SOUTH AFRICAN TRANSPORT SERVICES

ELECTRICAL ENGINEERING

SPECIFICATION NO. CEE.0115.86

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SPECIFICATION FOR 4 MICROFARAD

CAPACITOR SURGE ABSORBER

3 kV DC ELECTRIFICATION

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STATEMENT OF COMPLIANCE

1.0 SCOPE

1.1 This specification covers the S.A. Transport Services requirements for the supply of 4 uF capacitors required for the protection of 3 kV DC electrical equipment against surges caused by lightning.

2.0 REFERENCES

2.1 Except where otherwise provided for in this specification all equipment offered must comply with the requirements, of the relevant Standard specification of the S.A. Bureau of Standards if published, otherwise with the relevant standard of the British Standards Institution in force at the time of tendering.

SAT Specifications :-

CEE.0012.83/1 - Method of Tendering

3.0 METHOD OF TENDERING

3.1 Tendering shall be in accordance with S.A Transport Service's specification CEE.0012.83/1. Complies/Does not comply

4.0 ATMOSPHERIC SERVICE CONDITIONS

4.1 The capacitors shall be designed for outdoor installation and rated for operation under the following service conditions :

Altitude Level - 0 to 1 800 m above sea
Ambient temperature - minus 5 ^{o}C to plus 45 ^{o}C
Relative humidity - 10 % to 90 %
Lightning conditions- 11 flashes/km^{2}/annum
Air pollution - Heavy saline laden industrial and locomotive fumes, and severe dust conditions. Complies/Does not comply

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

5.0 ELECTRICAL SERVICE CONDITIONS

5.1 The capacitors shall be suitable for operation on DC supply, obtained from mercury arc/silicon diode rectifiers, which contain a superimposed alternating current ripple due to harmonics. Capacitors must therefore be capable of withstanding continuously the following harmonic voltage without overheating or deterioration :

6 th harmonics	-	300 Hz -	120 V.R.M.S.
12th harmonics	-	600 Hz -	30 V.R.M.S.
18th harmonics	-	900 Hz -	14 V.R.M.S
24th harmonics	-	1 200 Hz -	8 V.R.M.S

Complies/Does not comply

5.2 The operating voltage is 3 000 volts DC nominal, but varies during normal operation between 2 300 and 3 900 volts for sustained periods.

Complies/Does not comply

6.0 MECHANICAL SERVICE CONDITIONS

6.1 The capacitors shall be subjected to severe vibration.

Complies/Does not comply

7.0 TECHNICAL REQUIREMENTS

7.1 GENERAL

7.1.1 The capacitors shall be immersed in a non-flammable, non-toxic insulating medium and sealed under vacuum.

Complies/Does not comply

7.1.2 The capacitor container shall be constructed of steel and shall be of adequate mechanical strength to avoid bulging or bursting.

Complies/Does not comply

7.1.3 Each capacitor container shall be robust and leak-proof.

Complies/Does not comply

7.1.4 Each capacitor shall be suitable for mounting vertically between two horizontal brackets of which the inside surfaces are 278 mm apart (hor). In the inside surface of each bracket there are two M8 holes 40 mm from the base of the capacitor to the centre of the hole and spaced 90 mm (hor.) between hole centres.

Complies/Does not comply

7.1.5 A built-in discharge resistor must be provided which shall reduce the residual voltage to 50 V within 5 minutes.

No series spark gaps or fuses are to be provided in the capacitor circuit. Complies/Does not comply

7.1.6 Each capacitor shall be provided with a single terminal bushing with the earth side of the capacitor coupled to the container. Complies/Does not comply

7.2 RATING OF CAPACITORS

7.2.1 The electrostatic capacity shall be 4 microfarads. Insulating bushings must withstand flashover voltages of not less than 85 kV (dry) and 55 kV (wet) 50 Hz for one minute.

7.2.2 All capacitors shall be insulated to withstand a test voltage of not less than 20 kV DC for one minute between the terminal and the container. Complies/Does not comply

7.2.3 The capacitance tolerance of each capacitor shall not exceed plus or minus 10 % at 25 ^{o}C and not vary by more than 4 % total between 5 ^{o}C and 45 ^{o}C. Tenderers shall state and guarantee the tolerance. Complies/Does not comply

7.2.4 The peak surge current and voltage that the capacitor can withstand shall be stated by the tenderer.

7.3 RATING PLATE

7.3.1 A non-corrosive metal plate shall be fixed to each capacitor container giving the following information :

(1) Manufacturer's name
(2) Identification number
(3) Rated DC voltage
(4) Temperature category
(5) Insulating medium
(6) Insulation level
(7) Measured capacitance in microfarad
(8) Rating of discharge resistor Complies/Does not comply

8.0 INSPECTION AND TESTS

8.1 Test certificates to verify the ratings called for in clause 7.2 shall be submitted. Complies/Does not comply

8.2 Tenderers are specifically requested to comment on the discharging of the capacitors with time, while in service, and the test voltages, that can be applied to the capacitors approximately six months after the works tests specified. Complies/Does not comply

8.3 The Transport Services 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. Complies/Does not comply

8.4 The Transport Services 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 which is considered defective or inferior in quality of material, workmanship or design to that required by this specification. Complies/Does not comply

9.0 PACKING

9.1 All equipment shall be packed in such a manner that it will be adequately protected against damage during handling and transport. Complies/Does not comply

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