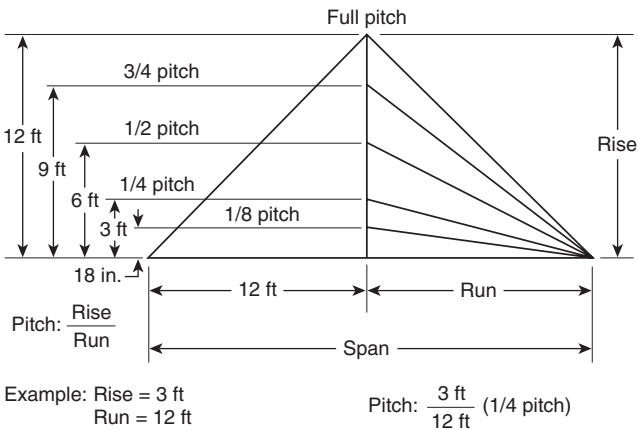


FIGURE 4.1.2 Roof Types: Protection Methods. (Drawings are top and end views of each roof type.)



For SI units, 1 in. = 25.4 mm; 1 ft = 0.305 m.

FIGURE 4.1.2.2 Roof Pitch.

4.4 Mechanical Damage or Displacement.

4.4.1 Any part of a lightning protection system that is subject to mechanical damage or displacement shall be protected with a protective molding or covering.

4.4.2 Where metal pipe or tubing is used around the conductor, the conductor shall be bonded to the pipe or tubing at both ends.

4.5 Use of Aluminum. Aluminum systems shall be installed in accordance with other applicable sections and 4.5.1 through 4.5.3.

4.5.1 Aluminum lightning protection equipment shall not be installed on or in direct contact with copper roofing materials or other copper surfaces, or where exposed to runoff from copper surfaces.

4.5.2 Aluminum materials shall not be used within 460 mm (18 in.) of the point where the lightning protection system conductor comes into contact with the earth.

4.5.2.1 Fittings used for the connection of aluminum down conductors to copper or copper-clad grounding equipment shall be of the bimetallic type.

4.5.2.2 Bimetallic connectors shall be installed not less than 460 mm (18 in.) above earth level.

4.5.3 An aluminum conductor shall not be attached to a surface coated with alkaline-base paint, embedded in concrete or masonry, or installed in a location subject to excessive moisture.

4.6 Strike Termination Devices.

4.6.1 General.

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.

4.6.1.2 Strike termination devices shall be provided where required by other sections of this standard.

4.6.1.3 Metal parts of a structure that are exposed to direct lightning flashes and that have a metal thickness of 4.8 mm ($\frac{3}{16}$ in.) or greater shall require only connection to the lightning protection system.

4.6.1.4 Such connections shall provide a minimum of two paths to ground.

4.6.1.5 Strike termination devices shall not be required for those parts of a structure located within a zone of protection.

4.6.2* Air Terminal Height. The tip of an air terminal shall be not less than 254 mm (10 in.) above the object or area it is to protect, as shown in Figure 4.6.2.

4.6.3 Air Terminal Support.

4.6.3.1 Air terminals shall be secured against overturning or displacement by one of the following methods:

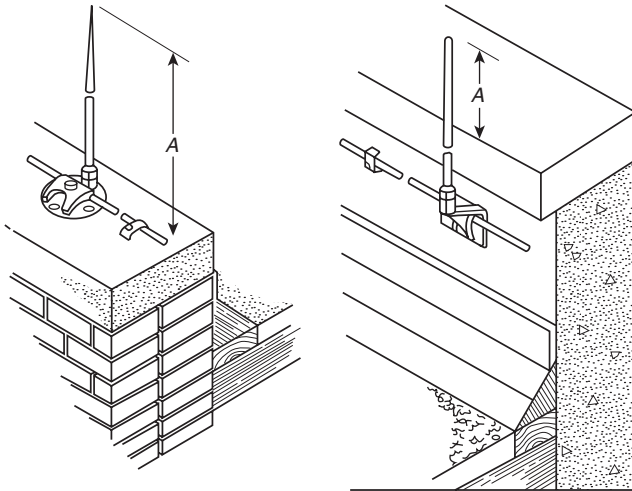
- (1) Attachment to the object to be protected
- (2) Braces that are permanently and rigidly attached to the structure

4.6.3.2 Air terminals exceeding 600 mm (24 in.) in height above the area or object they are to protect shall be supported at a point not less than one-half their height, as shown in Figure 4.6.3.2.

4.6.4 Ornaments.

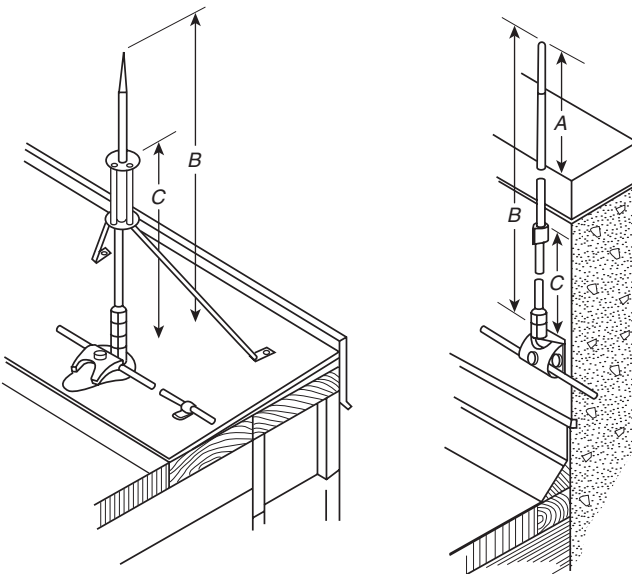
4.6.4.1 An ornament or decoration on a freestanding, unbraced air terminal shall not present, in any plane, a wind-resistance area in excess of 0.01 m² (20 in.²).

4.6.4.2 The requirement of 4.6.4.1 shall permit the use of an ornamental ball 127 mm (5 in.) or less in diameter.



A: 254 mm (10 in.)
 Note: Air terminal tip configurations can be sharp or blunt.

FIGURE 4.6.2 Air Terminal Height.



A: 600 mm (24 in.)
 B: Air terminals over 600 mm (24 in.) high are supported
 C: Air terminal supports are located at a point not less than one-half the height of the air terminal
 Note: Air terminal tip configurations can be sharp or blunt.

FIGURE 4.6.3.2 Air Terminal Support.

4.7 Zones of Protection. The geometry of the structure shall determine the zone of protection. One or more methods, as described in 4.7.1 through 4.7.3.4.2, shall be used to determine the overall zone of protection.

4.7.1 Roof Types. The zone of protection for the following roof types shall include the roof and appurtenances where protected in accordance with Section 4.8:

- (1) Flat or gently sloping roofs
- (2) Dormers

- (3) Domed roofs
- (4) Roofs with ridges, wells, chimneys, or vents

4.7.2 Multiple-Level Roofs.

4.7.2.1 For structures with multiple-level roofs no more than 15 m (50 ft) in height, the zone of protection shall include areas as identified in 4.7.2.3 and 4.7.2.4.

4.7.2.2 The zone of protection is a cone with the apex located at the highest point of the strike termination device, with its surface formed by a 45-degree or 63-degree angle from the vertical.

4.7.2.3 Structures that do not exceed 7.6 m (25 ft) above earth shall be considered to protect lower portions of a structure located within a one-to-two zone of protection as shown in Figure 4.7.2.3(a) and Figure 4.7.2.3(b).

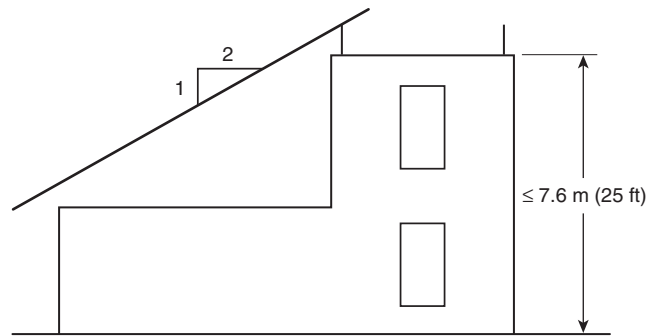


FIGURE 4.7.2.3(a) Lower Roof Protection for Flat Roof Buildings 7.6 m (25 ft) or Less in Height.

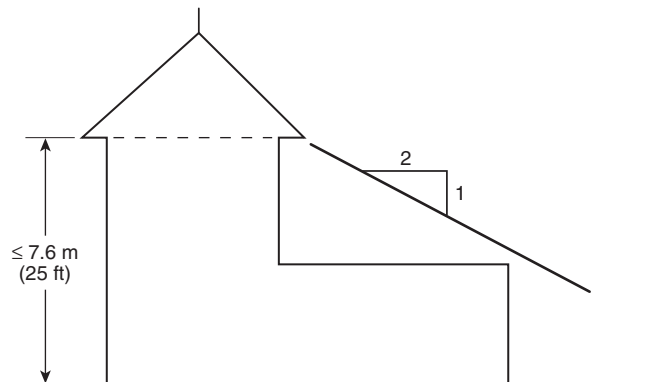


FIGURE 4.7.2.3(b) Lower Roof Protection Provided by Pitched Roof Buildings 7.6 m (25 ft) or Less in Height.

4.7.2.4 Structures that do not exceed 15 m (50 ft) above earth shall be considered to protect lower portions of a structure located within a one-to-one zone of protection as shown in Figure 4.7.2.4(a) and Figure 4.7.2.4(b).

4.7.3 Rolling Sphere Method.

4.7.3.1 The zone of protection shall include the space not intruded by a rolling sphere having a radius of 46 m (150 ft).