TECHNICAL SPECIFICATIONS FOR AN ENHANCED LIGHTNING AIR TERMINAL
for HV Power Facilities

GENERAL

1.1 The lightning protection system shall be of the enhanced type which is designed to capture lightning to a preferred point and safely convey the lightning energy to earth (ground) via a pre-determined route, with minimal risk of side flashing.

1.2 The complete lightning protection system will comprise the following key components.

(a) Lightning Air Terminal
(b) Mounting support
(c) Dedicated down conductor
(d) Lightning Strike Recorder
(e) Dedicated earthing system

1.3 The air terminal placement method shall comply with the Leader Inception Theory (LIT) per IEEE Std. 998. A computational tool validated against LIT placement methodology, e.g., LITCalc software, shall be used to select and position the appropriate air terminals.

THE LIGHTNING AIR TERMINAL

2.1 The lightning air terminal shall be an enhanced strike receptor that responds dynamically upon the approach of the downward leader.

2.2 The lightning air terminal shall be configured as a spheroid which is comprised of separate, electrically-isolated panels surrounding an earthed central finial.

2.3 The insulation material used to electrically isolate the panels shall be comprised of a base polymer which provides high ozone and UV resistance with a dielectric strength of 24 - 38 kV/mm.

2.4 The external shape of the advanced lightning rod shall be such that it will limit the development of point discharge or “corona” space charge under quasi-static thunderstorm conditions.

2.5 The central finial shall be elevated above the spheroid to a length of 16 mm.

2.6 The upper section of the central finial shall be rated to withstand 200 kA.

2.7 An air gap shall be provided between the individual electrically isolated panels (4 panels) and the finial tip of the central rod.

2.8 Arcing shall occur between the panel sections of the spheroid and the finial tip only upon the approach of a lightning downward leader.

2.9 The lightning air terminal shall have no moving parts and will have no dependence upon external power supply or batteries.

2.10 Under a normal atmosphere, all components of the advanced lightning terminal shall be corrosion resistant.

2.11 If using a “high voltage shielded cable”, such as HVSC Plus, as a down conductor, the lightning air terminal shall be insulated from all surrounding points and features of the structure being protected.

2.12 The lightning air terminal shall not be installed in a corrosive environment unless the manufacturer’s written approval has first been granted.

2.13 The lightning air terminal shall be installed per the manufacturer’s instructions.

2.14 The lightning air terminal shall be tested and certified in accordance with IEC 60060-1, IEC 62561-2, and IEC 62475.

MOUNTING SUPPORT OF LIGHTNING AIR TERMINAL

3.1 The mounting pole used to support the lightning air terminal shall either be a cylindrical, insulating fibreglass tube or aluminium mast with a relative height of at least 2 metres with respect to adjacent points. The pole will have an outside diameter of 68 mm.

3.2 The mounting pole and supports shall be securely fixed with brackets and guy wires where required.

3.3 The down conductor shall pass through the centre of the pole for the entire length of the pole.

DOWN CONDUCTOR

4.1 Each lightning air terminal should be fixed with one down conductor, unless otherwise specified by the manufacturer's design. The down conductor should have a minimum cross-sectional area of 50 mm² and can be bare or insulated, round or flat, copper or aluminium. The down conductor should be fixed securely at intervals of about 1 metre.

4.2 As an alternative, the use of a purpose-designed lightning down conductor cable (a high voltage shielded cable, such as HVSC Plus) is acceptable. The high voltage shielded cable shall consist of a core filler, stranded aluminium main conductor with semiconductive screen layer, insulation material with semiconductive screen layer, outer copper conductor and a PVC sheath or jacket. The high voltage shielded cable shall have a voltage withstand capability of more than 480 kV. The high voltage shielded cable shall be certified by an independent high voltage laboratory.

4.3 The main conductor within the high voltage shielded cable shall have a minimum cross sectional area of 50 mm².

4.4 The outer diameter of the high voltage shielded cable shall be less than 38 mm.

4.5 The high voltage shielded cable shall have a maximum inductance of 25 nH/m.

4.6 The main conductor shall allow for direct connection to the lightning rod through the use of a compression lug.

4.7 The high voltage shielded cable shall be fixed to the structure through the use of conductive saddles every 2 metres for the length of the cable route.

4.8 The high voltage shielded cable shall be installed per the manufacturer's instructions and shall not be subjected to bend radii of less than 0.6 metres.

EVENT RECORDING DEVICE

5.1 All systems shall be installed complete with the lightning strike recorder.

5.2 The lightning strike recorder shall contain a mechanical 6 digit display which will register all lightning peak currents exceeding 1500 A (when tested with an 8/20 µs impulse waveform).

5.3 The lightning strike recorder shall be housed in an IP 65 rated enclosure and will operate without reliance on batteries or an external power source.

5.4 The lightning strike recorder shall be installed per the manufacturer's instructions.

EARTHING

6.1 The earthing system shall comprise one or more lengths of 25 x 3 mm flat copper tape buried to a depth of no more than 800 mm, or deep driven, copper-bonded, steel-core earth rods. All components of the earthing system shall be electrically connected to the central injection rod which is securely connected to the lower end of the high voltage shielded cable.

6.2 The earthing system shall be installed so that the final impedance reading does not exceed 10 □, unless otherwise stipulated by the lightning protection manufacturer or consulting engineer.

6.3 It is recommended that the earthing system is bonded to all structural reinforcing steel of the building, along with all connecting services.

6.4 The use of earth resistance improvement material shall be applied in order to reduce the overall resistance levels of the earthing system.

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