

Electricity Specification 400C4

Issue 6 September 2021

Steel Tower Overhead Line Conductors (33kV and 132kV)



Amendment Summary

ISSUE NO. DATE	DESCRIPTION
Issue 6	New template applied throughout.
07/0921	Prepared by: D M Talbot Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, Engineering and Technical Director

Contents

1	Introduction	5
2	Scope	5
3	Definitions	5
4	General Requirements for Approvals and Testing	6
4.1	Product not to be Changed	6
4.2	Electricity North West Technical Approval	6
4.3	Quality Assurance	6
4.4	Formulation	7
4.5	Identification Markings	7
4.6	Minimum Life Expectancy	7
4.7	Product Conformity	7
4.8	Confirmation of Conformance	8
5	Requirements for Type and Routine Testing	8
5.1	Requirement for Type Tests at Suppliers Premises	8
5.2	Requirement for Routine Tests at the Supplier's Premises	8
5.3	Requirement for On Site Tests	8
6	Technical Particulars	8
6.1	General	8
6.2	Specifications for Individual Wires used to Manufacture Conductors to BS EN 50182	8
6.3	Conductor Greasing	9
6.4	Drums	9
6.5	Requirements for Approvals, Testing and Quality Control	9
6.6	Product Confirmation of Compliance Schedule	9
7	Documents Referenced	9
8	Keywords	10
	Appendix A – Conductors for New or Refurbished Line Construction: Specific Requirements	11
A1	Plain Stranded Aluminium Alloy Conductors	11
A2	Stranded Aluminium (Steel Reinforced)	11
A3	Stranded Aluminium Alloy (Steel Reinforced)	12
	Appendix B – Conductors for Repair Only: Specific Requirements	13
B1	Plain Stranded Hard Drawn Copper Conductors	13

B2 Stranded Aluminium (Steel Reinforced)	13
Appendix C – Product Confirmation of Compliance Schedules	14
Appendix D – Conformance Declaration	16

All Rights Reserved

The copyright of this document, which contains information of a proprietary nature, is vested in Electricity North West Limited. The contents of this document may not be used for purposes other than that for which it has been supplied and may not be reproduced, either wholly or in part, in any way whatsoever. It may not be used by, or its contents divulged to, any other person whatsoever without the prior written permission of Electricity North West Limited.

1 Introduction

This specification comprises general requirements for the approval and testing of steel tower overhead line conductors used on the distribution network (Network) owned and operated by Electricity North West Limited (Electricity North West), as Distribution Licensee.

2 Scope

This specification covers conductors used on Electricity North West's steel tower overhead line system operating at 33kV and 132kV.

3 Definitions

AAAC	All Aluminium Alloy Conductor.
AACSR	Aluminium Alloy Conductor Steel Reinforced.
ACSR	Aluminium Conductor Steel Reinforced.
Approval	Sanction by the Electricity North West Circuits Policy 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.
ENA ER	Energy Networks Association Engineering Recommendation.
HDAI	Hard-Drawn Aluminium.
HDCu	Hard-Drawn Copper.
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 Circuits Policy 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.

4 General Requirements for Approvals and Testing

4.1 Product not to be Changed

No change in the product, packaging or labelling shall be made after Approval has been granted without prior notice to the Electricity North West Circuits Policy Manager, and receipt of a written agreement to the proposed change from the Electricity North West Circuits Policy Manager.

4.2 Electricity North West Technical Approval

The Tenderer shall submit, with this Tender, proposals for testing which will demonstrate, to the satisfaction of the Electricity North West Circuits Policy Manager, compliance with this Specification. Such tests shall be carried out without expense to Electricity North West.

Alternatively, technical reports and other data may be submitted that the Tenderer considers will demonstrate, to the satisfaction of the Electricity North West Circuits Policy Manager, compliance with this Specification. Acceptance of this evidence shall be at the discretion of the Electricity North West Circuits Policy Manager but will not be unreasonably withheld.

Approval shall be 'factory specific' and is not transferable to another factory without the written Approval of the Electricity North West Circuits Policy Manager.

The Supplier and product shall comply with all the relevant requirements of Electricity North West documents EPD311 and CP311.

4.3 Quality Assurance

The Tenderer shall confirm whether or not Approval is held in accordance with a quality assurance scheme accredited under ISO 9000. If not, the Tenderer shall submit a statement of the quality assurance procedures employed to control the quality of the product, including the performance of Suppliers and Sub-Contractors.

The right is reserved for the repeat of such tests, from time to time, that the Electricity North West Circuits Policy Manager may deem to be reasonably necessary to demonstrate continued compliance with the Specification.

The Tenderer shall submit, with the Tender, a list of tests and inspections which are carried out on the product prior to despatch which shall demonstrate, to the satisfaction of the Electricity North West Circuits Policy Manager, fitness for installation and service.

The Tenderer shall provide free of charge to Electricity North West such samples as may, in the opinion of the Electricity North West Circuits Policy Manager, be reasonably required for inspection and/or retention as quality control samples. The Electricity North West Circuits Policy Manager will confirm the requirement for samples at the time of Tendering.

The right is reserved for inspections to be made of Tenderer's facilities, from time to time, as deemed reasonably necessary by the Electricity North West Circuits Policy Manager to ensure compliance with this Specification and any Contract of which it forms a part.

The Tenderer shall submit, with the Tender, such details of product packaging disposal, as will enable Electricity North West to comply with the requirements of BS EN ISO 14001 - Environmental Management Systems.

4.4 Formulation

The Tenderer shall submit, with the Tender, such details of the formulation and use of the product and associated substances as will enable Electricity North West to comply with the obligations of the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations 2002, in the use, storage and disposal of the product. The Tenderer may stipulate, prior to submission of such information, that it is to remain confidential, and the Electricity North West Circuits Policy Manager will, if requested, confirm agreement to this prior to receipt of the information.

4.5 Identification Markings

The Tenderer shall submit, with the Tender, details of markings which it is proposed to apply to the product or packaging to identify manufacturing batches or items. The forms and content of such markings shall be subject to the Approval of the Electricity North West Circuits Policy Manager and shall in all cases include the Electricity North West approved description and commodity code number.

The Tenderer shall submit, with the Tender, such details of marking gross weight on components, assemblies and packages, as will enable Electricity North West to comply with the Health and Safety Manual Handling Operation Regulations 1992, for components, assemblies and packages supplied with a gross weight over 1kg. The forms and content of such markings shall be subject to the Approval of the Electricity North West Circuits Policy Manager.

4.6 Minimum Life Expectancy

The minimum life expectancy of all products covered by this specification is:

- 40 years for aluminium based conductors.
- 75 years for copper based conductors.

4.7 Product Conformity

Preference will be given to those Suppliers who can provide suitable product conformity certification to a recognised or specified standard, or an equivalent certification.

4.8 Confirmation of Conformance

The Tenderer shall complete the conformance declaration sheets in [Appendix D](#). Failure to complete these declaration sheets may result in an unacceptable bid.

5 Requirements for Type and Routine Testing

The Electricity North West Circuits Policy Manager shall set out the requirement of the following tests to be carried out by the Supplier at the Supplier's cost.

5.1 Requirement for Type Tests at Suppliers Premises

These are a series of one-off type tests, which are carried out to ensure the satisfactory performance of the product design, under extremes of operating stresses, and of endurance, as may be appropriate, to be determined by the Electricity North West Circuits Policy Manager.

These may or may not be destructive tests.

5.2 Requirement for Routine Tests at the Supplier's Premises

These tests may be required to be carried out on every individual unit or component, as specified, or at some regular frequency to be determined by the Electricity North West Circuits Policy Manager.

The results of these tests may be required to be supplied to Electricity North West with each unit purchased or retained for inspection, at a period to be determined by the Electricity North West Circuits Policy Manager.

5.3 Requirement for On Site Tests

These will normally be included within the scope of on site commissioning but may be included if appropriate.

6 Technical Particulars

6.1 General

Only the conductors listed in the Appendices to this specification shall be used on the steel tower overhead line system. Additionally:

- New or refurbished lines shall use only the conductors (as identified in the appropriate overhead line specification) listed in [Appendix A](#) of this specification.
- Conductors identified as "for repair only" ([Appendix B](#)) shall be used only for this purpose, i.e. to match existing requirements. They shall not be used in the construction of new or refurbished lines, nor shall they be used to repair new lines built in accordance with this specification. (Refer to the Note in [Appendix B](#).)

6.2 Specifications for Individual Wires used to Manufacture Conductors to BS EN 50182

Wires used to manufacture conductors to BS EN 50182 shall comply with:

- BS EN 50183 for aluminium-magnesium-silicon alloy wires.
- BS EN 50189 for zinc coated steel wires.
- BS EN 60889 for hard-drawn aluminium wires.
- BS EN 61232 for aluminium-clad steel wires.

6.3 Conductor Greasing

Specific greasing requirements for each conductor type are given in the appendices. Where conductor greasing is applicable, it shall also comply fully with ENA ER L38.

6.4 Drums

All conductors shall be supplied on drums manufactured from timber and complete with battens sufficient in quantity to protect conductors during transport, storage and handling.

The drums shall be of such a design that they will withstand transport to site and usage appropriate to the erection of conductors by standard methods.

6.5 Requirements for Approvals, Testing and Quality Control

Type Approval, Quality Assurance, Formulation and Labelling shall be in accordance with the requirements of the appropriate conductor specification (refer to [Appendix A](#) or [B](#) for the conductor/specification reference).

The quality control scheme applicable to Aluminium Alloy Conductors shall include the following test which shall be applied to each drum of completed conductor:

- A 50m length shall be pulled off the drum.
- During this operation the conductor shall not have any undue tendency to form into a helix.
- When released the conductor shall not have a tendency to recoil back towards the drum.

6.6 Product Confirmation of Compliance Schedule

Tenderers shall complete the Product Confirmation of Compliance Schedules (refer to [Appendix C](#)).

7 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:	Environmental management systems. Requirements with guidance for use.
BS EN 50182:	Conductors for overhead lines. Round wire concentric lay stranded conductors.
BS EN 50183:	Conductors for overhead lines. Aluminium-magnesium-silicon alloy wires.
BS EN 50189:	Conductors for overhead lines. Zinc coated steel wires.
BS EN 60889:	Hard drawn aluminium wire for overhead line conductors.
BS EN 61232:	Aluminium-clad steel wires for electrical purposes.
BS 7884:	Specification for copper and copper-cadmium stranded conductors for overhead electric traction and power transmission systems.
ENA ER L38:	Overhead Line Conductors – Protection Against Corrosion by the Application of Anti-Corrosion Grease During Manufacture.
EPD311:	Approval of Equipment.
CP311:	Equipment Approval Process.

8 Keywords

Overhead; Conductor;

Appendix A – Conductors for New or Refurbished Line Construction: Specific Requirements

A1 Plain Stranded Aluminium Alloy Conductors

APPROVED DESCRIPTION (FOR PURCHASING AND PRODUCT LABELLING)	CONDUCTOR SPECIFICATION *	CONDUCTOR GREASING EN ER L38	ESTIMATED USAGE (METRES)	CC NUMBER	PRICE PER 1000 METRES
Conductor, AAAC, 200mm ² (Poplar) (37/2.87)	BS EN 50182	Cat 3		013690	
Conductor, AAAC, 300mm ² (Upas) (37/3.53)	BS EN 50182	Cat 3		013920	
Conductor, AAAC, 500mm ² (Rubus) (61/3.50)	BS EN 50182	Cat 3		013230	

* Individual wires shall comply with the appropriate specification as listed under Technical Particulars.

A2 Stranded Aluminium (Steel Reinforced)

APPROVED DESCRIPTION (FOR PURCHASING AND PRODUCT LABELLING)	CONDUCTOR SPECIFICATION *	CONDUCTOR GREASING EN ER L38	ESTIMATED USAGE (METRES)	CC NUMBER	PRICE PER 1000 METRES
Conductor, ACSR, 70mm ² (Horse) (12/2.79+7/2.79) **	BS EN 50182	Cat 3		013854	
Conductor, ACSR, 175mm ² (Lynx) (30/2.79+7/2.79)	BS EN 50182	Cat 3		013927	

* Individual wires shall comply with the appropriate specification as listed under Technical Particulars.

** 70mm² (Horse) shall be used for earth wire only (ie it shall not be used for phase conductor).

A3 Stranded Aluminium Alloy (Steel Reinforced)

APPROVED DESCRIPTION (FOR PURCHASING AND PRODUCT LABELLING)	CONDUCTOR SPECIFICATION *	CONDUCTOR GREASING EN ER L38	ESTIMATED USAGE (METRES)	CC NUMBER	PRICE PER 1000 METRES
Conductor, AACSR, 175mm ² (Keziah) (30/2.79+7/2.79)	BS EN 50182	Cat 3		013936	

* Individual wires shall comply with the appropriate specification as listed under Technical Particulars.

Appendix B – Conductors for Repair Only: Specific Requirements

B1 Plain Stranded Hard Drawn Copper Conductors

APPROVED DESCRIPTION (FOR PURCHASING AND PRODUCT LABELLING)	CONDUCTOR SPECIFICATION	CONDUCTOR GREASING	ESTIMATED USAGE (METRES)	CC NUMBER	PRICE PER 1000 METRES
Conductor, HDCu, 70mm ² (7/3.55)	BS 7884	N/A		013196	
Conductor, HDCu, 100mm ² (7/4.30)	BS 7884	N/A		013199	
Conductor, HDCu, 125mm ² (19/2.90)	BS 7884	N/A		013210	
Conductor, HDCu, 150mm ² (19/3.20)	BS 7884	N/A		013220	

B2 Stranded Aluminium (Steel Reinforced)

APPROVED DESCRIPTION (FOR PURCHASING AND PRODUCT LABELLING)	CONDUCTOR SPECIFICATION *	CONDUCTOR GREASING EN ER L38	ESTIMATE D USAGE (METRES)	CC NUMBER	PRICE PER 1000 METRES
Conductor, ACSR, 75mm ² (Racoon) (6/4.10+1/4.10)	BS EN 50182	Cat 3		013678	
Conductor, ACSR, 100mm ² (Dog) (6/4.72+7/1.57)	BS EN 50182	Cat 3		013862	
Conductor, ACSR, 400mm ² (Zebra) (54/3.18+7/3.18)	BS EN 50182	Cat 3		013870	

* Individual wires shall comply with the appropriate specification as listed under Technical Particulars.

Appendix C – Product Confirmation of Compliance Schedules

TENDERER.....

TABLE 1

CONDUCTOR:

ELECTRICAL AND MECHANICAL TESTS (SPECIFY BS):

SAMPLE NO AND LOCATION:

	Aluminium / Copper						Steel Wire				
	Stranded as Rec.	Dia Cleaned	Measured Resistance at 20 °C	Breaking Load	Wrapping Test	Torsion Test (Twists)	Strand Dia.	Tensile Strength	Stress at 1% Elongation	Elongation 200 mm Gauge Length %	Wrapping Test
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											

BS CRITERIA:

Minimum specified diameter :

Maximum specified resistance:

Outer strands (1-18)

Inner strands (19-30)

Minimum specified breaking loads :

BS CRITERIA

Minimum specified diameter:

Minimum tensile strength:

Minimum stress at 1% elongation:

Minimum elongation:

TENDERER.....

TABLE 2

CONDUCTOR DETAILS (To be completed by Tenderer for each conductor/size tendered for)

Item Number								
Conductor Size								
Conductor Stranding								
Conductor Material								
U.T.S.	(N)							
Diameter	(mm)							
Bare Weight	(Kg/m)							
Greased Weight	(Kg/m)							
Cross Sectional Area	(Sq.mm)							
Modulus of Elasticity	(N/Sq.mm)							
Coefficient of Linear Exp.	(deg C)							

Appendix D – 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)
4.1	Product not to be Changed		
4.2	Electricity North West Technical Approval		
4.3	Quality Assurance		
4.4	Formulation		
4.5	Identification Markings		
4.6	Minimum Life Expectancy		
4.7	Product Conformity		
4.8	Confirmation of Conformance		
5.1	Requirements for Type Tests at the Supplier's Premises		
5.2	Requirement for Routine Tests at the Supplier's Premises		
5.3	Requirement for On Site Tests		
6.1	General		
6.2	Specifications for Individual Wires used to Manufacture Conductors to BS EN 50182		
6.3	Conductor Greasing		

6.4	Drums		
6.5	Requirements for Approvals, Testing and Quality Control		
6.6	Product Confirmation of Compliance Schedule		

* Applicable specifications shall be stated in the Remarks column where alternatives are quoted within a section. The Remarks column shall also be used to indicate cases where the products or services exceed the quoted specifications.

Additional Notes: