21 LIGHTNING PROTECTION

21.1 GENERAL

21.1.1 Scope

1 This Part specifies the requirements for lightening protection.

2 Related Parts and Section are as follows:

(a) This Section

Part 1	General Provisions for Electrical Installation
Part 7	Conduit
Part 9	Cable Trays
Part 6	Cables and Small Wiring
Part 8	Trunking
Part 2	HV and MV Factory Built Assemblies (FBA's)

21.1.2 References

1 The following standards are referred to in this Part:

BS 6651.....Code of practice for protection of structures against lightning. (EN 62305-1, EN 62305-2 EN 62305-3, EN 62305-4)

BS 7430.....Code of practice for protective earthing of electrical installations

EN 62305 .....Protection against lightning

21.1.3 Quality Assurance

1 Design Criteria:

(a) Lightning protection systems must be designed, constructed and maintained in accordance with EN 62305 and QGEWC (KAHRAMAA).

(b) Where practicable, a minimum distance of 7 m must be provided between lightning protection Earth Electrodes and the Electrical Installation Earth Electrodes.

(c) Surge protective devices must be used at the Connection Point for Premises with a lightning protection system. These shall be installed typically at the Main Distribution Board.The use of structural steel in place of, or in connection with, lightning down conductors is not permitted unless approved by the Client. Where such approval is given, provision must be made for regular testing of the structural Earth system from roof level to ground (e.g. via a separate test cable installed through the building). Structural foundations or piles may be used as lightning Earth Electrodes if sufficiently separated from the Main Earth Electrodes and where inspection/ testing points are provided for future maintenance.

21.1.4 Submittals

1 Shop Drawing and product Data per Part 1.

(a) submit full technical details and conductor size calculations of each type of cable or wire proposed.

(b) submit exact route of each cable or wire proposed.

21.2 PRODUCTS

21.2.1 Materials

1 Generally:

(a) (Products used in the lightning protection system shall be copper or an approved copper alloy, unless otherwise specified, and specifically manufactured for the purpose.

2 Air Termination Conductors and Down Conductors:

(a) lightning air terminals and down conductors for lightning air terminals shall be provided as indicated on the drawings. Where vertical air terminations are used, they shall be min of 15 mm diameter tinned copper (air termination rod) 0.8 meter long with top spike, unless otherwise specified in the Project Documentation

(b) generally, roof conductors and down conductors shall be of PVC sheathed 3 x 20 mm (minimum) copper tape. PVC colour to be approved by the Engineer. However, bare copper tape may be unless indicated otherwise on the Project Drawings or Specification

(c) air termination rods shall be securely anchored and welded

(d) down conductors shall be run along the outer surface of the wall or column of the building

(e) down conductors shall be as short as possible, protected and directly connected to earthing system through test links (refer to item 7 below)

(f) anchoring bolts shall be used to hold roof conductors and down conductors in firm position

(g) lightning conductor connectors shall be provided for conductor splice connections and conductor terminal connections

(h) the connectors shall be heavy duty, cast metal and shall have hex-head screws in the bodies and holes in the tongues for bolts

(i) TV antenna, HVAC equipment, handrails and structures in the vicinity of the lightning protection system, if any, shall be bonded to the system by 3x20 sq. mm (minimum) PVC sheathed copper tape.

3 Main Earth Loops:

(a) 25 x 3 mm tinned copper tape, unless otherwise indicated on the Project Drawings or Specification.

4 Earth Electrodes:

(a) shall be of the earth rod type

(b) earth rod electrodes: 16 mm diameter steel core copper jacketed type, comprising a high strength steel alloy core with a molten welded copper covering, minimum 0.25 mm thick

(c) to be not less than 3.6 m long, in 1.2 m sections coupled by strong bronze couplers.

5 Earth Connectors:

(a) shall connection of rod electrodes: bolted type.

6 Removable Earth Links:

(a) to comprise a bolted copper link fixed on porcelain insulators and complete with studs, nuts and washers to take the earth tape and a bolted lug adequately sized for the final connection of the earth electrode.

7 Bolts, Washers And Nuts In Bolted Connections:

(a) high copper alloy or silicone bronze. Ferrous hardware is not acceptable.

8 Earth Pit Cover

(a) shall be of heavy duty construction

(b) shall have a recessed lifting hook

(c) shall have a brass plate, engraved “Electrical Earth Below”.

21.3 INSTALLATION

21.3.1 Installation

1 Removable Earth Links

(a) fix in every main earth lead to enable the electrode system to be disconnected for testing

(b) install in an accessible position, above ground as close as possible to the earth electrode.

2 Bolted Connections:

(a) multiple bolt type

(b) where bare copper is bolted in connections contact surfaces shall be silver electroplated.

3 Brazed Connections:

(a) where earthing terminal connections are to be brazed to equipment, thoroughly clean metal prior to brazing and repaint impaired surfaces to prevent corrosion.

4 Connections Between Dissimilar Metals:

(a) protect by:

(i) painting with a moisture resistant bituminous paint or compound, or

(ii) wrapping with protective tape to exclude moisture.

5 Earth Rod Electrodes:

(a) extensible rods of the same diameter shall be installed in holes drilled into the ground. If ground conditions permit, rods may be driven into the ground either manually or mechanically. The earth electrode shall be installed at such a depth that it penetrates the summer water table by a minimum of 2 metres. Under no circumstances shall lightning protection electrodes be connected to any QGEWC (KAHRAMAA) earthing electrode. A minimum distance of 7 metres shall be provided between any lightning earth electrode and a QGEWC (KAHRAMAA) earth electrode.

(b) weld earth connectors to the top of the rods, in sufficient number to make connection with all incoming cables.

6 Earth Pit:

(a) provide a concrete/PVC pit complete with a heavy duty concrete, cast iron or PVC cover with recessed lifting hook to the Engineers written approval, at the head of the earth rod, to protect the rod and allow access to connections for testing.

21.3.2 Testing

1 Testing earthing systems by the earth megger test.

2 The resistance of any one point in the lightning protection earth continuity system to the main earth electrode shall not exceed 10 ohms, unless allowed otherwise by QGEWC (KAHRAMAA), without taking account of any bonding to other services.

3 Install additional earth electrodes in parallel, if these figures are not met.

END OF PART