

Electricity Specification 400C10

Issue 10 December 2024

33kV Distribution Cables



Amendment Summary

ISSUE NO. DATE	DESCRIPTION
Issue 8 June 2021	<p>Restructure and reformatting of Model Electricity Specification. This 2021 issue constitutes a complete revision and re-issue of Model Electricity Specification in its entirety.</p> <p>Prepared by: Philip Howell Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, Engineering and Technical Director</p>
Issue 9 August 2023	<p>Updated format of ES document with General Requirements now in ES001 Addition of requirement for water blocking tests on aluminium conductors Removal of EPR insulation option Removal of mandatory requirement for marking sheath with “Property of ENWL” Requirement for design, testing to BS7870-4.10 with option to consider other standards</p> <p>Prepared by: Philip Howell Approved by: Policy Approval Panel and signed on its behalf by Paul Turner, PAP Chairperson</p>
Issue 10 December 2024	<p>Specification reference ES400DS1 corrected in text</p> <p>Prepared by: Philip Howell Approved by: Policy Approval Panel and signed on its behalf by Paul Turner, PAP Chairperson</p>

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1 Scope

This specification comprises general and technical requirements for 33kV cables with XLPE insulation used on the electricity distribution network (Network) owned by Electricity North West Limited, as Distribution Licensee.

2 Definitions

Approval	Sanction by the Electricity North West Limited 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.
ENWL	Electricity North West Limited
Maximum Voltage U_m	Maximum sustained power-frequency voltage between phase conductors, for which the cable is suitable
MDPE	Medium density polyethylene.
Rated Voltage U	Nominal power-frequency voltage between phase conductors, for which the cable is suitable
Rated Voltage U_0	Nominal power-frequency voltage between any conductor and earth for which the cable is suitable
Specification	The Specifications and schedules (if any) agreed by the parties for the purpose of the Contract.
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 C](#). 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 Operational Conditions

The following are general conditions of operation for 33kV cables:

- Nominal system voltage $U_0/U (U_m)$: 19/33 (36)kV.
- The working voltage of any part of the system does not normally exceed the normal system voltage by more than 6%.
- 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.

6 Installation Conditions

33kV Cables specified in this document shall be installed in accordance with ENWL specification ES400E5.

33kV Cables specified in this document will be pulled or laid direct into open trenches, pulled into ducts or installed in air. The cable can also be run in troughs, cement bound sand or suspended in cleats from the side walls. It is not envisaged that cables with increased fire performance properties shall be installed, but if required this shall be specified in the individual project Tender documents.

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

33kV Cables may be surrounded by ground water for most of their operating lives. Where cable is 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.

7 Cable Design

33kV cables shall be a single core extruded XLPE insulation design and supplied on drums as either single core or a “triplex” configuration depending upon actual purchasing specification.

[Appendix A](#) lists the range of conductor cross sections and configurations currently used by ENWL.

33kV cables shall comply with BS 7870 Part 4.10. Where any requirement of this Specification differs from the 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 ENWL Underground Circuits Policy Manager.

8 Manufacturing Location

At the time of Tender, the Tenderer shall provide details of manufacturing location(s) for each cable offered. The Tenderer shall also provide details of extrusion and curing technology for each cable offered by completing relevant section of [Appendix B – Schedule of Technical Particulars](#).

No compounds or processes shall be changed without the prior approval from the ENWL Underground Circuits Policy Manager

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

9 Reliability

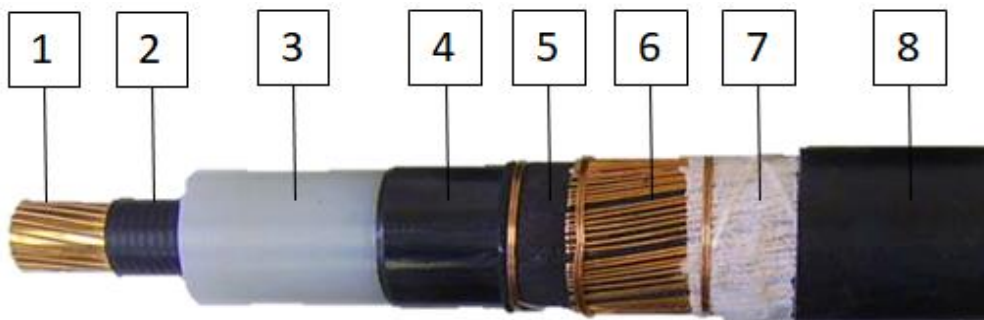
Reliability is paramount. When any Tender for 33kV cables is evaluated, preference will be given to proven established designs.

33kV Cables shall be available for continuous operation at their stated design loading for 365 days a year, 24 hours per day. A service life of up to 60 years is expected.

The Supplier shall demonstrate reliability for the offered design of the cable by providing evidence of satisfactory service life and Type test reports as detailed in [Section 11.1](#)

Cables offered must have successfully completed long term aging test detailed in clause 8.3 in BS 7870-4.10. The results and details of these tests must be provided in any tender. This test shall be repeated after every 100km of manufactured extruded core length of cable supplied or 5 years, whichever is the earliest.

10 Cable Construction



(Note image is for illustration and may not represent exactly the constructional elements of the cable)

- 1- For details of conductor, see [Section 10.1](#)
- 2- For details of conductor screen, see [Section 10.2](#)
- 3- For details of insulation, see [Section 10.4](#)
- 4- For details of insulation screen, see [Section 10.5](#)

- 5- For details of water blocking element under screen, see [Section 10.7](#)
- 6- For details of the copper wire screen, See [Section 10.8](#)
- 7- For details of the water blocking element over screen, see [Section 10.8](#)
- 8- For details of the oversheath, see [Section 10.9](#)
For details of markings on oversheath, see [Section 10.10](#)

The Tenderer shall complete [Appendix B - Schedule of Technical Particulars](#) for each cable cross section area and construction tendered.

10.1 Conductor

The conductors shall be circular compacted stranded plain annealed copper or stranded aluminium conductor complying with BS EN 60228. The conductors shall be clean and free from metallic and foreign particles, which may contaminate the insulation and cause high stress points.

Copper Conductors do not require any longitudinal water blocking elements.

Aluminium Conductors shall be longitudinal water blocked. The tenderer shall provide test evidence to show that the minimum of preparation of the conductor strands is required when jointing using standard shear bolt type mechanical connectors to pass requirements for d.c resistance in BS EN 61238-1-3. Ideally no removal of the water blocking elements is preferred. Any preparation requiring lifting of the of strands to remove underlying tapes shall be limited to the top layer only. The tenderer shall provide a fully detailed instruction if any preparation of water blocked aluminium conductors is required for jointing.

10.2 Insulation Extrusion Process

The semi-conducting screens and insulation shall be applied over the conductor together as a single pass extrusion free from factory repairs through in a triple head extruder. If a screening filter is fitted in the extruder head, it shall be as fine as possible without producing clogging and pressure rise which could lead to premature formation of cross linking particles or distortion or rupture of the filter.

To avoid contamination due to material handling, all contact with the factory atmosphere shall be eliminated. Consequently, a clean room environment fed by filtered air, with positive pressure shall be used for the opening of the packaging holding the polymer together with a completely enclosed system for transferring the granules from the clean room to the extruder.

A dry curing process only shall be used. The vulcanisation tube shall be filled with either dry nitrogen or with an oil compatible with the insulation and screen materials: the gas or oil shall be maintained under a sufficiently high hydrostatic pressure to control void formation from the by-products of the cross-linking process. **Steam curing shall not be used.**

Cooling of the core after completion of the cross-linking process shall be carried out by means of water, dry nitrogen, or oil of the same type used for the curing process. The cooling medium shall be maintained at a sufficiently high pressure to control void formation in the insulation and screens from by-products of the cross-linking process.

10.3 Conductor Screen

The conductor screen shall consist of an extruded layer of cross-linked semi-conducting compound of approximate thickness 0.7 mm. This screen shall be extruded in the same operation as the insulation and the insulation screen. It shall be fully bonded to the insulation (non-strippable) and shall not separate from the insulation due to the effects of bending, load cycling and short circuit.

The screen material shall not adhere to or penetrate the conductor or alternatively where this cannot be achieved, a non-hygroscopic semi-conducting tape may be applied to the conductor under the extruded layer.

10.4 Insulation

The insulation shall be XLPE extruded insulation with a “fully bonded” screen conforming to requirements of BS7870-4.10.

The minimum average insulation thickness shall be 8mm.

Maximum permissible insulation shrinkage shall be 2% when measured in accordance with the requirements of BS 7870 - 4.10, clause 7.3. In addition, a further test at 65°C for 24 hours shall be performed and the resulting shrinkage shall be no more than 2%

10.5 Insulation Screen

The insulation screen shall consist of an extruded layer of cross-linked semi-conducting compound of 1.0 mm approximate thickness. This screen shall be extruded in the same operation as the insulation and the conductor screen and shall be continuous and cover the whole area of the insulation and shall have no tendency in service to separate from the insulation due to the effects of bending, load cycling and short circuit.

10.6 Removal of By-products Prior to Sheathing

At an appropriate stage of manufacture following completion of the extrusion and curing process and prior to the application of the oversheath, the completed cable core shall be maintained at an elevated temperature, not exceeding 80 °C, for a sufficient period to reduce the gaseous and volatile by-products formed by cross linking down to a level below 1%.

10.7 Longitudinal Sealing Against Moisture

The cable shall have swellable water blocking tapes applied underneath and over the screen wires so that the cable passes the moisture penetration test outlined in IEC 60840: 2011

Moisture content of water blocking tape will be less than 50,000 ppm.

The tapes underneath the wires shall be semi-conducting.

10.8 Copper Screen Wires

The metallic screen shall consist of a layer of copper wires applied spirally or in an 'SZ' configuration with a maximum gap between wires of 4mm. The minimum outside diameter of each screen wire shall be no less than 1.0mm. The combined cross-sectional area of all wires shall be no less than 50mm².

The wires forming the screen shall be equalised by either a lapped Copper tape or wire. The tape or wire shall have a minimum cross-sectional area of 0.75 mm².

10.9 Oversheath

The oversheath shall consist of an extruded layer of black MDPE complying with the requirements of BS 7870-4.10. The Maximum permissible longitudinal shrinkage shall be 2%.

An outer graphite coating or extruded conductive layer is not required.

The nominal average thickness of the sheath shall be declared in the [Schedule of Technical Particulars](#). The minimum thickness at any point on the circumference shall not fall below the declared nominal average value by more than 5%.

10.10 Identification Markings

Over sheath embossing and printing for 33kV power cables shall be in accordance with BS 7870 part 4.10, clause 4.5.

Each delivery length of cable shall be allocated a unique batch reference identification number. This unique number shall be embossed or printed on the cable near to the metre mark. This unique reference number will be used to identify all materials used within the manufacturing process offering full product traceability. This number shall be referenced 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.

Cables supplied as laid up in a “triplex” formation shall have L1, L2, and L3 marked on the cable sheath by embossing or indenting.

11 Testing and Approval

11.1 Type Test Approval

Type tests shall be carried out to the requirements of BS 7870-4.10. Testing to alternative standards such as IEC60502-4 or ENA TS 09-17 may be considered provided the Tenderer can satisfy the ENWL Underground Circuits Policy Manager such tests represent an equivalent level of testing

A type test certificate signed by the representative of a competent witnessing body, or a report by the manufacturer giving the test results and signed by the appropriate qualified officer shall be acceptable as evidence of type testing.

Once successfully completed, type approval tests on cables do not need to be repeated unless there is a fundamental change in the design, material or manufacturing process. However, preference will be made to type test reports less than 5 years old to ensure continuous validation of the cable design and process.

Where a company is, for example, international and comprises of several dispersed manufacturing locations, the Type Approval of one manufacturing unit shall not imply automatic Approval of the other units in the company.

11.2 Routine and Sample Testing

Routine and Sample tests shall be carried out to the requirements of BS 7870-4.10.

The ENWL Underground Circuits Policy Manager or their nominated representative reserves the right to be present and witness routine and sample tests. Where the ENWL Underground Circuits Policy Manager wishes to witness any such tests, the date and time of testing shall be mutually agreed.

12 Sealing, Drumming and Logistical Requirements

On completion of the specified routine and sample tests in the manufacturer's works, the cable shall be placed on timber or steel drums taking care to prevent looseness of the cable and each end of the cable shall be firmly and properly secured to the drum.

Each end of every length of cable shall be sealed in such a way as to prevent the ingress of water both during transit and on site.

If specified on a Purchase Requisition, a factory fitted pulling eye shall be fitted to the leading end conductor and fully sealed against moisture.

Tenderers shall state at the time of Tender their proposed cable drum sizes and weights. Drums used for 33kV cables shall have a maximum width of 1200mm and a maximum weight of 2500kg.

Cable drums shall meet the requirements of ES400DS1.

Dec 24

All drums shall be supplied with adequate protection against mechanical damage of the cable during transportation and storage on site.

The preferred method is use of robust timber battens strapped across the drum flanges. The timber battens may fully cover the circumference of the drum (fully lagged), or partially (skeletal lagged) providing any gaps between the battens are not wide enough to allow mechanical plant (e.g. lifting forks) to penetrate and damage cable sheaths. The timber battens shall be secured by two or more tension straps around the drum. Nailed battens shall not be used.

The Tenderer may propose alternative methods for protection of the drums which shall be fully approved by ENWL Circuits Policy Manager before any Contract is placed.

The end of the cable left projecting from the drum shall also be adequately protected against damage during transit, storage and handling on site. The drum spindle hole shall be 125mm in diameter.

Each drum shall bear a unique distinguishing number either branded or chiselled on the outside of at least one flange, and the direction for rolling shall be indicated by an arrow. In addition, the following particulars of the cable shall be displayed on a label fixed on one flange of the drum:

- ENWL commodity code (as stated on individual Purchase Order);
- Name of manufacturer;
- Supplied length;
- Manufacturing batch identifier or drum number for trackability;
- Size of conductor and type of conductor material ("Cu" or "Al");
- Rated voltage and abbreviated description of cable construction (e.g. Cu/XLPE/WB/CWS/WB/MDPE);

- Gross and Nett weights;
- The metre marking start and end values;

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

All cable drums shall be returnable. The Tenderer shall provide details of the procedure for arranging to collect empty drums from the company's normal delivery locations.

Delivery will generally be in specified lengths either direct to site or to a suitable site as directed by ENWL or by ENWL Approved Contractors.

13 Customer 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.

14 Samples

During the Tender period the Tenderer shall submit samples for Approval as required by the ENWL Underground Circuits Policy Manager. Such samples shall remain the property of ENWL.

15 Technical Information Required with Tender

TECHNICAL INFORMATION REQUIRED WITH TENDER

Manufacturers Data sheet including section drawing for each cable offered

Manufacturers' Safety Data Sheets (if applicable)

Type Test Reports

Manufacturers' Routing and Sample Testing frequency summary

Evidence of reliability record

Details of Quality Management system

Details of Customer Support

Cable drums details:

Completed Appendix B - [Schedule of Technical Requirements](#)

Completed Appendix C – [Compliance Schedule](#)

16 Documents Referenced

DOCUMENTS REFERENCED	
ES001	ENWL Main Specifications
ES400 DS1	Returnable Wooden Drums and Lifting Spindles used for Storage and Supply of Mains Conductors
ES400E5	Installation, Commissioning and Repair of Underground Cables Operating at 33kV and 132kV
BS EN 60228	Conductors of insulated cables.
BS EN 61238-1-3	Compression and mechanical connectors for power cables Part 1-3: Test methods and requirements for compression and mechanical connectors for power cables for rated voltages above 1 kV ($U_m = 1,2$ kV) up to 36 kV ($U_m = 42$ kV) tested on non-insulated conductors
BS 7870 -4.10	LV and MV Polymeric Insulated Cables for Use by Distribution and Generation Utilities Part 4: Specification for Distribution Cables with Extruded Insulation for Rated Voltages of 11 kV and 33 kV Section 4.10: Single-Core 11 kV and 33 kV Cables (Implementation of HD 620)

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.
IEC 60502-4	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) - Part 4: Test requirements on accessories for cables with rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)
IEC 60840: 2011	Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um= 36 kV) up to 150 kV (Um = 170 kV) - Test methods and requirements

17 Keywords

33kV; Cable; MDPE; XLPE;

Appendix A – Schedules of Cables

ITEM NO.	ORDERING SPECIFICATION	SIZE (mm ²)	ENWL Commodity Code.
1	Single phase, stranded copper conductor : polymeric insulated 'quasi-dry design' with copper screen wires and swellable water blocking tapes under and over the screen wires.	Single core	
		185	046100
		240	046101
		300	046102
		400	046103
		500	046104
		630	046106
		Triplexed single core	
		185	004695
		240	004696
		300	004697
		400	004698
		500	004700
		2	Single phase, stranded aluminium conductor : polymeric insulated 'quasi-dry design' with copper screen wires and swellable water blocking tapes under and over the screen wires.
300	004699		
400	331388		
500	046203		
630	331389		
800	331390		
1000	331391		
Triplexed single core			
300	046200		
400	046201		
500	046202		

Appendix B – Schedule of Technical Particulars

This schedule is to be completed by the manufacturer at the time of tendering. The technical particulars entered shall be binding. No departures from these shall be permitted except with the written permission of ENWL Circuits Policy Manager.

NO	ITEM	VALUE	UNIT
1	Manufacturer		
2	Location and manufacturing extrusion line reference		
3	Voltage designation (U_o/U (U_m))		kV
4	Nominal cross-sectional area of conductor		mm ²
5	Conductor details		
	5.1 Material		
	5.2 Type of construction		
	5.3 Overall Diameter		mm
	5.4 Moisture blocking material		
6	Extruded conductor screen		
	6.1 Material		
	6.2 Nominal thickness (minimum average)		mm
7	Insulation		
	7.1 Material		
	7.2 Nominal (minimum average) thickness of insulation between conductor screen and core screen		mm
	7.3 Minimum thickness		mm
8	Insulation screen		
	8.1 Material		
	8.2 Nominal thickness (minimum average)		mm
	8.3 Minimum thickness		mm
	8.4 Nominal diameter over insulation screen		mm
9	Extrusion process		

NO	ITEM	VALUE	UNIT
	9.1 Type of extrusion line (catenary, vertical, etc)		
10	Curing process		
	10.1 Medium under which curing is carried out (e.g. dry nitrogen, silicone oil, etc)		
11	Cooling process		
	11.1 Cooling medium (water, dry nitrogen, etc)		
12	Heat treatment of cable core		
	12.1 Manufacturing stage at which carried out		
	12.2 Heating method (current loading, vacuum, etc)		
	12.3 Temperature		°C
	12.4 Duration		hours
13	Copper wire screen/earth conductor		
	13.1 Number and diameter of wires		No/mm
	13.2 Number and thickness of equalising tapes		No/mm
	13.3 Cross Sectional Area of wire screen		mm ²
14	Oversheath		
	14.1 Material		
	14.2 Nominal thickness (minimum average)		mm
	14.3 Minimum thickness at any point		mm
	14.4 Nominal overall diameter of completed cable		mm
15	Nominal weight of completed cable		kg/m
16	Maximum pulling force with pulling eye on conductor		kN
17	Minimum installation temperature		°C
18	Maximum permissible sidewall pressure on roller during installation		daN
19	Minimum radius of bend round which cable can be laid		
	19.1 Laid direct or in air		m

NO	ITEM	VALUE	UNIT
	19.2 In ducts		m
	19.3 Adjacent to joints or terminations		m
20	Nominal internal diameter of pipes or ducts		mm
21	Maximum dc resistance of conductor at 20°C		$\mu\Omega/m$
22	Maximum ac resistance of conductor at 90°C		$\mu\Omega/m$
23	Equivalent star reactance of three phase circuit at 50Hz		$\mu\Omega/m$
24	Equivalent star capacitance in pF/km.		$\rho F/m$
25	Maximum charging current per conductor per metre of cable at nominal voltage		mA/m
26	Maximum Continuous Current carrying capacity per phase based on following conditions; <ul style="list-style-type: none"> Single core cables are laid in touching trefoil. Cover to top of 33kV cables is 900mm. Both ends bonded 		
	26.1 Laid direct with $g = 1.2 \text{ K.m/W}$ and $T_g = 15 \text{ }^\circ\text{C}$.		A
	26.2 Laid direct with $g = 0.9 \text{ K.m/W}$ and $T_g = 15 \text{ }^\circ\text{C}$.		A
	26.3 Drawn into a 150mm ID smooth wall plastic duct (one cable or triplex cable per duct) where $g = 1.2 \text{ K.m/W}$ and $T_g = 15 \text{ }^\circ\text{C}$.		A
	26.4 Drawn into a 150mm ID smooth wall plastic duct (one cable or triplex cable per duct) where $g = 0.9 \text{ K.m/W}$ and $T_g = 15 \text{ }^\circ\text{C}$.		A
	26.5 In Air where $T_a = 25 \text{ }^\circ\text{C}$.		A
27	Conductor short circuit current carrying capacity for one second, cable loaded as Item 26, before short circuit and final conductor temperature of 250 °C		kA
28	Metallic sheath/screen short circuit current carrying capacity for one second , cable loaded as Item 26, before short circuit and final conductor temperature of 250 °C		kA

Appendix C – 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	ENWL 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	Requirement for Type Tests at the Supplier's Premises		
4.2	Requirement for Routine Tests at the Supplier's Premises and Sampling		
5	Operation Conditions		
6	Installation Conditions		
7	Cable Design		
8	Manufacturing Location		
9	Reliability		

10.1	Conductor		
10.2	Insulation Extrusion Process		
10.3	Conductor Screen		
10.4	Insulation		
10.5	Insulation Screen		
10.6	Removal of By-products Prior to Sheathing		
10.7	Longitudinal Moisture Sealing		
10.8	Copper Screen Wires		
10.9	Oversheath		
10.10	Identification Markings		
11.1	Type Testing		
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12	Sealing, Drumming and Logistical Requirements		
13	Customer Support		
14	Samples		
15	Technical Information Required with Tender		

Additional Notes: