SECTION 264100 - FACILITY LIGHTNING PROTECTION

1 PART 1 - GENERAL

1.1 SUMMARY:

A. Furnish and install all materials and labor required to provide a complete functional lightning protection and common ground system for the existing facility and new addition as shown and detailed on the plans, in accordance with these specifications. At completion, provide Owner with a UL Letter of Findings for the complete lightning protection system.

B. Types of lightning protection system material and components specified in this section include the following:

1. Air terminals
2. Bonding plates
3. Conductors
4. Connectors
5. Grounding plates
6. Grounding rods
7. Rod connections
8. Splicers

C. The detailed design of the lightning protection system shall be by the Contractor.

1.2 QUALITY ASSURANCE:

A. Manufacturers: Firms regularly engaged in manufacture of lightning protection system components, of types, sizes, and ratings required, and who are Class I manufacturer- members of Lightning Protection Institute.

B. Designer/Installer's Qualifications: Firm with at least 2 years of successful design/installation experience with projects utilizing lightning protection systems similar to that required for this project. NEC Compliance: Comply with NEC requirements pertaining to grounding, grounding electrodes and down conductor clearances.

C. NFPA Compliance: Comply with requirements of NFPA 780 "Lightning Protection Systems," as applicable to lightning protection systems for building projects.

D. ANSI Compliance: Comply with applicable requirements of ANSI Std. C2, C62.1, C62.2 and C114.1.

E. Obtain building plans from the Architect for use in designing the lightning protection system.

F. It is recommended the Contractor perform a soils analysis prior to submitting shop drawings to determine appropriate grounding system layout.

1.3 SUBMITTALS:

A. See Section 26 05 00 Common Work Results for Electrical for Submittal requirements. Supplemental information is listed within this section.

B. Product Data: Submit manufacturer's data on lightning protection system and all associated components. Include data for roof adhesive when used.

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C. Shop Drawings: Submit layout drawings of lightning protection system equipment and components including, but not limited to, conductor routing, connections, mounting details, air terminal locations, bonds to equipment and miscellaneous connections and grounding. Use roof plan(s) from the Architect as the background for the shop drawings. Review architectural drawings to determine types of materials to which lightning protection system equipment will be bonded/attached. Provide components to avoid dissimilar metal reaction.

D. UL Certification: Provide Owner with UL Master Label Certification for overall system, both new and existing. Provide certificate with warranty/operations and maintenance manual. Comply with UL 96A, "Master Labeled Lightning Protection Systems."

2 PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements, manufacturers offering lightning protection components which may be incorporated in the work include, but are not limited to, the following:

1. Conductors and Air Terminals:

   a. American Lightning Rod Co.
   b. Approved Lightning Protection Co., Inc.
   c. Capital Lightning Protection Co., Inc.
   d. Independent Protection Co., Inc.
   e. Thompson Lightning Protection, Inc.
   f. Lightning and Grounding Systems, Inc.
   g. A-C Lightning Security, Inc.
   h. Harger Lightning Protection, Inc.
   i. National Lightning Protection Corporation
   j. VFC Lightning Protection
   k. Prevectron
   l. Franklin

2.2 LIGHTNING PROTECTION SYSTEM COMPONENTS:

A. General: Provide lightning protection system materials and components, of types, sizes, ratings, for the Class of service indicated, which comply with manufacturer's standard materials, design, and construction in accordance with published product information, and as required for complete installation. Where type of components or materials are not otherwise indicated, comply with U.L., NFPA 780 and LPI (Lightning Protection Institute) standards. B. Class 1 Installation Materials:

1. Air Terminals: Solid copper; minimum diameter 3/8 inches (9.5mm), cast bronze base with bolted pressure cable connection.

2. Main Conductors: Copper cable; minimum size strand diameter, 0.045 inches (1.150mm - 17 AWG); 0.187#/ft. (278 g/m); 57,400 circular mils (29 sq. mm).

3. Secondary Conductors: Copper cable; minimum size strand diameter 0.045 inches (1.150mm - 17 AWG); number of wires 14.

2.3 ANCILLARY COMPONENTS:

A. Air Terminals: Bronze beam type, with clamp to fit 4inches to 8 inches beam with 8 sq in of surface contact; with 10 inches x ½ inch solid copper point with polished nickel-plated tip.

B. Air Terminals: Copper for concealed installation; 10 inches exposed with blunt point, ½ inch x 12 inches long solid copper stem, lead washer, support bracket and adjustable clamp type cable connector.

C. Connectors: Bronze right-angle thru-roof cable connector; bronze and lead seal flashing washer, ½ inch threaded stem, to fit roof thickness.

D. Connectors: 4 inch bronze parallel bonding clamp for connecting 1/0 or 2/0 cables where exothermic is not allowed by this specification.

E. Splicer: Where exothermic welding is not allowed, bronze straight cable splicer for splicing No. 4 and No. 6 cables.

F. Splicer: Where exothermic welding is not allowed, bronze pressure type "T" cable splicer for clamping standard cables through 2/0, with hex bolts and washers.

G. Coordinate with roofing system installer for all penetrations through the roof.

H. Ground Rod: Solid copper clad steel ¾ inch diameter x 10'.

I. Ground Rod Connection: Exothermic weld.

J. Adhesive Point Base: Cast bronze base plate with stainless steel bolt and washer, pressure type cable connector. Base shall be fastened using manufacturer approved adhesive or plastic roof cement.

K. Adhesive Flat Cable Holder: Copper cable fastener plate, up to and including 2/0. Plate shall be fastened using manufacturers approved adhesive or plastic roof cement.

L. Bonding Plate: 8 sq in steel plate with 1 inch diameter bolt-hole for bonding cable to structural steel, with vice-grip type cable connector with 2 inches of cable contact.

M. Equipment and Miscellaneous Bonds: Two hole bolted pressure clamps secured with stainless steel hardware.

N. Cable Fasteners: Copper compatible with the cable and mounting surface.

3 PART 3 - EXECUTION

3.1 INSTALLATION OF LIGHTNING PROTECTION SYSTEMS:

A. Install lightning protection systems as required, in accordance with equipment manufacturer's written instructions, and in compliance with applicable requirements of NEC, UL96A and NFPA 780 to ensure that lightning protection systems comply with requirements.

B. Coordinate with other work, including electrical wiring and roofing work, as necessary to interface installation of lightning protection system with other work.

C. Install conductors with direct paths from air terminals to ground connections avoiding sharp bends and narrow loops.

D. Install surge arresters as close as practical to equipment which they are to protect.

E. Conceal all system conductors as viewed from exterior grade level within 200 feet of building. Notify Architect/Engineer at least 24 hours before concealing lightning protection system components.

F. Secure conductors to structure every 3 feet minimum, using cable fasteners screwed to the structure.

G. Provide locator survey done to identify all utility piping, ducts, all underground obstructions, piping from building, etc., prior to driving new ground rods. Ground rod location shall be adjusted to avoid all obstructions. Do not install new ground rods outside property line. I. Coordinate with roofing system installer for all penetrations through the roof.

J. Provide anti-oxidation compound (Penetrox, etc.) between all surfaces of mechanical connections. Wipe off excess compound.

3.2 GROUNDING AND BONDING:

A. Provide equipment grounding and bonding connections, sufficiently tight to assure permanent and effective grounds and bonds.

1. Cable Connections: Use approved exothermic-welded connections for all conductor splices and connections between conductors and other components, except those above single-ply membrane roofing.

2. Bond all metallic objects and systems at roof levels and elsewhere on the structure. Primary bonds for metal bodies of conductance shall be bonded with appropriate fittings and full-size conductor; and shall consist of; but not be limited to the following: roof exhaust fans, HVAC units with related piping and ductwork, exhaust vents and any other roof piping systems, cooling towers, elevator hoist machinery supports and rails systems, radio or microwave antennas, flag poles, roof handrails and/or decorative screens, roof ladders, skylights, metal stacks, etc. Exterior architectural metal fascia and/or curtain walls or mullions, which extend the full height of the structure, shall also be bonded, if not inherently bonded through the building frame.

3. Bond all metal bodies of inductance located within six feet of a primary conductor or objects with primary bonds, using secondary cable and fittings. Typical of these are: plumbing vent stacks, roof flashings, parapet coping caps, gravel guards, isolated metal building panels or siding, roof drains, down spouts, roof ventilators, exterior balcony handrails, any other sizeable miscellaneous metal masses, etc.

4. Bond extremities of vertical metal bodies exceeding 60 feet (18 m) in length to the lightning protection system.

5. Bond ground rods together with loop conductor located 24 inches below grade. Provide “main” size copper conductor. Exothermically weld conductor to ground rods.

6. Bond grounded media on building that is within 6 feet of the ground to the lightning protection system.

7. Bond grounded media on building that is within 6 feet of the roof to the lightning protection downlead conductors.

8. Bond lightning protection system to grounded media on building at every 60 feet (18 m) with intermediate level interconnection loop conductors.

9. Bond downlead conductors to ground rods on top of rods utilizing an exothermic weld.

3.3 TESTING:

A. Ground Resistance Test:

1. Grounding electrode resistance testing shall be accomplished with a ground resistance direct-reading single test meter utilizing the fall-of-potential method and two reference electrodes. Perform test prior to interconnection to other grounding systems. Orient the ground electrode to be tested and the two reference electrodes in a straight line. Refer to fall of potential test methods/procedures to determine electrode spacing based on the dimensions of the grounding electrode system. Drive the two reference electrodes three (3) feet deep.

2. Test results shall be in writing, and shall show temperature, humidity and condition of the soil at the time of the tests. Provide a diagram (site plan) identifying where the reference electrodes were driven and distances from the lightning protection system to the electrodes. In the case where the ground resistance exceeds 5 ohms, drive additional ground rods and retest.

3.4 PERSONNEL TRAINING:

A. Building Maintenance Personnel Training: Train Owner's building maintenance personnel in procedures for testing and determining resistance-to-ground values of lightning protection system. Also instruct maintenance personnel in preparation and application of chemical solution for earth surrounding grounding rods for reducing ohmic resistance to required levels.

3.5 RECORD DRAWINGS/O&M SUBMITTAL:

A. The Contractor shall provide and maintain on the site an up-to-date record set of approved shop drawing prints which shall be marked to show each and every change made to the lightning protection system from the original approved shop drawings. This shall not be construed as authorization to deviate from or make changes to the shop drawings without written instruction from the Owner in each case. This set of drawings shall be used as a record set.

B. Upon completion of the work, the record set of prints shall be used to prepare clear, complete, accurate final record drawings reflecting any and all changes and deviations made to the system.