



# NS125

## Specification for Low Voltage Overhead Conductors

FEBRUARY 1998

Amendments included from CIAs 1073 Sep 1999, 1111 Jun 2000, 1181 Jul 2001, 1207 Oct 2001, 1219 Nov 2001, 1221 May 2002, NSAs 1276 Oct 2002, 1291 Mar 2003, 1299 Aug 2003, 1310a Oct 2003, 1353 May 2005, & 1366 Oct 2005



## SUMMARY

Network Standard NS125 is Ausgrid's specification for constructing Low Voltage Overhead Conductors.

## ISSUE

This Standard is subject to amendment by Ausgrid at any time.

**Ausgrid staff:** This Standard is for issue to all overhead line staff, and for reference by technical and engineering staff associated with the installation of overhead lines.

Where this document is issued as a controlled document replacing an earlier edition; remove and destroy the superseded document.

**Accredited Service Providers and Contractors:** This document is issued on an uncontrolled basis. It is the user's responsibility to ensure that the document being used is current and includes any amendments issued since the date on the document.

Ausgrid offers a subscription service which provides for updates and amendments to standards on payment of an annual fee

Current network standards are also available on Ausgrid's Internet site at [www.ausgrid.com.au](http://www.ausgrid.com.au).

## DISCLAIMER

This Standard 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. Any proposed deviation from this Standard must be submitted to Ausgrid for approval before it is implemented.

It is the responsibility of all persons involved to ensure that a safe system of work is employed and that statutory requirements are met.

Ausgrid will not accept any liability for work carried out to a superseded standard. Ausgrid may not accept work carried out which is not in accordance with current standard requirements.

Ausgrid's standards are subject to ongoing review. It is possible that conflict may exist between standard documents. In this event, the most recent standard is to prevail.

## 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 were 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.

# Network Standard NS125

Specification for Low Voltage Overhead Conductors

**1 February 1998**

## CONTENTS

1.	INTRODUCTION .....	1
2.	DEFINITIONS .....	2
3.	RESPONSIBILITIES .....	3
4.	CABLE .....	4
4.1	Phase Identification .....	4
4.2	Clearance Criteria .....	4
4.3	Ground Clearances .....	5
4.4	Clearance from Structures .....	6
4.5	Facade-Mounted Aerial Bundled Cable .....	6
4.6	Vegetation Clearances .....	6
5.	FITTINGS .....	7
5.1	Bi-metallic Compression Lugs .....	7
5.2	Sleeves .....	7
5.3	Compression Die Types .....	8
6.	ERECTION .....	9
6.1	Pulling in the Cable .....	9
6.2	Intermediate Supports .....	9
6.3	Midspan Joints .....	9
6.4	Vertical Bonding .....	9
6.5	Phasing/Arrangement of Conductors .....	9
6.6	Underground to Overhead Connections (UGOHs) .....	9
6.7	Erecting ABC Through Trees or Near Obstructions .....	9
6.8	Staying of Poles with Unbalanced Loads .....	10
6.9	Stainless Steel Bolts and Set-screws – Lubrication of Threads	10
7.	LV SUSPENDED SERVICES .....	11
8.	FUSE/LINK SWITCH DISCONNECTORS .....	12
8.1	Installation of Insulated Fuse/Link Switch Disconnectors ....	13
9.	ELECTRICAL SAFETY PROCEDURES .....	14
9.1	Proving De-energised .....	14
9.2	Live Line Work .....	14
10.	STORES AND MATERIALS .....	15
11.	REFERENCES .....	16
11.1	Ausgrid Documents .....	16

11.2	Other Standards and Documents .....	16
11.3	Acts and Regulations .....	16
APPENDIX A	VEGETATION CLEARANCE REQUIREMENTS .....	18
APPENDIX B	STOCKCODES .....	19
APPENDIX C	POLE TOP CONSTRUCTION DRAWINGS.....	21

# 1. INTRODUCTION

---

This network standard describes the minimum requirements that Ausgrid has adopted for Low Voltage Overhead Conductor installation within its regions. Ausgrid will make all the necessary design decisions and requirements for the installation of LV overhead conductors.

This network standard shall be read in association with Ausgrid's document ES10 *Requirements for Electricity Supply To Developments*, the Electricity Supply Association of Australia *Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines HB C(b)1-1999* and the following Australian Standards:

- AS 3560 "Electric Cables - XLPE insulated - Aerial bundled - For working voltages up to and including 0.6/1 kV".
- AS 3766 "Mechanical fitting for low voltages aerial bundled cables".
- AS 1222 Steel conductors and stays - Bare overhead
- AS 3607 Conductors – Bare overhead, aluminium and aluminium alloy – Steel reinforced
- AS 1531 Conductors – Bare overhead, aluminium and aluminium alloy

Low Voltage Overhead Conductor Installation shall only be performed by an Accredited Service Provider and in accordance with the requirements of ES4 *Service Provider Authorisation*.

Refer to Section 6 of ES 10 *Requirements for Electricity Supply to Developments* for details of Ausgrid's overhead and underground mains policy.

The general guidelines for the form of construction for each development shall be determined by Ausgrid and shall be in accordance with the prevailing Policy of the time. The final interpretation and decision as to the type of construction to be used shall be Ausgrid's, notification of the type of construction shall be issued in the preliminary design brief.

## 2. DEFINITIONS

---

Aerial Bundled Cable	A cable system used by Ausgrid for the low voltage overhead distribution system. The low voltage cable system consists of four compacted stranded hard-drawn aluminium conductors individually insulated with black cross-linked polyethylene (XLPE).
<b>Bare Conductor</b>	A conductor not provided with insulation rated for the operating voltage of the line.
Facade Mounted	Is the description used for the mounting of low voltage aerial bundled cable (as low voltage distribution mains) on to a facade of a commercial or retail premises.
I.R. Meter	An electrical device used for measuring insulation resistance (500 V I.R. Meter for LV tests and 1000 V I.R. Meter for HV tests).
High Voltage (HV) Distribution System	All mains and apparatus operating at nominal voltages between 1000 V and 33 kV.
Low Voltage Distribution System	All mains and apparatus operating at nominal voltages above extra low voltage and up to and including 1000 V.
Phasing (Phased)	Means a test to determine whether energised conductors of phase A, B, or C in a polyphase system may be satisfactorily connected together.
Customer	The customer is defined as the individual or entity presenting to Ausgrid for business dealings related to the connection and supply of electricity.
Accredited Service Provider	An Accredited Service Provider is defined as the individual or entity which enters a contractual arrangement with an Assured Quality Contractor or Ausgrid to complete works associated with the development of the electricity distribution system.

### 3. RESPONSIBILITIES

---

During the course of supply negotiations the Accredited Service Provider shall provide all information to allow Ausgrid to determine the most appropriate method of supply. Ausgrid will prepare and provide design information sufficient to enable design and construction drawings to be completed.

The customer/applicant for connection services is responsible for the design, supply of some materials and construction of the contestable connection work (including substations) to supply the new industrial/commercial development generally as detailed in Ausgrid's Electrical Standard ES10 *Requirements for Electricity Supply to Developments*. The customer/applicant for connection services can use either Ausgrid staff or Accredited Service Providers to complete the electrical design and construction for which he/she is responsible, as specified in the Design Information provided by Ausgrid for each particular project. Reference should be made to Ausgrid's Electrical Standard ES9 *Agreement for Supply to Developments*. The customer/applicant for connection services or the accredited designer is also responsible for providing local authorities and the RTA (as appropriate) with copies of the proposed construction plans at least 40 days before work is to commence, and must comply with any special requirements of these authorities. Refer also to Network Standard NS104 *Network Project Design Plans*.

The customer (end user) is responsible for supplying and installing the portion of service mains from the street alignment to the customer's terminals in accordance with the NSW Service and Installation Rules and Ausgrid's Local Service and Installation Rules.

All future rail crossings (overhead or underground) should allow for all poles or the ends of ductlines to be located OFF rail property wherever possible.

- Poles should be located in the road either side of a rail crossing, provided Rail's technical requirements on maximum span lengths etc permit this.
- Ducts should be run the full width of the rail corridor, finishing just outside the rail property boundary. Note that this does not necessarily require a bore across the entire width of rail land, only that the ductline protecting any cables should continue the entire width of the crossing, so that the need to enter rail land for works is minimised.

Where new works on existing crossings permit, advantage should be taken of the opportunity to extend ductlines or relocate poles where this is appropriate. Any such projects should be referred to Network Asset and Investment Management for a decision on what work should be included in these cases.

## 4. CABLE

---

In order to allow for future growth in electricity demands Customer Supply will specify the rating of cable required for all new mains. Cable is available on drums from the Ausgrid stores, or from a quality assured supplier. Stockcode numbers for LV cable, tools, and fittings, are given in Appendix B.

LV ABC complies with AS 3560 *Electric cables - XLPE insulated - Aerial bundled - For working voltages up to and including 0.6/1 kV*. It consists of four compacted stranded hard-drawn aluminium conductors individually insulated with black cross-linked polyethylene (XLPE).

To prevent corrosion of the aluminium conductor it is essential that the XLPE insulation has no holes.. Repair damage to the insulation with either a mastic lined heatshrink materials or by taping with a special vinyl-mastic insulating and sealing tape.

Cut ends of the cable that are not terminated with an electrical connector must be individually sealed with a heatshrink cable end cap. The cable remaining on a drum must also be sealed to provide electrical insulation and to keep out moisture.

The cross sectional area of LV ABC adopted as stock sizes are 95 mm<sup>2</sup> and 150 mm<sup>2</sup> Al.

The following bare conductors have been commonly used by Ausgrid.

- 7/4.50 AAC Mercury
- 19/3.75 AAC Pluto
- 6/1/3.00 ACSR Apple
- 37/3.75 AAC Triton
- 7/2.50 AAAC Chlorine
- 19/4.75 AAC Taurus
- 19/3.25 AAC Neptune

Mercury was the bare conductor generally used by Ausgrid for low voltage mains, however others such as apple and chlorine have also been used where load is low

### 4.1 Phase Identification

Identify phases by 'Lamping' LV ABC at open points. Cable end caps may be removed for lamping purposes, however, a new end cap must be fitted when finished.

**Note:** Never puncture a cable to lamp.

Use a volt stick to check that a cable is de-energised.

### 4.2 Clearance Criteria

Clearance criteria are based on:-

- the Ausgrid Safety and Operating Plan, and
- the Electricity Supply Association of Australia (ESAA) publication HB C(b)1-1999 'Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines', and
- Ausgrid drawing 515297 'Overhead Power Lines – Minimum Conductor Clearances'.

Design clearances must be in accordance with drawing 515297, and must also satisfy Clauses 4.3 and 4.4 below. The clearances specified are the minimum clearances that must be maintained after all possible conductor movements are taken into account, including sag and blow-out movements due to current loading, temperature and wind. Fault currents are not required to be accounted for in this calculation.

Refer to HB C(b)1-1999 for conductor sag and tension calculations.

Clause 4.3, including Table 1, summarises the minimum ground clearance requirements for low voltage conductors.

Clause 4.4, including Table 2, summarises the minimum clearance from structure requirements for low voltage conductors. Clearances from structures must comply with Section 8 of HB C(b)1 - 1999.

Design spacings for conductors of different circuits, including unattached crossings, attached crossings, and conductors on same supports (shared spans) must comply with drawing 515297.

The design clearance requirements as specified in this Network Standard, including drawing 515297, must be achieved for new construction and for replacement construction. Particular attention must also be given during pole replacement design and construction to ensure that the required clearances are achieved.

### 4.3 Ground Clearances

Minimum clearances above ground for low voltage bare conductors and

LV ABC aerial conductors are as specified in Table 1.

The minimum clearances in Table 1 apply to measurements in any direction from a conductor after the conductor has settled.

For the purposes of this Clause, the term "ground" includes any unroofed area accessible to vehicles or mobile plant or machinery.

**Table 1: Ground Clearances for New LV Aerial Conductors**

Location	Minimum Clearance
• Over the carriageway of roads	*6.0 metres
• Over ground other than the carriageway of roads	6.0 metres
• Over ground which by its nature cannot be traversed by vehicles or mobile plant or machinery	5.0 metres

\* Note: This minimum clearance is applicable for all public roads up to and including gazetted 4.6 metre high vehicle routes, except as follows: Additional clearance may be required in special circumstances, such as private roads and adjacent parts of public roads, especially in mining areas and heavy industrial sites. In these cases, specific clearance requirements must be obtained from Ausgrid.

#### 4.4 Clearance from Structures

The clearance of LV cable from structures is given in Table 2. The mode of measurement varies for different structures or parts of structures.

For roofs and similar structures below and beside LV cable, the distance between the conductors and the vertical projection of the edge of the structure must not be less than the minimum specified horizontal clearance, unless the minimum specified vertical clearance is achieved.

Where the structure is above the conductors, the minimum clearance applies in any direction.

All clearances in table 2 are minimum and must not be reduced by construction creepage.

**Table 2: Clearance of LV cable from Structures**

Location	Minimum Clearance	
	ABC	Bare
Vertically above those parts of any structure normally accessible to persons,	2.7 m	3.7
Vertically above those parts of any structure not normally accessible to persons but on which a person can stand.	0.1 m	2.7
In any direction (other than vertically above) from those parts of any structure normally accessible to persons, or from any part not normally accessible to persons but on which a person can stand. In any direction from any radio or television aerial.	0.1 m	1.5
In any direction from those parts of any structure (or advertising sign) not normally accessible to persons	0.1 m*	0.6m*

\* This clearance can be further reduced to allow for service termination at the point of attachment.

#### 4.5 Facade-Mounted Aerial Bundled Cable

New installations of façade-mounted aerial bundled cable, or extensions of existing façade-mounted aerial bundled cable, are not permitted.

#### 4.6 Vegetation Clearances

Accredited Service Providers designing new low voltage overhead lines must comply with the requirements of the Electricity Association of NSW document ISSC 3 – *Guide to Tree Planting and Maintaining Safety Clearances Near Power Lines*.

Prior to energising any new low voltage overhead line, vegetation clearances must be in accordance with the requirements of Network Standard NS179 *Vegetation Safety Clearances*. The clearances specified in NS179 are to prevail over the clearances indicated in document ISSC 3.

Vegetation clearance work must be carried out in accordance with Ausgrid's Electrical Safety Rules.

## 5. FITTINGS

---

### 5.1 Bi-metallic Compression Lugs

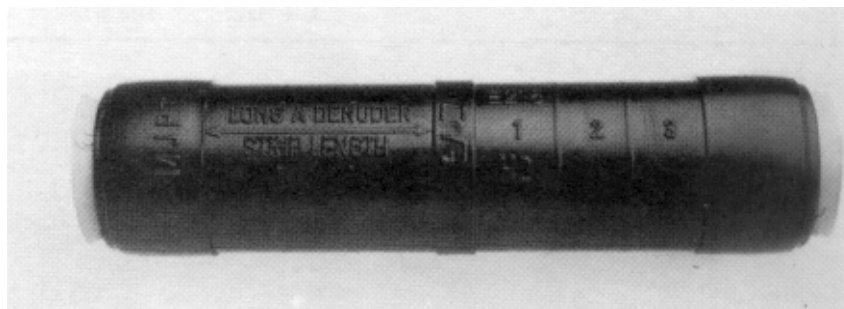
Use bi-metallic compression lugs (see Figure 1) to connect LV bare aluminium and ABC onto bare copper tails or terminals. With low voltage ABC use lugs either pre-insulated or supplied with a mastic-lined heatshrink sleeve.



**Figure 1 - Bi-metallic compression lug**

### 5.2 Sleeves

Use sleeves (see Figure 2) to connect individual cores of LV ABC midspan during maintenance and repair only. They are normally used to join cores as a result of damage.



**Figure 2 - Pre-insulated sleeve**

Sleeves for use with LV ABC are pre-filled with jointing compound and are supplied pre-insulated.

Note: Do not use sleeve joints midspan during erection. Use them as part of a repair or pole changeover.

### 5.3 Compression Die Types

Midspan joints in LV ABC must be staggered (see Section Midspan Joints).

**Table 4: Compression Fittings Die Sizes**

<b>Joint</b>	<b>Conductor</b>	<b>Cembre Die Size</b>	<b>Utilux Die Size</b>	<b>Number of Crimps</b>
Lugs				
Heatshrink	95 mm <sup>2</sup> LV ABC		38-180 AL	1
Pre-Insulated	95 mm <sup>2</sup> LV ABC	M215-50	38-215 CU	3*
Pre-Insulated	150 mm <sup>2</sup> LV ABC	M215-50	38-215 CU	3*
Sleeves				
Heatshrink	95 mm <sup>2</sup> LV ABC to		38-180 AL	1 each end
	95 mm <sup>2</sup> LV ABC		38-180 AL	1 each end
Pre-Insulated	95 mm <sup>2</sup> LV ABC to	M215-50	38-215 CU	3 each end*
	95 mm <sup>2</sup> LV ABC	M215-50	38-215 CU	3 each end*
Pre-Insulated	150 mm <sup>2</sup> LV ABC to	M215-50	38-215 CU	3 each end*
	150 mm <sup>2</sup> LV ABC	M215-50	38-215 CU	3 each end*

\* Or as marked on the sleeve

## 6. ERECTION

---

LV cable may be erected using either the paying-out or pulling-in method. See Appendix C for Pole Top Construction details.

### 6.1 Pulling in the Cable

The pulling tension for LV ABC must not exceed **4 kN**. For normal span lengths of bare conductor, a good rule of thumb is that the stringing tension is about half the sagging tension.

### 6.2 Intermediate Supports

After tensioning between strain points the cable should be secured to the intermediate poles in descending order of line angle deviation (ie. the poles with the largest angle of deviation should be completed first).

### 6.3 Midspan Joints

Tension jointing of bundles midspan must be avoided. At erection, where a choice exists, the bundles must be joined at the non-tension bond position of a poletop.

### 6.4 Vertical Bonding

Vertical Bonding will take place with parallel LV ABC cables of the same circuit at substations, links, terminations and tee connections. They must also be used at least every 100m.

### 6.5 Phasing/Arrangement of Conductors

ABC cables are to be arranged so that A phase is the conductor that has only one identifying rib, B phase is the conductor that has two ribs, C phase is the conductor that has three ribs and the Neutral is the multi ribbed conductor

Open wire construction is to be arranged so that the neutral conductor is located nearest to the footpath with A phase between it and the pole. C phase conductor is to be the furthest away from neutral and B phase is to be between C phase and the pole

All cable installations must be correctly phased at all points that may be used to connect to surrounding LV systems.

### 6.6 Underground to Overhead Connections (UGOHs)

Ausgrid's requirements for LV UGOHs are to be found in NS127.

### 6.7 Erecting ABC Through Trees or Near Obstructions

When erecting ABC through trees, consider:

- the risk of abrasion of the ABC by trees,
- sag variations and the effect of wind loading,
- the effect of wind loading on trees or branches bearing on the ABC, and
- the danger of trees providing access for unauthorised climbing.

Branches which may exert excessive pressure on the ABC must be removed.

Whether a particular branch will bear onto the ABC system under the effects of foliage or wind can only be judged by taking into account the individual circumstances and whether the branch can deflect enough to be a danger.

Where unauthorised access is a potential problem, consideration should be given to the possible danger of children climbing the trees.

### **6.8 Staying of Poles with Unbalanced Loads**

A pole which is to be subjected to unbalanced loads which would exceed the permissible design load limits of the pole must be stayed in accordance with Ausgrid drawing B1-61501, prior to attaching the unbalanced loads to the pole. If a concrete pole is used, this must be reported to Ausgrid in advance, so that any additional precautions to protect the concrete from crushing by the stay wire can be determined.

### **6.9 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 (e.g. Loctite Nickel Anti-Seize, or equivalent). Ausgrid stockcode is 177212.

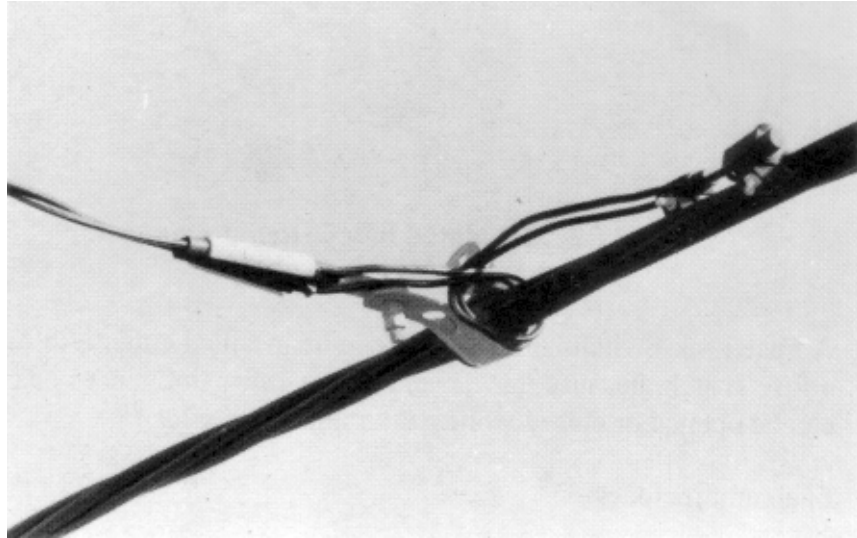
Where the lubricating grease will be in contact with an electrical insulating medium (e.g. heatshrink), the supplier of the insulating medium shall be consulted to ensure product compatibility.

## 7. LV SUSPENDED SERVICES

---

Suspended services may be used where consumer poles cannot be used for a three-block spacing, for narrow frontage blocks, or to avoid property crossing.

When pole positions are adjacent to the building alignment such that a suspended service would cross property and LV ABC has been used in the street, construct a midspan attached service instead (see Figure 3) or a 'flying fox' (suspended open wire service) where open wire construction exists. The midspan attached service has limited application and can only be installed using an elevating work platform.

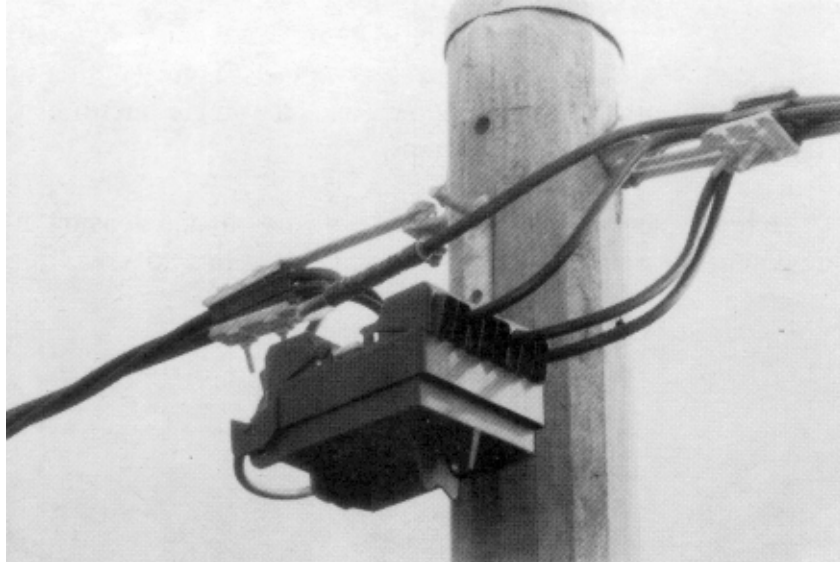


**Figure 3 - Midspan service take-off**

## 8. FUSE/LINK SWITCH DISCONNECTORS

---

Construct LV isolating points using insulated fuse/link switch disconnectors. The fuse/link switch disconnector for use with LV ABC is insulated as shown in Figure 4. The fuse/link switch disconnector for use with LV bare mains is not insulated, a diagram is included in Appendix C.



**Figure 4 - Insulated link switch disconnector**

Note: The insulated link switch disconnector is not suitable for mounting on a building facade.

A Fuse/Link Switch Disconnector can be installed either as a link switch or as a fuse switch.

Each unit includes:

- a pole mounting bracket.
- a set of three 630A link blades.
- a link storage kit.

## 8.1 Installation of Insulated Fuse/Link Switch Disconnectors

Mount the unit on a pole at least 4 metres above the ground, in such a position that the lower cover can be opened or removed with a standard operating stick. Make sure the unit is level so water cannot run into it. The units are supplied with a pole mounting bracket. Two M12 x 90 mm coach screws are to be used to attach it.

Join the supply and load neutrals above the switch unit using a pre-insulated sleeve.

Ensure that the supply is connected to the terminals marked SUPPLY, and the load is connected to the terminals marked LOAD. This is very important: the unit can not break its rated current if you connect it backwards.

Take care to ensure that moisture can not get to the conductor strands after installation:

- butt the insulation firmly against the terminal blocks.
- include a drip-loop in the conductor near the termination.

## 9. ELECTRICAL SAFETY PROCEDURES

---

When you are working on or near the Ausgrid electrical network, which includes the High Voltage Distribution System and the Low Voltage Distribution System as defined in this document, you must comply with the Ausgrid Electrical Safety Rules.

Work or testing must not be done on or near high voltage mains and apparatus until an operator has completed the procedures documented in Clause 8.1 of the Ausgrid Electrical Safety Rules.

The basic safety principle for low voltage work is that you must treat all low voltage mains and apparatus as alive until the low voltage mains and apparatus are isolated and proved de-energised.

If it is impractical for the low voltage mains and apparatus to be isolated and proved de-energised before the work is commenced, then you must comply with the procedures documented in the Ausgrid Electrical Safety Rules for work on or near exposed live low voltage mains and apparatus.

### 9.1 Proving De-energised

Except for ABC any line isolated for work must be tested at the work site with suitable voltage detecting equipment, to prove it is de-energised.

Low voltage ABC need not be tested to prove it de-energised provided that:

- No contact will be made with any conductor when working on the cable and
- Precautions are taken to make sure no electrical connection will be made without testing for possible current flow.

### 9.2 Live Line Work

Live line work on low voltage lines is permitted provided that personnel have the appropriate qualifications and training, and that the appropriate safety equipment is used. Live line work must comply with the procedures documented in the Ausgrid Electrical Safety Rules.

**Note:** Concrete or steel poles or structures, or poles carrying high voltage conductors, are to be treated as conductive. You must follow the precautions detailed in Ausgrid's Electrical Safety Rules when you work with conductive structures.

## 10. STORES AND MATERIALS

---

Contractors must only use approved products on the network. Ausgrid should be contacted regarding approved products. Alternative products may be submitted to Ausgrid for approval in accordance with the requirements of NUS181 Approval of Materials and Equipment and Amendment of Network Standards. A fee for the approval of alternative products for use on the network will be negotiated.

To purchase materials from Ausgrid, the Project Manager must contact the "Project Officer Network Procurement" on telephone number (02) 9394 6034. All materials will be made available for the Accredited Service Provider to pick up from:

**Central Warehouse  
2 Mayvic Street  
Chullora NSW 2190**

Alternatively, the Accredited Service Provider may obtain material from other sources provided the quality assurance and environmental management system requirements are met. Materials must comply with Ausgrid's relevant specifications.

All materials used for network projects must be new.

## 11. REFERENCES

---

### 11.1 Ausgrid Documents

Ausgrid's Supply Policy-Electrical Standards (ES range of documentation).

Network Standard NS179 Vegetation Safety Clearances.

Service and Installation Rules

### 11.2 Other Standards and Documents

AS 3560 Electric cables - XLPE insulated - Aerial bundled - For working voltages up to and including 0.6/1 kV

AS 3766 Mechanical fittings for low voltage aerial bundled cables

AS 1222 Steel conductors and stays - Bare overhead

AS 3607 Conductors – Bare overhead, aluminium and aluminium alloy – Steel reinforced

AS 1531 Conductors – Bare overhead, aluminium and aluminium alloy

HB C(b)1 –1999 Guidelines for Design and Maintenance of Overhead Distribution and Transmission Lines.

Electricity Association of NSW document ISSC 3 - *Guide to Tree Planting and Maintaining Safety Clearances Near Power Lines.*

New South Wales Service and Installation Rules.

Relevant Industry and WorkCover Guides and Codes of Practice.

### 11.3 Acts and Regulations

Electricity Supply (Safety Plans) Regulation 1997.

Electricity Safety Act 1945

Electrical (Installation Safety) Regulation 1992

Occupational Health and Safety Act 2000

Occupational Health and Safety Regulation 2001

All pertinent Environmental Regulations and Acts.

## **APPENDIX A VEGETATION CLEARANCE REQUIREMENTS**

Refer to and comply with Network Standard NS179 *Vegetation Safety Clearances*.

## APPENDIX B STOCKCODES

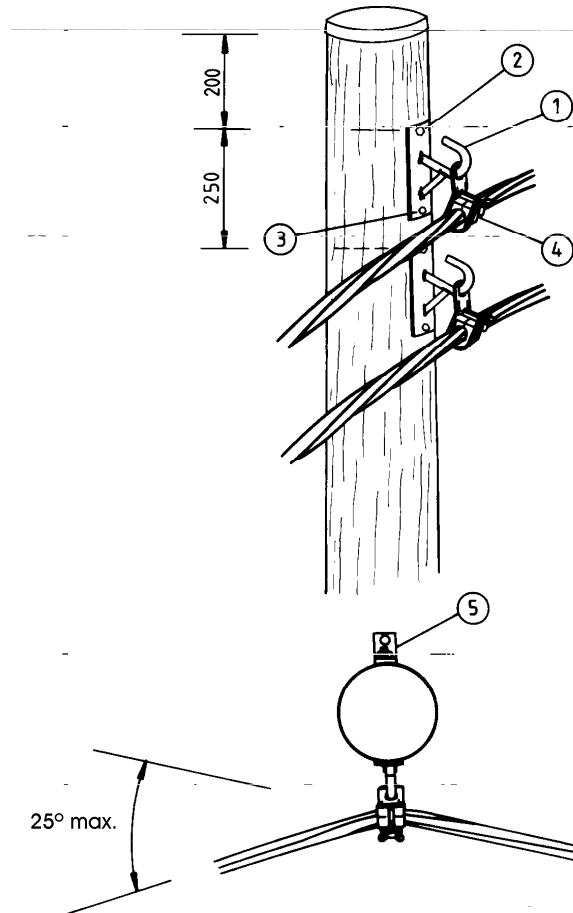
---

Item	Stockcode
LV ABC, 4 × 95 mm <sup>2</sup>	67959
LV ABC, 4 × 150 mm <sup>2</sup>	148080
Bolt and nut, M10 × 25 mm SS	44966
Bolt and nut, M12 × 40 mm SS	45146
Bracket hook	66621
Bracket, roller double	66555
Bracket, roller single	89870
Bracket, termination	66571
Cable end cap, heatshrink	62117
Cable pulling stocking, 4 × 95 mm <sup>2</sup>	43430
Cable pulling stocking, 4 × 150 mm <sup>2</sup>	152058
Cable stripping tool, 95 mm <sup>2</sup>	137703
Cable stripping tool, 150 mm <sup>2</sup>	152033
Clamp, strain, 4 × 95 mm <sup>2</sup> , 4 × 150 mm <sup>2</sup>	63222
Clamp, strain, 2 × 10 mm <sup>2</sup> /16 mm <sup>2</sup> service	128736
Clamp, strain, 2 × 25 mm <sup>2</sup> /35 mm <sup>2</sup> service	148056
Clamp, suspension, 4 × 95 mm <sup>2</sup>	63057
Clamp, suspension, 4 × 150 mm <sup>2</sup>	148072
Clamp, suspension, yoke bracket	66100
Clamp, suspension, breakaway 4 × 95 mm <sup>2</sup>	150961
Clamp, suspension, breakaway 4 × 150 mm <sup>2</sup>	150979
Comealong, 4 × 95 mm <sup>2</sup> and 4 × 150 mm <sup>2</sup>	4945
Compression lug bi-metallic, with heatshrink sleeve 95 mm <sup>2</sup>	58743
Compression lug bi-metallic, pre-insulated 150 mm <sup>2</sup>	150441
Connectors (IPC):	
150-95/240-95 AL bare open wire	73569
150-70/150-70 AL	143867
150-70/35-6 CU	143883
150-70/2 × 35-6 CU	143909
150-50/120-70 CU bare open wire	148387
95-35/120-70 CU bare open wire	73577
95-35/95-35 AL	73551
95-35/35-6 CU	73593
95-16/6-1.5 CU	73585

<b>Item</b>	<b>Stockcode</b>
Conductors	
120 mm <sup>2</sup> annealed tinned copper PVC insulated	64196
95 mm <sup>2</sup> annealed tinned copper PVC insulated	64204
70 mm <sup>2</sup> annealed tinned copper XLPE insulated	67868
25 mm <sup>2</sup> twisted twin AL XLPE insulated service Cable	148098
16 mm <sup>2</sup> twisted twin CU XLPE service cable	18598
10 mm <sup>2</sup> twisted twin CU XLPE service cable	90035
Copper bar, 40 mm × 6.3 mm	41111
Roller, stringing	51490
Sleeve full-tension, pre-insulated, 95 mm <sup>2</sup>	73361
Sleeve full-tension, pre-insulated, 150 mm <sup>2</sup>	150987
Sleeve, heatshrink zipper	
Swivel, 8 kN	90902
Tape, insulating, vinyl -mastic	69807
Washer, M10 SS	49411
Washer, M12 SS	49429
Washer, spring 10 mm	50120
Washer, spring 12 mm	143859
Wedge, core separation, 4 × 95 mm <sup>2</sup> or smaller	66951

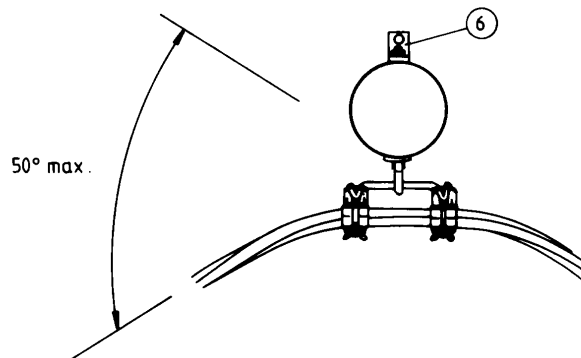
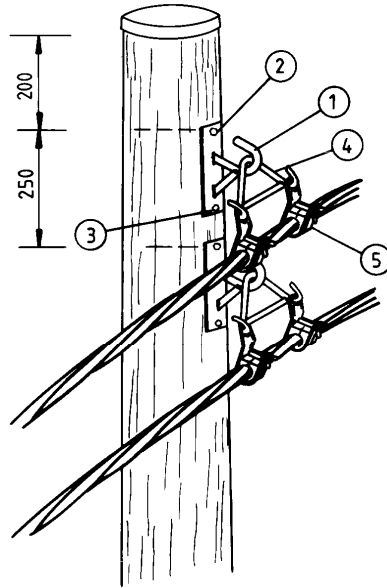
## APPENDIX C POLE TOP CONSTRUCTION DRAWINGS

### C1 LV ABC Intermediate Support 0° – 25° Line Deviation

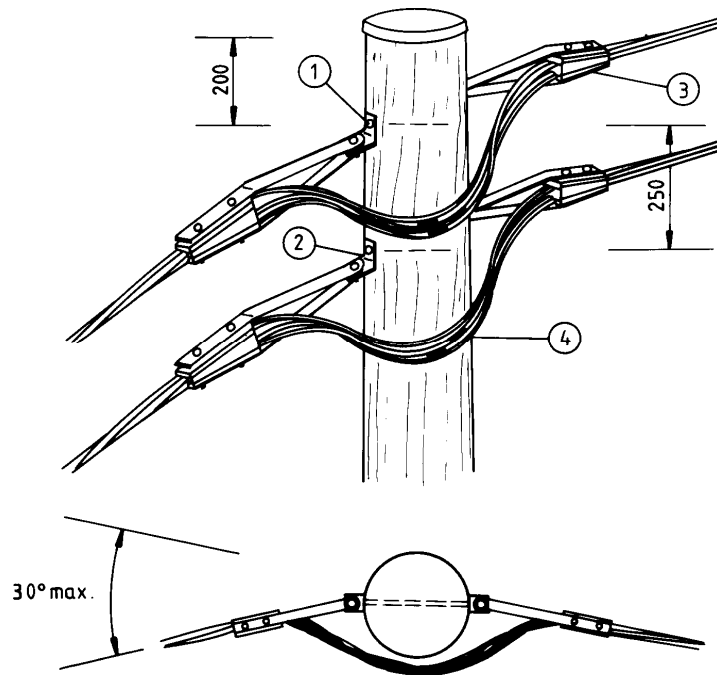


#### Materials

Item	Description	Stockcode	Quantity per cable
1.	Hook bracket ABC	66621	1
2.	Bolt and nut gal. hex M20	47118, 47217	1
3.	Screw, coach, gal, M12 ´ 75 mm	50468	1
4.	Suspension clamp	63057	1
5.	Termination bracket (if required for services)	66571	1

**C2 LV ABC Intermediate Support 25° – 50° Line Deviation**

**Materials**

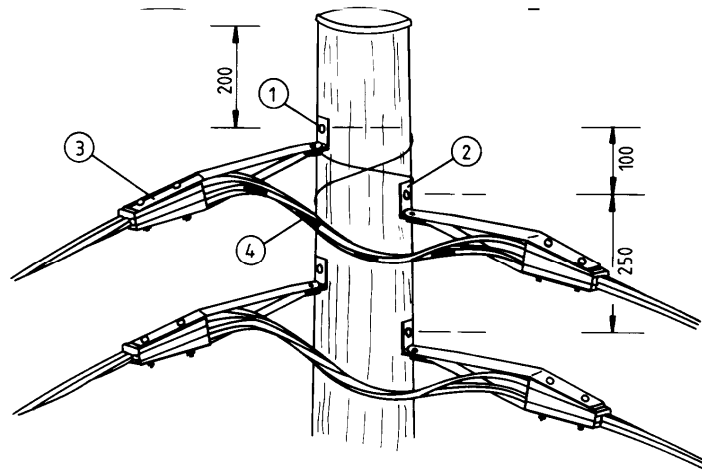
Item	Description	Stockcode	Quantity per cable
1.	Hook bracket ABC	66621	1
2.	Bolt and nut gal. hex M20	47118, 47217	1
3.	Screw, coach, gal, M12 ´ 75 mm	50468	1
4.	Suspension clamp yoke bracket	66100	1
5.	Suspension clamp	63057	2
6.	Termination bracket (if required for services)	66571	1

**C3 LV ABC Through Strain 0° – 30° Line Deviation**

**Materials**

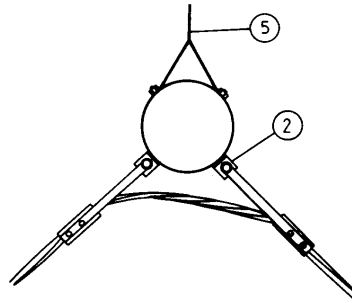
Item	Description	Stockcode	Quantity per cable	
1.	Bolt and nut gal. hex M20	47118, 47217	1	
2.	Termination bracket	66571	2	
3.	Strain clamp	63222	2	
4.	Compression sleeves (if required)	95 mm <sup>2</sup>	73361	4
		150 mm <sup>2</sup>	150987	4

**Note:** Tape cable tails together for neatness

#### C4 LV ABC Angle Strain 30° – 90° Line Deviation



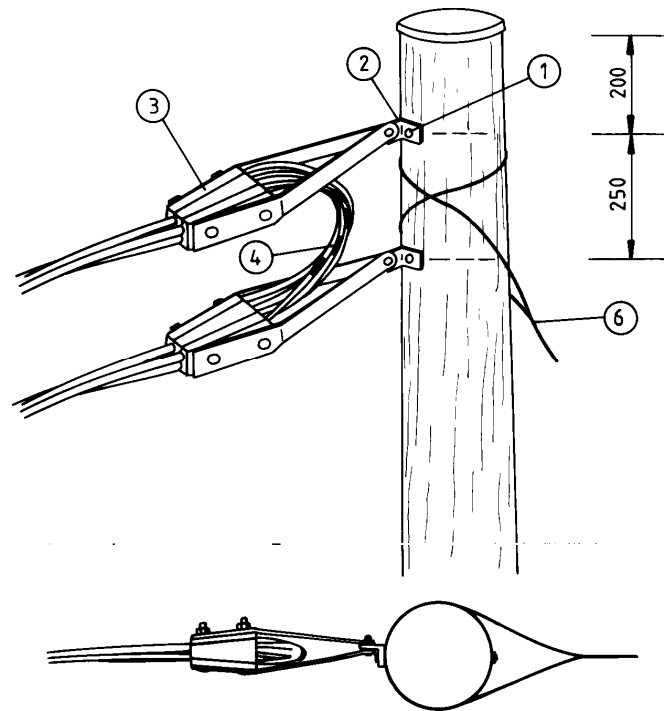
Separation of cross drilling to be a minimum distance of 100 mm between centres



#### Materials

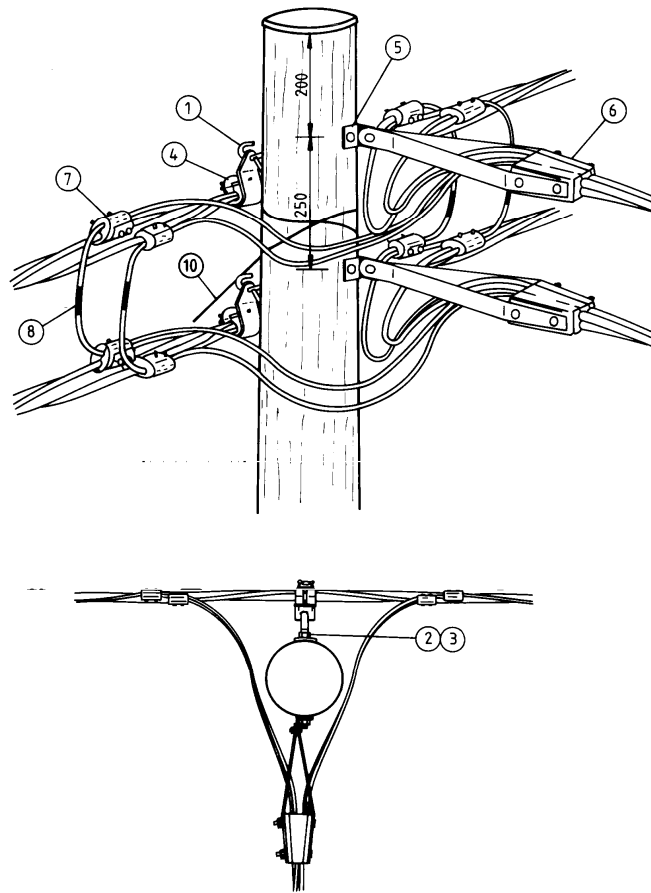
Item	Description	Stockcode	Quantity per cable
1.	Bolt and nut gal. hex M20	47118, 47217	2
2.	Termination bracket	66571	2
3.	Strain clamp	63222	2
4.	Compression sleeves (if required)	95 mm <sup>2</sup> 73361	4
		150 mm <sup>2</sup> 150987	4
5.	Stay (if required)		

**Note:** Tape cable tails together for neatness.

**C5 LV ABC Terminal Support****Materials**

Item	Description	Stockcode	Quantity for completed job	
1.	Bolt and nut gal. hex M20	47118, 47217	1	
2.	Termination bracket	66571	2	
3.	Strain clamp	63222	2	
4.	Compression sleeves (parallel cables)	95 mm <sup>2</sup>	73361	4
		150 mm <sup>2</sup>	150987	4
5.	Heatshrink cable end caps (single cable, not shown)	62117	4	
6.	Stay (if required)			

## C6 LV ABC Tee



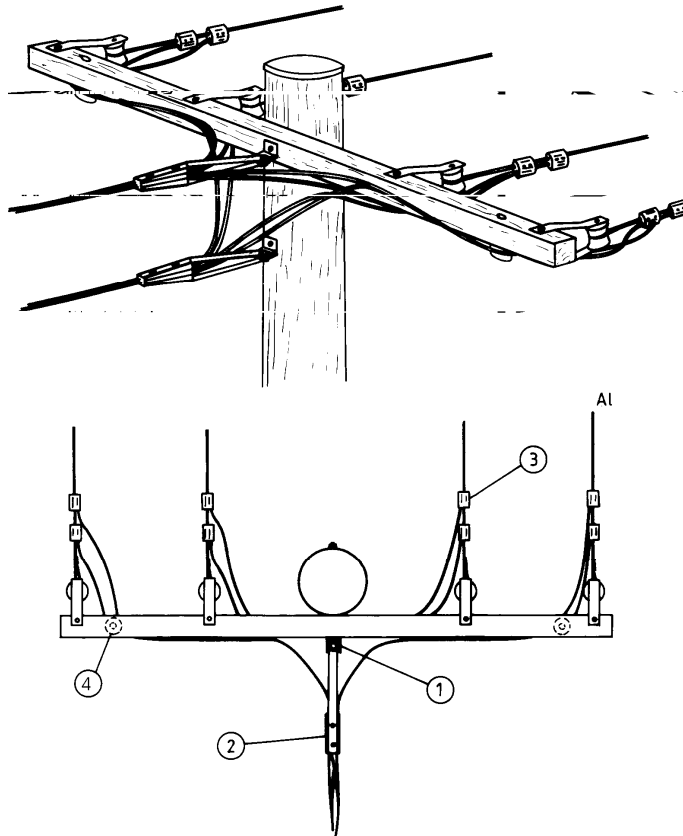
## Materials

Item	Description	Stockcode	Quantity per cable
1.	Hook Bracket ABC	66621	1
2.	Bolt and nut gal. hex M20	47118, 47217	1
3.	Screw, coach, gal. M12 ´ 75 mm	50468	1
4.	Suspension clamp	63057	1
5.	Termination bracket	66571	1
6.	Strain clamp	63222	1
7.	Connector, ABC 2 Bolt. 95/95	73551	4
8.	Compression sleeves (parallel cable tee)	95 mm <sup>2</sup> 73361	4
		150 mm <sup>2</sup> 150987	4
9.	Stay (if required)		

## Notes:

1. Tape cable tails together for neatness.
2. Use the tails of the tee cables to form the vertical bond.

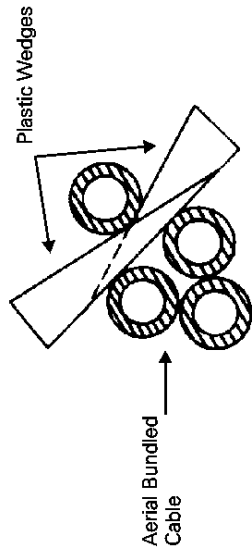
## C7 LV ABC to Bare OH Mains



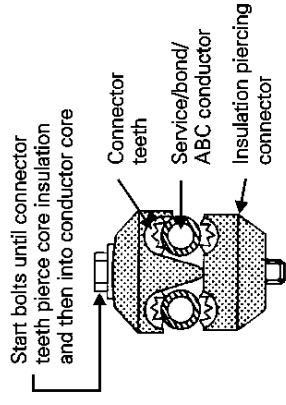
## Materials

Item	Description	Stockcode	Quantity per cable
1.	Termination bracket	66571	1
2.	Strain clamp	63222	1
3.	Piercing Connector 95 AL/95 – 240 AL Bare	73569	4
	Piercing Connector 95 AL/50 – 120 CU Bare	73577	4
4.	SH LVI Insulator	75804	2

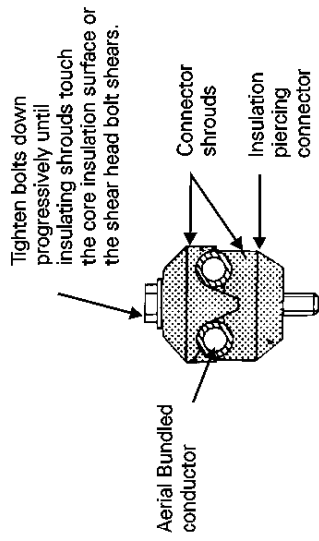
**Note:** Tape cable tails together for neatness.



**1** Use plastic wedges to separate the required core.



**2** Position the teeth centrally over the required cores

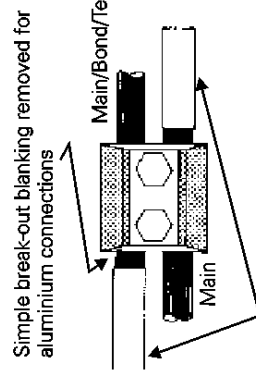


**3** The connector is fully installed when the insulated shrouds meet the core insulation surface

Tighten bolts down progressively until insulating shrouds touch the core insulation surface or the shear head bolt shears.

**Separating the Cores**

Note: connectors and taps may be used on both copper and aluminium conductors



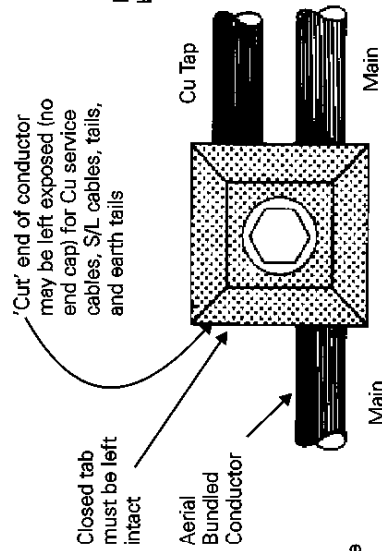
Simple break-out blanking removed for aluminium connections

Heatshrink cap to be outside connector

For two-bolt connectors, tighten both evenly (i.e. no more than 1 turn on each until tight or until shear head shears

**Aluminium Through Connection (or Bond)**

**Position insulation piercing connector**



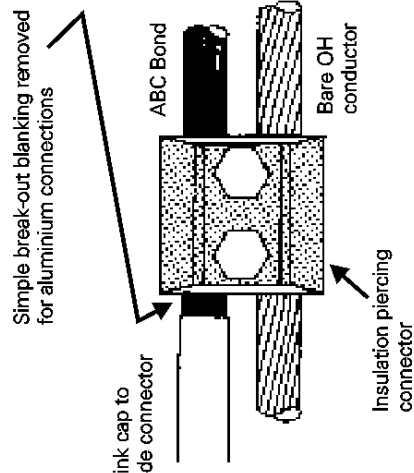
'Cut' end of conductor may be left exposed (no end cap) for Cu service cables, S/L cables, tails, and earth tails

Closed tab must be left intact

Insulation piercing connector

**Copper Tap Connection**

**Fully installed connector.**

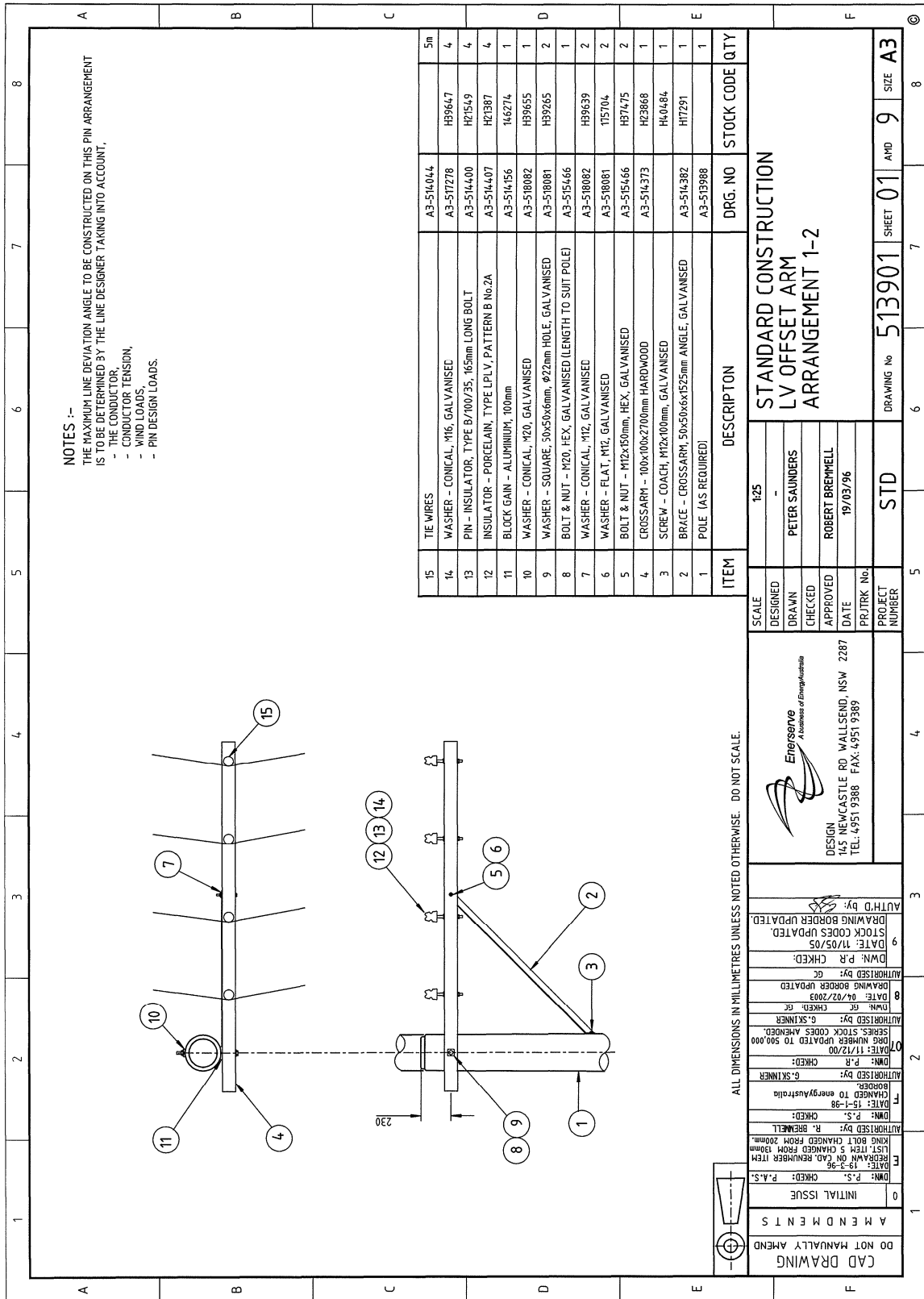


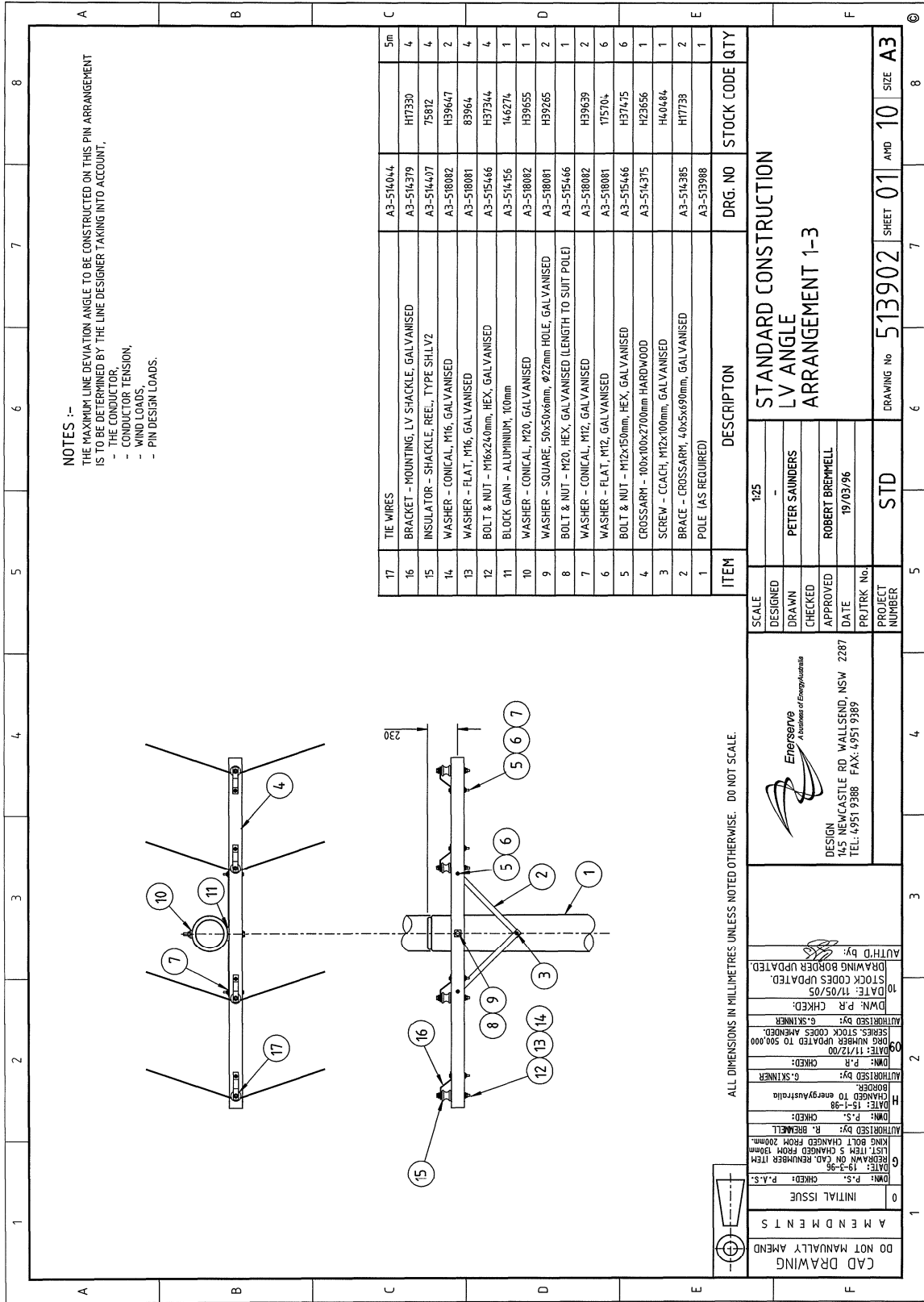
Simple break-out blanking removed for aluminium connections

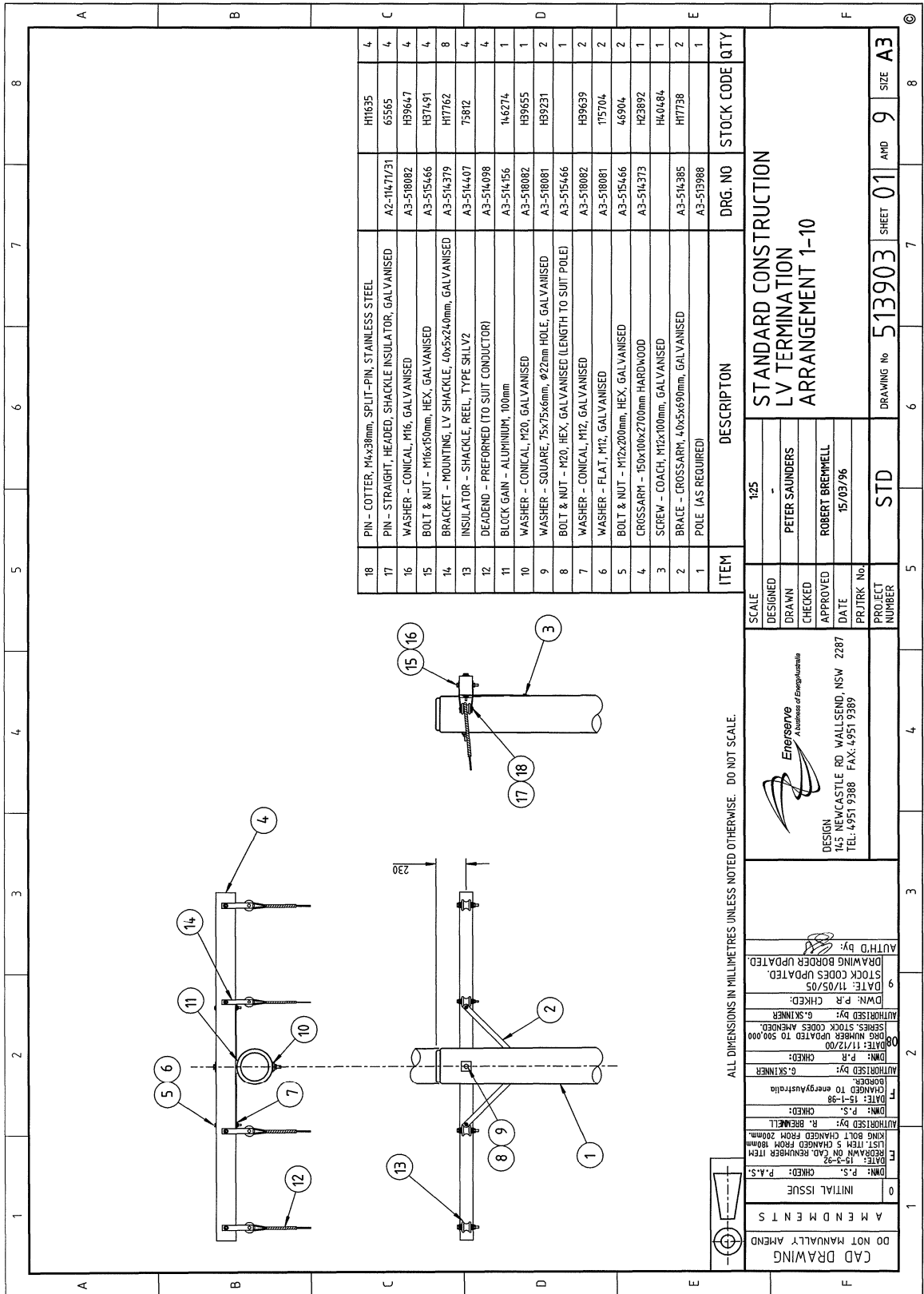
Heatshrink cap to be outside connector

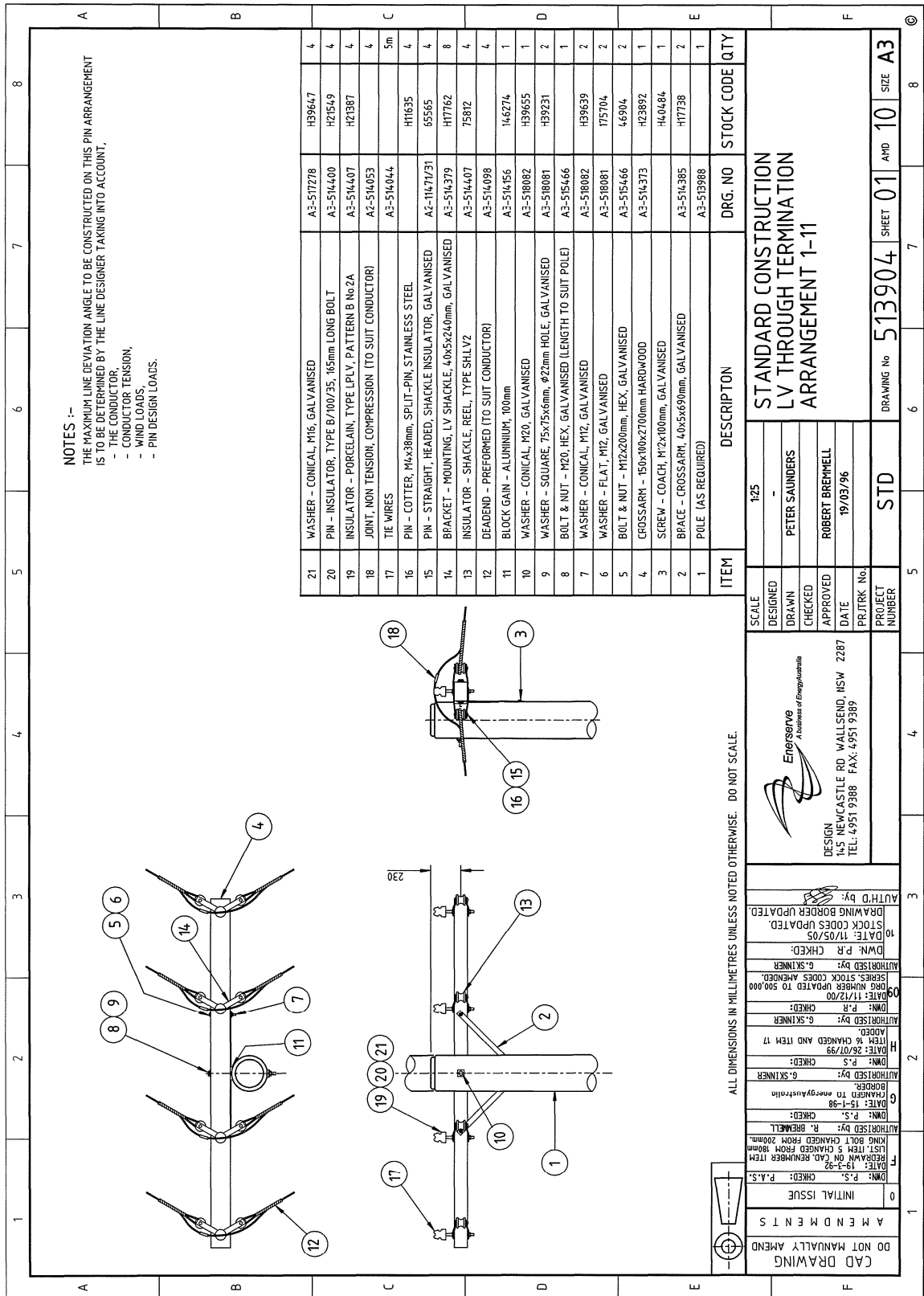
**Bonding ABC to bare OH conductor**

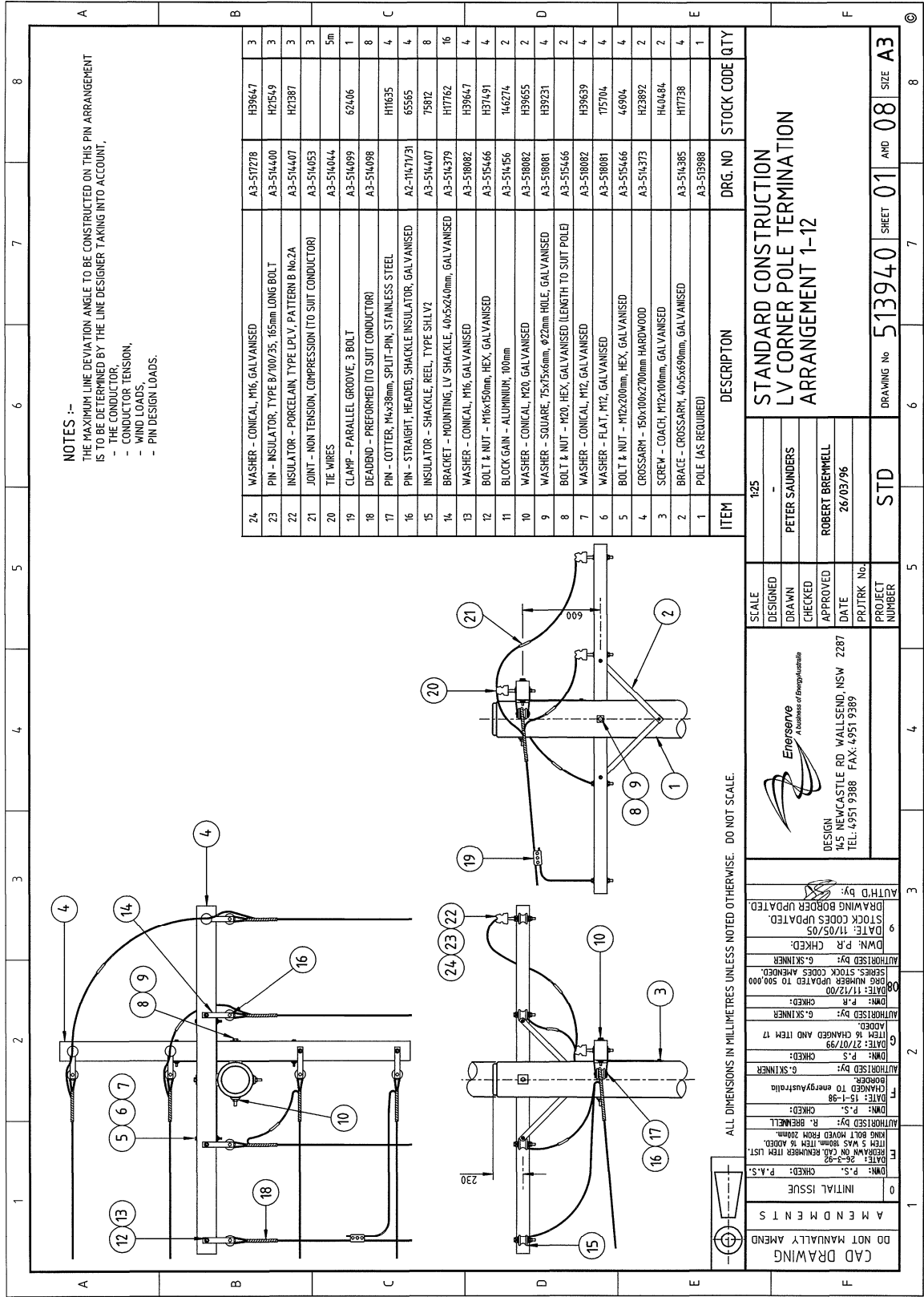


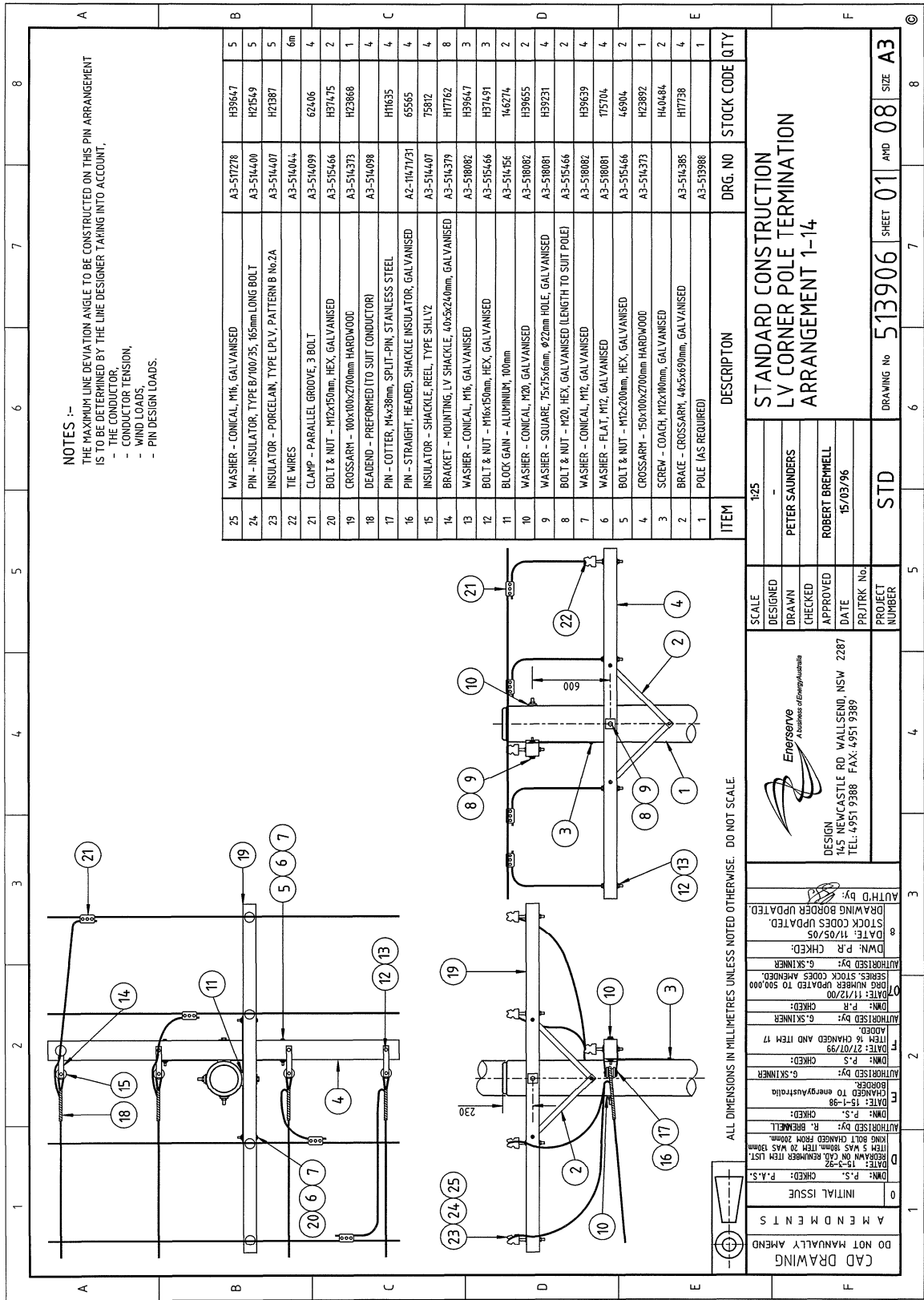












## APPENDIX D LV ABC CHECKLIST

---

### Insulated Fuse/Link Switch Disconnectors

		Yes	No
1	Have the locations of the LV isolation points been identified from system/network diagrams?	<input type="checkbox"/>	<input type="checkbox"/>
2	Has it been established if a minimum clearance of 4 m above ground can be achieved?	<input type="checkbox"/>	<input type="checkbox"/>
3	Has the supply end of the line been distinguished from the load end of the line?	<input type="checkbox"/>	<input type="checkbox"/>
4	Have the supply and load neutrals above the switching unit been joined using a pre-insulated sleeve?	<input type="checkbox"/>	<input type="checkbox"/>
5	Has the supply end of the line been connected to the supply end of the link box?	<input type="checkbox"/>	<input type="checkbox"/>
6	Has the load end of the line been connected to the load end of the link box?	<input type="checkbox"/>	<input type="checkbox"/>
7	Has a drip loop been included in the conductor near the terminal?	<input type="checkbox"/>	<input type="checkbox"/>
8	Has the insulation been butted firmly against the terminal blocks?	<input type="checkbox"/>	<input type="checkbox"/>
9	Has the base of the link box been closed?	<input type="checkbox"/>	<input type="checkbox"/>
10	Has it been established that all necessary tools and equipment are available?	<input type="checkbox"/>	<input type="checkbox"/>

### Street Lighting

1	Has the system/network diagrams been checked to ensure that the street lighting supply is maintained outside the LV ABC zone?	<input type="checkbox"/>	<input type="checkbox"/>
2	Have the existing lamps being fed formerly by the mains being replaced by ABC been converted to PEC(s)?	<input type="checkbox"/>	<input type="checkbox"/>
3	Has the PEC been tested to ensure the lamp(s) is working?	<input type="checkbox"/>	<input type="checkbox"/>

### Clearances

1	Have all the minimum clearances of LV ABC from structures been met?	<input type="checkbox"/>	<input type="checkbox"/>
2	Have all the minimum clearances of LV ABC from ground been met?	<input type="checkbox"/>	<input type="checkbox"/>

### Lugs

1	Has the lug been pre-filled with jointing compound?	<input type="checkbox"/>	<input type="checkbox"/>
2	Has the lug been pre-insulated?	<input type="checkbox"/>	<input type="checkbox"/>

Accredited

Service Provider: ..... Signature: .....

Date: .....



© Ausgrid.

This document must not be reproduced in whole or in part or converted to machine readable form or stored in a computer or imaging system without the written permission of Ausgrid.

Initial issue: October 1995

Second Edition: February 1998

Amended by CIA 1073, 20 Sept 1999; CIA 1111, 15 June 2000; CIA 1181, 4 July 2001;  
CIA 1207, 19 Oct. 2001; CIA 1219, 27 Nov. 2001 and CIA 1221, 6 May 2002

Document Control

Authorised By:

A handwritten signature in black ink that reads "J Mackay".

J Mackay

Document Number: NS125

**UNCONTROLLED COPY**