



Electricity Specification 348

Issue 5

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Surge Arresters

Contents

- 1 Introduction
 - 2 Scope
 - 3 Definitions
 - 4 General Requirements for Approvals and Testing
 - 5 Requirements for Type and Routine Testing
 - 6 Technical Particulars
 - 7 Item List
 - 8 Documents Referenced
 - 9 Keywords
- Appendices A, B, C and D

Approved for issue by the Technical Policy Panel

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Issue and Amendment Summary

Amendment No. Date	Brief Description and Amending Action
0 01/07/05	<p>Issue 1</p> <p>First Issue</p> <p>Prepared by: S Rushton</p> <p>Approved by the Technical Policy Panel and signed on its behalf by:</p>
0 21/07/06	<p>Issue 2</p> <p>Changes to the requirement of indicating means of failure. Addition of preferred values of residual voltage. Inclusion of consideration of weight of transfer.</p> <p>Prepared by: S Stelfox</p> <p>Approved by the Technical Policy Panel and signed on its behalf by:</p>
0 10/12/08	<p>Issue 3</p> <p>Latest template applied. Updated to reflect latest standards. Some sections re-ordered and re-worded for clarity. Section on indication of failure amended to additional features.</p> <p>Prepared by: G Bryson</p> <p>Approved by the Technical Policy Panel and signed on its behalf by:</p>
0 09/05/11	<p>Issue 4</p> <p>Latest template applied. Additional requirements to mechanical size of 11kV arresters.</p> <p>Prepared by: G Bryson</p> <p>Approved by the Technical Policy Panel and signed on its behalf by:</p>
0 11/06/15	<p>Issue 5</p> <p>Updated standards references, commodity codes and explanatory drawing added. Additional arrester for use on mobile phone base station solutions incorporated.</p> <p>Prepared by: S Rushton</p> <p>Approved by the Technical Policy Panel and signed on its behalf by: D Randles</p>

SURGE ARRESTERS

1. INTRODUCTION

It is necessary for high voltage overhead networks and associated cables and equipment to be protected from the effects of lightning. Protection is achieved by the installation of surge arresters at appropriate points on the network.

This Electricity Specification sets out the technical requirements for the purchase of surge arresters by Electricity North West Limited (Electricity North West) to be used on their electricity distribution system.

2. SCOPE

This specification covers surge arresters of the metal oxide resistor type for application on the 6.6kV, 11kV, 33kV and 132kV systems.

3. DEFINITIONS

Approval Sanction by the Electricity North West Protection 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, whose 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.

Supplier Any person to person's firm or company who supply goods to Electricity North West or a contractor of Electricity North West.

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 APPROVAL 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 Protection Policy Manager, and receipt of a written agreement to the proposed change from the Electricity North West Protection Policy Manager.

4.2 Electricity North West Technical Approval

- 4.2.1 The Tenderer shall submit, with this Tender, proposals for testing which will demonstrate, to the satisfaction of the Electricity North West Protection Policy Manager, compliance with this Specification. Such tests shall be carried out without expense to Electricity North West.
- 4.2.2 Alternatively, the Tenderer may submit technical reports and other data that he considers will demonstrate, to the satisfaction of the Electricity North West Protection Policy Manager, compliance with this specification. Acceptance of this evidence shall be at the discretion of the Electricity North West Protection Policy Manager but will not be unreasonable withheld.
- 4.2.3 Approval shall be 'factory specific' and is not transferable to another factory without the written approval of the Electricity North West Protection Policy Manager.
- 4.2.4 The supplier and product shall comply with all the relevant requirements of Electricity North West documents EPD311 and CP311.

4.3 Quality Assurance

- 4.3.1 The Tenderer shall confirm whether or not approval is held in accordance with a Quality Assurance scheme accredited under ISO9000. If not, he shall submit a statement of the quality assurance procedures employed to control the quality of the product, including the performance of the Suppliers and Sub-Contractors.
- 4.3.2 The right is reserved for the Electricity North West Protection Policy Manager to require, from time to time, the repeat of such tests as he may deem to be reasonably necessary to demonstrate continued compliance with the Specification.
- 4.3.3 The Tenderer shall submit, with his 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 Protection Policy Manager, fitness for installation and service.
- 4.3.4 The Tenderer shall provide free of charge to Electricity North West such samples as may, in the opinion of the Electricity North West Protection Policy Manager, be reasonably required for inspection and/or retention as quality control samples. The Electricity North West Protection Policy Manager will confirm the requirement for samples at the time of tendering.
- 4.3.5 The right is reserved for the Electricity North West Protection Policy Manager to make, from time to time, such inspection of the Tenderer's facilities as he may deem to be reasonable necessary to ensure compliance with this Specification and any Contract of which it forms a part.
- 4.3.6 The Tenderer shall submit, with his 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 his 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 etc Act 1974 and the Control of Substances Hazardous to Health Regulations 2004, in the use, storage and disposal of the product. The Tenderer may stipulate, prior to submission of such information, that he requires it to remain confidential and the Electricity North West Protection Policy Manager will, if requested, confirm his agreement to this prior to receipt of the information.

4.5 Identification Markings

4.5.1 The Tenderer shall submit, with his 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 Protection Policy Manager, and shall in all cases include the Electricity North West Approved Description and Commodity Code Number.

4.5.2 The Tenderer shall submit, with his 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 Protection Policy Manager.

4.6 Minimum Life Expectancy

The minimum life expectancy of all products covered by this specification is 20 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.

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

5. REQUIREMENTS FOR TYPE AND ROUTINE TESTING

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

5.1 Requirement for type tests at the 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 Protection Policy Manager.

These may or may not be destructive tests.

5.2 Requirement for routine tests at the Supplier' premises

These tests shall be carried out on every individual unit or component, as specified.

The results of these tests shall be supplied to Electricity North West with each unit purchased.

A copy of the results shall be supplied in Adobe Acrobat (pdf) format.

6. TECHNICAL PARTICULARS

6.1 Type of Arrester

Surge arresters shall be of the metal oxide type without gaps, suitable for use on ac systems and shall comply with BS EN 60099-4. The list of commodity codes for arresters is shown in Appendix C.

6.2 Arrester Housing

Housings shall be polymeric. Arresters shall have minimum creepage distances suitable for heavy pollution as defined in IEC/TS 60815.

6.3 Additional Features

If there are any additional features available such as indication of failure, the Tenderer shall state whether they are standard or optional. The Tenderer shall detail the costs associated with any optional feature.

6.4 Arrester Characteristics

6.4.1 Rated Voltage

The rated voltage of the surge arresters shall be as quoted in table 1.

Table 1: Rated Voltage

System Voltage	Arrester Rated Voltage
6.6kV and 11kV	15kV
33kV	36kV
132kV	132kV

6.4.2 Nominal Discharge Current

The nominal discharge current for all surge arresters shall be 10 000A.

6.4.3 Line Discharge Class

The line discharge class shall be as quoted in table 2. These classes are defined in BS EN 60099-4.

Table 2: Line Discharge Class

System Voltage	Class
6.6kV and 11kV	1
33kV	2
132kV	3

6.4.4 Residual Voltage

The residual voltages quoted in table 3 are indicative of a preferred value.

Table 3: Residual Voltage

System Voltage	Residual Voltage (kV) at current impulses with wave 8/20 μ s
6.6kV and 11kV	42
33kV	102
132kV	326

6.4.5 11kV Arrester for Mobile Phone Base Station (MPBS) Solution

An arrester is required for a specific solution on a pole mounted transformer (PMT) in providing supplies to mobile phone stations where the antennae are mounted on National Grid (NG) towers. These requirements are due to the rise of earth potential on towers and the arrester and its application is more fully covered in CP215 and ENA ER G78.

The specific requirements for this arrester are shown below. All other requirements for 11kV arresters apply where not stated below.

Characteristic	Requirement
1 second temporary over voltage (TOV)	28kV
Residual Voltage for 8/20 μ s, 10kA impulse	< 76kV
Minimum Current rating	10kA
Minimum Impulse current rating	40kA

6.4.6 Low Voltage Neutral Arrester

An arrester is to be used on the neutral point of the low voltage side of pole mounted transformers (PMTs). A specific device, the Bowthorpe Tyco Transient Voltage Clamp (TVC) is to be used for this purpose.

6.5 Mounting Arrangements

6.5.1 6.6kV and 11kV systems

Arresters for use on the 6.6kV and 11kV systems shall be capable of being mounted at any angle so as to enable them to act as support insulators associated with dry type cable terminations. They shall be able to withstand short circuit forces without the need to provide additional bracing. The Tenderer shall provide details of the maximum cantilever force for each arrester.

The standard mounting for these arresters shall use an M12 stud with 3 nuts, 2 flat washers and 2 spring washers at each end of the arrester.

Arresters shall be mounted on brackets which are approximately 300mm apart. The arrester shall be long enough to fit this gap and provide a stud length of 61mm beyond the bracket for the fitting of the nuts, washers and connectors. A typical construction arrangement on a pole mounted transformer and auto-recloser is shown in Appendix D.

6.5.2 33kV systems

33kV arresters may be suitable for upright mounting only, but they shall be self supporting without the need to provide additional bracing. The standard mounting for these arresters shall use an M16 stud with 3 nuts, 2 flat washers and 2 spring washers at each end of the arrester.

6.5.3 132kV systems

132kV arresters shall be suitable for upright mounting and shall be provided with a pedestal base. Insulated bushings / mounts shall be supplied. Project specific details for these arresters are detailed in Appendix A.

The Electricity North West Protection Policy Manager may wish to propose alternative mounting arrangements during tender stage negotiations. If so, the placing of any contract will depend upon the Supplier's agreement and ability to accommodate these.

6.6 Accessories

The Tenderer shall details the costs for all accessories at the tender stage.

6.7 Drawings

Dimensioned drawings for each arrester, including weights, alternative mounting arrangements and accessories shall be supplied with the tender. A full datasheet detailing all the arrester characteristics shall be supplied with the tender.

Drawings shall be supplied in AutoCad 2000 (dwg) and Adobe Acrobat (pdf) format files.

6.8 System Parameters

6.8.1 Frequency

The system frequency is 50Hz.

6.8.2 Voltage

The nominal and maximum system voltages are as quoted in table 4.

Table 4: System Voltage

Nominal System Voltage (kV)	Maximum System Voltage (kV) (under normal conditions)
6.6	7.2
11	12
33	36
132	145

6.8.3 Earthing

The 6.6kV, 11kV and 33kV systems are non-effectively earthed. The earthing factor is 1.73.

The 132kV system is directly earthed. The earthing factor is 1.4.

An earth fault clearance time of 3 second shall be assumed.

6.8.4 Fault Levels

The system fault levels are as quoted in table 5.

Table 5: System Fault Level

System Voltage (kV)	System Fault Level (kA)
6.6	21.9
11	13.1
33	17.5
132	21.9

6.9 Mechanical Strength following Failure

Should the arrester fail due to overload the following shall apply:

- The arrester shall fail in a safe manner without excessive shattering and ejection of material.
- The arrester shall remain self-supporting after failure.

6.10 Weather Ageing Tests

The arrester type shall have been subjected to both the 1000hr salt fog test series A and the 5000hr cyclic test series B in accordance with BS EN 60099-4.

7. DELIVERY AND OFF-LOADING

For 132kV arresters the Tenderer shall include for delivery and offloading. Installation and commissioning are outside the scope of this contract.

8. DOCUMENTS REFERENCED

Health and Safety Manual Handling Operations Regulations 1992

Health and Safety at Work Act 1974

Control of Substances Hazardous to Health (Amendment) Regulations 2004

BS EN ISO 9000 Quality Management Systems

BS EN ISO 14001 Environmental Management Systems

IEC TS 60815:2008 Selection and Dimensioning of HV Insulators for use in Polluted Conditions

BS EN 60099-4 Surge Arresters: Metal –oxide surge arresters without gaps for ac systems

ENA ER G78 Recommendations for low voltage supplies to mobile phone base stations with antennae on high voltage structures

CP215 Supplies to Mobile Phone Base Stations with Antennae on High Voltage Structures

EPD311 Approval of Equipment

CP311 Equipment Approval Process

9. KEYWORDS

Lightning; protection; arrester

APPENDIX A

GENERAL PARTICULARS OF DEFINITE WORK

(Relevant details to be completed by Purchaser)

Item	Description	
1	Site Name	
2	Site Grid Reference	
3	Number of Units	
4	Voltage	
5	Delivery Dates	

APPENDIX B

SELF-CERTIFICATION CONFORMANCE DECLARATION

CLAUSE BY CLAUSE CONFORMANCE WITH SPECIFICATION

The manufacturer shall declare conformance or otherwise, clause by clause, using the following levels of 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 :

Assessor

Name:

Company

Signature

Date

Clause / Sub-clause		Requirement	Conformance Code	Remarks (Must be completed if Conformance 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		
5	1	Requirement for type tests at the suppliers' premises		
5	2	Requirement for routine tests at the suppliers' premises		
6	1	Type of Arrester		
6	2	Arrester Housing		
6	3	Additional Features		
6	4	Arrester Characteristics		
6	5	Mounting Arrangements		
6	6	Accessories		
6	7	Drawings		
6	8	System Parameters		
6	9	Mechanical Strength following Failure		
6	10	Weather Ageing Tests		
7		Delivery and Offloading		

Additional Notes:

APPENDIX C
COMMODITY CODES

1. LIST OF ARRESTER COMMODITY CODES

Description	Commodity Code
11kV Surge Arrester	121886
33kV Surge Arrester	121878
11kV MPBS arrester	121850
LV Neutral Arrester (Transient Voltage Clamper TVC)	121894

APPENDIX D

TYPICAL CONSTRUCTION DRAWING 6.6/11KV ARRESTER

