

## SECTION 26 4113

### LIGHTNING PROTECTION FOR STRUCTURES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

##### 1.2 SUMMARY

Retain one of two paragraphs below. See Table 2 in the Evaluations for a list of the standards and the miscellaneous structures and special occupancies that are covered by the referenced standards.

- A. Section includes lightning protection system for ordinary structures.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Include layouts of the lightning protection system, with details of the components to be used in the installation.
  - 2. Include raceway locations needed for the installation of conductors.
  - 3. Details of air terminals, ground rods, ground rings, conductor supports, splices, and terminations, including concealment requirements.

Retain first subparagraph below to ensure coordination with roof installation, so as not to void roof warranty.

- 4. Include roof attachment details, coordinated with roof installation.

The calculations referred to by the subparagraph below determine the sideflash distance. Calculate according to NFPA 780; for UL 96A, use the 6-foot (1.8 m) rule. Metal bodies inside this distance need to be bonded, whereas the metal bodies outside the distance do not.

- 5. Calculations required by NFPA 780 for bonding of metal bodies.

##### 1.4 INFORMATIONAL SUBMITTALS

Retain "Coordination Drawings" Paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

- A. Coordination Drawings: Lightning protection system Shop Drawings, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Lightning protection cabling attachments to roofing systems and accessories.
  - 2. Lightning protection strike termination device attachment to roofing systems, coordinated with the roofing system manufacturer.
  - 3. Lightning protection system components penetrating roofing and moisture protection systems and system components, coordinated with the roofing system manufacturer.

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 01 4000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

- B. Qualification Data: For Installer.

Retain "Product Certificates" Paragraph below to require submittal of product certificates from manufacturers.

- C. Product Certificates: For each type of roof adhesive for attaching the roof-mounted air terminal assemblies, approved by the roofing-material manufacturer.
- D. Field quality-control reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For lightning protection system to include in maintenance manuals.
  - 1. In addition to items specified in Section 01 7823 "Operation and Maintenance Data," include the following:
    - a. Dimensioned site plan showing dimensioned route of the ground loop conductor and the ground rod locations. Comply with requirements of Section 01 7839 "Project Record Documents."
    - b. A system testing and inspection record, listing the results of inspections and ground resistance tests, as recommended by NFPA 780, Annex D.

- B. Completion Certificate:

Retain one of four options in subparagraph below. Coordinate subparagraph below with "Special Inspections" Paragraph in Part 3 "Field Quality Control" Article.

- 1. UL Master Label Certificate

## 1.6 QUALITY ASSURANCE

Retain one of or both installer options in "Installer Qualifications" Paragraph below. Either installer is qualified to install UL- or LPI-certified lightning protection systems.

- A. Installer Qualifications: UL-listed installer, category OWAY

## **PART 2 - PRODUCTS**

Manufacturers and products listed in SpecAgent and Masterworks Paragraph Builder are neither recommended nor endorsed by the AIA or AVITRU. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 01 6000 "Product Requirements."

### **2.1 MANUFACTURERS**

- A. Roof-Mounted Air Terminals: NFPA 780, Class I, copper unless otherwise indicated.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. East Coast Lightning Equipment Inc.
    - b. ERICO International Corporation.
    - c. Harger.
    - d. Heary Bros. Lightning Protection Co. Inc.
    - e. Independent Protection Co.
    - f. Preferred Lightning Protection.
    - g. Robbins Lightning, Inc.
    - h. Thompson Lightning Protection, Inc.

### **2.2 PERFORMANCE REQUIREMENTS**

Retain "NFPA Lightning Protection Standard" or "UL Lightning Protection Standard" Paragraph below. See "Lightning Protection Standards" Article in the Evaluations for a discussion of whether or not to retain the requirement of complying with NFPA 780 or UL 96.

- A. NFPA Lightning Protection Standard: Comply with NFPA 780 requirements for Class I buildings.

Retain "Lightning Protection Components, Devices, and Accessories" Paragraph below to specify that components of lighting protection system comply with requirements of lighting protection standard chosen in retained paragraph above.

### **2.3 MATERIALS**

NFPA 780, LPI 175, and UL 96A stipulate minimum size requirements for components, depending on selected metal and class of building. To require components larger than minimum size, to specify component material composition, or for Projects with unique lightning protection requirements, add component requirements here.

The specified standards prohibit the use of aluminum conductors and materials embedded in concrete or masonry, or installed in a location subject to excessive moisture, and within 18 in (460 mm) of the point where the lightning protection system conductor comes into contact with the earth.

- A. Air Terminals:
  - 1. Copper unless otherwise indicated.
  - 2. 24 inches (610 mm)] long.
  - 3. Rounded tip.
  - 4. Threaded base support.

Retain "Air Terminal Bracing" Paragraph below for terminals more than 24 inches (610 mm) in height that require bracing.

B. Air Terminal Bracing:

1. Copper.
2. 1/4-inch (6-mm)] diameter rod.

Retain "Class 1 Main Conductors" Paragraph for structures less than 75 feet (23 m) high, or retain "Class II Main Conductors" Paragraph below for structures more than 75 feet (23 m) high. Secondary conductor shall be of same material composition as main conductor.

C. Class 1 Main Conductors:

1. Stranded Copper: 57,400 circular mils in diameter.

D. Secondary Conductors:

1. Stranded Copper: 26,240 circular mils in diameter.

Retain "Ground Loop Conductor" Paragraph below if soil conditions at the Project site dictate the use of tinned conductors. If a ground ring is present, a ground loop may not be required. See discussion of ground rings in "Grounding and Bonding" Article in the Evaluations.

E. Ground Loop Conductor: Tinned copper

Copper-clad, steel ground rods are the most common grounding electrodes. See "Corrosion" Article in the Evaluations for assistance in selecting ground rod materials. UL 96 and NFPA 780 allow the use of ground rods no less than 1/2 inch (12.7 mm) in diameter and 96 inches (2400 mm) long. The smallest ground rod size commonly available is 5/8 inches (16 mm) in diameter by 96 inches (2400 mm) long.

F. Ground Rods:

1. Material: Copper-clad steel

Retain one of first two subparagraphs below if minimum dimensioned rods do not comply with Project requirements. The heavier rod dimensions give additional strength that may be needed due to soil conditions, but do not improve ground resistance.

2. Diameter: [5/8 inch (16 mm)] [3/4 inch (19 mm)].
3. Rods shall be not less than 120 inches (3050 mm) long.

Retain "Conductor Splices and Connectors" Paragraph below to prevent use of finger-, crimp-, and saddle-type cable connectors.

G. Conductor Splices and Connectors: Compression fittings that are installed with hydraulically operated tools, or exothermic welds, approved for use with the class type.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

Revise first paragraph below to indicate which standards apply. Retain UL 96A if just compliance with UL Master Label or LPI certification is desired. Retain NFPA 780 if the most stringent or comprehensive requirements are needed.

- A. Install lightning protection components and systems according to NFPA 780.
- B. Install conductors with direct paths from air terminals to ground connections. Avoid bends less than 90 degrees and 8 inches (203 mm) in radius and narrow loops.
- C. Conceal conductors within normal view from exterior locations at grade within 200 feet (60 m) of building. Comply with requirements for concealed systems in NFPA 780.
  - 1. Roof penetrations required for down conductors and connections to structural-steel framework shall be made using listed through-roof fitting and connector assemblies with solid rods and appropriate roof flashings. Use materials approved by the roofing manufacturer for the purpose. Conform to the methods and materials required at roofing penetrations of the lightning protection components to ensure compatibility with the roofing specifications and warranty.
  - 2. Install conduit where necessary to comply with conductor concealment requirements.

Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems." Retain "Air Terminals on Single-Ply Membrane Roofing" Subparagraph below for single-ply membrane roofing.

- 3. Air Terminals on Single-Ply Membrane Roofing: Comply with adhesive manufacturer's written instructions.

A ground ring installation based on requirements in Section 26 0526 "Grounding and Bonding for Electrical Systems" may be used as a ground loop for the lightning protection system, provided the counterpoise conductor complies with or exceeds minimum NFPA 780 requirements.

- D. Ground Ring Electrode: The conductor shall be not less than the main-size lightning conductor.

### **3.2 CONNECTIONS**

NFPA 780 allows for four different connection types (bolted, welded, high compression, and crimp). High-compression connectors and exothermic welds are the only type of connections suitable for both underground and concealed connections. Bolted- or crimp-type connections are suitable for aboveground, interior, and exterior exposed applications.

- A. Aboveground concealed connections, and connections in earth or concrete, shall be done by exothermic welds or by high-compression fittings listed for the purpose.
- B. Aboveground exposed connections shall be done using the following types of connectors, listed and labeled for the purpose: exothermic weld.
- C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

### **3.3 CORROSION PROTECTION**

- A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
- B. Use conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

### **3.4 FIELD QUALITY CONTROL**

Retain first option in "Special Inspections" Paragraph below if Owner engages special inspector. Consider retaining second option if authorities having jurisdiction allow Contractor to engage special inspector. If retaining second option, retain "Field quality-control reports" Paragraph in "Informational Submittals" Article. See "Lightning Protection System Certificates" Article in the Evaluations.

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

Retain one of two subparagraphs below.

1. Perform inspections as required to obtain a UL Master Label for system.
- B. Prepare test and inspection reports and certificates.

**END OF SECTION**