Electricity Distribution

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Company Directive

STANDARD TECHNIQUE: CA2W/1

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/XLPE cables. It shall be implemented in conjunction with the appropriate General Requirements in ST: CA2C.

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: **Marco Williams**

Implementation Date: **January 2025**

Approved by

Andrew Reynolds
Engineering Policy Manager

Date: **9th January 2025**

Target Staff Group	**Network Services Staff**
Impact of Change	**Amber – The changes have an impact on current working practices – Communicate at next team meeting and follow Implementation Actions below.**
Planned Assurance checks	**Checks to be carried out by Team Managers**

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.

Main Changes

Document updated to reflect changes to the General Requirements and table changes within this policy.

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 ensure that all of their 11kV Jointing staff have attended a briefing (HVUP24 11kV update) on these changes and that it is recorded in Crown.
New 11kV jointing staff who have completed **J20A** 11kV jointing course via the training centre on 11kV jointing skills courses do not require the briefing update.

Implementation Timetable

This Standard Technique can be implemented with immediate effect.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
January 2025	General Requirements and Tables updated	Marco Williams
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, 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/XLPE Triplex is to be found, then for material selection and installation data use 300mm² EPR/XLPE Triplex; but for the electrical purposes i.e. loadings, ratings etc. then the 240mm² EPR/XLPE Triplex shall be treated as 185mm² EPR/XLPE 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/XLPE 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

JOINTING PROCEDURE 7.601

JOINT MATERIALS				
Cable type	**Kit Ref**	**TEBK**	**Brass Gauze 31007**	**Denso Tape**
95 – 400mm² Triplex	TB 1101	1	1	1

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

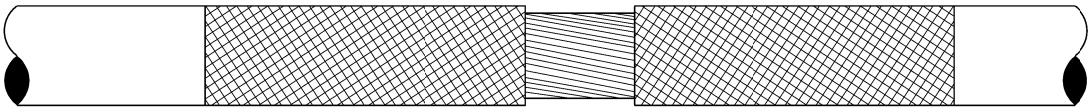
Additional Items:

- 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

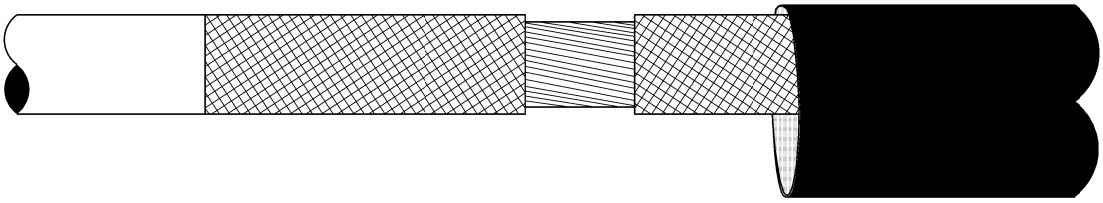
Note: - Individual material item numbers (E5) are to be found in ST: CA2S

JOINTING PROCEDURE 7.601	
Actions & General Requirements (ST: CA2C)	
Set and mark cables.	5/6
EPR/XLPE CABLE - Preparation	
Unravel and straighten individual cores.	--
Clean each oversheath for a distance of 1.5m.	--
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**	--
Abrade MDPE oversheaths for 100mm either side of the oversheath removal. **See JP2D 7.601.1**	17
Slide mastic lined heat-shrink sleeve onto the core and park beyond oversheath removal point. **See JP2D 7.601.1**	10
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.**	--
Open one end of tinned copper braid and make a hole 150mm-- from braid end in braid side.	--
Position the open end of braid over cable end and feed cable through hole made previously.	--
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**	--

JOINTING PROCEDURE 7.601	
Actions & General Requirements (ST: CA2C)	
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**	--
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**	--
Apply a second layer of black mastic tape over the braid and first layer applied around the cable as in step 7. **See JP2D 7.601.5** **Note: - the tape is butt jointed not overlapped to finish.**	--
Taking a second a layer of black mastic tape position over the roll spring assembly butting up to the layer applied instep 10, applying around the cable. **See JP2D 7.601.5** **Note: - the tape is butt jointed not overlapped to finish.**	--
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	
Repeat on remaining cores.	--
Once cold relay the cores back into trefoil formation and apply heavy duty cable ties either side of the assembly.	--
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**	--
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**	--
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.	--



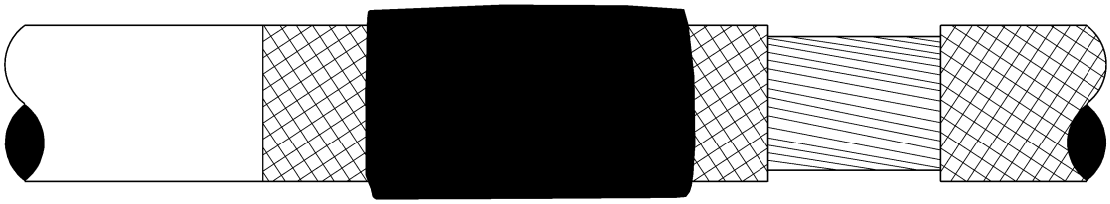
Step 4 & 5



Step 6

Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE	NATIONAL GRID Design Department. Avonbank,Feeder Road,Bristol BS2 OTB	nationalgrid Electricity Distribution
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
SCALE	N.T.S.			



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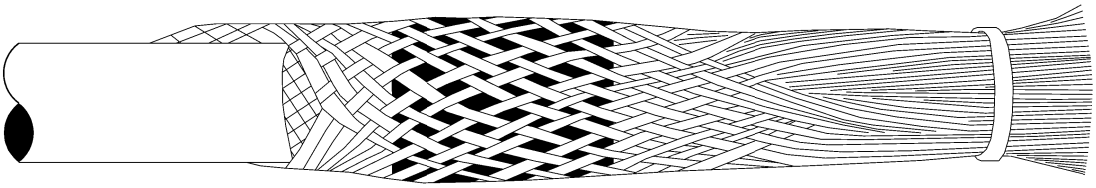

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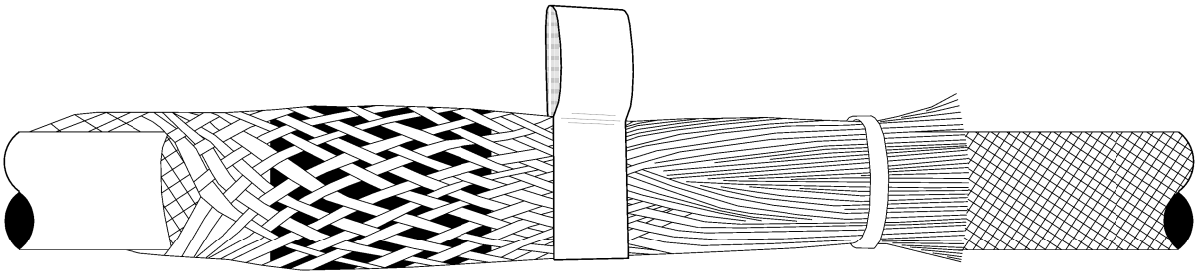
Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE	NATIONAL GRID Design Department. Avonbank,Feeder Road,Bristol BS2 OTB	nationalgrid Electricity Distribution
Drawn	RJB	05/13		
Checked			Title 95,185,300 & 400mm^2 EPR TRIPLEX TREFOIL BOND JOINT	Drg. No. JP2D 7.601.2
Approved				Rev No
SCALE	N.T.S.			



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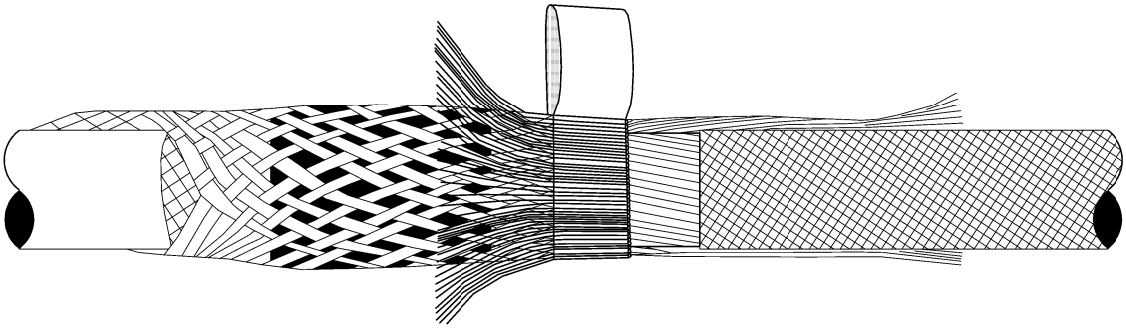

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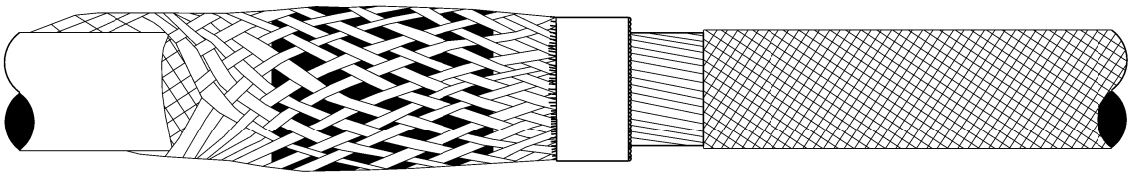
Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE	NATIONAL GRID Design Department. Avonbank,Feeder Road,Bristol BS2 OTB	nationalgrid Electricity Distribution
Drawn	RJB	05/13		
Checked			Title	Drg. No. / Rev No
Approved			95,185,300 & 400mm^2 EPR TRIPLEX TREFOIL BOND JOINT	JP2D 7.601.3
SCALE	N.T.S.			



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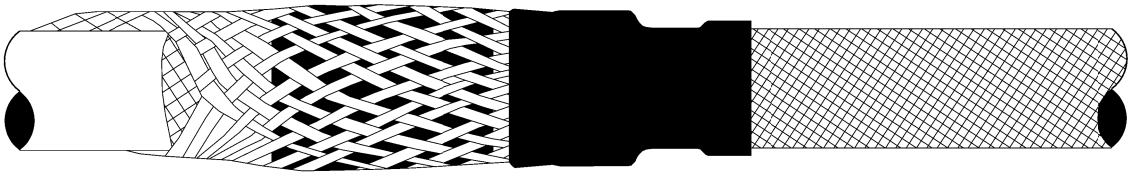

Step 12

Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE
Drawn	RJB	05/13
Checked		
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SCALE	N.T.S.	

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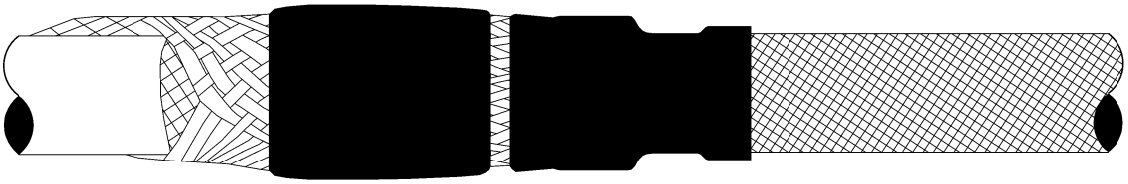
Title

95,185,300 & 400mm^2 EPR TRIPLEX TREFOIL BOND JOINT

Drg. No. JP2D 7.601.4

Rev No



Step 13

Step 14

Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE
Drawn	RJB	05/13
Checked		
Approved		
SCALE	N.T.S.	

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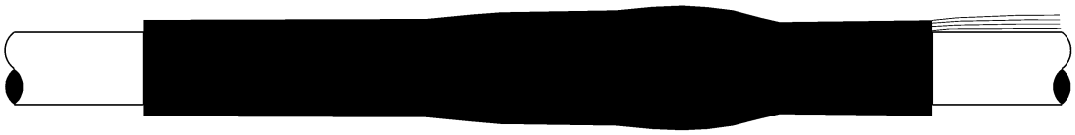
Title

95,185,300 & 400mm^2 EPR TRIPLEX TREFOIL BOND JOINT

Drg. No. JP2D 7.601.5

Rev No



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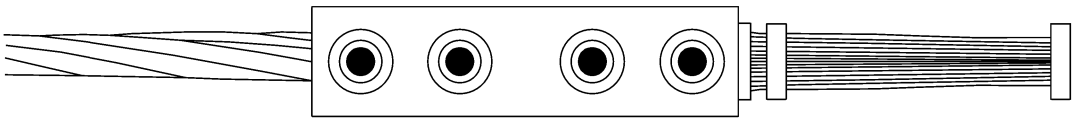

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Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE	NATIONAL GRID Design Department. Avonbank,Feeder Road,Bristol BS2 OTB	nationalgrid Electricity Distribution
Drawn	RJB	05/13		
Checked				
Approved			Title 95,185,300 & 400mm^2 EPR TRIPLEX TREFOIL BOND JOINT	Drg. No. JP2D 7.601.6 / Rev No
SCALE	N.T.S.			

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

JOINTING PROCEDURE 7.602

95 to 300mm² PILC to 70mm² EARTH BOND JOINT.

(This Jointing Procedure covers the equivalent Imperial PILC cable sizes up to and including 0.5in²)

This procedure is to be read in conjunction with the appropriate General Requirements ST: CA2C

JOINTING PROCEDURE 7.602

JOINT MATERIALS								
Cable type	**Kit Ref**	**Connector**	**Heavy Walled Mastic Lined Tube**	**Armour Bonding Module ABM STA/SWA**	**50mm² Earth Braid**	**Denso Tape**	**Scotch 5313 Tape**	**Knit Mesh**
0.15in² or 95mm² 0.3in² or 185mm² 0.5in² or 300mm²	TB 1102	1	1	2	1	1	1	1

Additional Items:

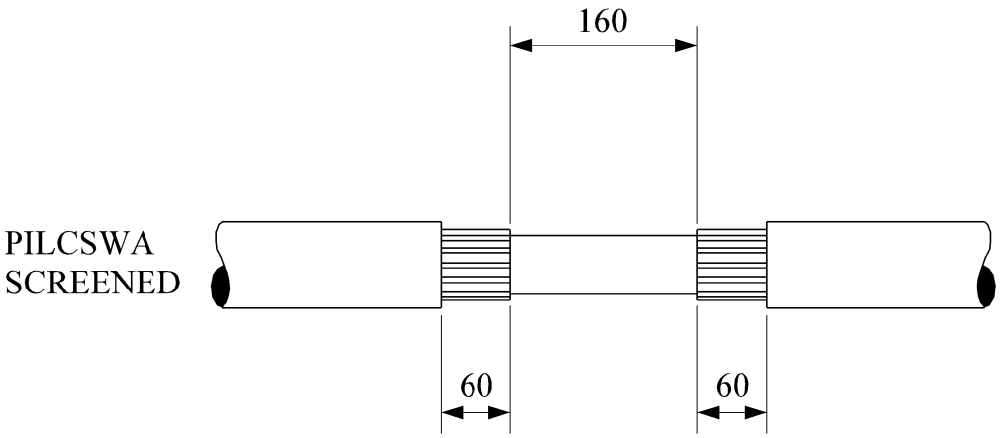
- PVC tape
- Scotch 70
- Scotch 13 tape
- Tinned copper wire 16 swg
- Tinned copper wire 20 swg
- De-solvit 1000 FD
- De-solvit 1000
- Workhorse dry wipes
- Emery cloth
- 5313 Water block tape
- Cable ties
- Sealing putty
- Aluminium oxide cloth 320 grit
- Aluminium oxide cloth 400 grit

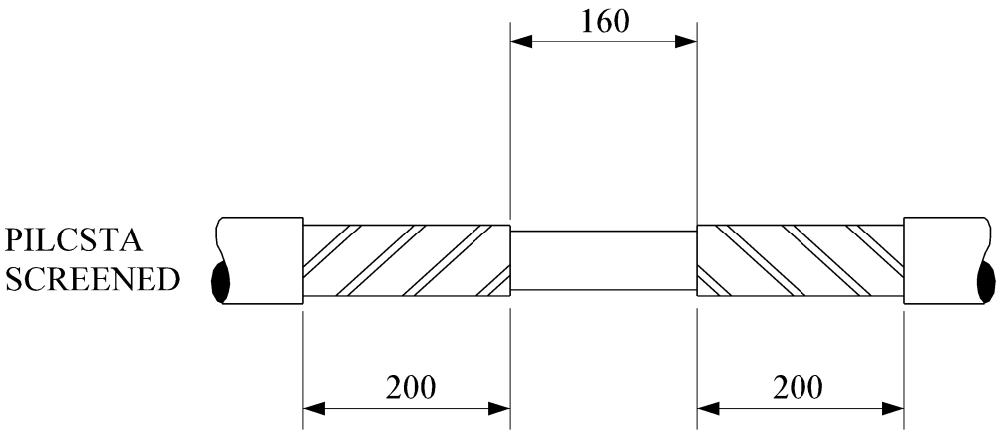
Note: - Individual material item numbers (E5) are to be found in ST:CA2S

JOINTING PROCEDURE 7.602	
Actions & General Requirements (ST: CA2C)	
Set and mark cables.	5/6
PILCSWA & PILCSTA CABLE - Preparation	
Clean each oversheath for a distance of 1.5m.	--
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
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
Remove the wire binder applied in 4, lift and turn the armour wires back at 90° to the lead sheath bedding.	11
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
Abrade the lead sheath circumferentially along the complete length using a file card, and clean with an approved degreaser – Fig 1.	42
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

JOINTING PROCEDURE 7.602	
Actions & General Requirements (ST: CA2C)	
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
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
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
Turn the earth braid tail back over the roll spring and gently dress down to flatten – Fig 4.	42
Apply the remaining turns of the roll spring; tighten by hand using a twisting action – Fig 5.	42
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
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.**	--
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.**	--
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.	--
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	
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
Taking the earth braid end and wrap with brass gauze, feed the braid into the connector entry and hand tighten the bolts.	36
Take the 70mm² bare HDC wire and place into the remaining entry of the brass connector, tighten and shear all bolts.	36
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.	--

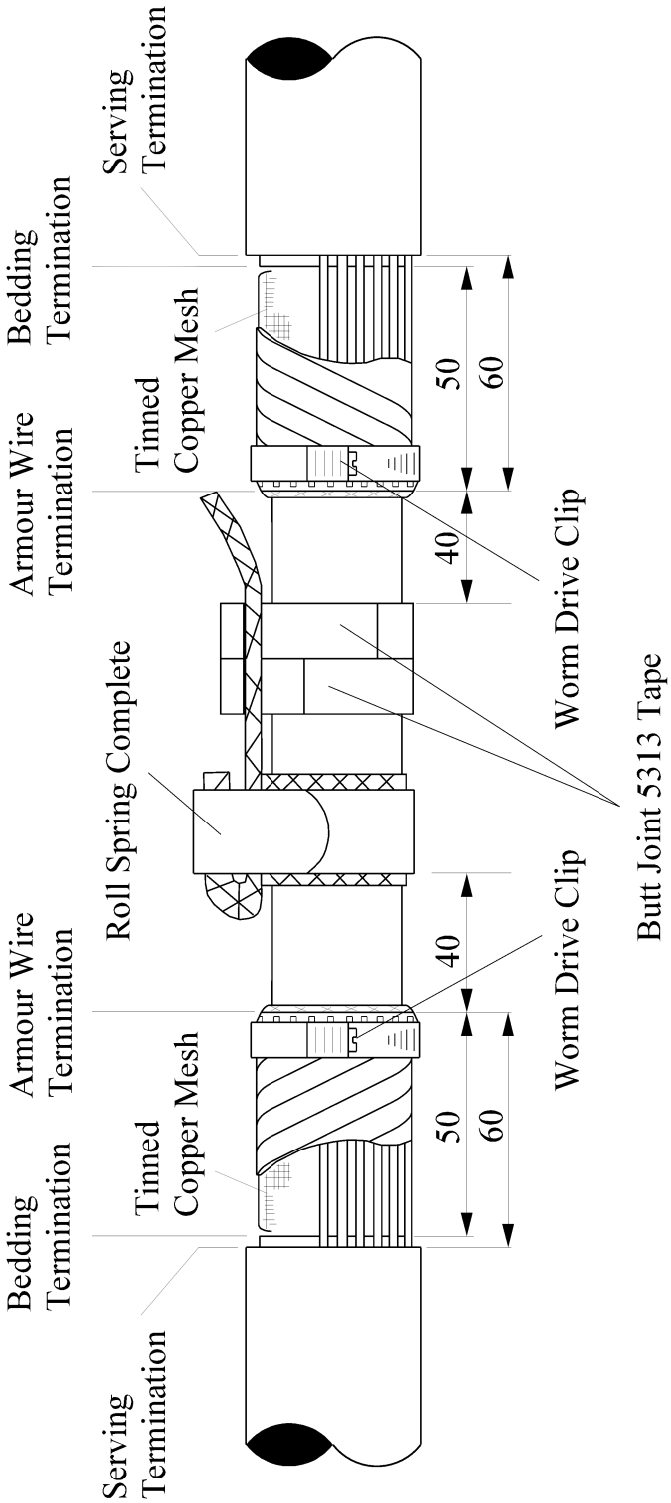
All dimensions in mm





Rev No	Drawn	Chk'd	App'd	Date	Revision

ORIGINAL ISSUE		DATE	NATIONAL GRID Design Department. Avonbank,Feeder Road,Bristol BS2 OTB	nationalgrid Electricity Distribution
Drawn	RJB	06/14		
Checked				
Approved			Title: STRIPPING DIMENSIONS PILCSWA & PILCSTA EARTH BOND JOINT	Drg. No. GR2D 7.602.1 / Rev No
SCALE	N.T.S.			



PILCSWA

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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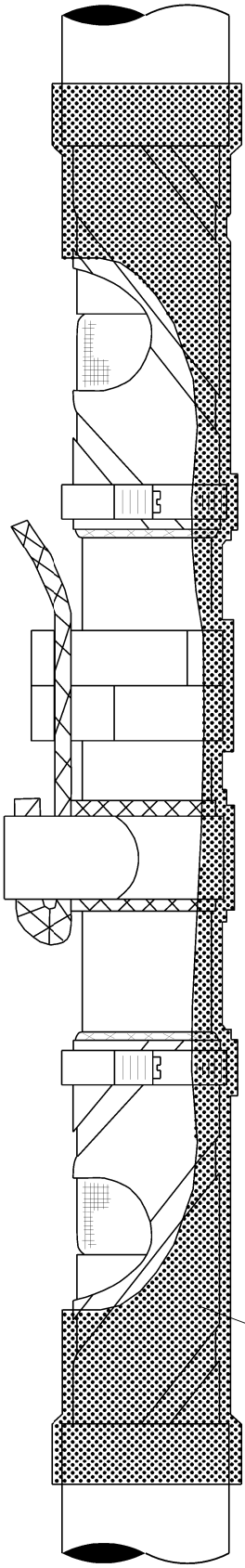
Title

DIMENSIONS OF
PILCSWA & PILCSTA
EARTH BOND JOINT

Drg. No. GR2D 7.602.2

Rev No



PILCSTA

Rev No	Drawn	Chk'd	App'd	Date	Revision

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

NATIONAL GRID
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Title: FINAL GENERAL ARRANGEMENT
PILCSWA & PILCSTA
EARTH BOND JOINT

Drg. No. GR2D 7.602.3

Rev No

APPENDIX A

SUPERSEDED DOCUMENTATION

This Standard Technique supersedes ST: CA2W dated May 2016 which has now been withdrawn.

APPENDIX B

RECORD OF COMMENT DURING CONSULTATION

ST: CA2W/1 - Comments

APPENDIX C

ASSOCIATED DOCUMENTATION

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

APPENDIX D

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 E

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 F

KEY WORDS

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