

Electricity Specification 400F2

Issue 3 December 2022

Specification for Steel Tower Fall-Arrest System



Amendment Summary

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1 Introduction

This Specification comprises general and technical requirements for a fall-arrest system for use on all electricity transmission lattice steel towers and masts used on the electricity distribution network (Network) owned by Electricity North West Limited, as Distribution Licensee. A schedule of rates is included in [Appendix A](#).

2 Scope

This Specification determines the requirements for the fixed fall-arrest system, fittings and terminations attached to Electricity North West transmission lattice steel towers and the associated fall-arrest device.

3 Definitions

Approval	Sanction by the Electricity North West Overhead Line 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.
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 Overhead Line 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.

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 Overhead Line Circuits Manager, and receipt of a written agreement to the proposed change from the Electricity North West Overhead Line Circuits 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 Overhead Line Circuits 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 Overhead Line Circuits Manager, compliance with this Specification. Acceptance of this evidence shall be at the discretion of the Electricity North West Overhead Line Circuits 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 Overhead Line Circuits 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 Overhead Line Circuits 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 Overhead Line Circuits 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 Overhead Line Circuits Manager, be reasonably required for inspection and/or retention as quality control samples. The Electricity North West Overhead Line Circuits 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 Overhead Line Circuits 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 Overhead Line Circuits 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 Overhead Line Circuits 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 Overhead Line Circuits Manager.

4.6 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.

5 Requirements for Type and Routine Testing

The Electricity North West Overhead Line Circuits 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 Overhead Line Circuits 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 Overhead Line Circuits 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 Overhead Line Circuits Manager.

6 System Requirements

6.1 Description

The system shall provide fall-arrest protection for linesmen climbing or descending on the normal climbing leg(s) of the tower from ground level to as close as is reasonably practicable to the top of the tower. The climb from ground level to above the anti-climbing device shall be made using a separate detachable system, this will prevent third party interference.

The system shall be suitable for use by four linesmen simultaneously and be of sufficient strength to sustain these linesmen in the event of a fall.

A system compatible Fall-Arrest Device (FAD) is included as part of the Specification. This fall-arrest device shall be supplied as a separate item to the fixed tower system.

The fixed parts of the system shall be in accordance with BS EN 353-1. The separate detachable system shall be in accordance with BS EN 353-2.

6.2 Materials

Wire rope shall be of 316 stainless steel grade 1.4401 minimum. All terminations and fittings for the steel rope shall be of the same material.

Tower fixing brackets shall be either 316 stainless steel grade 1.4401 or mild steel plate to BS 4360 grade 50B or 50C, galvanized finish to BS EN ISO 1461 to give a minimum coating of 610g of zinc per square metre of steelwork.

All fasteners for stainless steel components shall be 316 stainless steel grade 1.4401. Fasteners for galvanized steel components shall be to BS 4360 grade 50B, ISO Metric Black Hexagon to BS 4190 galvanized to BS EN ISO 1461 as above.

All washers for stainless steel components shall be 316 stainless steel grade 1.4401. All washers for galvanized steel components shall be to BS 4360 grade 43A galvanized to BS EN ISO 1461 as above.

The FAD shall be constructed of material that allows compliance with BS EN 353-1.

The manufacturer shall use fixings of appropriate size that are fit for purpose.

6.3 Technical Details – Fixed Tower Fall-Arrest System

The stainless steel wire rope used for this fall-arrest system shall be a minimum 8mm 19/1 strand construction with a minimum tensile strength of 45.00kN.

The stainless steel wire rope and associated fittings shall retain their tensile strength and have a guaranteed life of 35 years in normal atmospheric conditions.

Anti-vibration measures shall be provided to prevent wear on fittings at joints, support brackets and terminations.

The stainless steel wire rope and associated fittings shall be suitable for use by four linesmen simultaneously, and be of sufficient strength to sustain these linesmen in the event of a fall.

The stainless steel wire rope shall be attached as close as practicable to the tower top and shall terminate at the lower end above the anti-climbing guard. A method of gaining access up to and through the anti-climbing guard using fall-arrest protection shall be included as part of the overall system.

6.4 Technical Details – Fall-Arrest Device (FAD)

The FAD shall be capable of limiting the shock loading on the body of the linesman to no more than 6kN. Any shock absorber needed in the system to achieve this shall be fitted to the FAD rather than to the steel wire rope.

Any fall from the tower shall be arrested by the FAD operating on the wire rope. The fall shall be arrested within one metre of its start point.

The FAD shall be secured to the wire rope by a two-way latching mechanism. It shall be easily attached to the steel wire rope preferably by a one handed operation. Once on the rope it shall not be possible to remove the FAD unless both latches have been operated.

The FAD shall incorporate a webbing strop to facilitate rescue (i.e. a means of cutting the device free if necessary).

FADs shall be capable of passing through intermediate brackets unaided during climbing (both ascending and descending). It shall have the facility to be detached from the steel rope at any point.

It shall not be possible for the climber to move along the rope once attached to the FAD if the FAD has been inadvertently positioned in the wrong plane on the steel wire rope, i.e. upside down.

Attachment of the FAD to the linesman's harness fall-arrest position shall be by minimum double action carabiner.

6.5 Corrosion Protection

All ungalvanized components for the fixed tower system shall be manufactured from 316 stainless steel grade 1.4401.

All bright steel components for the fixed tower system shall be given a hot dip galvanized finish to BS EN ISO 1461.

All bolts, nuts and washers for the fixed tower system for stainless steel components shall be 316 stainless steel grade 1.4401.

All other bolts, nuts and washers for the fixed tower system shall be hot dip galvanized to BS EN ISO 1461.

6.6 Anti-Vibration Measures

Any system shall comply with the requirements to reduce aeolian vibration to acceptable limits. These limits dictate that for normal use the components of the system shall have a minimum life expectancy of 35 years.

Anti-vibration measures shall be stated by the Supplier. To validate the statement, test results that show the effectiveness of the anti-vibration measures shall be available for inspection by Electricity North West.

6.7 Protection Against Electrolytic Reaction

Any system that employs the use of dissimilar metals shall incorporate measures to reduce the effects of electrolytic reaction to acceptable levels. These limits dictate that for normal use, the components of the system shall have a minimum life expectancy of 35 years.

Method of protection against electrolytic reaction shall be stated by the Supplier. To validate the statement, test results that show the effectiveness of these measures shall be available for inspection by Electricity North West.

6.8 Steel Rope Terminations

All components for the terminations of the stainless steel wire rope onto the tower steelwork shall have at least the same minimum failing load as the stainless steel wire rope.

Brackets fixed to tower steelwork shall not have a detrimental effect on the integrity of the structural steelwork of the tower.

Terminations to the stainless steel wire rope shall be of two types:

Tower top termination:

- This shall be of the factory swaged type and shall be supplied to Electricity North West with either a test certificate or certificate of conformity.
- It shall be marked with a unique identification number and have a traceable record of manufacture and fabrication.
- The strength of this termination shall be equal to that of the stainless steel wire rope.
- End fittings shall provide means of detachment from tower steelwork.
- Prior to dispatch, 1 out of every 100 systems shall be proof loaded to 95% of the ultimate tensile strength (UTS) of the stainless steel wire rope, and held for one minute. (The system that has been tested shall be discarded after the test.) No failures are acceptable.
- Each individual termination shall be proof loaded to 6kN prior to dispatch.

Lower end termination:

- This can be either swaged or mechanical type termination.
- No test certificate or certificate of conformity shall be required for this termination.

- A means of tension adjustment of the stainless steel wire rope shall be included at this point.
- End fittings shall provide means of detachment from tower steelwork.

6.9 Intermediate Brackets

Intermediate brackets shall be capable of supporting the stainless steel wire rope along the length of the normal climbing leg(s) of the steel tower.

Intermediate brackets shall have a means of releasing the wire rope should this be required.

Bend lines in the tower shall be fitted with intermediate brackets to maintain the parallel distance of the wire rope to the tower. Brackets fitted on bend lines shall have sufficient strength to resist bending once the steel wire rope has been tensioned.

Intermediate brackets shall be installed no greater than three metres apart.

The distance between the stainless steel wire rope and the tower shall:

- Provide the easiest possible climb for the linesman (ascent and descent).
- NOT force the linesman to lean out at any point during a climb.
- NOT bring the linesman so close to the tower that it causes discomfort at any point during a climb.

6.10 Registration and Identification

Each swaged termination on the stainless steel wire rope and any bracket or steelwork used in conjunction with the top end termination of the steel wire rope shall have a unique identification (ID) number stamped on or attached to it. These ID numbers shall be cross-referenced against the component test/conformity certificate. The ID numbers shall remain visible throughout the life of the system.

On completion of installation of the system on the tower a label shall be attached at the lower end fixing bracket giving the complete tower system its own registration number. This number shall be logged in the Master Asset Management System (MAMS). A record of date of installation, type of system and installer shall be kept as part of this record.

The FAD is to be issued as PPE to every linesman who is to climb a tower in Electricity North West. The FAD shall have the date of manufacture, type of fall-arrest device, BS/EN standard applicable and unique ID number etched on its body.

6.11 Method Statement for Installation Under Live Conditions

The Supplier shall provide Electricity North West with a detailed method statement for installation of the system on towers under live-line conditions.

Some towers will require an outage i.e. Heavy Angled Towers, Terminal Towers and Tee-Off Towers. The Tenderer shall include within the Schedule of Rates an allowance to visit site to complete a one-off installation.

6.12 Guarantee

As a whole, the tower fall-arrest system shall be given a life expectancy of at least 35 years. Suppliers shall give a written guarantee to this effect. Fall-arrest devices shall be subject to a maximum of 5 years usage. This may be extended, but only with the written consent of the manufacturer.

6.13 Type Approval of the Complete System

A minimum factor-of-safety (FOS) of 2 is required on the complete system; based on 4 men falling simultaneously. This shall be proven by a witness test carried out by the engineer.

7 Training

Training in all aspects of use of the system shall be provided by the Supplier and included in the offer.

8 Documents Referenced

DOCUMENTS REFERENCED	
Health and Safety at Work Etc Act 1974.	
Control of Substances Hazardous to Health Regulations 2002.	
Manual Handling Operations Regulation 1992.	
BS EN ISO 1461	Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods.
BS EN ISO 9000	Quality management systems
BS EN ISO 14001: 1996	Environmental management systems.
BS EN 353-1	Personal protective equipment against falls from a height. Guided type fall-arresters including a rigid anchor line
BS EN 353-2	Personal protective equipment against falls from a height. Guided type fall arresters including a flexible anchor line

BS 4190: 2001

ISO metric black hexagon bolts, screws and nuts

BS 4360

Specification for weldable structural steels

9 Keywords

Safety; tower;

Appendix A – Schedule of Rates

A1 Supply Only

COST ITEM		COST
1	25 metre system, complete with all necessary parts and fixings	
2	30 metre system, complete with all necessary parts and fixings	
3	60 metre system, complete with all necessary parts and fixings	
4	Cost per additional 1 metre, complete with all necessary parts and fixings	
5	Cost per additional 2 metre, complete with all necessary parts and fixings	
6	Cost per additional 3 metre, complete with all necessary parts and fixings	
7	Cost per additional 4 metre, complete with all necessary parts and fixings	

A2 Supply and Installation

COST ITEM		COST
1	25 metre system, complete with all necessary parts and fixings	
2	30 metre system, complete with all necessary parts and fixings	
3	60 metre system, complete with all necessary parts and fixings	
4	Cost per additional 1 metre, complete with all necessary parts and fixings	
5	Cost per additional 2 metre, complete with all necessary parts and fixings	
6	Cost per additional 3 metre, complete with all necessary parts and fixings	

7 Cost per additional 4 metre, complete with all necessary parts and fixings

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)
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		
5.1	Requirements for Type Tests at the Supplier's Premises		
5.2	Requirement for Routine Tests at the Supplier's Premises		
6.1	Description		
6.2	Materials		
6.3	Technical Details - Fixed Tower Fall-Arrest System		
6.4	Technical details - fall-arrest device (FAD)		
6.5	Corrosion Protection		
6.6	Anti-Vibration Measures		

6.7	Protection Against Electrolytic Reaction		
6.8	Steel Rope Terminations		
6.9	Intermediate Brackets		
6.10	Registration and Identification		
6.11	Method Statement for Installation Under Live Conditions		
6.12	Guarantee		
6.13	Type Approval of the Complete System		
7	Training		

* 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: