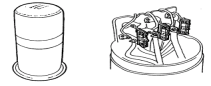


SPS DISTRIBUTION COMMISSIONING FORM (DCF)

2.12 Low voltage cable with/without pillars



Purpose: This instruction covers the testing and commissioning of all new installations of low voltage cross-linked polyethylene (XLPE) and polymeric orange circular cables with or without pillars at the initial energization of an SPS and the customer connection to this supply. For more information, refer to the *Distribution Commissioning Manual (EDM 34137510)*.

Note: The following tests must be carried out after installation, alteration, repair or jointing and before the cable is put into service. The contractor handovers the SPS unit to the SPS technician, as per Part 1 Section 2. Contractor Handover to SPS Technician.

PART 1 - Network Service / Supply Cable

1. Job Details

Location of Pillars			
SPS Scope No.			
Lot No. and Road Name			
Nearest Pick ID	<i>(Meter No., Pole No. etc).</i>		
Applicable arrangements – Drawing No. (General Arrangement, Single Line Diagram, Termination Drawing)			
Uni-Pillar (GAD).			
Test Equipment Used			
Test Instrument Type	Serial Number	Calibration date	
Pillar to be configured as:	1 Ø	Split (2) Ø	3 Ø

Network Cable to Pillar						
Size of Conductors:	Phases Ø	mm ²	Length of cable:	Metres	No. Cores	
	Neutral	mm ²	Length of cable:	Metres	No. Cores	
Cable Type:						
Consumer's Main						
Size of Conductors:	Phases Ø	mm ²	Length of cable:	Metres	No. Cores	
	Neutral	mm ²	Length of cable:	Metres	No. Cores	
Cable Type:						

2. SPS Contractor Handover to SPS Technician

I hereby certify that all ITR's and mandatory tests associated with the SPS up to the customers connections box have been completed with satisfactory results and hereby transfer control to the person responsible for commissioning the Uni-Pillar.			
SPS Contractor Representative		BNA	
Signature		Date & Time	
Western Power Representative		BNA	
Signature		Date & Time	

3. Isolation

<ol style="list-style-type: none"> 1. De-energize potential sources of supply to the Uni-Pillar, isolate by airgap, lockout & tag out. 2. Ensure consumers installation is electrically separated from pillar. 3. Test for deenergised before commencing work <u>or</u> if change of task occurs. Level 2 PPE is required until proven de-energized. 			
Confirmed	Yes <input type="checkbox"/>	No <input type="checkbox"/>	

4. Continuity and phasing test

- Confirm test instruments are calibrated and 'in date'.
- Short and test between each phase and neutral then between phase to phase, if any combination of the below are open circuit this indicates incorrect polarity and requires further testing not covered by this document.
- Where sites have only 2 cores available, you must supplement the earth core for an independent earth (IE)
 - Each core must have 500V applied between it and the main earth stake within the SPS boundary with a bridge/link placed between IE and core being tested at the Uni-Pillar. This method is for the supply cable and not to be used for the consumer main.

Stage	Continuity - Results are to be recorded in MΩ/Ω where applicable.			
Arrangement		1 Φ	Split Φ	3 Φ
Steps	R – W Ω			
	R – B Ω			
	W – B Ω			
	R – N Ω			
	W – N Ω			
	B – N Ω			
	R – E(Ω)/IEMΩ			
	W – E Ω			
	B – E Ω			
	N- E(Ω)/IEMΩ			

5. Insulation Resistance Test

- Use a 1kV insulation resistance tester (DO NOT exceed 1000V for this test) for 1 minute between conductor to conductor and conductor to neutral.
- Record the values obtained.
- Values greater than 10 MΩ for new cable and 1 MΩ for existing cables are acceptable. This test may not be practical for existing cables because of connected services.
- Ensure all persons are clear of the circuit before testing.
- Test and record the insulation resistance values measured using an insulation resistance tester.

Circle either:

New	Existing
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Note: Do not perform insulation resistance test once the service cable at the SPS is connected, as there is potential for equipment damage.

Stage	Insulation Resistance <i>Record actual measurements in MΩ All cores including spares shall be tested.</i>			
Arrangement		1 Φ	Split Φ	3 Φ
Steps	R – W MΩ			
	R – B MΩ			
	W – B MΩ			
	R – N MΩ			
	W – N MΩ			
	B – N MΩ			
	R – E/IE MΩ			
	W – E/IE MΩ			
	B – E/IE MΩ			
	N – E/IE MΩ			

6. Visual Inspection and Safety Check

Description		Result
1.	Confirm that the cable is de-energised (with an approved testing device) before proceeding.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
2.	Check that the pillars finished ground level is satisfactory.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
3.	Check that all the cables and pillars are correctly installed and that there is no sign of damage.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
4.	Check that no cables are exposed and backfill if required.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
5.	Ensure no earth rod is installed in the pillar and the earth jumper removed.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail

6.	Check the service cable connections are completed in line with the pillar arrangement drawings (<i>SPS-MOD-06- EDM 64769770</i>) and are free from damage.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
7.	Check that the labelling is correct as per the SPS Pillar termination drawing.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
8.	Ensure the inspection point of the lugs are visible and not covered by any heat shrink. (Copper must be visible and inserted to the full extent the lug will accept.)	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
9.	Check that there are no loose connections or unconnected service cables in the pillar. (Ensure consumer main must be disconnected.)	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
10.	Check that the neutrals are all solidly and separately bolted to the neutral bar/block. (Bolts to be marked as an indicator they have been correctly tensioned).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
11.	Inspect and confirm the neutral tag identifier has been affixed to the neutral cable only and is clearly visible.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
12.	All insulating covers are to be secure, fixed in place and in a safe to energise state.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Escalate any failed results to relevant parties and if re-commissioning is required; commissioning must be re-initiated and new forms completed.		

7. Critical checks before energizing.

- All insulating covers are to be secure, fixed in place and in a safe to energize state.
- Confirm earth jumper within uni-pillar has been removed.
- Ensure all spare cores are labelled and terminated.
- Consumer isolated - Load neutral removed & Service Protection Device (SPD) removed.
- Ensure overhead supply has been cut away.
- Ensure consumer main cannot make inadvertent contact with live parts.

8. Commissioning – Live tests to be completed at SPS Customer Connection Box.

If energisation occurs more than two weeks after the above testing, conduct all insulation resistance tests again to ensure the cables are safe to energise.

Stage	Steps	
Commissioning Checks	Ensure that all persons and equipment are clear of the circuit and all pillars and units are secured.	<input type="checkbox"/>
	Check that the LV fuses / protection devices are correct as per the SPS single line diagram.	<input type="checkbox"/>
	Each phase must be energised in turn from the remote end and checked at customer connection box for correct phasing. Record the voltages.	<input type="checkbox"/>
	Ensure SPS output terminals have been terminated and are correct as per the SPS single line diagram.	<input type="checkbox"/>

Stage	Steps				
	If applicable, energize the circuit in accordance with any active low voltage switching program and record the switching program number:				<input type="checkbox"/>
Stage		Acceptable range	Instruction	SPS Mode	Genset Mode
Energisation of the SPS associated LV network	Test and record voltages at the SPS output terminals. <i>(Fill all applicable voltage fields.)</i>	Single Φ Expected Value 216–253V.	Red - Neutral	V	V
			Ind Earth - Red	V	V
		Single Φ Expected Value 0 – 6V	Ind Earth - Neutral	V	V
			Split Φ Expected Value 216–253V.	Red - Neutral	V
		White - Neutral		V	V
		Ind Earth - Red		V	V
		Ind Earth - White		V	V
		Split Φ Expected Value 0 – 6V	Ind Earth - Neutral	V	V
		Split Φ Expected Value 451–509V	Red - White	V	V
		Three Φ Expected Value 216– 253V.	Red - Neutral	V	V
			White - Neutral	V	V
			Blue - Neutral	V	V
			Ind Earth - Red	V	V
			Ind Earth - White	V	V
			Ind Earth - Blue	V	V
Three Φ Expected Value 0 – 6V	Ind Earth - Neutral	V	V		
Three Φ Expected Value 376–440V	Red - White	V	V		
	Red - Blue	V	V		
	White - Blue	V	V		

Stage	Steps				
	Source Impedance at SPS Output Terminals	<1.0 ΩZ	Red to Neutral	ΩZ	ΩZ
			White to Neutral	ΩZ	ΩZ
			Blue to Neutral	ΩZ	ΩZ
	<i>If value exceeds 1.0 ΩZ checks must be performed to ensure the impedance is inherent to the SPS unit. Refer to SPS System impedance work instruction EDM 67994432</i>				
	Record phase details – Sequence, colour, and rotation if applicable. i.e., L1 – Red, L2 – White etc.	∅		∅	∅

De-energize Uni-Pillar – Pillar should now be ready for hand over and placed into service.

Ensure all covers and cabling in safe state for part 2. If part 2 not to be completed on the same day, service cable is to be de-energised with info tag affixed to the customer connection circuit breaker at the SPS AC distribution board.

Note: If Part 2 is not completed within 2 weeks of original test dates they must be completed again in full.

PART 2 - Consumer connection to Uni-Pillar

1. Handover to Persons responsible for energizing consumer kw/h meter.

I hereby certify that all ITR's and mandatory tests associated with LV distribution from the SPS have been completed with satisfactory results and hereby transfer control to the person responsible for connecting the consumer to the uni-pillar and energising the consumers installation.			
The uni-pillar is now to be treated as live and energised unless proven otherwise.			
Part 1 responsible party (Name & Organisation)		BNA	
Signature		Date & Time	
Part 2 responsible party (Name & Organisation)		BNA	
Signature		Date & Time	

2. Isolation

<ol style="list-style-type: none"> 1. De-energize potential sources of supply to the Uni-Pillar, isolate by airgap or lockout & tag out. 2. Ensure consumers installation is electrically separated from pillar. 3. Test for de-energised before commencing work <u>or</u> if change of task occurs. Level 2 PPE is required until proven de-energized. 			
Confirmed	Yes <input type="checkbox"/>	No <input type="checkbox"/>	

3. Continuity

Short and test between each phase and neutral then between phase to phase, if any combination of the below are open circuit this indicates incorrect polarity and requires further testing not covered by this document. For single phase installations: A trailing test lead (TL) must be used to confirm polarity of single core XLPE cabling.

Stage	Continuity			
Arrangement	1 Φ	Split Φ	3 Φ	
Steps	R – W Ω			
	R – B Ω			
	W – B Ω			
	R – N Ω			
	W – N Ω			
	B – N Ω			
	R – E (TL) Ω			
	W – E Ω			
	B – E Ω			
	N – E (TL) Ω			

4. Insulation resistance test

This test is to be carried out using a 1 kV tester (never use 5 kV insulation testers for this test) between phase to phase, phase to neutral, and neutral to earth for 1 minute. Apply test voltage as per table below.

Values greater than 10 MΩ for new cables and 1 MΩ for existing cables are acceptable.

Circle either:

New	Existing
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Ensure that all persons are clear of the circuit before testing. Record actual values in MΩ.

Note: Do not perform insulation resistance test if SPS is not air-gapped OR the consumers installation is not disconnected, as there is potential for equipment damage.

Stage	Insulation Resistance <i>Record actual measurements in MΩ</i> <i>All cores including spares shall be tested.</i>			
Arrangement		1 Φ – 500V	Split Φ – 1kV p/n-e 500	3 Φ – 1kV
Steps	R – W MΩ			
	R – B MΩ			
	W – B MΩ			
	R – N MΩ			
	W – N MΩ			
	B – N MΩ			
	R – E MΩ			
	W – E MΩ			
	B – E MΩ			
	N – E MΩ			

5. Visual inspection and safety check

Visual Inspection and Safety Check – Customer Meter Panel		
Description		Result
1.	Confirm that the cable is de-energised (with an approved testing device) before proceeding.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
2.	Check that all the Kw/h meters installed as per WASIR and that there is no sign of damage.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
3.	<u>Ensure customer load active and load neutral are left out of the meter.</u>	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
4.	Ensure consumer main labelled as per WAER. (Switchboard and uni-pillar).	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
5.	Check that no underground cables are exposed and backfill if required.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail

6.	Terminate Active conductor/ conductors to SPD, s, terminate neutral conductor to meter.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
7.	Ensure consumer main is mechanically protected as per WAER.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
8.	All insulating covers are to be secure, fixed in place and in a safe to energise state.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
9.	If any electrical works on the consumer installation were completed during the changeover, the temporary disconnection tag <u>must</u> be completed and <u>signed</u> in full. Energization cannot occur unless this is signed.	<input type="checkbox"/> Pass <input type="checkbox"/> Fail
Escalate any failed results to relevant parties and if re-commissioning is required; commissioning must be re-initiated and new forms completed.		

6. Connect consumer main into the Uni-pillar.

Description		Step Completed	
1.	Test for de-energised before connecting.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
2.	At the kw/h meter the SPD should be de-energized and load tails not connected into the meter.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
3.	At the uni-pillar connect the neutral core first then connect the phases in order of phase sequence. <i>(Connect the consumer main to the front connection blocks within the pillar.)</i>	Yes <input type="checkbox"/>	No <input type="checkbox"/>
4.	Confirm terminations have no exposed copper protruding past the terminal block.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
5.	Perform tug test on all consumer main terminations within the uni-pillar.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
6.	Confirmed customer main switch off.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
7.	Re-instate all uni-pillar covers internal and external and ensure lid fixing bolts have been re-instated and are fully tightened.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
8.	Reinstate load <u>active</u> tail into the kw/h meter. **Load neutral tail to remain disconnected for SCT.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
9.	Re-energise at the SPS and energise service to Kw/h SPD.	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Escalate any failed results to relevant parties and if re-commissioning is required; commissioning must be re-initiated and new forms completed.			

7. Critical checks before energizing

1. All insulating covers are to be secure, fixed in place and in a safe state to energize.
2. All tests on both Part 1 & Part 2 have been carried out successfully.
3. Consumer isolated - Load neutral removed & SPD removed.
4. If any works have been completed on the consumers installation during the changeover, ensure that the temporary disconnection tag is completed in full and signed. Energization cannot occur unless this has been done.

Note: Critical check#4 is non-applicable if **no** electrical contractor related work was performed out during the outage.

8. Commissioning

Final commissioning for the consumer main is to be carried out via the Service Connection Test (SCT) form (EDM 53524514). Person responsible for performing SCT is to sign below.

Note: If energisation occurs more than two weeks after the above testing, conduct all insulation resistance tests again to ensure the cables are safe to energise.

9. SCT Details & final sign off

Service Connection Test			
Installation Address:			Date of SCT:
Line Z Stickers Applied	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
SCT Line Impedance: <1.0ZΩ			
	L1	L2	L3
Inverter Mode			
Genset Mode			
I the undersigned, hereby certify that I have performed the tests above, and confirm that the service connection is safe and correctly connected to the network.			
Tester Name:	BNA:	Signature:	
Comments:			