WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales
Gwasanaethu Canolbarth a De Orllewin Lloegr a Chymru

Company Directive

STANDARD TECHNIQUE: CA2W

Relating to the Procedure for Making an 11kV Trefoil Bond Joint.

Policy Summary

This Standard Technique document contains the approved 11kV trefoil bond Joint for triplex EPR cables. It shall be implemented in conjunction with the appropriate General Requirements in ST: CA2C/8.

This ST has not been written as a training document. It is not intended to be exhaustive in content and you must refer to your supervisor if you require training or instruction.

You shall work safely and skilfully, utilising the training/instruction you have already received, relating to the contents of this document and its cross-references.

You must make sure that you understand your job instructions and that you have the necessary tools and equipment for the job.

Author: Peter White

Implementation Date: May 2016

Approved by

Policy Manager

Date: 17 May 2016

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IMPLEMENTATION PLAN

Introduction

This Standard Technique document contains the approved 11kV trefoil bond Joint, this jointing procedure allows a stranded 70mm² bare copper earth wire to be jointed to the copper screen wires of the 11kV triplex cable and 11kV PILC cables thus complying with ST: TP21D/1.

Main Changes

This is a new document and has been introduced to take into account the need to run a 70mm² bare copper conductor in parallel with the 11kV cable as detailed in ST: TP21D/1 Jointing Procedure drawings.

Impact of Changes

This document now provides the means to undertake the jointing of the 70mm² bare copper conductor to an 11kV triplex cable and 11kV PILC cables.

Implementation Actions

Team managers to disseminate the information to their respective 11kV Jointers, Jointers mates and other relevant staff.

No formal training will be required to undertake this suite of joints as all techniques are already within the 11kV Jointers skill set.

Implementation Timetable

This Standard Technique can be implemented with immediate effect.

Document Revision & Review Table		
Date	**Comments**	**Author**
May 2016	This is a new document.	Peter White

ST: CA2W Relating to the Procedure for Making an 11kV Trefoil Bond Joint.

INTRODUCTION

This Standard Technique document contains the approved 11kV trefoil bond Joint, this jointing procedure allows a stranded 70mm² bare copper earth wire to be jointed to the copper screen wires of the 11kV triplex cable and 11kV PILC cables thus complying with ST: TP21D. This procedure shall be completed on the triplex and PILC cable **BEFORE** any transition jointing place. It should be noted that the 70mm² copper earth wire shall be connected to **all three cores** of the triplex cable.

NOTE: - The 70mm² copper earth wire shall be laid below the triplex cable and shall be in DIRECT contact with the native soil of the trench bottom i.e. the crushed 3mm to dust of crushed limestone or granite dust shall be installed on top of the 70mm² earth wire, with only the ends of the 70mm² brought out through the stone dust to enable jointing onto the triplex or PILC cables.

In compliance with specification EE 89 the 70mm² HDC shall 150mm away from any power cable circuits or ducts and laid in native soil.

This Jointing Procedure shall be implemented in conjunction with the appropriate General Requirements, contained in ST: CA2C/8, including: -

1. General Cleanliness and Accident Prevention.

2. Joint Bay Preparation.

3. General Jointing Procedures – Dead Cables.

If the need arises to undertake a straight joint configuration (i.e. non-standard) not covered within the Standard Technique the Policy Manager, Avonbank, is to be consulted.

Cable sizes shown are the maximum for the individual joint, cable sizes below the maximum and there combinations are accommodated and are provided for in the relevant Jointing Procedure, this is particularly evident for transitional jointing.

Where 240mm² EPR Triplex is to be found, then for material selection and installation data use 300mm² EPR Triplex; but for the electrical purposes i.e. loadings, ratings etc. then the 240mm² EPR Triplex shall be treated as 185mm² EPR Triplex.

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ST: CA2W Relating to the Procedure for Making an 11kV Trefoil Bond Joint.

JOINTING PROCEDURE 7.601

95, 185, 300 and 400mm² EPR TRIPLEX TREFOIL BOND JOINT.

(This Jointing Procedure covers cable sizes up to and including 400mm²)

This procedure is to be read in conjunction with the appropriate General Requirements ST: CA2C/8 Section 6 of the 11kV Jointing Manual

JOINT KIT REFERENCES

CABLE SIZE	JOINT KIT REFERENCES
All cable sizes.	**Trefoil bond Joint**
95mm²	TB1101
185mm²	TB 1101
300mm²	TB 1101
400mm²	TB 1101

Note: - The jointing materials for 240mm² EPR Triplex will be as 300mm² EPR Triplex. Any reference to EPR equally applies to XLPE.

JOINTING PROCEDURE 7.601

JOINT KIT MATERIALS

KIT REF	TEBK	Brass Gauze Pack E 5 31007	Denso tape
TB 1101	1	1	1

ADDITIONAL ITEMS FOR EACH JOINT

PVC tape
Scotch 70
Scotch 13 tape
Tinned copper wire 16 swg
Tinned copper wire 20 swg
De-solvit 1000 FD
De-solvit 1000
Workhorse dry wipes
Emery cloth
5313 Water block tape
Cable ties
Sealing putty
Aluminium oxide cloth 320 grit
Aluminium oxide cloth 400 grit

Note: - Individual material item numbers (E 5) are to be found in Section 4 of the 11kV Jointing Manual.

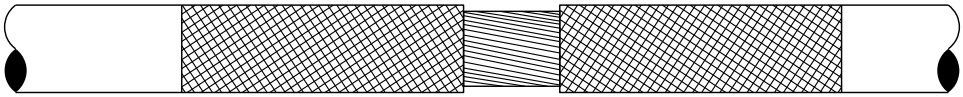
JOINTING PROCEDURE 7.601

Actions		General Requirements (ST: CA2C/8)

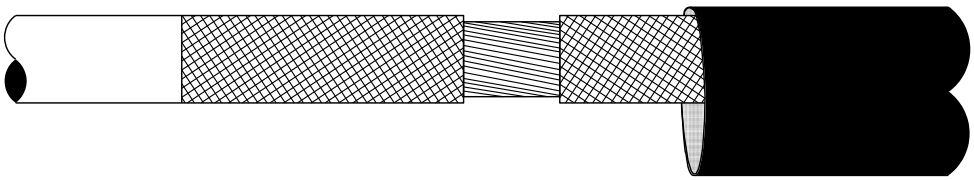
Refer to Drawings **JP2D 7.601.1, 7.601.2, 7.601.3, 7.601.4, 7.601.5** and **7.601.6** whilst undertaking this Jointing Procedure.

1.	Set and mark cables.	5/6
	EPR CABLE - Preparation	
2.	Unravel and straighten individual cores.	--
3.	Clean each oversheath for a distance of 1.5m.	--
4.	Remove MDPE oversheath 30mm, clear of the jointing position, in length and underlying bedding tapes to expose bare copper screen wires. See **JP2D 7.601.1**	--
5.	Abrade MDPE oversheaths for 100mm either side of the oversheath removal. See **JP2D 7.601.1**	17
6.	Slide mastic lined heat-shrink sleeve onto the core and park beyond oversheath removal point. See **JP2D 7.601.1**	10
7.	Apply one complete turn of black mastic 5313 tape around the oversheath 20mm from the oversheath termination. See **JP2D 7.601.2** **Note: - the tape is butt jointed not overlapped to finish.**	--
8.	Open one end of tinned copper braid and make a hole 150mm from braid end in braid side.	--
9.	Position the open end of braid over cable end and feed cable through hole made in step 8.	--
10.	Position the braid over the black mastic 5313 tape and copper screen wires positioning the braid end 50mm past the oversheath removal point, stretch the braid to tighten onto the cable and hold in position using cable ties. See **JP2D 7.601.2**	--
11.	Apply two turns of the roll spring over the braid and then turn the braid end back over the roll spring, complete application of the roll spring. See **JP2D 7.601.3**	--

Actions		**General Requirements (ST: CA2C/8)**
12.	Trim the braid ends tight to the roll spring and applying a minimum of two half lap layers of PVC tape in a direction to tighten the roll spring, completely cover the assembly overlapping onto the oversheaths by 10mm. See **JP2D 7.601.4**	--
13.	Apply a second layer of black mastic tape over the braid and first layer applied around the cable as in step 7. **Note**: - **the tape is butt jointed not overlapped to finish.** See **JP2D 7.601.5**	--
14.	Taking a second a layer of black mastic tape position over the roll spring assembly butting up to the layer applied in step 10, applying around the cable. **Note: - the tape is butt jointed not overlapped to finish.** See **JP2D 7.601.5**	--
15.	Slide the mastic lined sleeve applied in step 3 over the complete assembly centralising over the roll spring position and start shrinking at the centre and working towards the sleeve ends. See **JP2D 7.601.6**	--
	COMPLETION OF JOINT	
16.	Repeat on remaining cores.	--
17.	Once cold relay the cores back into trefoil formation and apply heavy duty cable ties either side of the assembly.	--
18.	Taking the three braids place flat onto each other and cable tie together, round the braid ends and wrap with brass gauze, feed the braids into the connector entry and hand tighten the bolts. See **JP2D 7.601.6**	--
19.	Take the 70mm² bare HDC wire and place into the remaining entry of the brass connector, tighten and shear all bolts. See **JP2D 7.601.6**	--
20.	Cover the connector with a minimum of two half lap layers of Denso tape overlapping by the tape width onto the braids and bare HDC at either end; ensure the tape paste is worked well into the assembly.	--



Step 4 & 5



Step 6

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Drawn	RJB	05/13		
Checked				
Approved			Title 95,185,300 & 400mm^2 EPR TRIPLEX TREFOIL BOND JOINT	Drg. No. JP2D 7.601.1 / Rev No
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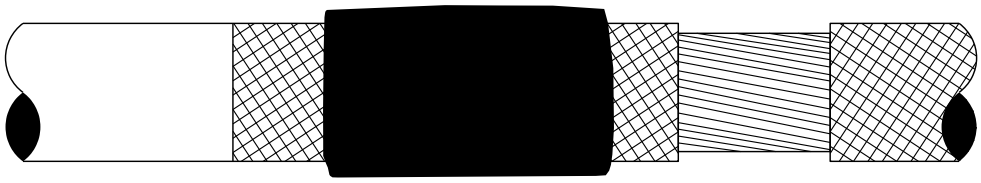

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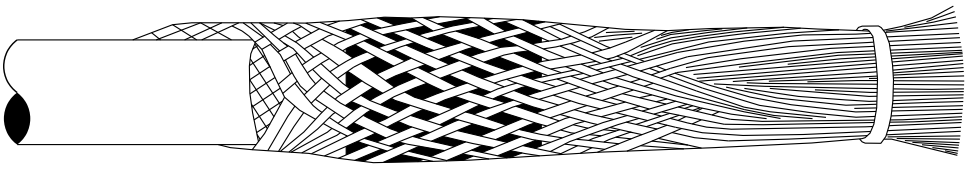

Step 10

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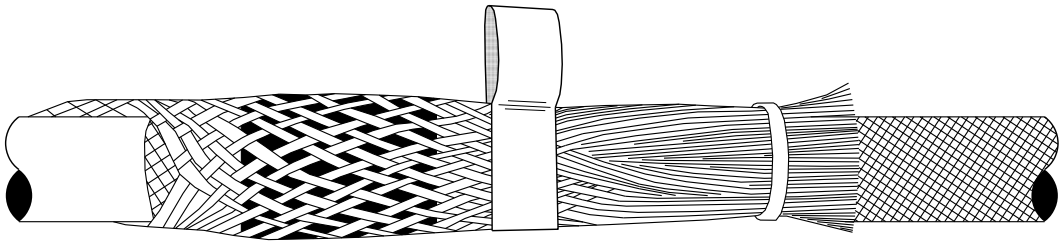

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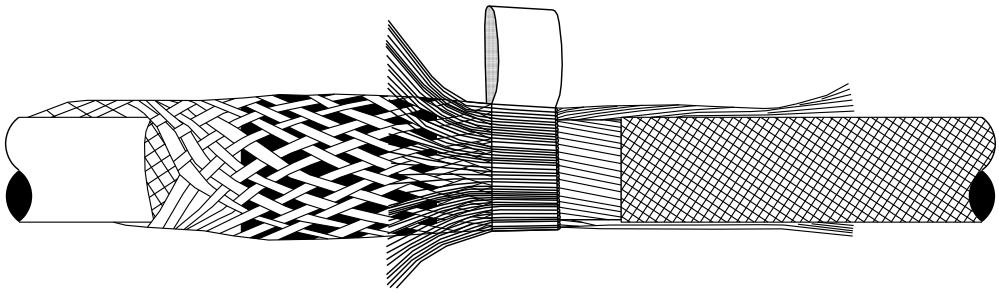

Step 11

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Drawn	RJB	05/13		
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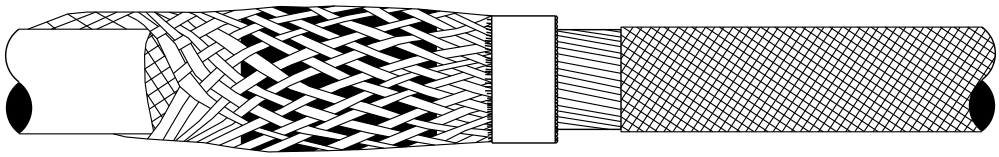

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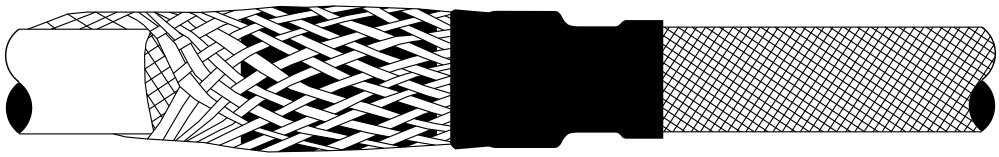

Step 12

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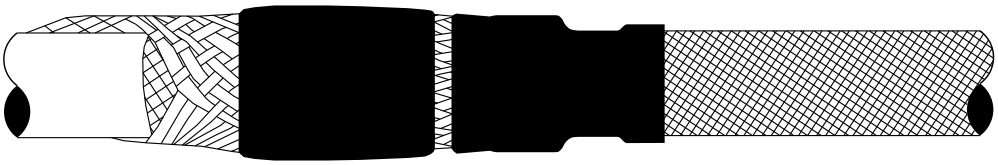

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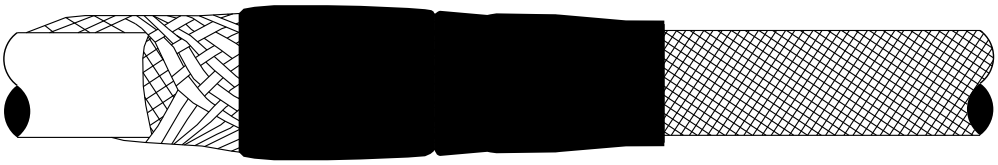

Step 14

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Drawn	RJB	05/13		
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SCALE	N.T.S.		Title 95,185,300 & 400mm^2 EPR TRIPLEX TREFOIL BOND JOINT	Drg. No. JP2D 7.601.5 / Rev No

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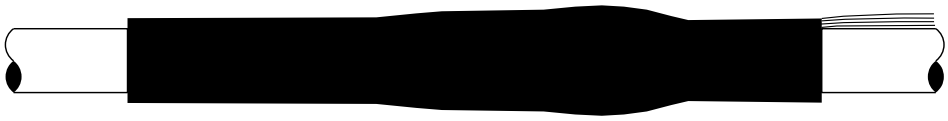

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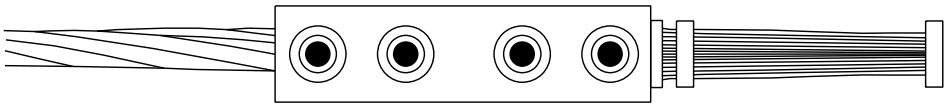

Step 18 & 19

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Drawn	RJB	05/13		
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SCALE	N.T.S.		Title 95,185,300 & 400mm^2 EPR TRIPLEX TREFOIL BOND JOINT	Drg. No. JP2D 7.601.6 / Rev No

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ST: CA2W Relating to the Procedure for Making an 11kV Trefoil Bond Joint.

JOINTING PROCEDURE 7.602

95 to 300mm^2 PILC to 70mm^2 EARTH BOND JOINT.

(This Jointing Procedure covers the equivalent Imperial PILC cable sizes up to and including 0.5in^2)

This procedure is to be read in conjunction with the appropriate General Requirements ST: CA2C/8 Section 6 of the 11kV Jointing Manual

JOINT KIT REFERENCES

CABLE SIZE	JOINT KIT REFERENCES
All cable sizes.	**Earth bond Joint**
0.15in² or 95mm²	TB1102
0.3in² or 185mm²	TB 1102
0.5in² or 300mm²	TB 1102

JOINTING PROCEDURE 7.602

JOINT KIT MATERIALS

KIT REF	CONNECTOR	HEAVY WALLED MASTIC LINED TUBE	ARMOUR BONDING MODULE ABM STA/SWA	50mm² earth braid	Denso tape	Scotch 5313 Tape	Knit mesh
TB 1102	1	1	2	1	1	1	3

ADDITIONAL ITEMS FOR EACH JOINT

PVC tape
Scotch 70
Scotch 13 tape
Tinned copper wire 16 swg
Tinned copper wire 20 swg
De-solvit 1000 FD
De-solvit 1000
Workhorse dry wipes
Emery cloth
5313 Water block tape
Cable ties
Sealing putty
Aluminium oxide cloth 320 grit
Aluminium oxide cloth 400 grit

Note: - Individual material item numbers (E 5) are to be found in Section 4 of the 11kV Jointing Manual.

JOINTING PROCEDURE 7.602

Actions		General Requirements (ST: CA2C/8)

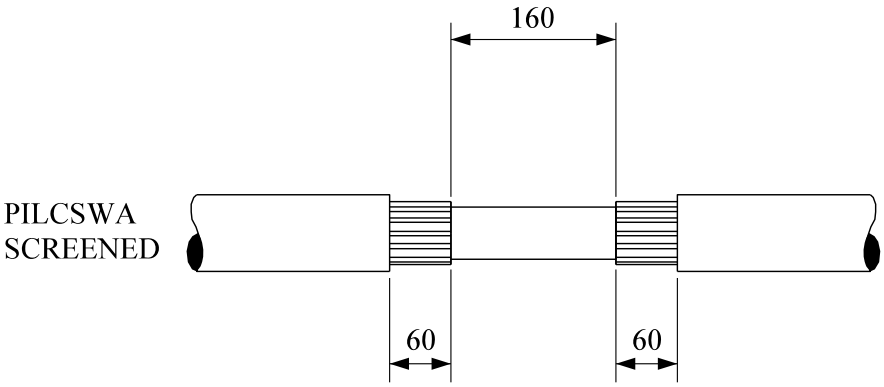
Refer to Drawings **JP2D 7.602.1, 7.602.2** and **7.602.3** whilst undertaking this Jointing Procedure.

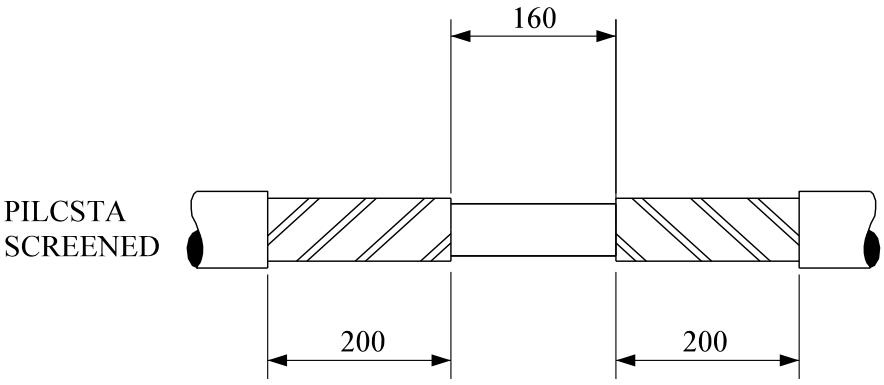
1.	Set and mark cables.	5/6
	PILCSWA & PILCSTA CABLE - Preparation	
2.	Clean each oversheath for a distance of 1.5m.	--
3.	At a position clear of the jointing location, remove the oversheath or serving 280mm in length and underlying bedding tapes to expose the steel wire armours. See **JP2D 7.602.1**	11
4.	At the armour termination position, apply a 16 swg wire binder around the armour wires or tapes, partly cut through the armour wires or tapes with a hacksaw fitted with a depth guard.	11
5.	Remove the wire binder applied in 4, lift and turn the armour wires back at 90° to the lead sheath bedding	11
6.	Warm the bitumastic coating over the lead sheath and the armour wires or tapes until it just begins to melt, with a gas torch. Remove the bitumastic coating and clean the lead sheath and armour wires or tapes with a wipe moistened with an approved degreaser.	11
7.	Abrade the lead sheath circumferentially along the complete length using a file card, and clean with an approved degreaser – Fig 1.	42
8.	Take the length of tinned copper mesh and fold in half along its length (thus reducing the width), wrap two layers around the lead sheath – Fig 2.	42
9.	Re-lay the armour wires over the tinned copper mesh and secure with a worm drive clip, tighten with a torque driver set at 5Nm. **NOTE:** - Ensure worm drive is place in such a way as to not impede the that will be installed on to the lead sheath.	12
10.	Lay the earth braid directly onto the tinned copper mesh ensuring there is sufficient tail to allow the earth braid to be turned back over the roll spring – Fig 3.	42

	Actions	**General Requirements (ST: CA2C/8)**
11.	Starting with the end of the roll spring opposite the earth braid apply one complete turn over the earth braid wrapping in the same direction as the tinned copper mesh – Fig 4.	42
12.	Turn the earth braid tail back over the roll spring and gently dress down to flatten – Fig 4.	42
13.	Apply the remaining turns of the roll spring; tighten by hand using a twisting action – Fig 5.	42
14.	Cover the complete assembly using 19mm "VM" tape; first fold 50mm of the tape end in half with the mastic side to the outside. Lay the folded end between the earth braid and lead sheath abutting the roll spring; wrap the tape in the same direction as the roll spring with the mastic side down. Apply a half lapped layer over the assembly overlapping 10mm onto the metallic sheath either side of the roll spring ensure the assembly is completely covered.	42
15.	Apply one complete turn of black mastic 5313 tape around the lead sheath 20mm from the roll spring position. **Note: - the 5313 tape is butt jointed not overlapped to finish.**	--
16.	Apply a second complete turn of black mastic 5313 tape around the lead sheath 20mm from the first black mastic 5313 tape ensuring the butt joint are not adjacent to each other. **Note: - the 5313 tape is butt jointed not overlapped to finish.**	--
17.	Position the earth braid over the black mastic tape positioning the braid 50mm past the oversheath removal point, stretch the braid to tighten onto the cable and hold in position using cable ties.	--
18.	Apply a second layer of black mastic tape over the earth braid and first layer applied around the cable as in step 17 and 18. **Note: - the 5313 tape is butt jointed not overlapped to finish.**	--
	COMPLETION OF JOINT	
19.	Slide the heavy walled mastic lined sleeve over the complete assembly centralising over the roll spring position and start shrinking at the centre and working towards the sleeve ends.	51
20.	Taking the earth braid end and wrap with brass gauze, feed the braid into the connector entry and hand tighten the bolts.	36

Actions		**General Requirements (ST: CA2C/8)**
21.	Take the 70mm² bare HDC wire and place into the remaining entry of the brass connector, tighten and shear all bolts.	36
22.	Cover the connector with a minimum of two half lap layers of Denso tape overlapping by the tape width onto the braids and bare HDC at either end; ensure the tape paste is worked well into the assembly.	--

All dimensions in mm





Rev No	Drawn	Chk'd	App'd	Date	Revision

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Drawn	RJB	06/14		
Checked				
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SCALE	N.T.S.		Title: STRIPPING DIMENSIONS PILCSWA & PILCSTA EARTH BOND JOINT	Drg. No. GR2D 7.602.1 / Rev No

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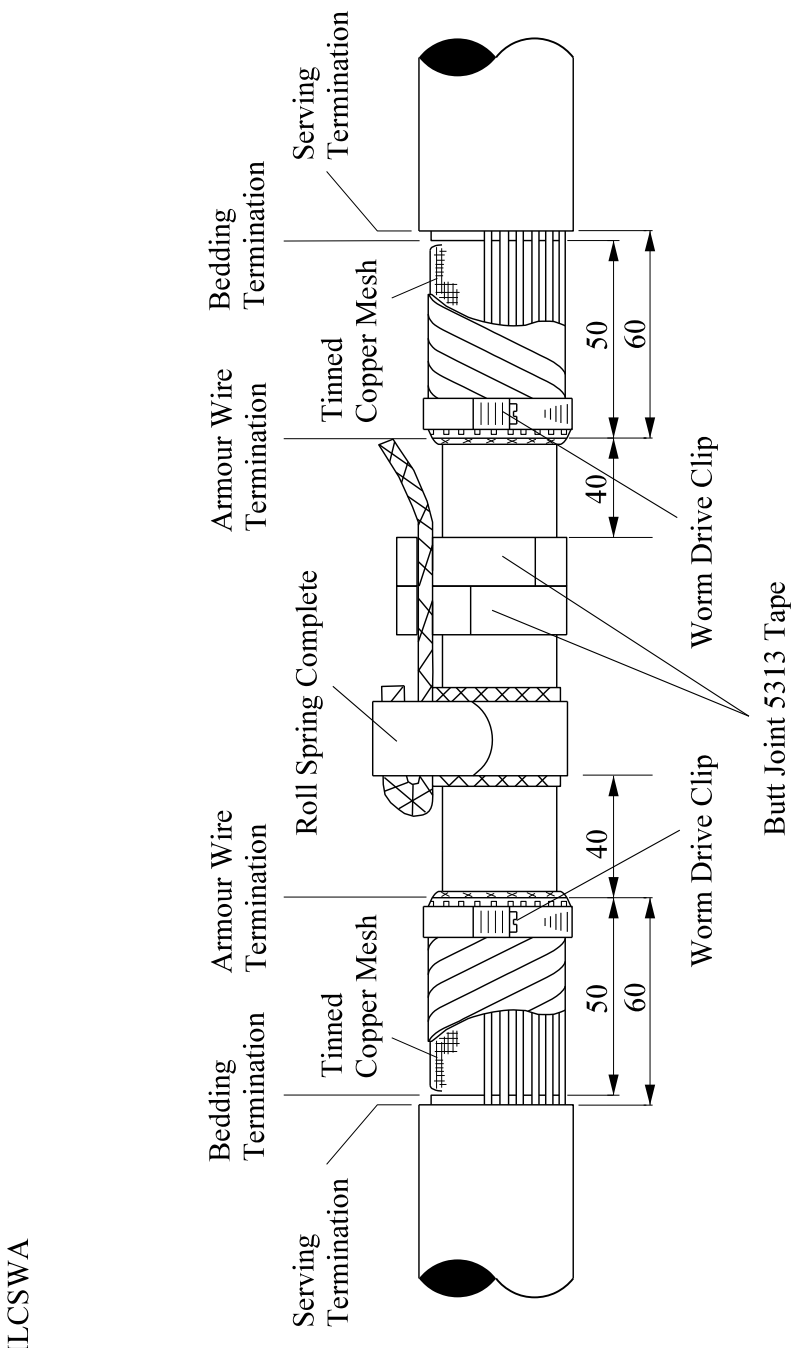

PILCSWA

Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE
Drawn	RJB	04/13
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Title: DIMENSIONS OF PILCSWA & PILCSTA EARTH BOND JOINT

Drg. No. GR2D 7.602.2

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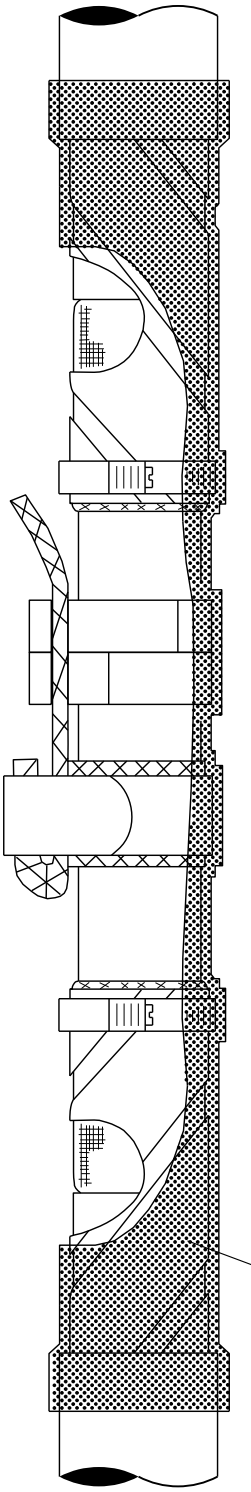

Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE
Drawn	RJB	04/13
Checked		
Approved		
SCALE	N.T.S.	

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Title: FINAL GENERAL ARRANGEMENT
PILCSWA & PILCSTA
EARTH BOND JOINT

Drg. No. GR2D 7.602.3

Rev No

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APPENDIX A

SUPERSEDED DOCUMENTATION

This is a new document.

APPENDIX B

ASSOCIATED DOCUMENTATION

ST:CA2A, ST:CA2C, ST:CA2M, ST:CA2N, ST:CA2O, ST:CA2S, ST:CA2U, ST:CA2V, ST: CA7D.

APPENDIX C

IMPACT ON COMPANY POLICY

None, this document now provides the means to undertake the jointing of the 70mm² bare copper conductor to an 11kV triplex cable and 11kV PILC cable.

APPENDIX D

IMPLEMENATION OF POLICY

Team managers to disseminate the information to their respective 11kV Jointers, Jointers mates and other relevant staff.

No formal training will be required to undertake this suite of joints as all techniques are already within the 11kV Jointers skill set.

Independent Connection Providers (ICPs) shall follow the requirements of ST: CA2W and all jointing works shall comply with ST: CA2W.

Where any difficulty is encountered in the application of this Standard Technique the author shall be notified who will determine whether a variation is appropriate.

APPENDIX E

KEY WORDS

11kV trefoil bond joint, 11kV transitional straight joints.