SPOORNET

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ENGINEERING & TECHNOLOGY
TECHNOLOGY MANAGEMENT

SPECIFICATION

SPECIFICATION FOR SURGE ARRESTERS FOR 3kV DC ELECTRIFICATION

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1.0 SCOPE

This specification covers Spoornet's requirements for the supply of outdoor surge arresters required for the protection of 3kV direct current electrical equipment against surges caused by lightning and switching surges.

2.0 REFERENCES

Except where otherwise provided for in this specification all equipment offered must comply with the requirements of the relevant standard specification for surge arresters of the S.A. National standards, otherwise with the relevant international standards effective at the time of tendering.

2.1 South African National Standards

SANS 60099-4 : Metal Oxide surge arresters without gaps for ac systems.

SANS 121 : Hot dip galvanized coatings for fabricated iron or steel article.

2.2 The following Spoornet drawing is referred to herein: -

CEE-TLE-6: Adapter plate, Surge arrester.

3.0 TENDERING PROCEDURE

3.1 **Tenderers shall indicate clause by clause compliance with the specification.** This shall take the form of a separate document listing all the specification's clause numbers indicating the individual statement of compliance or non-compliance. This document can be used by tenderers to elaborate on their response to a clause.

3.2 Tenderers shall motivate a statement of non-compliance.

3.3 Where equipment offered does not comply with standards or publications referred to in the specification, tenderers shall state which standards apply and submit a copy in English.

3.4 Tenderers shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.

3.5 The "Technical Data Sheet" - Appendix 1 to this specification shall be fully completed by tenderers. Failure to submit fully completed data sheet(s) may preclude a tender from further consideration.

4.0 APPENDICES

Appendix 1 - Technical Data Sheet.
This appendix calls for specific technical information to be submitted by the tenderers.

5.0 ATMOSPHERIC SERVICE CONDITIONS

5.1 The arresters shall be designed for outdoor installation and rated for continuous operation under the following service conditions:

Altitude	-	0 to 1800m above sea level
Ambient temperature	-	minus10 °C to plus 45 °C
Relative humidity	-	10% to 90%
Atmosphere	-	Heavy polluted environment: salt laden industrial and locomotive fumes, and severe dust conditions.
Lightning conditions	-	12 Ground flashes per square kilometre per annum .

5.2 The arresters are to be installed on 3kV DC electrification structures and shall be exposed to direct sunlight.

6.0 ELECTRICAL SERVICE CONDITIONS

6.1 The arrester shall be suitable for operation on DC supply, obtained from silicon diode rectifiers, which contain a superimposed alternating current ripple due to harmonics.

6.2 The operating voltage is 3kV DC nominal, but varies during normal operation between 2,3kV and 3,9kV for sustained periods.

7.0 MECHANICAL SERVICE CONDITIONS

The arrester shall be subjected to severe vibration.

8.0 SURGE ARRESTER REQUIREMENTS

8.1 GENERAL

8.1.1 The arrester shall be of the metal oxide type.

8.1.2 The arrester shall be station class with a line discharge class 3 in accordance with SANS 60099-4.

8.1.3 The arrester shall be contained in an enclosure made of the insulating material, porcelain that is non-flammable and non-hygroscopic and so designed as to prevent the ingress of dirt and moisture. This material shall be resistant to UV radiation, corrosion and electric erosion and tracking under normal operating conditions.

8.1.4 To verify the seal integrity the manufacturer shall indicate the leakage rate of the arrester and what type of leakage test method has been used. The Integrated Helium Mass Spectrometer or the Membrane method is the preferred method.

8.1.5 All ferrous parts of the arrester i.e. terminals, connecting clamps, nuts and bolts shall be stainless steel, or mild steel galvanised in accordance with specification SANS 121 for " Hot dip galvanised coatings for fabricated iron or steel article".

8.1.6 In the event of an internal flash-over of which the surge energy exceeds the energy discharge capacity of the arrester, provision should be made to relieve the pressure and prevent the arrester from exploding, scattering porcelain fragments over a wide area with the consequent possible damage to equipment and injury to staff.

8.1.7 The arrester shall be designed to give a clear visible indication in the event of failure, in order to easily identify faulty arresters. The visual indication shall be visible from ground level. The visual indication shall be visible from ground level. A description of the visual indication system shall be given in the "Technical data sheet" Appendix 1.

8.1.8 The minimum outdoor earth clearance between the line connection and any other part of the arrester that is connected to earth, shall be 150mm.

8.1.9 The arrester shall be pedestal mounted, with an adapter plate according to drawing number CEE-TLE-6.

8.2 ARRESTER RATINGS

8.2.1 Rated voltage of the arrester Ur - 4,8kV DC.

8.2.2 Rated nominal discharge current - 10kA.

8.2.3 Discharge current withstand capability (4/10 μs two shots) - 100kA.

8.2.4 Continuous operating voltage (Uc) - 4,0 kV.

8.2.5 Pressure Relief Capability - 40kA/0,2 secs.

8.2.6 Line Discharge Class in accordance with SANS 60099-4 - Class 3

8.2.7 The residual peak voltage shall not exceed the insulation level of the traction substation. The substation is capable of withstanding a test voltage of 10,5kV (rms) 50Hz AC for one minute.

9.0 MARKING

Each arrester shall be legibly and indelibly marked with the following information in a position where the information can readily be seen.

- Manufacturer's name.
- Year of manufacture
- Rated DC Voltage.
- Continuous operating Voltage. (Uc)
- Serial Number
- The words "Metal Oxide" and "Outdoor" - type
- Insulating medium
- The word "Live" on or near the connecting terminal if the arrester has a metal casing that is connected to the earth terminal, and the word "Earth" on or near the earth terminal.

10.0 TESTS

10.1 Test certificates to verify requirements shall be submitted with tender documents.

10.2 The required tests shall be performed according to the S.A. National Standards for surge arresters or relevant international standards.

10.3 Spoornet reserves the right to carry out any check tests on data submitted. However, the successful tenderer will still be responsible for efficient operation of the equipment in service and its compliance with the specification.

10.4 Spoornet reserves the right to inspect the equipment at any stage during or after manufacture and be represented at any tests, and shall have full power to reject any item that is considered defective or inferior in quality of material, workmanship or design to that required by this specification.

11.0 PACKING

All equipment shall be packed in such a manner that it will be adequately protected against damage during handling and transport.

END

APPENDIX 1

TECHNICAL DATA SHEET
(To be completed by tenderer)

1.0	Type of arrester	.....
2.0	Manufacturer	.....
3.0	Rated DC voltage (Ur)	.....kV
4.0	Continuous operating DC voltage	.....kV
5.0	Nominal discharge current	.....kA
6.0	High current impulse withstand capability (4/10μs)	.....kA
7.0	Maximum residual voltage at steep or lightning impulse current.	.....kV
8.0	Long duration current impulse	.....A / .....μs
9.0	Pressure relief withstand	.....kA / .....s
10.0	Energy discharge capability	.....kJ/kV$_{Ur}$
11.0	Vibration resistance	.....g
12.0	Mechanical bump strength	.....g
13.0	Creepage distance	.....mm
14.0	Height	.....mm
15.0	Mass	.....kg
16.0	Temperature range	.....°C
17.0	Altitude	.....m
18.0	Visible indication - description	.....
	.....	
	.....	
	.....	
19.0	Additional information	.....
	.....	
	.....	
	.....	