Technical reference
Lightning protection to NFPA & UL standards

Within certain markets installation of an LPS, including component selection, is governed by American NFPA and UL standards rather than their IEC/BS EN equivalent.

The appropriate standards for lightning protection in these markets are:
- UL 96 Lightning Protection Components
- UL 467 Grounding and Bonding Equipment
- NFPA 780 Standard for the Installation of Lightning Protection Systems
- UL 96A Installation Requirements for Lightning Protection Systems

UL 96 and UL 467 are product standards for lightning protection components; NFPA 780 and UL 96A are application standards governing satisfactory installation of an LPS.

UL 96 & UL 467

These standards define the requirements for lightning protection components, including their design, material composition, performance and testing to ensure they are suitable for application in an LPS. UL 96 covers above ground lightning protection components, including:
- Air termination components (air terminals and bases)
- Conductors
- Connector fittings (conductor clips, clamps, bimetallic connectors and bonding plates etc)

Components are divided into 3 Classes, to reflect their intended application (Class I, Class II, Class II modified).

UL 467 covers grounding (UK - earthing) and bonding equipment used to create a grounding system in line with the requirements of NFPA 780. Products include:
- Ground clamps, bushings and fittings
- Grounding electrodes (rods/plates) and ground mesh

Products are determined suitable for use in an LPS following testing and evaluation by UL. Where a product successfully passes UL evaluation it may carry a UL Mark appropriate to the testing carried out.

Installation of lightning protection systems to NFPA 780/UL 96A

Application standards NFPA 780 and UL 96A cover assessment of risk from lightning and installation of an appropriate LPS. Structures to be protected are defined as one of two classes, as follows, which correlates back to the product grade which should be installed:
- **Class I:** buildings less than 75 feet in height
- **Class II:** structures greater than 75 feet in height, and special structures such as heavy duty stacks and steeples

Three options are proposed for the design of air termination systems:
- **Air termination placement:** Air terminals are placed in a grid pattern at intervals of up to 20 or 25 feet
- (dependent on air terminal height), with a relaxation in the spacing if air terminals are not on the perimeter of the structure (for roof lengths or widths exceeding 50 feet). These spacings
- apply to flat or gently sloping roofs only with more complex roof structures requiring specific design to protect all parts
- **Rolling sphere method:** Similar in principle to IEC/BS EN 62305, though with a single sphere radius of 150 feet. At all times the rolling sphere should only be in contact with the tips of the air terminals and not the fabric of the structure
- **Protective angle method:** Based on the ratio of height/size of a higher building with regard to a lower one. It does not apply for structures over 50 feet in height, where air termination placement or the rolling sphere should be used

Installed air terminals (air rods) should not be less than 10” in length or ⅜” in diameter, and where above 24” in height require bracing at minimum half their height.

There should be at least two down conductors from air termination system to the grounding system, which should be secured to the structure with suitable connectors at intervals no more than 3 feet apart.

Air termination and down conductor components can be manufactured from copper, copper alloy or electrical grade aluminium, unless otherwise specified, on the proviso that:
- Copper components should not be in contact with aluminium or external galvanized steel surfaces
- Aluminium products should not be in contact with the earth, be set in concrete or masonry, be installed in wet locations, or be in contact with coated surfaces using alkaline paint

The grounding system for lightning protection should be bonded to all other grounding systems at the structure, including those for power and communication, as well as underground metallic services (utilities etc). The bonding conductor should be the same size as the main down conductor and main system conductor.

Grounding electrodes can be rods or plates. Rods should not be less than ½” in diameter and 8 feet in length, and should be manufactured from copperbonded steel, solid copper or stainless steel. Grounding arrangements using ringed conductors or steel rebars are also acceptable.

Note: products shown in this catalogue with the UL Mark have been successfully evaluated by UL.