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Electricity Specification 400C9

Issue 9 August 2024

11kV Distribution Cables

Amendment Summary

ISSUE NO. DATE	DESCRIPTION
Issue 7 **September 2021**	Restructure and reformatting to the new Model Electricity Specification template. Update of technical information to latest versions of British Standards. Addition of the following cable types: • 95/185/300mm^2 aluminium triplex cables with LSOH sheath • 400mm^2 aluminium conductor, triplex cable with MDPE sheath • 400mm^2 copper conductor, single core cable with LSOH sheath • 400mm^2 aluminium conductor, single core cable with LSOH sheath Prepared by: P. Howell Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, Engineering and Technical Director
Issue 8 **February 2023**	400mm^2 copper conductor triplex cable with MDPE sheath added to Appendix A. Prepared by: D M Talbot Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, Engineering Director
Issue 9 **August 2024**	Updated to latest ES template No technical content changed Prepared by: P Howell Approved by: Policy Approval Panel and signed on its behalf by Paul Turner, PAP Chairperson

Contents

1 Scope

This Specification covers the technical requirements for 11kV cables for use on the Electricity North West Limited (hereinafter referred to as Electricity North West) Distribution System.

2 Definitions

Approval	Sanction by the Electricity North West Underground Circuits Manager that specified criteria have been satisfied
Contract	The agreement between Electricity North West and the Contractor for the execution of the Works including therein all documents to which reference may properly be made in order to ascertain the rights and obligations of the parties under the said agreement.
Contractor	The person or person's firm or company, including personal representatives, successors and permitted assigns, who's Tender has been accepted by Electricity North West.
PVC	Poly Vinyl Chloride
Specification	The Specifications and schedules (if any) agreed by the parties for the purpose of the Contract.
Sub-Contractor	Any person (other than the Contractor) named in the Contract for any part of the Works or any person to whom any part of the Contract has been sub-let with the consent in writing of the Electricity North West Underground Circuits Manager, and the legal representatives, successors and assigns of such person.
Supplier	Any person or person's firm or company who supplies goods to Electricity North West or to its Contractor.
Tender	An offer in writing to execute work or supply goods at a fixed price.
Tenderer	The person or person's firm or company, including personal representatives, successors and permitted assigns, invited by Electricity North West to submit a Tender.
XLPE	Cross linked Polyethylene

3 General Requirements for Approvals and Testing

3.1 Product not to be Changed

Compliance with this clause shall be in accordance with ES001.

3.2 Electricity North West Limited Technical Approval

Compliance with this clause shall be in accordance with ES001.

3.3 Quality Assurance

Compliance with this clause shall be in accordance with ES001.

3.4 Formulation

Compliance with this clause shall be in accordance with ES001.

3.5 Identification Markings

Compliance with this clause shall be in accordance with ES001.

3.6 Minimum Life Expectancy

The minimum life expectancy of all products covered by this Specification is 60 years.

3.7 Product Conformity

Compliance with this clause shall be in accordance with ES001.

3.8 Confirmation of Conformance

The Tenderer shall complete the conformance declaration sheets in Appendix B.

Failure to complete these declaration sheets may result in an unacceptable bid.

4 Requirements for Type and Routine Testing

Compliance with this clause shall be in accordance with ES001.

4.1 Requirement for Type Tests at Suppliers Premises

Compliance with this clause shall be in accordance with ES001.

4.2 Requirement for Routine Tests at the Supplier's Premises

Compliance with this clause shall be in accordance with ES001

5 Conditions of Installation

Cables specified in this Specification will be pulled or laid into open trenches, pulled into ducts or installed in air. Cables may also be installed directly by trenchless installation techniques.

During storage and after installation cables can be expected to be subjected to the full range of climatic conditions encountered in the UK.

Cables may be surrounded by ground water for most of their operating life. Where cables are installed in ducts, flooding of ducts can occur resulting in permanently wet sections along the cable route.

Cables installed above ground will be supported by means of cleats either vertically or horizontally and these cables may be exposed to direct sunlight for significant periods.

Cables may be installed on wood poles in contact with the pole and, therefore, in contact with a pole preservation medium such as creosote.

Accessories may be cold applied or require application of heat.

6 Conditions of Operation for Power Cables

The following are the general conditions under which power cables purchased in accordance with this Specification are required to operate:

- Nominal system voltage 11 000/6 360 volts.
- The working voltage of any part of the system does not normally exceed the normal system voltage by more than 6%.
- Basic Impulse Level (lighting withstand) of 95kV.
- Nominal system frequency: 50Hz.
- The system operates with the neutral point earthed either directly or through a resistance or reactance at one or more points.

7 Cable Longevity

Reliability is paramount. When any Tender for 11kV cables is evaluated, preference will be given to proven established designs.

The Supplier shall demonstrate reliability for the offered design of the cable by providing evidence of satisfactory service life.

Cables offered shall be designed and manufactured to operate satisfactorily under the installation and operating conditions detailed in Section 5 and 6.

Cables offered must have successfully passed the long-term aging test detailed in BS7870;4.10 clause 8.3.

Preference will be for manufacturers that carry out the test on a continual 1-year cycle.

8 Technical Particulars

8.1 Technical Requirements

Where a requirement of this Specification differs from that of another quoted Specification or Standard, the requirements of this Specification shall apply.

If a Tenderer is unsure regarding any requirement of this Specification, clarification shall be sought in writing from Electricity North West.

11kV cables shall comply with BS 7870 - 4.10.

8.2 Cable Design

This Specification covers the supply of the following types of 11kV distribution cables:

- Single core laid up in triplex formation: **95, 185, 300mm^2 class 1 solid round aluminium conductors** , XLPE insulated 'quasi-dry design' with copper screen wires and swellable water blocking tapes under and over the screen wires and solid round aluminium phase conductors with MDPE or LSOH oversheath.

- Single core laid up in triplex formation: **400mm^2 class 2 round stranded aluminium conductors** , XLPE insulated 'quasi-dry design' with copper screen wires and swellable water blocking tapes under and over the screen wires and solid round aluminium phase conductors with MDPE or LSOH oversheath.

- Single core laid up in triplex formation: **400mm^2 class 2 round stranded copper conductors** , XLPE insulated 'quasi-dry design' with copper screen wires and swellable water blocking tapes under and over the screen wires and solid round aluminium phase conductors with MDPE or LSOH oversheath.

- Single core : **400mm^2 class 2 round stranded aluminium conductors** , XLPE insulated 'quasi-dry design' with copper screen wires and swellable water blocking tapes under and over the screen wires and solid round aluminium phase conductors with MDPE or LSOH oversheath.

- Single core : **400mm^2 class 2 round stranded copper conductors** , XLPE insulated 'quasi-dry design' with copper screen wires and swellable water blocking tapes under and over the screen wires and solid round aluminium phase conductors with MDPE or LSOH oversheath.

- Single core : **630mm^2 class 2 round stranded copper conductors** , XLPE insulated 'quasi-dry design' with copper screen wires and swellable water blocking tapes under and over the screen wires and solid round aluminium phase conductors with MDPE oversheath.

8.3 Conductors

Depending on specific cable, the conductors shall either be:

a) circular round solid aluminium complying with BS EN 60228 (class 1) ,or ;
b) circular compacted stranded copper conductors complying with BS EN 60228 (class 2) ,or :
c) circular compacted stranded aluminium conductors complying with BS EN 60228 (class 2)

8.4 Insulation

The conductor screen, insulation and insulation screen shall be applied as a continuous single pass triple extrusion free of factory repairs. It shall use cross linked polyethylene (XLPE) type DIX 3 or EPR type DIE 5 to BS 7870-1, Annex B

Insulation thickness shall comply with BS 7870:4.10 and any additional requirements of ENATS 09-17.

Concentricity and circularity of the extruded insulation shall comply with the requirements of BS7870 - 4.10.

Insulation shrinkage shall be performed at 130°C for 6 hours and limited to 2%. In addition, a further test at 65°C for 24 hours shall be performed and the results noted.

8.5 Copper Wire Screen

The metallic screen shall be copper wires of 35mm^2 applied in a spiral or "SZ" configuration with maximum gap of 4mm at any point between wires. The wires should be lapped with a copper equalising tape applied in a counter helix.

8.6 Water Blocking Tapes

Swellable water blocking tapes shall be applied under and over the screen wires. The swellable water blocking tapes under the wires shall be semi-conducting. Moisture content of water blocking tape will be less than 50,000 ppm.

8.7 Oversheath

Depending on the specific cable, the oversheath shall be either:

a) an extruded layer of red MDPE type DMP 5 to BS 7870-1, Annex B. Maximum permissible shrinkage shall be 2% when subjected to a retraction test as defined in BS EN 60811. The compound shall have a density within the range quoted in ENA TS 09-17.
or.
b) an extruded layer of orange Low Smoke, zero halogen (LSOH) compound to type DMZ 4 to BS 7870-1, Annex B.

Oversheath embossing/indenting and printing shall be in accordance with BS 7870:4.10 clause 4.5.

Each cable shall be metre marked by printing or embossing/indenting. All external markings shall be clearly visible.

The cable may be supplied as single core, or as three single cores laid up in triplex formation depending on the types listed in Appendix A.

Cables that are supplied laid up in triplex formation shall have L1, L2 and L3 marked externally by embossing or indenting.

An option to have "Electricity North West" or "ENW" printed on to the sheath or conductor to enable positive identification of ownership in event of theft may be requested in the tendering process. Manufacturers shall provide details and any additional costs for this option if requested to do so.

8.8 Cable Identification

Each delivery length of cable shall be allocated a unique reference number. This unique reference number shall be embossed on the cable near to the metre mark. This unique reference number will be used to identify all materials used within the manufacturing process. This number shall appear on the factory test sheet covering the cable length and shall be clearly marked on the drum on which the length is delivered and shall be referred to on all invoices and advice notes.

9 Manufacturing

At the time of Tender, the Tenderer shall provide details of manufacturing location(s) for each cable offered. For cables with extruded insulation, the Tenderer shall also provide details of extrusion and curing technology for each cable offered. The cross-linking process will be completely "Dry Cured" and no water will be used during this process.

Any Approval granted will be site specific and will not be transferable to any other site without the prior written agreement of the Electricity North West Underground Circuits Manager.

10 Type Tests

All cables offered shall be fully Type Tested and Qualified according to the requirements of the Technical Specification and Standards detailed for each cable type. The Tenderer shall provide Type Test certificates and Type Test reports, including details of independent witnesses, at the time of Tender.

Where a Tenderer wishes to offer a cable which has been Type Tested to an alternative Standard(s), full details of the alternative Standard(s) and how it differs from the Specified Standard(s) shall be provided at the time of Tender along with Type Test certificates.

11 Logistical Requirements

11.1 Cable Drums

The cable on the drum shall not be susceptible to damage during transit, storage and handling on site.

Drums used for 11 and 33kV cables shall have a maximum width of 1200mm and a maximum weight of 2500kg.

All cable drums shall be returnable, and the Tenderer shall arrange to collect empty drums from the company's normal delivery locations. Tenderers shall state at the time of Tender their proposed cable drum sizes and weights for each cable type offered.

The ends of all cables shall be effectively sealed against the ingress of moisture by a method appropriate to the cable type. Tenderers shall detail at the time of Tender their proposed sealing arrangement for each cable type offered.

The cable end projecting from the drum shall be protected from damage during transit, storage and handling on site.

Tenderers shall state at the time of Tender their proposed method of protection for each cable.

11.2 Drum labels

All cable drums shall be marked in accordance with the relevant cable specification or standard. The drum label shall also contain:

- Electricity North West commodity code
- Name of manufacturer
- Supplied length
- Rated voltage
- Number of cores
- Size of conductor
- Type of conductor material ("Cu" or "Al")
- Abbreviated description of cable construction
- Gross and nett weights
- Direction of rolling drum
- The metre marking start and end values
- The unique reference number

Cable drums may be stored for long periods outdoors. All drum labels shall remain legible and durable under these conditions

12 Technical Support

The required minimum level of support is as follows:

- Contractual or technical advice is to be available, in English, by telephone during normal working hours.
- Attendance at site by the manufacturer, or the manufacturer's representative within 5 working days of any request made by ENWL following identification of a defect or other major issue relating to the cable.

Tenderers shall provide details of the support available including contact details of Technical Support operatives.

13 Samples

During the Tender period the Tenderer shall submit samples for Approval as required by the Electricity North West Underground Circuits Manager. The samples will be of reasonable lengths to allow for any testing on suitability for the ENWL cable jointing system to be made.

Such samples shall remain the property of Electricity North West.

14 Cable Data Sheets

The Tenderer shall supply full Technical Data sheet for each cable type, detailing the following information:

- Cable Construction including cross sectional drawing
- Maximum dc resistance of phase conductor at 20°C in ohm/km.
- Maximum ac resistance of phase conductor at maximum conductor temperature in ohm/km.
- Equivalent star reactance at 50 Hz in ohm/km.
- Equivalent star capacitance in pF/km.
- Charge current per phase at normal voltage and frequency in mA/m.
- Zero sequence impedance Ro + jXo in ohms/km.
- Minimum dynamic bending radius in mm.
- Minimum static bending radius in mm.
- Recommended pulling method and maximum pulling tension in kgF.
- The maximum continuous current carrying capacity per phase conductor for the following conditions:
    - In Air (excluding solar gain)
    - Laid direct in ground with Ground thermal resistivity (g) = 1.2 °C/W
    - Laid direct in ground with Ground thermal resistivity (g) = 0.9 °C/W
    - Drawn into a 150mm ID smooth wall plastic duct (one cable or triplex cable per duct) where g = 1.2 °C/W
    - Drawn into a 150mm ID smooth wall plastic duct (one cable or triplex cable per duct) where g = 0.9 °C/W

    The following assumptions shall be made when quoting ratings:

    - Single core cables are laid in touching trefoil.
    - Depth of cover to top of 11kV cables is 600mm.
    - Ground temperature = 15 °C.
    - Air temperature = 25 °C.

15 Documents Referenced

DOCUMENTS REFERENCED	
Health and Safety at Work Act 1974	
Control of Substances Hazardous to Health Regulations 2002	
Manual Handling Operations Regulations 1992	
BS EN ISO 9000	Quality management systems
BS EN ISO 14001: 2004	Environmental management systems. Requirements with guidance for use
BS EN 60228: 2005	Conductors of insulated cables
BS 6234	Specification for polyethylene insulation and sheath of electric cables
BS 7655	Insulation and sheathing materials for cables
BS 7870 Part 4	Single Core 11 & 33kV Cables
ENA TS 09-17	Single core cables for use in substations having extruded insulation and rated voltages of 6350/11 000 volts, and 19 000/33 000 volts
CENELEC HD 605	Electrical Cables – Additional test Methods
CP311:	Equipment Approval Process.
ES001:	Main Specifications

16 Keywords

11kV; Cable; EPR; MDPE; XLPE;

Appendix A – Schedule of Cables

ITEM	ORDERING SPECIFICATION	SIZE (MM^2)	CC NO.
A	Single Core laid up in triplex formation: polymeric insulated 'quasi-dry design' with copper screen wires, swellable water blocking tapes under and over the screen wires and **solid aluminium phase conductors**. **MDPE oversheath**	95 185 300	004679 004680 004681
B	Single Core laid up in triplex formation: polymeric insulated 'quasi-dry design' with copper screen wires, swellable water blocking tapes under and over the screen wires and **solid aluminium phase conductors**. **LSOH oversheath**	95 185 300	995183 995184 995184
C	Single Core: polymeric insulated 'quasi-dry' design with copper screen wires, swellable water blocking tapes under and over the screen wires and **stranded copper phase conductors.** **MDPE oversheath**	400	004701
D	Single Core: polymeric insulated 'quasi-dry' design with copper screen wires, swellable water blocking tapes under and over the screen wires and **stranded copper phase conductors.** **LSOH oversheath**	400	004761
E	Single Core polymeric insulated 'quasi-dry' design with copper screen wires, swellable water blocking tapes under and over the screen wires and **stranded aluminium phase conductors.** **MDPE oversheath**	400	004685
F	Single Core laid up in triplex formation: polymeric insulated 'quasi-dry' design with copper screen wires, swellable water blocking tapes under and over the screen wires and **stranded aluminium phase conductors.** **MDPE oversheath**	400	005702
G	Single Core laid up in triplex formation: polymeric insulated 'quasi-dry' design with copper screen wires, swellable water blocking tapes under and over the screen wires and **stranded copper phase conductors.** **MDPE oversheath**	400	**TBA**
H	Single Core: polymeric insulated 'quasi-dry' design with copper screen wires, swellable water blocking tapes under and over the screen wires and **stranded aluminium phase conductors.** **LSOH oversheath**	400	**TBA**
J	Single Core polymeric insulated 'quasi-dry' design with copper screen wires, swellable water blocking tapes under and over the screen wires and **stranded aluminium phase conductors.** **MDPE oversheath**	630	004703

Appendix B – Conformance Declaration

SECTION-BY-SECTION CONFORMANCE WITH SPECIFICATION

The Tenderer shall declare conformance or otherwise for each product/service or range of products/services, section-by-section, using the following Conformance Declaration Codes.

Conformance Declaration Codes:

N/A =	Clause is not applicable/appropriate to the product/service.
C1 =	The product/service conforms fully with the requirements of this clause.
C2 =	The product/service conforms partially with the requirements of this clause.
C3 =	The product/service does not conform to the requirements of this clause.
C4 =	The product/service does not currently conform to the requirements of this clause, but the manufacturer proposes to modify and test the product in order to conform.

Manufacturer:

Product/Service Description:

Product/Service Reference:

Name:

Company:

Signature:

SECTION-BY-SECTION CONFORMANCE			
Section	**Section Topic**	**Conformance Declaration Code**	**Remarks * (must be completed if code is not C1)**
3.1	**Product not to be Changed**		
3.2	**Electricity North West Technical Approval**		
3.3	**Quality Assurance**		
3.4	**Formulation**		
3.5	**Identification Markings**		
3.6	**Minimum Life Expectancy**		
3.7	**Product Conformity**		
3.8	**Confirmation of Conformance**		
4.1	**Requirements for Type Testing**		
4.2	**Requirements for Routine Testing**		
7	**Longevity**		
8.1	**Technical Requirements**		
8.3	**Conductors**		
8.4	**Insulation**		
8.5	**Copper Wire Screen**		
8.6	**Water Blocking Tapes**		
8.7	**Oversheath**		

8.8	**Identification**		
9	**Manufacturing**		
10	**Type Tests**		
11	**Logistical Requirements**		
12	**Technical Support**		
13	**Samples**		
14	**Cable Data Sheets**		

Additional Comments :