WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Company Directive

STANDARD TECHNIQUE : NC7C

WPD G81 Framework Appendix Part 3 for the Installation and Record Requirements for LV Housing Developments

This document shall be read in conjunction with:

ENA Engineering Recommendation G81, Framework for Design and Planning, Materials Specification and Installation and Record for Low Voltage Housing Development Installations and Associated, New, HV/LV Distribution Substations – Part 3 Installation Records.

Author:	**Andy Hood**
Implementation Date:	**October 2012**
Approved by	
	Policy Manager
Date:	9th October 2012

1.0 REVISION HISTORY

DATE	COMMENTS	AUTHOR
17/02/2014	Previous Revision History Table and latest Revision and Review Table have been combined.	**A. Hood**
04/02/2014	Removal of text relating to Adoption and Distribution System Access Agreement that has been replaced by Network Access and Adoption Agreement.	**Paul B Smith**
08/10/2012	Requirements previously included in WPD Appendix G81-3.1 Issue G and WPD G81-3.2 Issue D have been combined together in this new combined document called ST:NC7C The following additional documents have been referenced: • ST:SD5A • ST:SD5C • ST:SD5D • ST:SD8B Part 1 • ST:SD8B Part 2 • ST:CA6 • ST:TP21D Cables shall be installed in accordance with ENA ER G81 Part 3 and ST:CA6 Cable ratings are now defined in ST:SD6B Part 1 and 2 Cable diameters and minimum bending radii have been updated Service entry requirements are now defined in ST:SD5A Cut-out arrangements are defined in ST:SD5D Requirements for multi-occupancy buildings are now defined in ST:SD5C and not WPD Appendix G83-3.2. Test / check sheets are now included in Annex A Phase to neutral voltage check has been added to A1 Requirement to confirm cable is clear of other apparatus added to A2 The implementation requirements are defined in Annex B	**A. Hood**

2.0 INTRODUCTION

2.1 This G81 Framework Annex specifies Western Power Distribution's requirements for the installation and record requirements for low voltage electricity underground cable networks and associated new HV/LV distribution substations for housing developments undertaken under the OFGEM Competition in Connections regime. This document shall be read in conjunction with:

- The National Framework Documents
- The Network Access and Adoption Agreement
- Western Power Distribution (WPD) Housing Development Framework Appendices relating to design and materials.
- Western Power Distribution (WPD) Housing Development Framework Appendix relating to cable recording techniques.
- WPD Standard technique ST:SD5A, The Design of LV Domestic Connections.
- WPD Standard technique ST:SD5C, LV Connections to Multi-occupancy Buildings.
- WPD Standard technique ST:SD5D, Standard Arrangements for LV Cut-outs
- WPD Standard Technique ST:SD8B Part 1, LV Underground Cable Ratings
- WPD Standard Technique ST:SD8B Part 2, 11kV Underground Cable ratings
- WPD Standard Technique ST:CA6, Installation of Underground Cables
- WPD Standard Technique ST:TP21D, 11kV, 6.6kV and LV Earthing

3.0 UNDERGROUND CABLES

3.1 In addition to satisfying the requirements of ENA Engineering Recommendation G81 Part 3, underground cables shall be installed in accordance with ST:CA6A.

3.2 General installation data for WPD low voltage cables is given Table 1, below.

3.3 Rating information for WPD LV cables is defined in ST:SD8B Part 1 and for 11kV and 6.6kV cables in ST:SD8B Part 2.

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Table 1 Cable Diameters and Minimum Bending Radii

Cable Type	Typical Overall Diameter (mm)	Minimum Bending Radius (mm)
$25mm^2$ 1ph hybrid	12	125
$35mm^2$ 1ph hybrid	14	125
$16mm^2$ 1ph copper concentric	12	100
$25mm^2$ 1ph copper concentric	14	125
$16mm^2$ 1ph copper split concentric	15	125
$25mm^2$ 1ph copper split concentric	18	150
$25mm^2$ 3ph hybrid	23	200
$35mm^2$ 3ph hybrid	25	250
$16mm^2$ 3ph copper concentric	21	200
$25mm^2$ 3ph copper concentric	25	200
$16mm^2$ 3ph copper split concentric	26	250
$25mm^2$ 3ph copper split concentric	30	250
$95mm^2$ 3 core wavecon	35	650
$185mm^2$ 3 core wavecon	46	850
$300mm^2$ 3 core wavecon	55	950
$95mm^2$ 3 core wavecon	38	650
$185mm^2$ 3 core wavecon	53	850
$300mm^2$ 3 core wavecon	63	950
$600mm^2$ solidal	TBC	400
$740mm^2$ solidal	TBC	400

4.0 PLANT

4.1 Plant shall be installed in accordance with ENA Engineering Recommendation G81 Part 3. The earthing requirements for Plant are specified in ST:TP21D.

5.0 SERVICE ENTRIES FOR NEW DWELLINGS ON RESIDENTIAL ESTATES

5.1 The requirements for service entries are specified in ST:SD5A. For the avoidance of doubt, service cables and ducts shall not be installed within a cavity wall as this significantly de-rates the cable.

5.2 Cut-out arrangements shall be in accordance with WPD Standard Technique SD5D/1

6.0 MULTI-OCCUPANCY DWELLINGS

6.1 WPD requirements, which are based on ENA Engineering Recommendation G87 are specified in ST:SD5C.

7.0 TESTS AND RECORDS

7.1 The details of records and tests required, together with test record sheets are given below.

7.2 Further WPD requirements covering underground assets recording techniques, procedures and records are detailed in WPD's Framework Document Appendix on Cable Recording Techniques.

7.3 Other data to be recorded on site

- Site location / address
- Recorded by (name and contractor) and when
- Cable sizes
- Depth of plant below final ground level
- Size, type and manufacturer of jointing chambers
- Cable drum number and manufacturer
- Cable length
- Duct and sub duct sizes. (Sections to be shown where multiple ducts are laid)
- Cable laid by and when
- Map number or reference and scale: minimum scale 1/500 for underground cable recording
- LV Link box maker, type, rating and (if present) serial number
- LV Fuse cabinet / board / pillar make, type, serial number, number of outgoing ways
- HV/LV transformer, type (eg unit), make, rating, serial number, tapping range, fixed and variable losses (from test certificate)
- HV ring main unit / tee circuit breaker – make, type, ratings normal and short circuit current and serial number
- Make and type of substation housing with serial number (if present)

7.4 Test records required

Test sheets, for completion by the third party, including some aide-memoire checks are provided in Annex A of this document. These checks shall be carried out for each installation / item of equipment. It should be noted that in listing only some checks this in no way removes any of the requirements stated elsewhere.

APPENDIX A

TEST / CHECK / RECORD SHEETS

A1 Services Test/Check Sheet

SERVICES TEST / CHECK SHEET						
SITE LOCATION:						
House / plot number	**Phase (L1, L2, L3)**	**Phase-neutral voltage/s (V)**	**Polarity and phase rotation (3PH) tested and correct? Y/N**	**Insulation resistance value 0.5 / 1kV test (MΩ)**	**Earth fault loop impedance value (Ω)**	**Meter box installed correctly, including gas seals? Y/N**

I confirm the above tests / checks and that the installation is compliant with requirements of National Framework Documents and WPD Framework Appendices

Signed…….

Company……

Date…….

A2 Mains Cable Test/Check Sheet

MAINS CABLE TEST / CHECK SHEET			
SITE LOCATION:			
Item	**Section 1**	**Section 2**	**Section 3**
Section / location description:			
Insulation resistance, ph-ph & ph-earth 0.5 /1kV test (MΩ):			
Continuity checked and OK? (Y/N):			
Trench depth checked and OK (Y/N):			
Cable clear of other utility apparatus? (Y/N):			
Cable marker tape laid throughout length? Y/N			
Reinstatement compliant with NRSWA spec., where applicable? (Y/N):			

I confirm the above tests / checks and that the installation is compliant with requirements of National Framework Documents and WPD Framework Appendices

Signed…….

Company……

Date…….

A3 PME Electrode Test/Record Sheet

PME ELECTRODE TEST / RECORD SHEET	
SITE LOCATION –	
Describe location of electrode	**Earth resistance value - Ohms**

I confirm the above tests / checks and that the installation is compliant with requirements of National Framework Documents and WPD Framework Appendices

Signed…….

Company……

Date…….

A4 Substation Test/ Check Sheet

HV / LV SUBSTATION TEST / CHECK SHEET	
SITE LOCATION –	
Test / check	**Result**
Earthing:	
Value of HV earth resistance or combined HV/LV earth resistance, as applicable (Ohms):	
Value of LV earth resistance (Ohms) (Only applicable where HV and LV earths are segregated)	
Overlap resistance (Ohms) (Only applicable where HV and LV earths are segregated)	
HV earth link position? (In / Out)	
LV Fuse Cabinet:	
Insulation resistance 500/1000V (MΩ)	
All fuse-way carriers in place? Y/N	
LV Protection - Ratings of fuses installed (A), by fuse-way or circuit breaker settings, as applicable.	
LV Generator Connectors Provided (Y/N)	
HV/LV Transformer:	
Insulation resistances HV-LV winding / earth 5kV HV (GΩ)	
Pressure test, value (kV) and duration (minutes)	
Voltage and phasing checks OK? (Y/N)	
Tap position (1,2 etc.) and % setting (+/- %)	
Oil moisture content ppm	
Oil electric breakdown strength kV / gap	
Confirmation from oil supplier that PCB content <5ppm Y/N	
HV Switchgear / HV Protection:	
Switchgear insulation resistance 5kV test (GΩ)	
Switchgear pressure test value (kV) and duration (minutes)	
Protection test, secondary injection or dummy HV fuse tester (e.g. B&S device) OK? (Y/N)	
HV Protection Setting (fuse rating (A), CT ratio, relay type and setting/s etc.) as applicable.	
Functional test of interlocks and operation OK? (Y/N)	
Insulation test of any loose test devices (test plugs etc.) (GΩ)	
Gas pressure indication satisfactory? (Y/N)	
Busbar resistance if work includes connections of busbars, new to new or new to existing. (Micro Ohms, i.e. μΩ)	

I confirm the above tests / checks and that the installation is compliant with requirements of National Framework Documents and WPD Framework Appendices

Signed…….
Company……
Date…….

A5 HV Cable Test/Check Sheet

HV CABLE TEST / CHECK SHEET			
SITE LOCATION:			
Item	**Section 1**	**Section 2**	**Section 3**
Section / location description:			
Insulation resistance, ph-ph & ph-earth 0.5 /1kV test (MΩ):			
Continuity checked and OK? (Y/N):			
Trench depth checked and OK (Y/N):			
Cable clear of other utility apparatus? (Y/N):			
Cable marker tape laid throughout length? Y/N			
Reinstatement compliant with NRSWA spec., where applicable? (Y/N):			

NOTE – Following HV "closing" jointing by WPD to connect into WPD network, WPD undertake insulation and pressure tests of the circuit prior to energisation.

I confirm the above tests / checks and that the installation is compliant with requirements of National Framework Documents and WPD Framework Appendices

Signed…….

Company……

Date…….

A6 HV Polymeric VLF Test Sheet

AC VLF FOR 11kV POLYMERIC CIRCUITS (XLPE or EPR)			
SITE LOCATION-			
Test Voltage	**Test Points**	**Time**	**Result**
2.5 Uo	**All Phases to Earth**	**30 min**	
2.5 Uo	**Phase 1 to Phase 2**	**30 min**	
2.5 Uo	**Phase 1 to Phase 3**	**30 min**	
2.5 Uo	**Phase 2 to Phase 3**	**30 min**	
Where Uo = the power frequency voltage between phase and earth			

Note:- Where the cable is to be connected to an existing Western Power Distribution cable, the above test shall be carried out by an authorised member of Western Power Distribution.

I confirm the above tests/checks and that the installation is compliant with requirements of National Framework Documents and WPD Framework Appendices

Signed……

Company……

Date……

A7 AC Switchgear Pressure Test Sheet

AC PRESSURE TEST FOR 11 kV SWITCHGEAR (NOT CONNECTED)			
SITE LOCATION-			
Manufacturer:			
Type:			
Serial Number:			
Switch 1			
Test Voltage	**Test Points**	**Time**	**Result**
24kV	**All Phases to Earth**	**1 min**	
24kV	**Phase 1 to Phase 2**	**1 min**	
24kV	**Phase 1 to Phase 3**	**1 min**	
24kV	**Phase 2 to Phase 3**	**1 min**	
24kV	**All Phases Across open switch**	**1 min**	
Switch 2			
Test Voltage	**Test Points**	**Time**	**Result**
24kV	**All Phases to Earth**	**1 min**	
24kV	**Phase 1 to Phase 2**	**1 min**	
24kV	**Phase 1 to Phase 3**	**1 min**	
24kV	**Phase 2 to Phase 3**	**1 min**	
24kV	**All Phases Across open switch**	**1 min**	
Switch 3			
Test Voltage	**Test Points**	**Time**	**Result**
24kV	**All Phases to Earth**	**1 min**	
24kV	**Phase 1 to Phase 2**	**1 min**	
24kV	**Phase 2 to Phase 3**	**1 min**	
24kV	**Phase 1 to Phase 3**	**1 min**	
24kV	**All Phases Across open switch**	**1 min**	

Note:- These tests must be carried out prior to any cable being connected to the switch.

Where the switch is mounted directly on to a transformer the 11kV windings of the transformer shall disconnected from the switch prior to the test commencing.

I confirm the above tests/checks and that the installation is compliant with requirements of National Framework Documents and WPD Framework Appendices

Signed……

Company……

Date……

A8 Transformer Test Sheet

11kV/415V TRANSFORMER TESTS			
SITE LOCATION-			
Manufacture			
Size KVA			
Serial Number			
Tap Setting			
HV WINDING DC PRESSURE TEST			
Test Voltage	**Test Points**	**Time**	**Result**
18kV	**Winding to Earth**	**15 min**	
LV WINDINGS			
1000V	**Winding to Earth**	**1 min**	

I confirm the above tests/checks and that the installation is compliant with requirements of National Framework Documents and WPD Framework Appendices

Signed……

Company……

Date……

APPENDIX B

SUPERSEDED DOCUMENTATION

This document supersedes WPD Appendix G81-3.1 Issue G and with WPD Appendix G81-3.2 Issue D 3 months from the issue of this document. See also Appendix E.

APPENDX C

ASSOCIATED DOCUMENTATION

ENA ER G81 Part 1
ENA ER G81 Part 2
ENA ER G81 Part 3
ENA ER G81 Part 4
ENA ER G81 Part 5
ENA ER G81 Part 6
ENA ER G81 Part 7
Western Power Distribution (WPD) Housing Development Framework Appendices relating to design and materials.
Western Power Distribution (WPD) Housing Development Framework Appendix relating to cable recording techniques.
WPD Standard technique ST:SD5A, The Design of LV Domestic Connections.
WPD Standard technique ST:SD5C, LV Connections to Multi-occupancy Buildings.
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APPENDIX D

POLICY IMPACT

This document is applicable to all ICPs involved in the design, installation and recording of LV domestic connections. This document combines the existing requirements of WPD Appendix G83-3.1 Issue G and WPD Appendix G83-3.2 Issue D. The installation requirements for flats are now included in ST:SD5C.

APPENDIX E

IMPLEMENTATION

For a period of 3 calendar months from the date of issue of this document ICPs may either comply with WPD Appendix G81-3.1 Issue G and WPD Appendix G81-3.2 Issue D or alternatively comply with the requirements of this document. After this 3 month period this document shall be implemented in full.

APPENDIX F

KEY WORDS

G81, Competition in Connections, Housing, Framework, Independent Connection Provider, ICP, Appendix, Installation, Record, Records, Recording.