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Electricity Specification 400F4

Issue 3 May 2021

Pole-Mounted Assemblies for Drop-Out Expulsion Fuses and Links

Amendment Summary

ISSUE NO. DATE	DESCRIPTION
Issue 3 **May 2021**	Restructure and reformatting of Model Electricity Specification. This 2021 issue constitutes a complete revision and re-issue of Model Electricity Specification in its entirety. Prepared by: David M Talbot Approved by: Policy Approval Panel and signed on its behalf by Steve Cox, Engineering and Technical Director

Contents

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1 Introduction

This Specification comprises general requirements for approvals and testing of drop-out expulsion fuse (DOEF) mounts, fuse carriers, and solid links for use on overhead lines employed on the electricity distribution network owned by Electricity North West Limited (Electricity North West). Refer to Drawing I-400F4-DOEF-001.

Also included are technical particulars relating to the constructional requirements of all DOEF mounts, fuse carriers, solid links and automatic sectionalising links (ASLs). Appendix A comprises a schedule of all DOEF mounts, fuse carriers, and solid links.

Refer to ES334 for the specifications and ratings of fuses, ASLs and solid links.

2 Scope

This Specification details the range, design, constructional and technical requirements for pole-mounted DOEF mounts, fuse tubes, solid links and ASLs to be used on the 6.6/11kV overhead line network.

3 Definitions

Approval	Sanction by the Electricity North West Overhead Lines Circuits Manager that specified criteria have been satisfied
ASL	Automatic Sectionalising Link
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.
DOEF	Drop-Out Expulsion Fuse
OHL	Overhead line
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 Minimum Life Expectancy

The minimum life expectancy of all products covered by this Specification is 45 years.

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 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 Technical Requirements

6.1 Introduction

Pole-mounted fuse units supplied to this specification will be used to:

- Protect high-voltage overhead lines and distribution plant.
- Provide a means of isolation for operational purposes.

Fuse tubes, solid links or ASLs shall be manually operated within the limits specified to disconnect live circuits and to energise circuits believed to be healthy. An arrangement fitted with an arc control device capable of breaking loads up to 200 amps shall be provided as an option. Equipment supplied shall comply with ENA TS 41-36: 2012.

6.2 Purpose of Equipment

The equipment shall provide:

- Automatic disconnection and isolation of supply in the event of a fault.
- Manual load-breaking disconnection if possible.

6.3 Design and Construction Standards

The equipment shall comply with the following standards:

- This Specification.
- BS 2692-2: 1956, all applicable clauses.
- BS EN 62271-102: 2002, Clauses 1 to 3, 4.1 to 4.7, and 9 to 11.
- ENA TS 41-36: 2012, all applicable clauses.

The fuses, ASLs and solid links used in DOEF assemblies shall meet the requirements of ES334.

6.4 Fuse Mounts

6.4.1 Mounting

Fuse mounts shall be designed for manual operation. (The hot-stick operating rods to be used will not be less than 4.8m long and inclined at an approx. angle of 15° to the vertical.)

The manual operations are:

- Insertion and removal.
- Opening and closing.

The maximum force applied to the link during closing will be 150N.

Fuse mounts shall:

- Be of a double insulator design.
- Consist of a vertically mounted, single pole with an option to install removable expulsion type fuse carriers, ASLs or solid links.
- Be suitable for mounting on the support steelwork (long links or short links), shown in ES400S11, Drawings I-400S11-SWK-015 and -016, without swivelling. Refer to Drawing I-400F4-DOEF-001.
- And, be suitable for mounting on a pole, as shown in Drawing I-400F4-DOEF-001, without swivelling.
- Be designed and constructed to prevent the accumulation of water.
- Be operable using pole heads and adapter suitable for link switches.

The lower fixed contact assembly shall be designed to enable the fuse-carrier, ASL or solid link to be engaged easily in all conditions.

Mountings fitted with an arc control device for load break requirements shall not cause interference during any of the above operations. The mounting unit shall permit the fuse, ASL or solid links to be inserted and secured without the need for any special tools.

6.4.2 Fault Operation

Fuse mounts shall be designed and constructed to operate as follows: any rupturing of the fuse element, or operation of the ASL will cause the upper contact of the unit to disengage from the upper fixed contact of the fuse mount. The fuse-carrier or ASL shall then pivot freely on the lower fixed contact of the fuse mount (it shall eventually come to rest hanging vertically from the pivot point).

6.4.3 Conductor Connections

The upper and lower fixed contacts of the fuse-mount shall be equipped with suitable terminals, supplied complete with all fixings (nuts, bolts, washers, etc), to enable stranded overhead line copper conductors to be

securely connected to them via a palm lug with a single 13mm hole or alternatively to clamp stranded copper conductor (in the range 32mm^2 to 100 mm^2). The nuts, bolts and washers shall made from stainless steel.

6.4.4 Contacts

Under all service conditions:

- The upper fixed contact assembly shall be designed to facilitate correct engagement (of fuse carrier, ASL or solid link) during closing operations.
- The fixed contacts of the fuse mount shall be designed to maintain good electrical contact with the fuse-carrier, ASL or solid link. An example of such a system would be application of constant pressure on the contacts by a spring.

On closing, the contacts shall wipe and clean.

6.4.5 Optional Load Break Device

An optional load break device with following features is required:

- It shall have an 11kV back portion complete with a 200A load break interrupter device.
- It shall be supplied as a kit suitable for use with fuse tubes or ASLs.
- The load break attachment shall not cause interference with the moving parts of the unit when opened, closed or during fault operation.

6.4.6 Changing Fuses, Solid Links and ASLs

To reduce disruption to customer supplies, the upper and lower portions of the fuse shall have a shorting bar attached that will allow the fitting of a 'shorting device' enabling fuses, solid links and ASLs to be changed.

6.4.7 Insulators

Insulators shall be manufactured from silicone-based material and meet the general requirements of ES400I4.

6.4.8 Fuse Tubes

Expulsion type fuse tubes shall be capable of accepting fuse-links having ratings of 6 to 100 amps.

6.4.9 Ratings

The following minimum ratings shall be verified by type testing the complete fuse assembly to BS 2692-2.

VOLTAGE (KV)	EQUIPMENT TYPE	RATED CURRENT (A)	RATED SHORT-TIME WITHSTAND CURRENT (KA)	RATED PEAK WITHSTAND CURRENT (KA)	RATED DURATION OF SHORT CIRCUIT (SECONDS)	BREAKING CAPACITY (KA)
12	Expulsion Fuse	100, 200 (with Fuse)	N/A	N/A	N/A	8.0
	Solid	200	4	10	3	N/A

6.4.10 ASLs

The back portion shall be suitable to allow for the operation of ASLs.

6.4.11 Insulation

The rated voltage and insulation levels for this equipment shall comply with ENA TS 41-36 Table 1.2.

6.4.12 Electrical Clearances

To verify that the isolation properties of the fuse mount comply with 6.4.11 above, the carrier shall be removed and a test voltage shall be applied across the terminals of the fuse mount in accordance with BS 2692-2 clause 22.

Fuse mounts shall be designed to comply with the "basic electrical clearance" (Phase to Earth) values detailed in BS 7354 1990 “Design of HV Open Terminal Stations” Table 4 associated with the nominated BIL of the equipment.

Gaps between live and earthed metalwork of completed assemblies shall be sufficient such that the use of an operating rod will not cause a short circuit

7 Testing

7.1 Type Tests

Complete assemblies shall pass the type tests in BS 2692-2. Note that the rated breaking capacity shall not apply to ASLs and solid links.

7.2 Routine Tests

The routine tests in BS 2692-2, Clause 2.9 shall be passed.

8 Documents Referenced

All references to documents listed below are to the latest versions, unless stated otherwise.

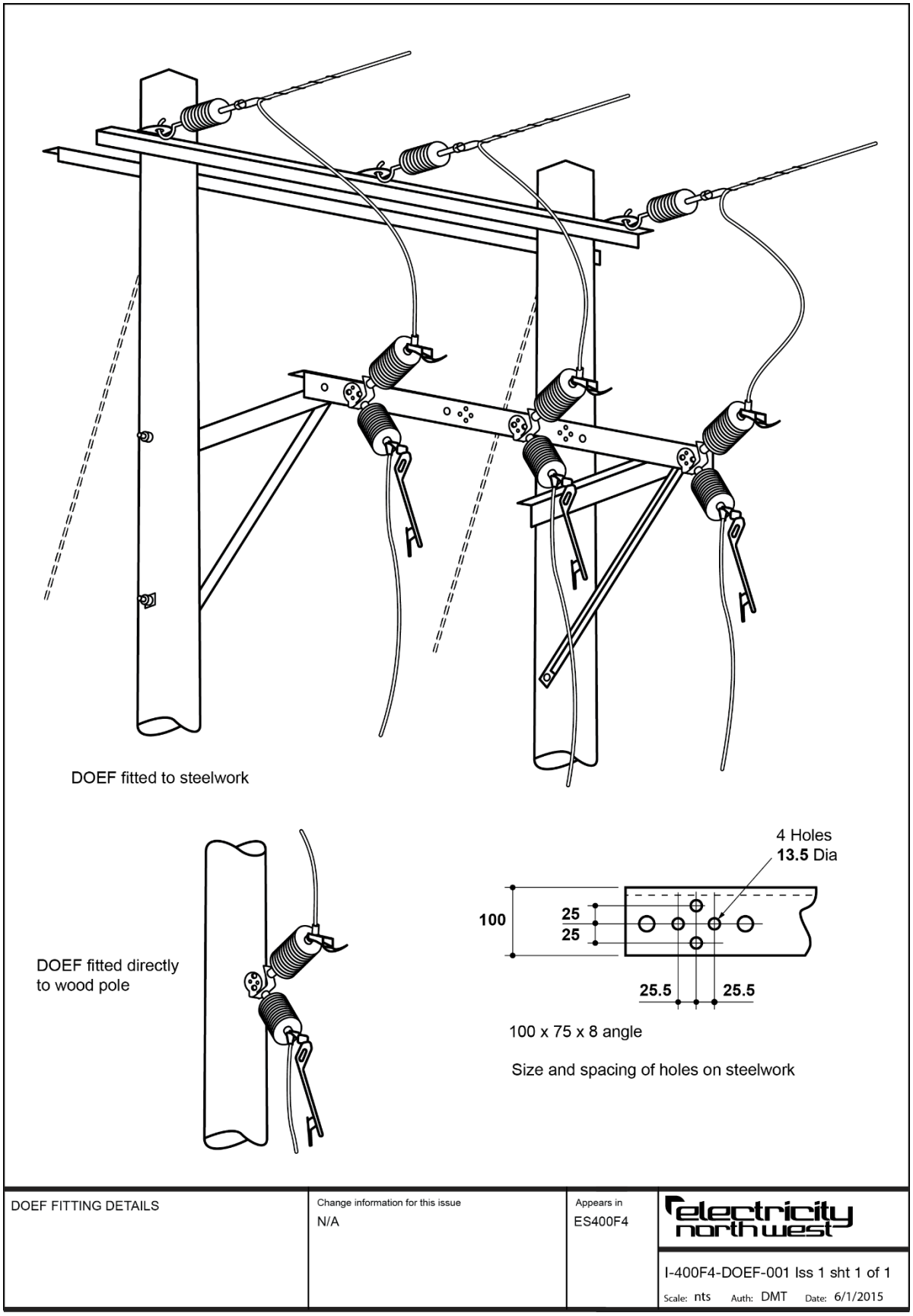
DOCUMENTS REFERENCED	
Health and Safety at Work Act 1974	
Control of Substances Hazardous to Health Regulations 2002	
Health and Safety Manual Handling Operation regulations 1992	
BS EN ISO 9000	Quality Management Systems
BS EN 1461	Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods.
BS EN ISO 14001	Environmental management systems. Requirements with guidance for use.
BS EN 62271-102	High-voltage switchgear and control gear. Alternating current disconnectors and earthing switches
BS 2692-2	Fuses for voltages exceeding 1000 V a.c. Expulsion fuses
BS 7354	Code of practice for design of high-voltage open-terminal stations
ENA TS 41-36	Distribution switchgear for service up to 36kV (cable and overhead conductor connected).
ES334	HV and LV Fuse-Links
ES400I4	Overhead Line Insulators.
ES400S11	Overhead Line Steelwork for Wood Pole Lines and Ancillary Steelwork for Lattice Steel Towers.

EPD311	Approval of Equipment.
CP311	Equipment Approval Process.

9 Keywords

Fuse

Drawing I-400F4-DOEF-001



Appendix A – Schedule of All Pole-Mounted Expulsion Switch, Fuse Tube and Solid Links

APPROVED DESCRIPTION (FOR PURCHASING AND PRODUCT LABELLING)	CC NUMBER
Pole-mounted DOEF, NEMA (universal) type... *1	
...link, switch, single mount, 11kV	122500
...link, DOEF, fuse tube, 11kV	122502
...link, solid brass, 11kV	122501
Pole-mounted DOEF, Morris Line Equipment... *1, *2	
...fuse holder, DOEF	122645
...angle bracket, DOEF unit 70/2470	122653
...link switch, single mount, 11kV	125261
Pole-mounted DOEF, J&P... *1	
...fuse tube	122874
...fuse unit 11-22kV	122491

*1 Components from different types of DOEF are not interchangeable. Different heads are needed on the hot-stick operating rods for different types of DOEF.

*2 Morris Line Equipment is a porcelain-type and uses fuse tube and solid link (a 100A fuse is sometimes used in place of a solid link).

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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		
4.7	Product Conformity		
4.8	Confirmation of Conformance		
5.1	Requirement for Type Tests at the Supplier's Premises		
5.2	Requirement for Routine Tests at the Supplier's Premises		
6	Technical Requirements		List the clauses in the following standards with which the product complies: – BS 2692-2: 1956. – BS EN 62271-102: 2002. – ENA TS 41-36: 2012.
6.1	Introduction		
6.2	Purpose of Equipment		

6.3	Design and Construction Standards		
6.4.1	Mounting		
6.4.2	Fault Operation		
6.4.3	Conductor Connections		
6.4.4	Contacts		
6.4.5	Optional Load Break Device		
6.4.6	Changing Fuses, Solid Links and ASLs		
6.4.7	Insulators		
6.4.8	Fuse Tubes		
6.4.9	Ratings		
6.4.10	ASLs		
6.4.11	Insulation		
6.4.12	Electrical Clearances		
7.1	Type Tests		
7.2	Routine Tests		

* 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: