WATER SUPPLIES DEPARTMENT

STANDARD SPECIFICATION E-60-01

LOW VOLTAGE POWER FACTOR CORRECTION CAPACITOR

1. GENERAL

1.1 Scope

This Specification covers the design, construction, manufacture, testing and delivery of low voltage power factor correction capacitor equipment. The equipment shall include all sub-units and component items to form a complete working system.

1.2 Site Conditions

The capacitor supplied shall be capable of operating satisfactorily without mechanical or electrical damage or degradation of operating characteristics under the following conditions :

1.2.1 Operating Conditions

(a)	Ambient temperature	:	40°C maximum continuous for 4 hours 35°C average over any 24 hours 5°C minimum.
(b)	Humidity	:	Up to 98% relative humidity.
(c)	Altitude	:	Not greater than 1000 metres.

1.2.2 Electrical Conditions

(a)	Electricity Supply	:	380V 3-phase, 50 Hz, 4-wire system with solidly earthed neutral and maximum prospective symmetrical fault current 40 kA.
(b)	Voltage variation	:	±6%
(c)	Frequency variation	:	±2%

2. DESIGN AND CONSTRUCTION

2.1 Design

The capacitors supplied shall comply with IEC 60831 and shall be made of dry type dielectric of metallised polypropylene film. Synthetic impregnants, where used, must not be harmful for human contact and must not be a type that has been disqualified by any National Agency due to its adverse environmental effect e.g. Polychlorinated Biphenyls (PCB), Askerel etc.

The capacitor shall be so designed that it will not cause fire or explosion in the event of failure. It shall be of a "self-healing" type with low dielectric loss of less than 0.5 watt per kVAr. Each capacitor unit supplied shall be of three phases, delta connected type and fitted with a suitable internal over-pressure disconnector or fusing device. In addition, a permanently connected discharge device shall be provided for each capacitor to reduce the residual voltage from the crest valve of the rated voltage to less than 50V within one minutes after the capacitor is disconnected from the power supply.

2.2 Construction

The enclosure of the capacitor shall be made of sheet metal to IP42 of IEC 60529.

For multiple unit assembly, the capacitors shall be connected together inside an enclosure by rigid PVC sleeved copper bars bolted to their terminals. An earth stud terminal shall be provided for the earthing connection of the capacitors.

Suitable lifting lugs shall be installed on the capacitors cubicle to facilitate handling during transporation. A stainless steel rating plate shall be provided and fixed by screws on the capacitor cubicle.

3. INSPECTION AND TESTING

3.1 General

The capacitor shall be subject to both routine tests and type tests.

Routine tests shall be carried out at the manufacturer's works. Witnessing of these tests by an Independent Inspection Body is not required, but certified test reports shall be submitted to WSD for approval immediately after completion of the tests.

Type tests shall be certified by a competent witness/testing authority.

3.2 Routine Tests

The following routine tests to IEC 60831 shall be carried out by the manufacturer on every capacitor supplied before delivery:-

(i) Capacitance measurement and output calculation
(ii) Measurement of the tangent of the loss angle (tan δ) of the capacitor
(iii) Voltage test between terminals
(iv) Voltage test between terminals and container
(v) Test of the internal discharge device
(vi) Sealing test

3.3 Type Tests

Type test reports/certificates on the following tests to IEC 60831 shall be submitted together with routine test reports pursuant to section 3.2 above. The type tests shall be carried out on capacitor unit of the same design, rating and construction as the capacitor to be supplied under the contract:-

(i) Thermal stability test
(ii) Measurement of the tangent of the loss angle (tan δ) of the capacitor at elevated temperature
(iii) Voltage test between terminals
(iv) Voltage test between terminals and container
(v) Lightning impulse voltage test between terminals and container
(vi) Discharge test
(vii) Ageing test
(viii) Self-healing test
(ix) Destruction test

- End of this Specification -