

# NFPA 780

## 2008 Edition

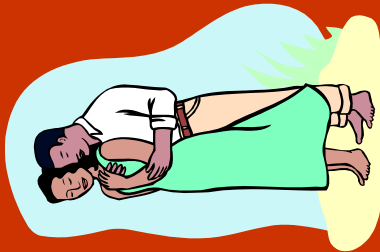
ULPA/LPI Annual Conference

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Orlando, FL

# Materials

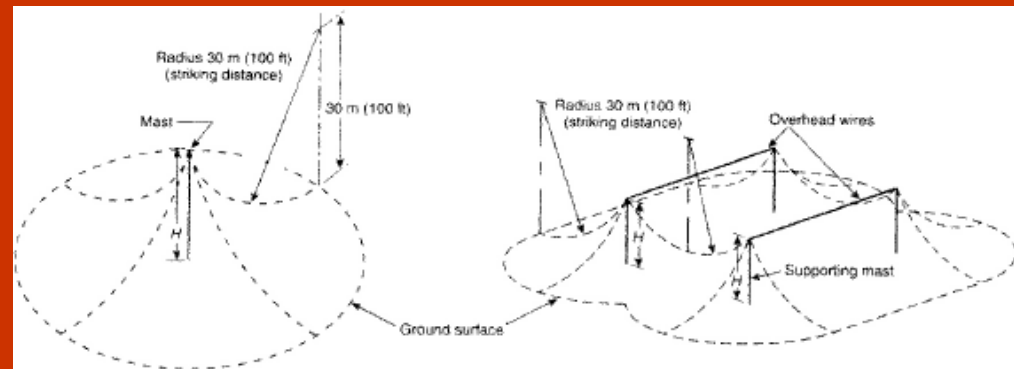
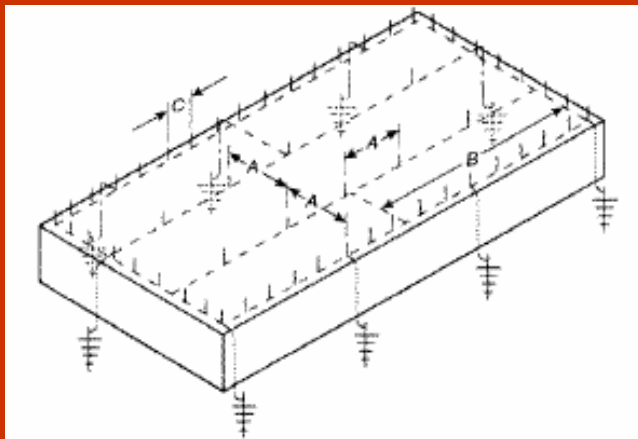
- Copper lightning protection materials shall not be installed on or in contact with aluminum roofing, aluminum siding, or other aluminum surfaces.



- Aluminum lightning protection materials shall not be installed on or in contact with copper surfaces.

# Strike Termination

- Par. 4.6.1.1 Strike termination devices include air terminals, metal masts, permanent metal parts of structures as described in Section 4.9, and overhead ground wires. Combination of these strike termination devices shall be permitted.

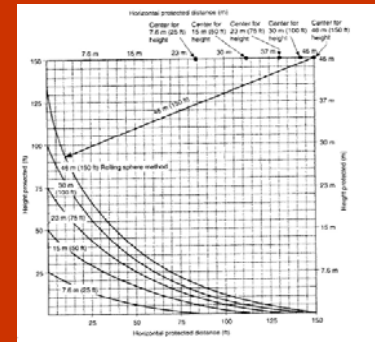


# Zone of Protection

- Wording is changed in various paragraphs from Rolling Sphere **Model** to Rolling sphere **Method**.



# Zone of Protection



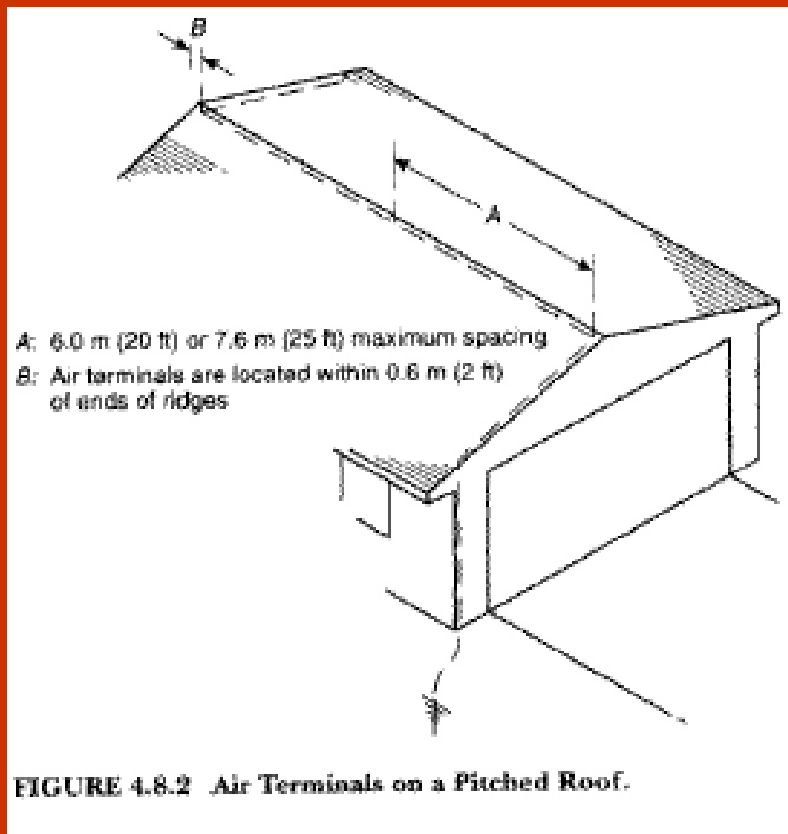
- The formula terms are changed to use the value **R = rolling sphere radius** (150 ft. or 46m for ordinary structures) – So the formula now reads:

$$d = \sqrt{h_1(2R - h_1)} - \sqrt{h_2(2R - h_2)}$$

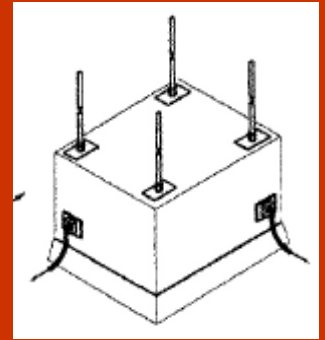
- Same term change in 7.3.3.4, where **R = rolling sphere radius** (100 ft. or 30 m for hazardous structures)

# Strike Termination

- 4.8.2 – Location of Devices. As shown in Figure 4.8.2, the distance between strike termination devices and ridge ends on pitched roofs, or edges and outside corners of flat or gently sloping roofs, **shall not exceed** 0.6m (2 ft.). (replaces - at or within)



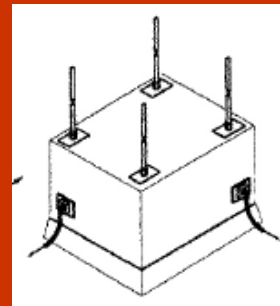
# Strike Termination



- **NEW 4.8.9 – Metal Roof Top Units**. Roof top mechanical units with continuous metal housings less than 4.8 mm (3/16 in.) thick such as air conditioning / heating units, metal air intake / exhaust housings, cooling towers, and so forth, shall be protected by 4.8.9.1 through 4.8.9.2.2.
- 4.8.9.1 Air terminals shall be installed in accordance with 4.8.1 and 4.8.2.
- 4.8.9.1.1 These air terminals shall be mounted on bases having a minimum contact area of 1940 mm<sup>2</sup> (3 in.<sup>2</sup>) each secured to bare metal of the housing or mounted by drilling and tapping to the unit's frame per 4.16.3.2 and 4.16.3.3.

# Strike Termination

- **(NEW 4.8.9 – Metal Roof Top Units - contd.)**
- 4.8.9.2 At least two main-sized conductors shall be installed.
- 4.8.9.2.1 The connection shall be made to bare metal at the base or lower edges of the unit using main size lightning conductors and bonding devices that have a surface contact area of not less than 1940 mm<sup>2</sup> (3 in.<sup>2</sup>) and shall provide two or more paths to ground, as is required for strike termination devices.
- 4.8.9.2.2 These two main bonding plates shall be located as far apart as practicable at the base or lower edges of the unit's electrically continuous metal housing and connected to the lightning protection system.



# Main Conductors

## 4.9.3 Substitution of Main Conductors

4.9.3.1 Ancillary metal parts of a structure, such as eave troughs, downspouts, ladders, chutes, or other metal parts **except as permitted in 4.16.1** shall not be substituted for the main conductor.

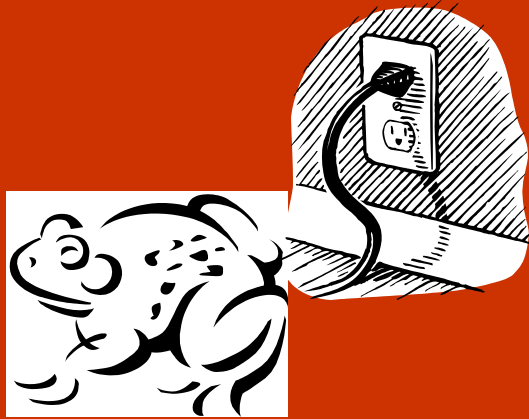
(4.16.1 – General. The structural steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.)

4.9.3.2 – Permanent exterior metal handrails and ladders that are **subject to direct lightning strikes (e.g., on roofs or between roofs)** and are electrically continuous shall be permitted to be used as main conductors where the minimum thickness is 1.63 mm (0.064 in.)



# Grounding

- The term is now “Grounding Electrode”, not “Grounding or Ground **Terminal**”

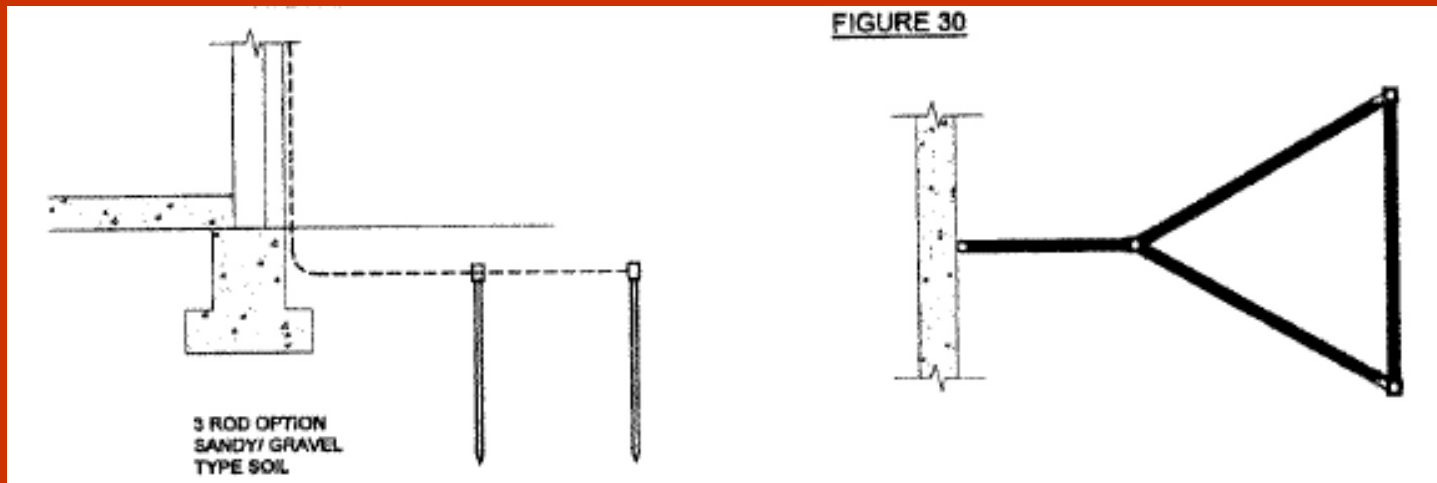


4.13.1.5 Grounding electrodes shall be copper-clad steel, solid copper, or stainless steel. (eliminates- galvanized steel)

# Grounding



- Par. 4.13.2.4 Multiple Ground Rods. Where multiple connected ground rods are used, the separation between any two ground rods shall be at least the sum of their **driven depths** where practicable. (replaces “lengths”)



# Grounding



Par. 4.13.8.1 **Shallow Topsoil.** The methods in 4.13.3 through 4.13.7 shall be used in shallow topsoil conditions where practicable.

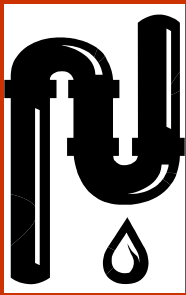
4.13.8.1.1 Where the methods described in 4.13.3 through 4.13.6 are found to be impractical due to topsoil depth less than 460 mm (18 in.), it shall be permitted to provide a ground terminal (*sic*) buried at the maximum depth of topsoil available.

4.13.8.1.2 The ground terminal (*sic*) for shallow topsoil shall be either a ground ring electrode in accordance with 4.13.5, or a plate electrode in accordance with 4.13.6 a minimum distance of 0.6 m (2 ft.) from the foundation or exterior footing. The ground ring electrode shall be buried at maximum depth of topsoil available.

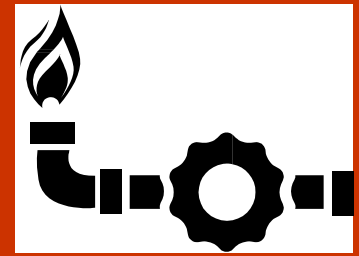


# Grounding

- 4.13.8.1.3 Where a method of 4.13.8.1.2 is impossible, radial(s) shall be permitted to be laid directly on bedrock a minimum distance of 3.6 m (12 ft.) from the foundation or exterior footing. A ground ring electrode encircling the structure shall be permitted to be laid directly on bedrock a minimum distance of 0.6 m (2 ft.) from the foundation or exterior footing.
- 4.13.8.1.4 In those cases where the grounding conductor is laid directly on bedrock, the conductor shall be secured to the bedrock every 0.9 m (3 ft.) by nailing, conductive cement, or a conductive adhesive to ensure electrical contact and protect against movement.



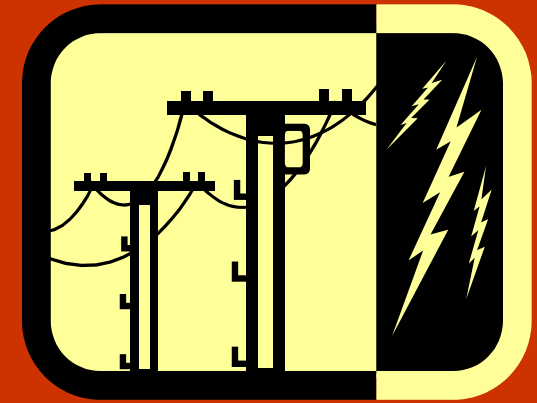
# Bonding



- 4.14.1 General. All grounding media and buried metallic conductors that can assist in providing a path for lightning currents in or on a structure shall be interconnected to provide a common ground potential.
- (See same change in 4.20.1.1 **Ground Level Potential Equalization.**)
- 4.14.1.1 This interconnection shall include lightning protection, electrical service, communications, and antenna system grounds, as well as underground metallic piping systems. (replaces “telephone”)



# Surge Protection



- 4.18.3.1 Electrical Power Circuits.
  - 4.18.3.1.1 The SPD shall protect against a surge produced by a 1.2/50  $\mu$ s, 8/20  $\mu$ s combination waveform generator.
  - 4.18.3.1.2 SPDs at the service entrance shall have an *I<sub>max</sub>* rating of at least 40kA 8/20  $\mu$ s per phase or a nominal discharge current (*I<sub>n</sub>*) rating of at least 20 kA 8/20  $\mu$ s per phase.
- 4.18.3.2 Signal, Data, and Communication Protection. SPDs shall be listed for the protection of signal, data, and communications systems and shall have an *I<sub>max</sub>* rating of at least 10 kA 8/20  $\mu$ s or greater when installed at the entrance.
- 4.18.4 SPDs Measured Limiting Voltage. Where an SPD has been listed as a transient voltage surge suppressor (TVSS) the published suppressed voltage rating (*SVR*) for each mode of protection shall be selected to be no greater than those given in Table 4.18.4 for the different power distribution systems to which they can be connected.

# Surge Protection



- 4.18.6 Communications Surge Protection
- 4.18.6.1 SPDs shall be provided for all communications systems (including but not limited to CATV, alarm, and data) and antenna systems at facility entrances.
- 4.18.6.2 SPDs shall be selected taking into consideration aspects such as the frequency, bandwidth, and voltage. Losses (such as returns loss, insertion loss, impedance mismatch, or other attenuation) introduced by the SPDs shall be within acceptable operational limits.
- 4.18.6.3 SPDs protecting communications systems shall be grounded.

# Watercraft

- Chapter 8 – Protection for Watercraft has been completely rewritten.

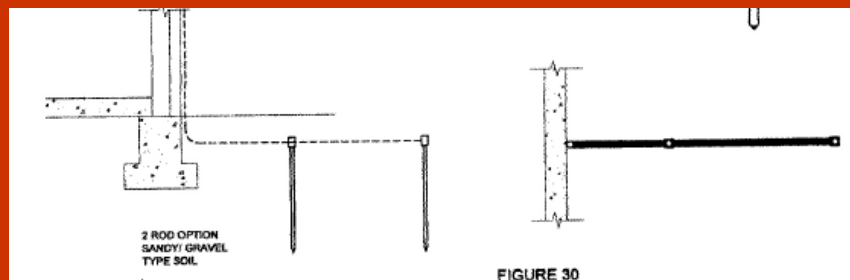
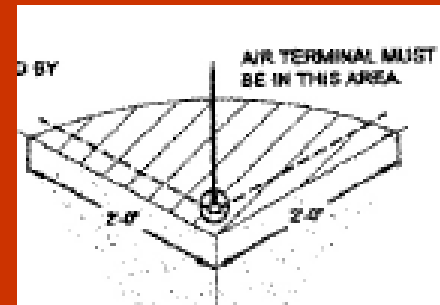


# Annex A (tidbits)



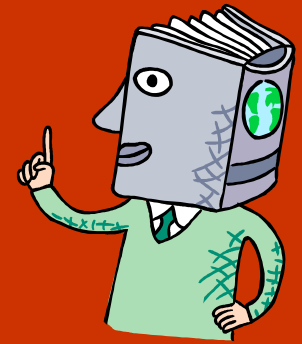
- A.4.7.3.2 It is recognized that the sides of tall structures are subject to direct lightning strikes. Due to the low risk of strikes to the sides of tall structures and the minimal damage caused by these typically low current level discharges, the cost of protection for the sides of tall structures is not normally justified.

A.4.8.2 & A.4.8.8.3 Strike termination devices should be placed as close as practicable to roof edges and outside corners.



- A.4.13.2.4 Minimal benefit is gained from the second ground rod if placed closer than the sum of the driven depth of both rods.

# Annex A (tidbits)



- A.4.13.8.1 For those instances in which it is necessary to install the grounding conductor directly on bedrock, it is recommended that main conductor **solid strips** be utilized...
- A.4.14.1 **Isolating spark gaps** can be used to provide the required bond in those cases where galvanic corrosion is a concern or where direct bonding is not allowed by local code...
- A.4.18.2.5 Most services to facilities will require discrete surge suppression devices .... Occasionally, services will be located in an area or manner where the threat from lightning induced surges and overvoltage might be negligible. For example, ... **exempt services** less than 30 m **(100 ft.) in length that are run in grounded metal conduit** ... Other examples ... where **fiber optic** transmission lines (with no conducting members) are used.

# Annex B



- Principles of Lightning Protection
- **B.2 Lightning Protection Systems**. There is a new series of paragraphs discussing the physics of lightning attachment, and how cone of protection and the rolling sphere method are derived technically.

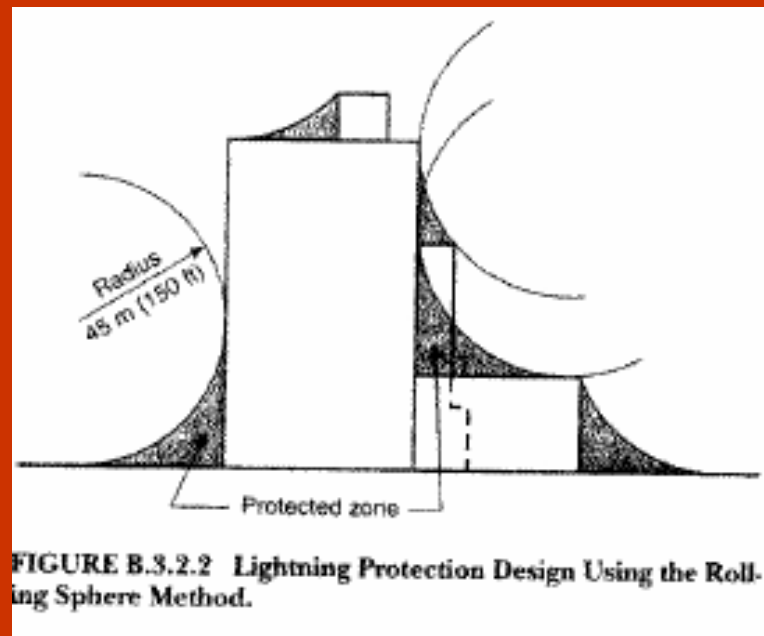
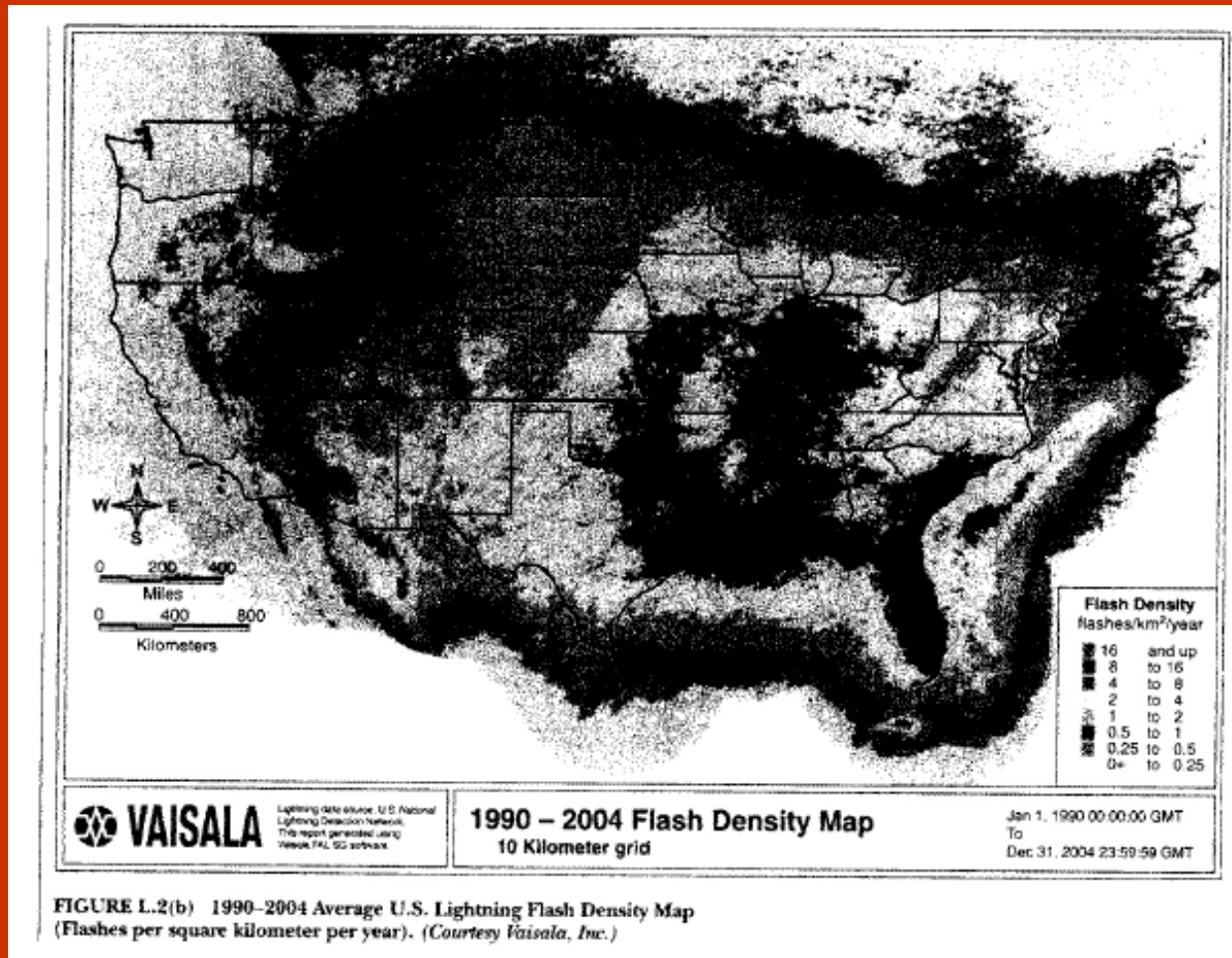


FIGURE B.3.2.2 Lightning Protection Design Using the Rolling Sphere Method.

# Annex L – Risk Assessment

- Figure L.2(b) **1990 – 2004 Flash Density** Map (Vaisala)



# New Annex N

- Wind Turbine Generator Systems



- this is an entirely new Annex covering information relevant to Wind Turbine protection.

# Schedule for 2010 cycle 2011 Document

- Public proposal closing date 12/1/08
- Date for ROP review meeting 2/9-11/09
- Final date for ROC meeting 11/6/09
- Completion of Reports 1/15/10
- NFPA General meeting 6/5-9/10
- New document issued 7/30/10