

SECTION 26 41 00

FACILITY LIGHTNING PROTECTION

PART 1 GENERAL

1.1 DESCRIPTION

This section specifies the furnishing and installation of a complete master labeled lightning protection system, complying with NFPA 780, UL96 and UL 96A.

1.2 RELATED WORK

- A. Section 05 50 13, MISCELLANEOUS METAL FABRICATIONS: penetrations through the roof.
- B. Section 26 00.00 20, BASIC ELECTRICAL MATERIALS AND METHODS: General electrical requirements that are common to more than one section of Division 26.
- C. Section 33 71 02.00 20, UNDERGROUND ELECTRICAL DISTRIBUTION: Requirements for grounding system electrical tests.

1.4 QUALITY ASSURANCE

In each standard referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears. Interpret references in these standards to "authority having jurisdiction," or words of similar meaning, to mean Contracting Officer.

1.4.1 Installation Drawings

- a. Submit installation shop drawing for the overall lightning protection system. Drawings shall include physical layout of the equipment, mounting details, relationship to other parts of the work, and wiring diagram.
- b. Submit detail drawings for each major component to include manufacturer's descriptive and technical literature, catalog cuts, and installation instructions.

1.4.2 UL Listing or Label

Submit proof of compliance. Label of or listing in UL Electrical Construction is acceptable evidence. In lieu of label or listing, submit written certificate from an approved, nationally recognized testing organization equipped to perform such services, stating that items have been tested and conform to requirements and testing methods of Underwriters Laboratories.

1.4 SUBMITTALS

In accordance with Section 01 33 00, SUBMITTAL PROCEDURES, submit the

following:

SD-02 Shop Drawings:

1. Isometric and plan views showing layout and connections to the required metal surfaces.
2. Show the methods of mounting the system to the adjacent construction.

SD-07 Certificates: Submit proof that the installer of the lightning protection system is a certified Lightning Protection Institute (LPI) installer, and has had suitable and adequate experience installing other lightning protection systems, and is capable of installing the system as recommended by the manufacturer of the equipment.

Two weeks prior to final inspection, submit four copies of the following certifications to the COR:

1. Certification that the lightning protection system has been properly installed and tested.
2. Certification that the lightning protection system has been inspected by a UL representative and has been approved by UL without variation.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. National Fire Protection Association (NFPA):

70 National Electrical Code (NEC)
780 Standard for the Installation of Lightning Protection Systems
- C. Underwriters Laboratories, Inc. (UL):

96 Lightning Protection Components
96A Installation Requirements for Lightning Protection Systems
467 Standard for Grounding and Bonding Equipment

PART 2 PRODUCTS

2.1 MATERIALS

Do not use a combination of materials that forms an electrolytic couple of such nature that corrosion is accelerated in presence of moisture unless moisture is permanently excluded from the junction of such metals. Where unusual conditions exist which would cause corrosion of conductors, provide conductors with protective coatings or oversize conductors. Where mechanical hazard is involved, increase conductor size to compensate for hazard or protect conductors by covering them with molding or tubing made of wood or nonmagnetic material. When metallic conduit or tubing is provided, electrically bond conductor to conduit or tubing at the upper and

lower ends by clamp type connectors or welds (including exothermic).

- A. Attach master labels to each item by its manufacturer as evidence that the materials have been manufactured in conformance with the UL Standards for master label lightning protection materials.
- B. In addition to conformance to UL 96, the component material requirements are as follows:
 - 1. Copper Conductors: UL Listed Lightning protection grade for lightning protection systems. Lightning Conductors shall be in accordance with NFPA 780 and UL 96 for Class I, Class II, or Class II modified materials as applicable.
 - 2. Aluminum Conductors: UL Listed Lightning protection grade for lightning protection systems. Do not allow aluminum to contact the earth and do not use in any other manner that will contribute to rapid deterioration of the metal. Observe appropriate precautions at connections with dissimilar metals in accordance with NFPA 70 Article 1100-14. Provide aluminum cable conductors for bonding and interconnecting metallic bodies to main cable that are at least equivalent to strength cross-sectional area of a No. 4 AWG aluminum wire. When perforated strips are provided, use strips that are much wider than solid strips. Use a strip width that is at least twice that of the diameter of the perforations. Use an aluminum strip which has a thickness of not less than the diameter of No. 12 AWG and at least 1 1/2 inches wide for connecting exposed water pipes.
 - 3. Provide Air Terminals in accordance with UL 96, except provide Class II for Class I and Class II applications. Support air terminals more than 24 inches in length by suitable brace, with guides, not less than one-half the height of the terminal.
 - 4. Ground rods: Copper clad steel, not less than 3/4 inch diameter by 10 feet long. Rods made of copper-clad steel shall conform to UL 467 and galvanized ferrous rods shall conform to IEEE C135.30. Ground rods of copper-clad steel, steel, stainless steel, galvanized ferrous, and solid copper shall not be mixed on the project.
 - 5. Tubing: Stiff copper or brass.
- C. Anchors and fasteners: Bolt type which are most suitable for the specific anchor and fastener installations. Clamp-type connectors for splicing conductors shall conform to UL 96, class as applicable, and, Class 2, style and size as required for the installation. Clamp-type connectors shall only be used for the connection of the roof conductor to the air terminal and to the guttering. All other connections, bonds, and splices shall be done by exothermic welds or by high compression fittings. The exothermic welds and high compression fittings shall be listed for the purpose. The high compression fittings shall be the type which require a hydraulically operated mechanism to apply a minimum of 10,000 psi.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. Installation shall be coordinated with the roofing manufacturer and installer.
- B. Install the conductors as inconspicuously as practical and with the proper bends.
- C. Install the vertical conductors within the concealed cavity of exterior walls. Run the conductors to the exterior at elevations below the finished grade and make the ground connections to the earth outside of the building or stack perimeter.
- D. Make connections of dissimilar metal with bimetallic type fittings to prevent electrolytic action.
- E. Use the exothermic welding type connections that form solid metal joints in the main vertical and horizontal conductors, and for connections that are not exposed in the finish work.
- F. Protect copper conductors with stiff copper or brass tubing, which enclose the conductors from the top to the bottom of the tubing, between one foot below and seven feet above the finished grade. The conductor shall be bonded to the top and bottom of the tubing.
- G. Sheath copper conductors, which pass over cast stone, cut stone, architectural concrete and masonry surfaces, with not less than a 1/16 inch thickness of lead to prevent staining of the exterior finish surfaces.
- H. For the earth connections, install ground rods, and the conductor connections to them and the main water pipes in the presence of the COR. For the conductors located outside of the building or stack, install the conductors not less than two feet below the finished grade.
- I. For structural steel buildings, connect the steel framework of the buildings to the main water pipe near the water system entrance to the building.
- J. Connect lightning protection cables to all metallic projections, equipment, and components above the roof as indicated on the drawings.
- K. Connect exterior metal surfaces, located within three feet of the lightning protection system conductors, to the lightning protection system conductors to prevent flashovers.
- L. Maintain horizontal or downward coursing of main conductor and insure that all bends have at least an 8-inch radius and do not exceed 90 degrees.
- M. Conductors shall be rigidly fastened every three feet along the roof and down to the building to ground.
- N. Air terminals shall be secured against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces permanently and rigidly attached to the building or structure. Install air terminal bases, cable holders and other roof-system supporting means without piercing roof metal.

- O. Use clamp supports to secure supporting means to roof standing seams only.
- P. Use through-roof connectors for down-conductor attachment to roof system. Provide flashing in accordance with Section 05 50 13, MISCELLANEOUS METAL FABRICATIONS.
- Q. Down-conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel or the structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 100 feet.
- R. Counterpoise shall be of No. 2/0 copper cable and shall be laid around the perimeter of the structure in a trench not less than 2 feet deep at a distance not less than 3 feet nor more than 8 feet from the nearest point of the structure.
- S. Grounding: Test the ground resistance to earth by standard methods and conform to the ground resistance requirements specified in Section 26 00 00.00 20, BASIC ELECTRICAL MATERIALS AND METHODS.
- T. Where shown, use the structural steel framework or reinforcing steel as the main conductor:
 - 1. Weld or bond the non electrically continuous sections together and make them electrically continuous.
 - 2. Verify the electrical continuity by measuring the ground resistances to earth at the ground level, at the top of the building or stack, and at intermediate points with a sensitive ohmmeter. Compare the resistance readings.
 - 3. Connect the air terminals together with an exterior conductor connected to the structural steel framework at not more than 60 foot intervals.
 - 4. Install ground connections to earth at not more than 60 foot intervals around the perimeter of the building.
 - 5. Do not pierce the structural steel in any manner. Connections to the structural steel shall conform to UL Publication No. 96A.
- U. When the lightning protection systems have been installed, have the systems inspected by a UL representative. Obtain and install a UL numbered master label for each of the lightning protection systems at the location directed by the UL representative and the COR.
- V. Metal fences that are electrically continuous with metal posts extending at least 2 feet into the ground require no additional grounding. Other fences shall be grounded on each side of every gate.

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