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Specifications for Lightning Protection



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Specifications for Lightning Protection

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1 Purpose and Scope

1.1 This Engineering Practice is intended as a guide for specifying farm lightning protection systems, and to check existing, new or proposed lightning protection systems against accepted standards of design, materials, and installation.

1.2 This Engineering Practice is applicable to protection of farm homes, barns, sheds, silos, slatted floors, fences, trees, barn equipment and other sizable bodies of conductance or inductance. Included are ordinary structures up to 23 m (75 ft) high.

1.3 Common assemblies on typical buildings are detailed to show current practices under normal conditions. Examples cannot cover the wide range of structural variations existing on farms. It is recommended that when a condition is not covered herein, the owner or his agent obtain engineering consultation by an engineer experienced in lightning protection principles, theories, and installation requirements, or from an established and recommended manufacturer or distributor of lightning protection materials and equipment.

1.4 In areas not covered by this Engineering Practice, refer to the National Fire Protection Association Standard No. 78, Lightning Protection Code; Underwriters' Laboratories Standard, Requirements for Master Label Lightning Protection; or Lightning Protection Institute Standard LPI-175, Installation Code.

2 Materials

2.1 Materials for lightning protection shall be inherently resistant to corrosion or properly protected against corrosion. No materials shall be combined which form an electrolytic coupling that accelerates corrosion.

2.2 Copper commonly required for commercial electrical work, with 98% conductivity when annealed, is the preferred material for farm lightning protection. Other acceptable materials are listed in paragraphs 2.3, 2.4 and 2.5. Material such as galvanized steel is not acceptable except as specified elsewhere in this Engineering Practice.

2.3 Alloyed metals used shall be substantially as resistant to corrosion and have the same conductivity as copper under similar conditions.

2.4 Copper-clad steel shall have a copper covering permanently and effectively welded to the steel core, in such proportions that conductance is not less than 30% of the conductance of an equivalent cross section of solid copper.

2.5 Aluminum is acceptable as a substitute for copper in lightning protection, with the stipulations that (a) aluminum shall not be used underground, in contact with ground or where air may be laden with corrosive

elements; (b) when an aluminum system is joined with copper or copper-clad grounds, the union shall be made with approved bimetal connectors; (c) precautions be taken at connections with dissimilar metals; and (d) cable conductors be of electrical conductor grade aluminum.

2.6 Materials shall be used in those forms and sizes specified in the following Sections: Air Terminals, Conductors, Grounding, and Connectors and Other Fittings.

3 Air Terminals

3.1 Air terminals are the topmost elements of the lightning protection system and are designed to intercept a direct stroke. They must be so placed and spaced that it is assured lightning will strike one or more of the terminals, not a vulnerable part of the roof or a projection.

3.2 Air terminals shall be 9 mm (3/8 in.) minimum diameter for solid copper or 13 mm (1/2 in.) minimum for solid aluminum. Tubular air terminals shall have a wall thickness of 0.8 mm (0.032 in.) for copper and 1.63 mm (0.064 in.) for aluminum, with a minimum 16 mm (5/8 in.) outside diameter.

3.3 Air terminals shall extend above the protected object at least 254 mm (10 in.) but no more than 914 mm (36 in.). If over 610 mm (24 in.) high, air terminals shall be suitably braced.

3.4 Air terminals up to 610 mm (24 in.) high shall be spaced at intervals of 6.1 m (20 ft) or less; those 610 mm (24 in.) or higher shall be spaced at 7.6 m (25 ft) intervals or less. Terminals shall be placed on the ridges of gable, gambrel, and hip roofs of ordinary or high slope, and at the perimeters of flat or low-slope roofs. A shed roof with a high or normal slope shall be considered as half of a gable roof. There shall be an air terminal within 0.6 m (2 ft) of the end of each ridge or each corner of a flat or low-slope roof.

3.5 Air terminals shall be placed within 0.6 m (2 ft) of the edge along the perimeter of a flat or low-slope roof. A low-slope roof is one which is 12.2 m (40 ft) wide or less and has a pitch of 1/8 or less; or is over 12.2 m (40 ft) wide and has a pitch of 1/4 or less. The center of such a roof shall have intermediate air terminals at intervals not exceeding 15.2 m (50 ft).

3.6 Chimney air terminals may be anchored directly, or secured by an acceptable metal band around the chimney. No outside corner of a chimney shall be more than 0.6 m (2 ft) from an air terminal. Copper chimney air terminals and all related components shall be hot-dip lead coated to prevent corrosion. Aluminum points, cable and fittings on chimneys need not be lead coated.

3.7 All dormers and roof projections as high or higher than the main ridge shall be fully protected. Prominent dormer and roof extensions lower than the main roof require protection according to their size, within spacing requirements for air terminals. If a major dormer gives a roof a low-rise configuration, it shall be so treated. The lightning protection system shall be kept continuous through all levels.

3.8 Air terminals may be "dead ended" (connected by only one path to a main conductor) on dormers below the main ridge level if that conductor run is 4.9 m (16 ft) or less in length and is horizontal or downward coursing. Terminals may be "dead ended" on dormers or projections that are level with the main roof, provided the conductor run does not exceed 2.4 m (8 ft).

3.9 Air terminals shall be optional on metal roof projections, such as cupolas, ventilators, chimney extensions and caps, air-conditioning units, etc., depending on conductivity. If the metal is of sufficient strength and conductivity to approximate that of a standard air terminal, it may be directly bonded as described in Section 7: Bonding of Metal Bodies. Those not sufficiently conductive shall be protected with air terminals.

4 Conductors

4.1 Main conductors are those used to (a) interconnect air terminals in a direct or a closed-loop roof system; (b) serve as downleads from the roof system to the ground system; (c) connect metal bodies of inductance or