194.

Note 8. Buy in from TE Connectivity Part No AKR400-240/1 or from Acculec Power Part No ALKR400/240.

Note 9. Buy in from TE Connectivity Part No BK400-258/1 or from Acculec Power Part No BLK400-262.

Note 10. Buy in from TE Connectivity Part No BK400-323/1 or from Acculec Power Part No BLK400-322.

Note 11. Buy in from Acculec Power Part No BLK500/150.

Note 12. Buy in from TE Connectivity Part No BK500-258/1 or from Acculec Power Part No BLK500/262.

Note 13. Buy in from TE Connectivity Part No BK500-323/1 or from Acculec Power Part No BLK500/322.

Table 42 – Joint Kit Cable Range

Three Core Cable Range		TE Connectivity Base	
Polymeric	PILC	Kit Number	Kit Stockcode
95mm^2 to 185mm^2	95mm^2 to 185mm^2	EPKJ-SY148	177851
185mm^2 to 300mm^2	185mm^2 to 300mm^2	EPKJ-SY149	177852
500mm^2	500mm^2	EPKJ-SY150	177853

15.3 Core connectors

The core connectors used are of the compression type.

The connector material shall match the conductor material on which they are used (ie for copper cables the connectors shall be copper, and for aluminium cables the connectors shall be aluminium).

For transition joints from copper to aluminium, the connectors shall be of the bi-metal type.

For size transition joints the connectors shall match both the transition sizes and the conductor materials. The connectors shall be installed strictly in accordance with the manufacturer's specification for crimping dies, number of crimps, and position of crimps.

Installed connectors shall maintain the load current carrying capacity of the jointed cores.

15.4 Earth continuity

The metal sheath and the screen wires of the three core cable shall be made continuous by laying the screen wires across the joint and attaching to the metal sheath by wiping.

15.5 Requirements

The following requirements must be satisfied when constructing a transition straight through joint for three core cables:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The joint shall be constructed in accordance with the installation instruction supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- No jagged edges shall be left on the terminated screen papers.
- All metal sheaths terminations must be belled.
- All components involved in the joint (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.

- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.
- The completed joint must be allowed to cool down before applying mechanical load to it.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

16.0 THREE-TO-ONE TRANSITION JOINT (THREE CORE POLYMERIC TO SINGLE CORE PILC) HV2-26

16.1 Introduction

This specification provides the requirements for a three-to-one joint from three core polymeric insulated wire screened cables to single core, paper insulated, screened, metal sheathed, polymeric oversheathed cables.

16.2 Approved joint kits

Ausgrid's stockcodes of approved transition three-to-one joint kits are provided in the table below.

Table 43 – Transition Three-to-One Joint Kits

Three-to-One Joint				Transition Joint Base Kit Stockcode	Connector Stockcode
from Three Core Polymeric	Insulation Shim Kit	to Single Core PILC	Insulation Shim Kit		
150mm^2 Cu	N/A	185mm^2 Cu	N/A	See Note 2	177764
300mm^2 Al	N/A	185mm^2 Cu	N/A	177918	56994
400mm^2 Al	177854	185mm^2 Cu	177895	177919	177729
400mm^2 Al	177854	300mm^2 Cu	N/A	177919	177728
500mm^2 Al	N/A	185mm^2 Cu	177895	177919	177737

N/A – Not Applicable, means that insulation shims are not required for that particular cable size.

Note 1. The above kits do not include connectors.

Note 2. Trifurcate the three core polymeric cable using trifurcation kit stockcode 177783, then make three, single core transition straight through joints using stockcode 177931.

Insulation shim kits consist of tubings that are used to build up the diameter of the cable cores to suit the base kit.

Table 44 – Joint Kit Cable Range

Three Core Cable Range	Single Core Cable Range	TE Connectivity Base Kit Number	Kit Stockcode
Polymeric	PILC		
185mm^2 to 300mm^2	185mm^2 to 300mm^2	EPKJ-SY152	177918
500mm^2	300mm^2	EPKJ-SY153	177919

16.3 Core connectors

The core connectors used are of the compression type.

The connector material shall match the conductor material on which they are used (ie for copper cables the connectors shall be copper, and for aluminium cables the connectors shall be aluminium).

For transition joints from copper to aluminium, the connectors shall be of the bi-metal type.

For size transition joints the connectors shall match both the transition sizes and the conductor materials. The connectors shall be installed strictly in accordance with the manufacturer's specification for crimping dies, number of crimps, and position of crimps.

Installed connectors shall maintain the load current carrying capacity of the jointed cores.

16.4 Earth continuity

The metal sheath and the screen wires of the cables shall be made continuous by laying the screen wires across the joint and attaching to the metal sheath by wiping.

16.5 Requirements

The following requirements must be satisfied when constructing a transition three-to-one joint:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The joint shall be constructed in accordance with the installation instruction supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- No jagged edges shall be left on the terminated screen papers.
- All metal sheaths terminations must be belled.
- All components involved in the joint (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.
- The outer tubular heatshrink tubings must overlap each other by a minimum of 100mm each.
- The completed joint must be allowed to cool down before applying mechanical load to it.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

17.0 THREE-TO-ONE TRANSITION JOINT (3 CORE PILC TO SINGLE CORE POLYMERIC) HV2-27

17.1 Introduction

This specification provides the requirements for a three-to-one joint from three core, paper-insulated, screened or belted, metal sheathed, polymeric oversheathed, armoured and unarmoured cables to single core polymeric insulated wire screened cables.

17.2 Approved joint kits

Ausgrid's stockcodes of approved transition three-to-one joint kits are provided in the table below.

Table 45 – Transition Three-to-One Joint Kits

Three-to-One Joint				Transition Joint Base Kit Stockcode	Connector Stockcode
from Three Core PILC	Insulation Shim Kit	to Single Core Polymeric	Insulation Shim Kit		
0.05 inch^2 (32mm^2) Cu	N/A	185mm^2 Cu	N/A	180171	See Note 4
0.06 inch^2 (39mm^2) Cu	N/A	185mm^2 Cu	N/A	180171	185053
50mm^2 Cu	N/A	70mm^2 Cu	N/A	177914	177765
0.1 inch^2 (65mm^2) Al	186766	185mm^2 Cu	N/A	177916	See Note 5
70mm^2 Al	186766	185mm^2 Cu	N/A	177916	See Note 6
70mm^2 Cu	186766	185mm^2 Cu	N/A	177916	186767
95mm^2 Al	N/A	70mm^2 Cu	177891	177915	H107797
95mm^2 Cu	N/A	70mm^2 Cu	177891	177915	177787
95mm^2 Cu	N/A	185mm^2 Cu	N/A	177915	176517
95mm^2 Cu	179067	300mm^2 Cu	N/A	177916	179881
0.15 inch^2 (97mm^2) Cu	N/A	185mm^2 Cu	N/A	177915	176517
0.15 inch^2 (97mm^2) Cu	179067	300mm^2 Cu	N/A	177916	179881
0.2 inch^2 (129mm^2) Cu	N/A	185mm^2 Cu	N/A	177915	See Note 7
0.2 inch^2 (129mm^2) Cu	179067	300mm^2 Cu	N/A	177916	See Note 8
185mm^2 Cu	N/A	185mm^2 Cu	N/A	177915	150250
185mm^2 Cu	N/A	300mm^2 Cu	N/A	177916	176518
0.3 inch^2 (194mm^2) Al	N/A	185mm^2 Cu	N/A	177915	179667
0.3 inch^2 (194mm^2) Cu	N/A	185mm^2 Cu	N/A	177915	184561
0.3 inch^2 (194mm^2) Cu	N/A	300mm^2 Cu	N/A	177916	See Note 9
240mm^2 Al	N/A	185mm^2 Cu	N/A	177916	H104828
240mm^2 Al	N/A	300mm^2 Cu	N/A	177916	See Note 10
240mm^2 Cu	N/A	300mm^2 Cu	N/A	177916	177766
0.4 inch^2 (258mm^2) Cu	N/A	185mm^2 Cu	N/A	177916	See Note 11
0.4 inch^2 (258mm^2) Cu	N/A	300mm^2 Cu	N/A	177916	See Note 12
300mm^2 Al	N/A	185mm^2 Cu	N/A	177916	56994
300mm^2 Cu	N/A	185mm^2 Cu	N/A	177916	176518
300mm^2 Al	N/A	300mm^2 Cu	N/A	177916	177727

Three-to-One Joint				Transition Joint Base Kit Stockcode	Connector Stockcode
from Three Core PILC	Insulation Shim Kit	to Single Core Polymeric	Insulation Shim Kit		
300mm² Cu	N/A	300mm² Cu	N/A	177916	80929
400mm² Al	177894	300mm² Cu	177854	177917	177728
0.5 inch² (323mm²) Al	N/A	185mm² Cu	N/A	177916	179664
0.5 inch² (323mm²) Cu	N/A	185mm² Cu	N/A	177916	See Note 13
0.5 inch² (323mm²) Al	N/A	300mm² Cu	N/A	177916	See Note 14
0.5 inch² (323mm²) Cu	N/A	300mm² Cu	N/A	177916	184562
0.75 inch² (484mm²) Al	N/A	300mm² Cu	177854	177917	152603
500mm² Al	N/A	185mm² Cu	2 x 177893	177917	177737
500mm² Al	N/A	300mm² Cu	177854	177917	152603

N/A – Not Applicable, means that insulation shims are not required for that particular cable size.

Table 46 – Transition Three-to-One Joint Kits for Pit Applications Only

Three-to-One Joint				Transition Joint Base Kit (TE Part No EPKJ-SY227) Stockcode	Connector Stockcode
from Three Core PILC	Insulation Shim Kit	to Single Core Polymeric	Insulation Shim Kit		
185mm² Cu	177894	185mm² Cu	2 x 182588	182587	150250
185mm² Cu	177894	300mm² Cu	182588	182587	176518
0.3 inch² (194mm²) Cu	177894	185mm² Cu	2 x 182588	182587	184561
0.3 inch² (194mm²) Cu	177894	300mm² Cu	182588	182587	See Note 9
300mm² Cu	N/A	185mm² Cu	2 x 182588	182587	176518
300mm² Cu	N/A	300mm² Cu	182588	182587	80929
0.5 inch² (323mm²) Cu	N/A	185mm² Cu	2 x 182588	182587	See Note 13
0.5 inch² (323mm²) Cu	N/A	300mm² Cu	182588	182587	184562

N/A – Not Applicable, means that insulation shims are not required for that particular cable size.

Note 1. The above kits do not include connectors.

Note 2. Insulation shim kits consist of tubings that are used to build up the diameter of the cable cores to suit the base kit.

Note 3. The joint kits detailed in Table 46 have reduced stripping dimensions and utilise a reinforced wraparound outer sleeve for environmental protection in lieu of the standard tubular sleeves. These joints shall only be used for pit applications.

Note 4. Buy in from TE Connectivity Part No CKR185-32/1 or from Acculec Power Part No CASR185/32.

Note 5. Buy in from TE Connectivity Part No BK65-185/1 or from Acculec Power Part No BLK65/185.

Note 6. Buy in from TE Connectivity Part No BK70-185/1 or from Acculec Power Part No BLK70/185.

Note 7. Buy in from TE Connectivity Part No CKR185-129/1 or from Acculec Power Part No CASR185/120.

Note 8. Buy in from TE Connectivity Part No CKR300-129/1 or from Acculec Power Part No CASR300/120.

Note 9. Buy in from TE Connectivity Part No CKR300-194/1 or from Acculec Power Part No CASR300/199.

Note 10. Buy in from TE Connectivity Part No BK240-300/1 or from Acculec Power Part No BLK240/300.

Note 11. Buy in from TE Connectivity Part No CKR258-185/1 or from Acculec Power Part No CASR262/185.

Note 12. Buy in from TE Connectivity Part No CKR300-258/1 or from Acculec Power Part No CASR300/262.

Note 13. Buy in from TE Connectivity Part No CKR323-185/1 or from Acculec Power Part No CASR322/185.

Note 14. Buy in from TE Connectivity Part No BK323-300/1 or from Acculec Power Part No BLK322/300.

Table 47 – Joint Kit Cable Range

Three Core Cable Range PILC	Single Core Cable Range Polymeric	TE Connectivity Base Kit Number	Kit Stockcode
0.06inch^2 (39mm^2) Cu	185mm^2	SMOE-63783	180171
50mm^2 to 70mm^2	50mm^2 to 70mm^2	EPKJ-SY166	177914
95mm^2 to 185mm^2	95mm^2 to 185mm^2	EPKJ-SY167	177915
185mm^2 to 300mm^2	185mm^2 to 300mm^2	EPKJ-SY169	177916
500mm^2	500mm^2	EPKJ-SY159	177917

17.3 Core connectors

The core connectors used are of the compression type.

The connector material shall match the conductor material on which they are used; i.e. for copper cables the connectors shall be copper, and for aluminium cables the connectors shall be aluminium.

For transition joints from copper to aluminium, the connectors shall be of the bi-metal type.

For size transition joints the connectors shall match both the transition sizes and the conductor materials. The connectors shall be installed strictly in accordance with the manufacturer's specification for crimping dies, number of crimps, and position of crimps.

Installed connectors shall maintain the load current carrying capacity of the jointed cores.

17.4 Earth continuity

The metal sheath and the screen wires of the cables shall be made continuous by laying the screen wires across the joint and attaching to the metal sheath by wiping.

17.5 Requirements

Following requirements must be satisfied when constructing a transition three-to-one joint:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The joint shall be constructed in accordance with the installation instruction supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- No jagged edges shall be left on the terminated screen papers.
- All metal sheath terminations must be belled.
- All components involved in the joint (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.
- The outer tubular heatshrink tubings must overlap each other by a minimum of 100mm each.
- The completed joint must be allowed to cool down before applying mechanical load to it.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

18.0 POT END (LIVE END SEAL) HV1-37

18.1 Introduction

This specification provides the requirements for a pot end (live end seal) on three core and single core polymeric insulated wire screened cables.

18.2 Using pot ends (live end seals)

Pot ends (Live End Seals) shall only be used for maintaining the existing network (e.g. decommissioning a section of 11kV cable) and must not be used on newly installed cables or network extensions such as staged subdivisions.

Where pot ends are to be used, they shall only be installed on cables:

- where it is possible to visually trace the entire length of cable from the pot end to the source of supply, or
- where it is possible to visually trace the entire length of cable from the pot end to the tee joint to which the pot ended section of cable is connected. Additionally, it shall be possible to identify the cables connected to the other two legs of the tee joint using cable identification equipment.

When pot ends are to be direct buried, the pot end shall be located as close as practicable to either:

- the source of supply, or
- the tee joint to which the pot ended section of cable is connected.

This requirement is to minimise future civil works for the purposes of cable identification.

If it is intended to join cable to the pot ended section of cable in the future, sufficient cable length shall be left to allow for the pot end to be replaced with a straight through joint.

18.3 Approved pot end kits

Ausgrid's stockcodes of approved pot ends are provided in the table below.

Table 48 – Pot Ends Kits

Cable Range	TE Connectivity Base Kit Number	Kit Stockcode
70mm^2	MXSE-SY236	182657
95 - 240mm^2	MXSE-SY233	179533
300 – 400mm^2	MXSE-SY234	179534
500mm^2	MXSE-SY235	182656

Note: The above kits are single core. Three core pot ends require 3 kits in addition to the trifurcation kit (See Clause 18.4).

18.4 Trifurcating kits – pot ends

Trifurcating of three core cables into single core cables is necessary as pot ends are only available as single core kits.

Ausgrid's stockcodes of approved trifurcating kits are provided in the Table 49. The basic components of a kit are: glove, core rejacketing tube, sealing sleeves, mastic and installation instruction.

Table 49 – Trifurcation Kits

Cable Range	Trifurcating Kit – Pot Ends Stockcode
95 – 185mm^2	177783
300 – 500mm^2	177782

18.5 Requirements

The following requirements must be satisfied when constructing a pot end:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The pot end shall be constructed in accordance with the installation instruction supplied in the pot end kit.
- The kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- All components involved in the pot end (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.

- The completed pot end must be allowed to cool down before applying mechanical load to it.
- The completed joint, if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

19.0 POLYMERIC TEE JOINTS (POLYMERIC MAIN TO POLYMERIC TEE) HV3-40

19.1 Introduction

This specification provides the requirements for constructing a polymeric tee joint from three core or single core polymeric insulated wire screened main cables to three core or single core polymeric insulated wire screened tee cables.

Ausgrid has approved the use of cold pour resin for use on three core and single core polymeric insulated wire screened cables and heatshrink for use on single core polymeric insulated wire screened cables.

19.2 Approved polymeric cold pour resin tee joint kits

Ausgrid's stockcodes of approved polymeric cold pour resin tee joint kits are provided in the table below.

These cold pour resin tee joints are not suitable for pit applications.

Table 50 – Polymeric Cold Pour Resin Tee Joint Kits

Main Cable Size Polymeric	Tee Cable Size Polymeric	Tee Joint Base Kit Stockcode	Polyurethane Resin Stockcode
95mm^2 Al 3-core	95mm^2 Al 3-core	185033	10 x 75390
185mm^2 Cu 1-core	185mm^2 Cu 1-core	185033	10 x 75390
185mm^2 Cu 1-core	400mm^2 Al 3-core	185033	9 x 75390
185mm^2 Al 3-core	70mm^2 Cu 1-core	185033	10 x 75390
185mm^2 Al 3-core	95mm^2 Al 3-core	185033	10 x 75390
185mm^2 Al 3-core	185mm^2 Al 3-core	185033	10 x 75390
300mm^2 Al 3-core	70mm^2 Cu 1-core	185033	10 x 75390
300mm^2 Al 3-core	95mm^2 Al 3-core	185033	10 x 75390
300mm^2 Al 3-core	185mm^2 Al 3-core	185033	9 x 75390
300mm^2 Al 3-core	185mm^2 Cu 1-core	185033	9 x 75390
300mm^2 Al 3-core	300mm^2 Al 3-core	185033	9 x 75390
300mm^2 Al 3-core	400mm^2 Al 3-core	185033	9 x 75390
300mm^2 Cu 1-core	300mm^2 Cu 1-core	185033	9 x 75390
300mm^2 Cu 1-core	400mm^2 Al 3-core	185033	9 x 75390
400mm^2 Al 3-core	70mm^2 Cu 1-core	185033	10 x 75390
400mm^2 Al 3-core	300mm^2 Cu 1-core	185033	9 x 75390
400mm^2 Al 3-core	300mm^2 Al 3-core	185033	9 x 75390
400mm^2 Al 3-core	400mm^2 Al 3-core	185033	9 x 75390

Note 1. The above kits include mechanical connectors.

Note 2. Stockcode 75390 provides 6 litres of resin.

Table 51 – Joint Kit Cable Range

Main Cable Range Polymeric	Tee Cable Range Polymeric	Sicame Base Kit Part No	Tee Joint Base Kit Stockcode
95mm^2 - 400mm^2 3-core 70mm^2 - 300mm^2 1-core	95mm^2 - 400mm^2 3-core 70mm^2 - 300mm^2 1-core	52464-30	185033

19.2.1 Requirements for polymeric cold pour resin tee joints

The following requirements must be satisfied when constructing a polymeric cold pour resin tee joint:

- The joint hole must be a minimum depth of 900mm (for footways) to accommodate the joint mould and still maintain the cover as specified in NS130.
- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The connectors shall be installed in accordance with the manufacturer's installation instructions.
- The joint shall be constructed in accordance with the installation instructions supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- Resin shall be used in accordance with the manufacturer's instructions.
- The resin in the completed joint must be allowed to set before applying mechanical load to it or energising the joint. This will typically be a minimum of three hours.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

19.3 Approved polymeric heatshrink tee joint kits

Ausgrid's stockcodes of approved polymeric heatshrink tee joint kits are provided in the table below.

Table 52 – Polymeric Heatshrink Tee Joint Kits

Main Cable Size Polymeric	Tee Cable Size Polymeric	Tee Joint Base Kit Stockcode
185mm^2 Cu 1-core	70mm^2 Cu 1-core	178272
300mm^2 Cu 1-core	70mm^2 Cu 1-core	178272
185mm^2 Cu 1-core	185mm^2 Cu 1-core	178273
300mm^2 Cu 1-core	300mm^2 Cu 1-core	178273

Note: The above kits include mechanical connectors for both the core conductors and screen wires.

Table 53 – Joint Kit Cable Range

Main Cable Range	Tee Cable Range	TE Connectivity Base Kit Number	Kit Stockcode
185mm^2 to 300mm^2 Cu	70mm^2	MXSB-SY188	178272
185mm^2 to 300mm^2 Cu	185mm^2 to 300mm^2 Cu	MXSB-SY289	178273

19.3.1 Requirements for heatshrink tee joints

The following requirements must be satisfied when constructing a polymeric heatshrink tee joint:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The connectors shall be installed in accordance with the manufacturer's installation instructions.
- The joint shall be constructed in accordance with the installation instruction supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- All components involved in the joint (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.
- The completed joint must be allowed to cool down before applying mechanical load to it.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

20.0 POLYMERIC STUB TEE JOINTS HV3-39

20.1 Introduction

This specification provides the requirements for constructing a polymeric cold pour resin stub tee joint on three core and single core polymeric insulated wire screened cables.

20.2 Approved polymeric cold pour resin stub tee joint kits

Ausgrid's stockcodes of approved polymeric cold pour resin stub tee joint kits are provided in the table below.

These cold pour resin stub tee joints are not suitable for pit applications.

Table 54 – Polymeric Cold Pour Resin Stub Tee Joint Kits

Cable 1	Cable 2	Stub Tee Joint Base Kit Stockcode	Polyurethane Resin Stockcode
95mm^2 Al 3-core	95mm^2 Al 3-core	185033	10 x 75390
185mm^2 Cu 1-core	185mm^2 Cu 1-core	185033	10 x 75390
185mm^2 Cu 1-core	400mm^2 Al 3-core	185033	10 x 75390
185mm^2 Al 3-core	70mm^2 Cu 1-core	185033	10 x 75390
185mm^2 Al 3-core	95mm^2 Al 3-core	185033	10 x 75390
185mm^2 Al 3-core	185mm^2 Al 3-core	185033	10 x 75390
300mm^2 Al 3-core	70mm^2 Cu 1-core	185033	10 x 75390
300mm^2 Al 3-core	95mm^2 Al 3-core	185033	10 x 75390
300mm^2 Al 3-core	185mm^2 Al 3-core	185033	10 x 75390
300mm^2 Al 3-core	185mm^2 Cu 1-core	185033	10 x 75390
300mm^2 Al 3-core	300mm^2 Al 3-core	185033	10 x 75390
300mm^2 Al 3-core	400mm^2 Al 3-core	185033	10 x 75390
300mm^2 Cu 1-core	300mm^2 Cu 1-core	185033	10 x 75390
300mm^2 Cu 1-core	400mm^2 Al 3-core	185033	10 x 75390
400mm^2 Al 3-core	70mm^2 Cu 1-core	185033	10 x 75390
400mm^2 Al 3-core	300mm^2 Cu 1-core	185033	10 x 75390
400mm^2 Al 3-core	300mm^2 Al 3-core	185033	10 x 75390
400mm^2 Al 3-core	400mm^2 Al 3-core	185033	10 x 75390

Note 1. The above kits include mechanical connectors.

Note 2. Stockcode 75390 provides 6 litres of resin.

Table 55 – Joint Kit Cable Range

Cable 1 Range Polymeric	Cable 2 Range Polymeric	Sicame Base Kit Part No	Stub Tee Joint Base Kit Stockcode
95mm^2 - 400mm^2 3-core 70mm^2 - 300mm^2 1-core	95mm^2 - 400mm^2 3-core 70mm^2 - 300mm^2 1-core	52464-30	185033

20.2.1 Requirements

The following requirements must be satisfied when constructing a polymeric cold pour resin stub tee joint:

- The joint hole must be a minimum depth of 900mm (for footways) to accommodate the joint mould and still maintain the cover as specified in NS130.
- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The connectors shall be installed in accordance with the manufacturer's installation instructions.
- The joint shall be constructed in accordance with the installation instructions supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- Resin shall be used in accordance with the manufacturer's instructions.
- The resin in the completed joint must be allowed to set before applying mechanical load to it or energising the joint. This will typically be a minimum of three hours.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

21.0 TRANSITION TEE JOINTS (POLYMERIC MAIN TO PILC TEE) HV3-41

21.1 Introduction

This specification provides the requirements for constructing a transition cold pour resin tee joint from three core or single core polymeric insulated wire screened main cables to three core or single core paper insulated, screened, metal sheathed, polymeric oversheathed, armoured and unarmoured tee cables.

21.2 Approved transition cold pour resin tee joint kits

Ausgrid's stockcodes of approved transition cold pour resin tee joint kits are provided in the table below.

These cold pour resin tee joints are not suitable for pit applications.

Table 56 – Transition Cold Pour Resin Tee Joint Kits

Main Cable Size Polymeric	Tee Cable Size PILC	Tee Joint Base Kit Stockcode	Polyurethane Resin Stockcode
95mm^2 Al 3-core	95mm^2 Al 3-core	185035	10 x 75390
185mm^2 Cu 1-core	95mm^2 Al 3-core	185035	10 x 75390
185mm^2 Cu 1-core	185mm^2 Cu 1-core	185035	10 x 75390
185mm^2 Cu 1-core	300mm^2 Al 3-core	185035	9 x 75390
185mm^2 Al 3-core	95mm^2 Al 3-core	185035	10 x 75390
185mm^2 Al 3-core	185mm^2 Cu 1-core	185035	10 x 75390
300mm^2 Cu 1-core	95mm^2 Al 3-core	185035	10 x 75390
300mm^2 Cu 1-core	97mm^2 Cu 3-core	185035	10 x 75390
300mm^2 Cu 1-core	185mm^2 Cu 1-core	185035	9 x 75390
300mm^2 Cu 1-core	300mm^2 Cu 1-core	185035	9 x 75390
300mm^2 Cu 1-core	300mm^2 Al 3-core	185035	9 x 75390
300mm^2 Cu 1-core	323mm^2 Al 3-core	185035	9 x 75390
300mm^2 Al 3-core	95mm^2 Al 3-core	185035	10 x 75390
300mm^2 Al 3-core	185mm^2 Cu 1-core	185035	9 x 75390
300mm^2 Al 3-core	300mm^2 Cu 1-core	185035	9 x 75390
300mm^2 Al 3-core	300mm^2 Al 3-core	185035	9 x 75390
400mm^2 Al 3-core	95mm^2 Al 3-core	185035	10 x 75390
400mm^2 Al 3-core	185mm^2 Cu 1-core	185035	9 x 75390
400mm^2 Al 3-core	300mm^2 Cu 1-core	185035	9 x 75390
400mm^2 Al 3-core	300mm^2 Al 3-core	185035	9 x 75390

Note 1. The above kits include mechanical connectors.

Note 2. Stockcode 75390 provides 6 litres of resin.

Table 57 – Joint Kit Cable Range

Main Cable Range Polymeric	Tee Cable Range PILC	Sicame Base Kit Part No	Tee Joint Base Kit Stockcode
95mm^2 - 400mm^2 3-core 70mm^2 - 300mm^2 1-core	95mm^2 - 323mm^2 3-core 95mm^2 - 323mm^2 1-core	52464-37	185035

21.3 Requirements

The following requirements must be satisfied when constructing a transition cold pour resin tee joint:

- The joint hole must be a minimum depth of 900mm (for footways) to accommodate the joint mould and still maintain the cover as specified in NS130.
- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The connectors shall be installed in accordance with the manufacturer's installation instructions.
- The joint shall be constructed in accordance with the installation instructions supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- No jagged edges shall be left on the terminated screen papers.
- All metal sheaths terminations must be belled.
- Resin shall be used in accordance with the manufacturer's instructions.
- The resin in the completed joint must be allowed to set before applying mechanical load to it or energising the joint. This will typically be a minimum of three hours.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

22.0 TRANSITION TEE JOINTS (PILC MAIN TO POLYMERIC TEE) HV3-42

22.1 Introduction

This specification provides the requirements for constructing a transition cold pour resin tee joint from three core or single core paper insulated, screened, metal sheathed, polymeric oversheathed, armoured and unarmoured main cables to three core or single core polymeric insulated wire screened tee cables.

22.2 Approved transition cold pour resin tee joint kits

Ausgrid's stockcodes of approved transition cold pour resin tee joint kits are provided in the table below.

These cold pour resin tee joints are not suitable for pit applications.

Table 58 – Transition Cold Pour Resin Tee Joint Kits

Main Cable Size PILC	Tee Cable Size Polymeric	Tee Joint Base Kit Stockcode	Polyurethane Resin Stockcode
0.06 inch^2 (39mm^2) Cu 3-core	185mm^2 Cu 1-core	185034 & 3 x 185027 (see Note 3)	10 x 75390
0.06 inch^2 (39mm^2) Cu 3-core	300mm^2 Cu 1-core	185034 & 3 x 185027 (see Note 3)	10 x 75390
95mm^2 Al 3-core	95mm^2 Al 3-core	185034	10 x 75390
95mm^2 Al 3-core	185mm^2 Cu 1-core	185034	10 x 75390
95mm^2 Al 3-core	185mm^2 Al 3-core	185034	10 x 75390
95mm^2 Al 3-core	300mm^2 Al 3-core	185034	10 x 75390
95mm^2 Cu 3-core	300mm^2 Cu 1-core	185034	10 x 75390
0.15 inch^2 (97mm^2) Cu 3-core	300mm^2 Al 3-core	185034	10 x 75390
0.15 inch^2 (97mm^2) Cu 3-core	400mm^2 Al 3-core	185034	10 x 75390
0.2 inch^2 (129mm^2) Cu 3-core	300mm^2 Cu 1-core	185034	10 x 75390
185mm^2 Cu 1-core	185mm^2 Cu 1-core	185034	10 x 75390
185mm^2 Cu 1-core	185mm^2 Al 3-core	185034	10 x 75390
185mm^2 Cu 1-core	300mm^2 Cu 1-core	185034	9 x 75390
185mm^2 Cu 1-core	300mm^2 Al 3-core	185034	9 x 75390
185mm^2 Cu 1-core	400mm^2 Al 3-core	185034	9 x 75390
185mm^2 Cu 3-core	185mm^2 Cu 1-core	185034	10 x 75390
185mm^2 Cu 3-core	300mm^2 Cu 1-core	185034	9 x 75390
185mm^2 Cu 3-core	300mm^2 Al 3-core	185034	9 x 75390
185mm^2 Cu 3-core	400mm^2 Al 3-core	185034	9 x 75390
0.3 inch^2 (194mm^2) Cu 3-core	185mm^2 Cu 1-core	185034	10 x 75390
0.3 inch^2 (194mm^2) Cu 3-core	300mm^2 Cu 1-core	185034	9 x 75390
0.3 inch^2 (194mm^2) Cu 3-core	400mm^2 Al 3-core	185034	9 x 75390
240mm^2 Cu 3-core	95mm^2 Al 3-core	185034	10 x 75390
240mm^2 Cu 3-core	185mm^2 Al 3-core	185034	9 x 75390
240mm^2 Cu 3-core	400mm^2 Al 3-core	185034	9 x 75390
240mm^2 Al 3-core	300mm^2 Cu 1-core	185034	9 x 75390
240mm^2 Al 3-core	95mm^2 Al 3-core	185034	10 x 75390
240mm^2 Al 3-core	185mm^2 Al 3-core	185034	9 x 75390

Main Cable Size PILC	Tee Cable Size Polymeric	Tee Joint Base Kit Stockcode	Polyurethane Resin Stockcode
240mm^2 Al 3-core	300mm^2 Al 3-core	185034	9 x 75390
240mm^2 Al 3-core	400mm^2 Al 3-core	185034	9 x 75390
300mm^2 Cu 1-core	150mm^2 Cu 3-core	185034	9 x 75390
300mm^2 Cu 1-core	185mm^2 Cu 1-core	185034	9 x 75390
300mm^2 Cu 1-core	300mm^2 Cu 1-core	185034	9 x 75390
300mm^2 Cu 1-core	300mm^2 Al 3-core	185034	9 x 75390
300mm^2 Cu 1-core	400mm^2 Al 3-core	185034	9 x 75390
300mm^2 Cu 3-core	150mm^2 Cu 3-core	185034	9 x 75390
300mm^2 Cu 3-core	185mm^2 Cu 1-core	185034	9 x 75390
300mm^2 Cu 3-core	300mm^2 Cu 1-core	185034	9 x 75390
300mm^2 Al 3-core	95mm^2 Al 3-core	185034	10 x 75390
300mm^2 Al 3-core	185mm^2 Cu 1-core	185034	9 x 75390
300mm^2 Al 3-core	185mm^2 Al 3-core	185034	9 x 75390
300mm^2 Al 3-core	300mm^2 Cu 1-core	185034	9 x 75390
300mm^2 Al 3-core	300mm^2 Al 3-core	185034	9 x 75390
300mm^2 Al 3-core	400mm^2 Al 3-core	185034	9 x 75390
0.5 inch^2 (323mm^2) Al 3-core	185mm^2 Cu 1-core	185034	9 x 75390
0.5 inch^2 (323mm^2) Al 3-core	300mm^2 Cu 1-core	185034	9 x 75390
0.5 inch^2 (323mm^2) Al 3-core	400mm^2 Al 3-core	185034	9 x 75390

Note 1. The above kits include mechanical connectors.

Note 2. Stockcode 75390 provides 6 litres of resin.

Note 3. Stockcode 185027 is a mechanical connector suitable for connecting 0.06inch^2 Cu 3-core PILC cables (Main) to 185-300mm^2 Polymeric cables (Tee). These connectors are to replace the connectors contained in the tee joint base kit.

Table 59 – Joint Kit Cable Range

Main Cable Range PILC	Tee Cable Range Polymeric	Sicame Base Kit Part No	Tee Joint Base Kit Stockcode
95mm^2 - 323mm^2 3-core 95mm^2 - 323mm^2 1-core	95mm^2 - 400mm^2 3-core 70mm^2 - 300mm^2 1-core	52464-31	185034

22.3 Requirements

The following requirements must be satisfied when constructing a transition cold pour resin tee joint:

- The joint hole must be a minimum depth of 900mm (for footways) to accommodate the joint mould and still maintain the cover as specified in NS130.
- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The connectors shall be installed in accordance with the manufacturer's installation instructions.
- The joint shall be constructed in accordance with the installation instructions supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- No jagged edges shall be left on the terminated screen papers.
- All metal sheaths terminations must be belled.
- Resin shall be used in accordance with the manufacturer's instructions.
- The resin in the completed joint must be allowed to set before applying mechanical load to it or energising the joint. This will typically be a minimum of three hours.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

23.0 TRANSITION TEE JOINTS (THREE DIFFERENT CABLES) HV3-44

23.1 Introduction

This specification provides the requirements for constructing a transition cold pour resin tee joint from three different cables. The cables can be three core or single core paper insulated, screened, metal sheathed, polymeric oversheathed, armoured and unarmoured; or three core or single core polymeric insulated wire screened cables.

23.2 Approved transition cold pour resin tee joint kits

Ausgrid's stockcodes of approved transition cold pour resin tee joint kits are provided in the table below.

These cold pour resin tee joints are not suitable for pit applications.

Table 60 – Transition Cold Pour Resin Tee Joints (three different cables)

Cable 1	Cable 2	Cable 3	Tee Joint Base Kit Stockcode	Polyurethane Resin Stockcode
95mm^2 Cu 1-core PILC	185mm^2 Cu 1-core Polymeric	300mm^2 AL 3-core PILC	185034	10 x 75390
95mm^2 Cu 3-core PILC	185mm^2 Cu 1-core Polymeric	185mm^2 Cu 3-core PILC	185034	10 x 75390
95mm^2 Cu 3-core PILC	185mm^2 Cu 1-core Polymeric	300mm^2 AL 3-core PILC	185034	10 x 75390
185mm^2 Cu 1-core PILC	0.2 inch^2 (129mm^2) Cu 3-core PILC	300mm^2 Cu 1-core Polymeric	185034	9 x 75390
185mm^2 Cu 1-core Polymeric	400mm^2 AL 3-core Polymeric	300mm^2 Cu 1-core Polymeric	185033	9 x 75390
300mm^2 AL 3-core PILC	185mm^2 Cu 1-core Polymeric	185mm^2 Cu 1-core Polymeric	185035	9 x 75390
300mm^2 AL 3-core PILC	400mm^2 AL 3-core Polymeric	185mm^2 Cu 3-core PILC	185034	9 x 75390
300mm^2 AL 3-core PILC	400mm^2 AL 3-core Polymeric	300mm^2 Cu 1-core Poly	185035	9 x 75390

N/A – Not Applicable, means that the accessory pack is not required.

Note 1. The above kits include mechanical connectors.

Note 2. Stockcode 75390 provides 6 litres of resin.

Table 61 – Joint Kit Cable Range

Cable Range for all Three Cables being Polymeric	Sicame Base Kit Part No	Tee Joint Base Kit Stockcode
95mm^2 - 400mm^2 3-core 70mm^2 - 300mm^2 1-core	52464-30	185033

Cable Range for Two Cables being PILC	Cable Range for One Cable being Polymeric	Sicame Base Kit Part No	Tee Joint Base Kit Stockcode
95mm^2 - 323mm^2 3-core 95mm^2 - 323mm^2 1-core	95mm^2 - 400mm^2 3-core 70mm^2 - 300mm^2 1-core	52464-31	185034

Cable Range for Two Cables being Polymeric	Cable Range for One Cable being PILC	Sicame Base Kit Part No	Tee Joint Base Kit Stockcode
95mm^2 - 400mm^2 3-core 70mm^2 - 300mm^2 1-core	95mm^2 - 323mm^2 3-core 95mm^2 - 323mm^2 1-core	52464-37	185035

23.3 Requirements

The following requirements must be satisfied when constructing a transition cold pour resin tee joint:

- Where the transition tee joint comprises of two PILC cables and one polymeric cable, or two polymeric cables and one PILC cable, the two cables of the same type (i.e. two PILC cables or two polymeric cables) shall come into the joint from opposite ends, so that the cables of the same type shall share the same tunnel of the connector as shown in Figure 22-1 below.
- Where it is not practicable to have the two cables of the same type (i.e. two PILC cables or two polymeric cables) coming into the joint from opposite ends (so that the cables of the same type share the same tunnel of the connector), three mechanical connectors (Stockcode 185027) shall be used to replace the connectors contained in the tee joint base kit. These connectors are suitable for cables in the size range 25-323mm^2.

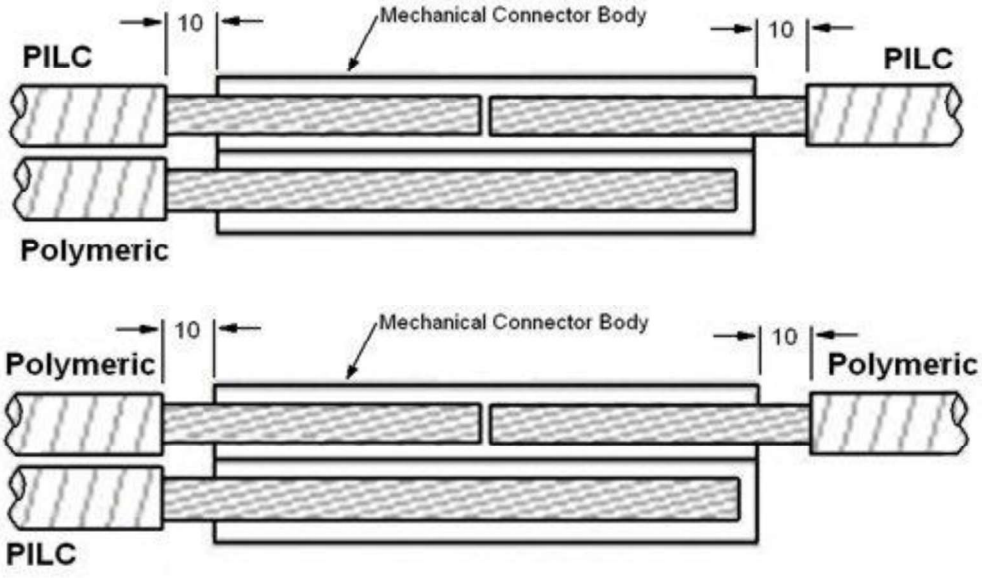


Figure 22-1 - Constructing a Transition Tee Joint

- The joint hole must be a minimum depth of 900mm (for footways) to accommodate the joint mould and still maintain the cover as specified in NS130.
- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The connectors shall be installed in accordance with the manufacturer's installation instructions.
- The joint shall be constructed in accordance with the installation instructions supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter and must not be damaged during the jointing process.

- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- No jagged edges shall be left on the terminated screen papers.
- All metal sheaths terminations must be belled.
- Resin shall be used in accordance with the manufacturer's instructions.
- The resin in the completed joint must be allowed to set before applying mechanical load to it or energising the joint. This will typically be a minimum of three hours.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

24.0 TRANSITION STUB TEE JOINTS HV3-43

24.1 Introduction

This specification provides the requirements for constructing a transition cold pour resin stub tee joints on three core or single core polymeric insulated wire screened cables and three core or single core paper insulated, screened, metal sheathed, polymeric oversheathed, armoured and unarmoured cables.

24.2 Approved transition cold pour resin stub tee joint kits

Ausgrid's stockcodes of approved transition cold pour resin stub tee joint kits are provided in the table below.

These cold pour resin stub tee joints are not suitable for pit applications.

Refer to Table 54 for Polymeric stub tee joint kits.

Table 62 – Transition Cold Pour Resin Stub Tee Joint Kits

Polymeric Cable Size	PILC Cable Size	Stub Tee Joint Base Kit Stockcode	Polyurethane Resin Stockcode
95mm² Al 3-core	95mm² Al 3-core	185034	10 x 75390
95mm² Al 3-core	240mm² Al 3-core	185034	10 x 75390
95mm² Al 3-core	240mm² Cu 3-core	185034	10 x 75390
95mm² Al 3-core	300mm² Al 3-core	185034	10 x 75390
150mm² Cu 3-core	300mm² Cu 1-core	185034	10 x 75390
150mm² Cu 3-core	300mm² Cu 3-core	185034	10 x 75390
185mm² Cu 1-core	95mm² Al 3-core	185034	10 x 75390
185mm² Cu 1-core	185mm² Cu 1-core	185034	10 x 75390
185mm² Cu 1-core	185mm² Cu 3-core	185034	10 x 75390
185mm² Cu 1-core	300mm² Cu 1-core	185034	10 x 75390
185mm² Cu 1-core	300mm² Al 3-core	185034	10 x 75390
185mm² Cu 1-core	300mm² Cu 3-core	185034	10 x 75390
185mm² Al 3-core	95mm² Al 3-core	185034	10 x 75390
185mm² Al 3-core	185mm² Cu 1-core	185034	10 x 75390
185mm² Al 3-core	240mm² Al 3-core	185034	10 x 75390
185mm² Al 3-core	240mm² Cu 3-core	185034	10 x 75390
185mm² Al 3-core	300mm² Al 3-core	185034	10 x 75390
300mm² Cu 1-core	95mm² Al 3-core	185034	10 x 75390
300mm² Cu 1-core	185mm² Cu 1-core	185034	10 x 75390
300mm² Cu 1-core	194mm² Cu 3-core	185034	10 x 75390
300mm² Cu 1-core	300mm² Cu 1-core	185034	10 x 75390
300mm² Cu 1-core	300mm² Al 3-core	185034	10 x 75390
300mm² Cu 1-core	300mm² Cu 3-core	185034	10 x 75390
300mm² Al 3-core	95mm² Al 3-core	185034	10 x 75390
300mm² Al 3-core	185mm² Cu 1-core	185034	10 x 75390
300mm² Al 3-core	185mm² Cu 3-core	185034	10 x 75390
300mm² Al 3-core	240mm² Al 3-core	185034	10 x 75390
300mm² Al 3-core	300mm² Cu 1-core	185034	10 x 75390
300mm² Al 3-core	300mm² Al 3-core	185034	10 x 75390

Polymeric Cable Size	PILC Cable Size	Stub Tee Joint Base Kit Stockcode	Polyurethane Resin Stockcode
400mm² Al 3-core	95mm² Al 3-core	185034	10 x 75390
400mm² Al 3-core	120mm² Cu 3-core	185034	10 x 75390
400mm² Al 3-core	185mm² Cu 1-core	185034	10 x 75390
400mm² Al 3-core	185mm² Cu 3-core	185034	10 x 75390
400mm² Al 3-core	194mm² Cu 3-core	185034	10 x 75390
400mm² Al 3-core	300mm² Cu 1-core	185034	10 x 75390
400mm² Al 3-core	300mm² Al 3-core	185034	10 x 75390

Note 1. The above kits include mechanical connectors.

Note 2. Stockcode 75390 provides 6 litres of resin.

Table 63 – Joint Kit Cable Range

Cable 1 Range Polymeric	Cable 2 Range PILC	Sicame Base Kit Part No	Stub Tee Joint Base Kit Stockcode
95mm² - 400mm² 3-core 70mm² - 300mm² 1-core	95mm² - 323mm² 3-core 95mm² - 323mm² 1-core	52464-31	185034

24.3 Requirements

The following requirements must be satisfied when constructing a transition cold pour resin stub tee joint:

- The joint hole must be a minimum depth of 900mm (for footways) to accommodate the joint mould and still maintain the cover as specified in NS130.
- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The cable cores must be cut with a hacksaw or a suitable power driven saw to prevent deformation of the conductor strands. Cable cutters shall not be used as they tend to deform the conductor strands.
- The connectors shall be installed in accordance with the manufacturer's installation instructions.
- The joint shall be constructed in accordance with the installation instructions supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- No jagged edges shall be left on the terminated screen papers.
- All metal sheath terminations must be belled.
- Resin shall be used in accordance with the manufacturer's instructions.
- The resin in the completed joint must be allowed to set before applying mechanical load to it or energising the joint. This will typically be a minimum of three hours.
- The completed joint if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

25.0 TRANSITION JOINT INVOLVING 22KV OR 33KV PILC CABLES (22KV OR 33KV PILC TO 11KV POLYMERIC) HV2-28

25.1 Introduction

This specification provides the requirements for transition joints from 22kV or 33kV rated PILC cables that are operated at 11kV to 11kV polymeric insulated wire screened cables.

25.2 Approved joint kits

Ausgrid's stockcodes of approved transition joint kits are provided in the table below.

Table 64 – 22kV Transition Joint Kits

Transition Joint				Transition Joint Base Kit	Connector Stockcode
From 22kV PILC	Insulation Shim Kit	To 11kV Polymeric	Insulation Shim Kit		
0.25 inch^2 (161mm^2) Cu3 PL SWJ	N/A	185mm^2 Cu 1-core	N/A	177916	179882
0.25 inch^2 (161mm^2) Cu3 PL SWJ	N/A	300mm^2 Cu 1-core	N/A	177916	See Note 3

Table 65 – 33kV Transition Joint Kits

Transition Joint				Transition Joint Base Kit	Connector Stockcode
From 33kV PILC	Insulation Shim Kit	To 11kV Polymeric	Insulation Shim Kit		
0.25 inch^2 (161mm^2) Cu3 PL SWJ	N/A	185mm^2 Cu 1-core	2 x 177893	177917	179882
0.25 inch^2 (161mm^2) Cu3 PL SWJ	N/A	300mm^2 Cu 1-core	177854	177917	See Note 3
0.25 inch^2 (161mm^2) Cu3 PL SWJ	N/A	400mm^2 Al 3-core	177854	177853	See Note 4
0.25 inch^2 (161mm^2) Cu3 P HSL SWJ	N/A	300mm^2 Cu 1-core	N/A	185022	See Note 3

N/A – Not Applicable, means that insulation shims are not required for that particular cable size.

Note 1. The above kits do not include connectors.

Note 2. Insulation shim kits consist of tubings that are used to build up the diameter of the cable cores to suit the base kit.

Note 3. Buy in from TE Connectivity Part No CKR300-161/1 or from Acculec Power Part No CASR300/162.

Note 4. Buy in from TE Connectivity Part No BK400-161/1 or from Acculec Power Part No BLK400/162.

25.3 Core connectors

The core connectors used are of the compression type.

The connector material shall match the conductor material on which they are used; i.e. for copper cables the connectors shall be copper, and for aluminium cables the connectors shall be aluminium.

For transition joints from copper to aluminium, the connectors shall be of the bi-metal type.

For size transition joints the connectors shall match both the transition sizes and the conductor materials. The connectors shall be installed strictly in accordance with the manufacturer's specification for crimping dies, number of crimps, and position of crimps.

Installed connectors shall maintain the load current carrying capacity of the jointed cores.

25.4 Earth continuity

The metal sheath and the screen wires of the single core cables shall be made continuous by laying the screen wires across the joint and attaching to the metal sheath by wiping.

25.5 Requirements

The following requirements must be satisfied when constructing a transition three-to-one joint:

- The cable cores must not be bent tighter than the manufacturer's specified minimum internal bending radius during the jointing process. The completed joint and the first 500mm of each associated cable must be straight when set in position.
- The joint shall be constructed in accordance with the installation instruction supplied in the joint kit.
- The joint kit contents and the prepared cable ends must be kept free of foreign matter, and must not be damaged during the jointing process.
- The insulation screen shall be neatly terminated. Special care must be taken to ensure that the insulation is not damaged while removing the insulation screen.
- No jagged edges shall be left on the terminated screen papers.
- All metal sheaths terminations must be belled.
- All components involved in the joint (including cable components) which will come into contact with either mastic tape or adhesive sealants must be thoroughly cleaned and degreased prior to the application of such sealing agents. Cleaning must only be done using lint-free cloth.
- Heatshrink tubings must be properly and evenly shrunk, free of voids, and must not be damaged from overheating. Heatshrink components with adhesive sealant coatings must provide effective sealing against moisture ingress when installed.
- The outer tubular heatshrink tubings must overlap each other by a minimum of 100mm each.
- The completed joint must be allowed to cool down before applying mechanical load to it.
- The completed joint, if direct buried, shall be surrounded in soft bedding material to a depth of 100mm above the joint. The bedding material must comply with the requirements of NS130.

26.0 CABLE DESCRIPTION CODES

Cable description codes are provided in NS100 External Annexure C.

27.0 MINIMUM INTERNAL BENDING RADIUS

Nominal minimum internal bending radii of cables are provided in NS130.

28.0 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.

29.0 RECORDKEEPING

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

Table 66 – 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. 2014/21250/329)	Unlimited
Working documents (emails, memos, impact assessment reports, etc.)	Records management system Work Folder for Network Standards (HPRM ref. 2014/21250/329)	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.

30.0 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.

31.0 DOCUMENT CONTROL

Document Owner : Head of Network Strategy & Future Grid

Distribution Coordinator : Manager Network Standards & Electrical Safety

Annexure A – Cable Preparation

A1 Removing the graphite from the cable sheath

A1.1 Tools and material required

The following tools and material are required for the removal of graphite from the cable sheath:

- Leather gloves,
- Safety glasses,
- Approximately five glass slides (approximately 80 x 30 x 2mm) per cable (stockcode 177752 or available direct from Sydney Glass Pty Ltd), and
- A lead scraping tool may also be used as an alternative to the glass slides.

A1.2 Method

Remove the graphite from the cable sheath as follows (Ref: Figure A-1 below):

1. Wear safety glasses and leather gloves.
2. Holding a piece of glass as shown in the figure below or a lead scraper, shave off a thin strip of graphite coated cable sheath, approximately 100mm long.
3. Repeat around the circumference of the cable making sure that each strip overlaps the mark left behind by the previous strip.
4. Abrade, clean and degrease the cable sheath as per the installation instruction.

Notes:

- When the glass edge becomes blunt, use a different point on the edge of the glass slide or use a new piece of glass.
- Do not touch the newly shaved length of the cable sheath with anything that carries graphite.
- If a section of cable sheath has been removed and the cores are exposed, work away from the exposed cores to minimise the risk of contaminating the exposed cores with graphite.

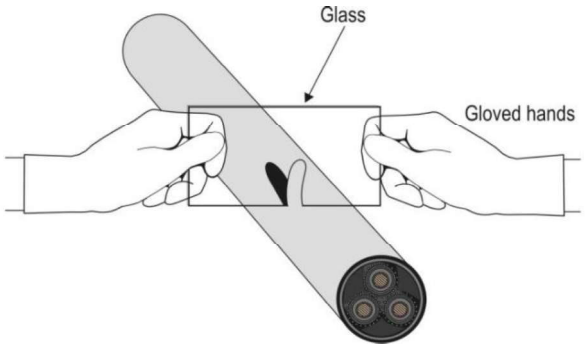


Figure A-1 – Removing the Graphite from the Cable Sheath

A1.3 Safety precautions and first aid procedures

Graphite has been classified as having low toxicity, and a non-carcinogenic substance. However, normal industrial safety precautions such as wearing leather gloves, safety glasses and safety boots should be observed.

First aid procedures are:

Swallowed: Keep individual calm, do not induce vomiting, seek medical attention.

Eye: Flush eyes with water for 15 minutes, seek medical attention if irritation persists.

Skin: Wash with soap and water, remove contaminated clothing and launder before reuse.

Inhaled: If affected, remove individual to fresh air, seek medical attention if breathing difficulties occur.

A2 Removing the cable sheath

Remove the cable sheath as follows:

1. Obtain the sheath removal dimension from the relevant installation instruction.
2. Mark the sheath removal position with a white pencil or approved paint marker.
3. Position the blade of the cable sheath stripping tool so that the cutting edge of the blade is facing in the direction of the sheath removal mark.
4. Move the stripping tool along the cable sheath to the required length (sheath removal mark).
5. Turn the cable stripper at right angles to the cut made in step 3 and move the stripper around the circumference of the cable.
6. If the cable has a composite sheath, repeat Steps 1 to 5 for the inner layer of the composite sheath.

A3 Removing the insulation screen

Remove the insulation screen as follows (Ref: Fig A-2 below):

1. Obtain the insulation screen removal dimension from the relevant installation instruction.
2. Mark the insulation screen removal position with a white pencil or approved paint marker.
3. Position PVC tape (sticky side out) aligning the edge of the tape with the dimension for the insulation screen removal.
4. Starting 2mm from the edge of the PVC tape, using the screen scoring tool, longitudinally score the insulation screen until the cut end of the cable is reached.
5. From the starting point in step 4 above move approximately 6mm around the circumference of the cable. Starting 2mm from the edge of the PVC tape, using the screen scoring tool, longitudinally score the insulation screen until the cut end of the cable is reached creating a 6mm wide set of “tram lines”.
6. Using the rat tail file, file around the edge of the PVC tape, ringing the insulation screen to expose the insulation below.

   Notes:

   - The file shall only contact the insulation screen when moving in a forward direction. Allowing the file to contact the insulation screen when moving in a reverse direction has the tendency to create a rough finish.
   - The insulation screen shall be filed in a manner to prevent excessive heat build up. If excessive heat is produced a ring of insulation screen will remain on the insulation. This is not acceptable.
   - For three core cables care must be exercised to prevent damage to adjacent cores whilst filing of the insulation screen is being carried out.
   - The insulation screen shall be filed sufficiently to expose the underlying insulation for the entire circumference of the cable.
   - Care shall be exercised to prevent the unnecessary removal of insulation.
7. Starting at the cut end of the cable, separate the insulation screen layer from the insulation in the “tram lined” area. Gripping the insulation screen with long nose pliers, peel the insulation screen from the insulation for the length of the “tram lined” area up to where the insulation

screen has been the filed. Avoid contact between the long nose pliers and areas of the insulation that will not be removed to accommodate either a lug or a ferrule.

8. Starting at the cut end of the cable and continuing to where the insulation screen has been filed, grip the insulation screen with long nose pliers and peel the remaining insulation screen from the insulation. Avoid contact between the long nose pliers and areas of the insulation that will not be removed to accommodate either a lug or a ferrule.
9. Check the insulation to ensure no traces of insulation screen are left on the insulation.
10. Remove the PVC tape.

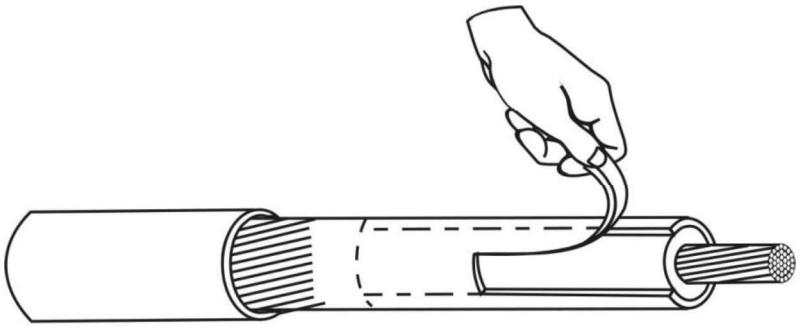


Figure A-2 – Removing the Insulation Screen

A4 Removing the XLPE core insulation (where applicable)

Remove the XLPE core insulation as follows (Ref: Fig A-3 below):

1. Obtain the insulation removal dimension from the relevant installation instruction.
2. Mark the insulation removal position with a white pencil or approved paint marker.
3. Apply 6 layers of PVC tape (sticky side out) aligning the edge of the tape with the insulation removal dimension mark plus 42mm to act as a stop. The 42mm distance is specific to the recommended insulation stripping tool.
4. Position the XLPE insulation stripping tool at the end of the core insulation so that the blade is just clear of the core end and close the handle.
5. Adjust the jaw opening using the notched wheel on the tool body so that the tool has a firm grip on the core insulation.
6. Check and if necessary, adjust the blade depth so that the blade does not protrude enough to damage the conductor. The cutting blade depth is adjusted by loosening the blade locking screw and turning the cam screw. When the correct depth has been achieved, securely tighten the locking screw.

7. Clamp the XLPE stripping tool onto the end of the cable core, and start removing the insulation by turning the tool in a clockwise direction with sufficient pressure along the core so that the tool spirals towards the stopper. Keep rotating the tool until the leading edge of the stripping tool comes into contact with the tape stopper. The stopper will stop any further spiral movement and allow the blade to complete the stripping with a tapered edge.
8. Remove the tape stopper.

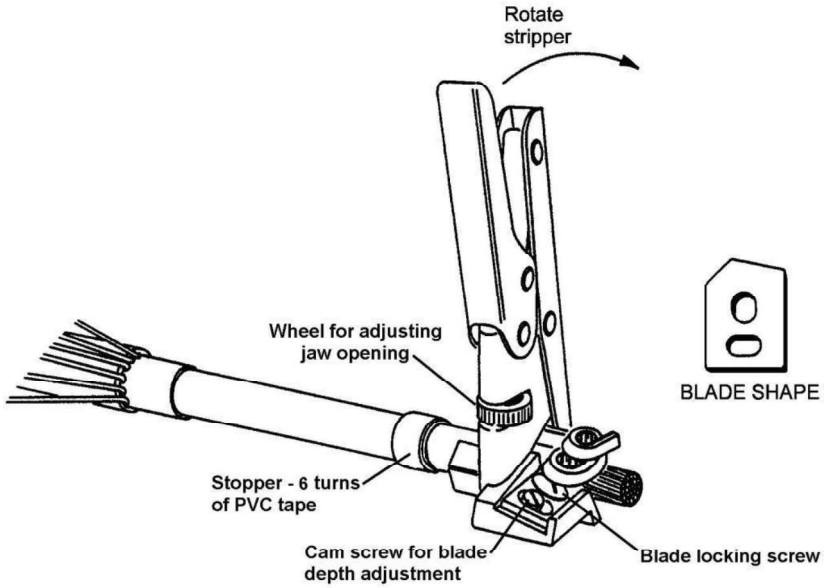


Figure A-3 – Removing the XLPE Core Insulation

9. Clean the insulation and insulation screen in accordance with the approved method in the associated installation instruction.

A5 Removing the EPR core insulation (where applicable)

Remove the EPR core insulation as follows:

1. Obtain the insulation removal dimension from the relevant installation instruction.
2. Mark the insulation removal position with a white pencil or approved paint marker.
3. Put a small nick in the insulation at the marked position with a knife (this will hold the Kevlar string in position).
4. Using the Kevlar string, cut through the insulation at the marked position.
5. Starting 2mm from the edge of the cut made in step 4, using a knife, longitudinally score the insulation until the cut end of the cable is reached.
6. Starting at the cut end of the cable, separate the insulation from the conductor.
7. Clean the insulation and insulation screen in accordance with the approved method in the associated installation instruction.

A6 Presence of water

When it is suspected that water has ingressed into a cable it must be inspected to confirm the actual presence of water in the cable and the extent of water ingress. A large amount of water may be visible, or even flow out of the cable however, where it is not so obvious, water indicating tapes shall be used.

Check for the presence of water:

- in between outer and inner layers of the composite sheath,
- between the sheath and the core/s,
- in between screen wires, and
- in between the core conductor strands.

If the presence of water is not obvious, use water indicating tape (trade name 'Watesmo'. stockcode 177743). Tear a short piece of this tape from the roll using a pair of dry forceps or dry fingers and touch the point where you want to check for the presence of water. If the tape encounters water its light blue colour will change to deep blue immediately.

Note: **'**Watesmo' tape does not change its colour due to atmospheric moisture. If any signs of moisture are identified during the jointing or terminating process the Ausgrid representative must be contacted immediately.

A7 Removal of water swellable tape

Some polymeric cables incorporate water swellable tapes as a precautionary measure against radial ingress of moisture into the cores. Water swellable tapes incorporate water swellable powder, which is not classified as a toxic substance. However, safety precautions and good hygiene are essential for minimising the risks of exposure.

A7.1 Method of removal from cables and disposal

Remove the water swellable tapes as follows:

- Wear a dust mask and rubber gloves.
- Carefully remove the tape, cut it where required, and place it in a plastic bag.
- Seal off the bag and dispose of it as ordinary waste.

Note: Rough handling of the tape may lead to emission of water swellable dust.

A7.2 Health Risks

Water swellable tape is a moderate irritant to skin, eyes and mucous membranes. Personnel who have a history of skin disease or allergy should seek medical advice before direct contact or dust exposure during slitting or rough handling.

A7.3 Special first aid procedures

Eye: Flush eyes with plenty of water and seek medical attention if irritation persists.

Skin: Wash with mild soap and water, remove contaminated clothing and launder before reuse.

Inhalation: Remove person to fresh air and seek medical attention.