

26 4113 - Lightning Protection for Structures**PART 1 - GENERAL****1.1. SUMMARY**

- A. This Section includes lightning protection for buildings and associated structures and requirements for lightning protection system components.

1.2. REFERENCE STANDARDS

Applicable only to the extent specified.

- A. National Fire Protection Association (NFPA)
 - 1. 780: Standard for Installation of Lightning Protection Systems.
 - 2. 70: National Electrical Code (NEC), 2023 edition or latest edition.
- B. National Institute of Standards and Technology (NIST)
- C. Occupational Safety and Health Administration (OSHA)
 - 1. 29 CFR 1910.7: Definitions and Requirements for a Nationally Recognized Testing Laboratory (NRTL).
- D. Underwriters Laboratories (UL)
 - 1. 96: Lightning Protection Components
 - 2. 96A: Installation Requirements for Lightning Protection Systems

1.3. SUBMITTALS

- A. Product Data for each component specified. Include the following:
 - 1. Roof adhesive data.
 - 2. Air terminal illustrations.
 - 3. Cable termination components.
- B. Shop and Coordination Drawings: Lightning protection system 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. Layouts of the lightning protection system, with details of the components to be used in the installation, including but not limited to raceway locations needed for the installation of conductors.
 - 2. Details of air terminals, ground rods, ground rings, conductor supports, splices, and terminations, including concealment requirements.

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3. Retain first subparagraph below to ensure coordination with roof installation, so as not to void roof warranty.
 4. The calculations referred to by the subparagraph below determine the side flash 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.
 5. Lightning protection cabling attachments to roofing systems and accessories.
 6. Lightning protection strike termination device attachment to roofing systems, coordinated with the roofing system manufacturer.
 7. Lightning protection system components penetrating roofing and moisture protection systems and system components, coordinated with the roofing system manufacturer.
- C. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by nationally recognized testing laboratory (NRTL) or trade association. Include lists of completed projects with project names and addresses, names, and addresses of architects and owners, and other information specified.
- D. Maintenance Data: For lightning protection system to include in maintenance manuals.
1. In addition to items specified in Section 017823 "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 017839 "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.
- E. Certification, signed by Contractor, that roof adhesive for air terminals is approved by manufacturers of both the terminal assembly and the single-ply membrane roofing material.
- F. Field inspection reports indicating compliance with specified requirements.

1.4. QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who is certified by the Lightning Protection Institute as a Master Installer/Designer to install lightning protection system.

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- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled by an organization concerned with product evaluations and that can determine compliance with appropriate standards for the current production of listed items.
 - 1. The Terms “Listed” and “Labeled”: As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A NRTL as defined in OSHA Regulation 1910.7.
- C. Conform to NFPA 780.
- D. Conform to UL 96A.
- E. Conform to the most stringent requirements of the following standards.
 - 1. LPI certification of system.
 - 2. ETL Master Label indicating system complies with specified requirements.

1.5. SEQUENCING AND SCHEDULING

- A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures, and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

PART 2 - PRODUCTS**2.1. MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Advance Lightning Technology, LTD.
- C. Approved Lightning Protection Co., Inc.
- D. ERICO; a brand of nVent
- E. Harger Lightning Protection, Inc.
- F. Heary Bros. Lightning Protection Co.
- G. National Lightning Protection
- H. Thompson Lightning Protection Co.

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- A. Materials: All equipment shall be UL approved and marked in accordance with UL procedures. All equipment shall be new and of a design and construction to suit the application in accordance with UL 96A requirements. Bronze and stainless steel may be used for some components. Aluminum material shall not be contact with copper material and bimetal connector shall be used for interconnecting copper and aluminum.
- B. Air Terminals:
 - 1. Air terminals shall be UL approved and shall be solid copper, aluminum, or bronze. Copper air terminals may be nickel plated. The minimum sizes are 1/2 inch in diameter for solid copper or bronze air terminals, and 5/8 inch in diameter for solid aluminum air terminals. Air terminals shall be a minimum of 12 inches in height, and shall have a rounded or "bullet" tip.
 - 2. Air terminals shall be located in accordance with the requirements of NFPA 780 and UL 96A.
 - 3. Air terminals shall extend at least 36 inches above the object or area they are designed to protect and 5 feet above walking surface.
- C. Conductors: All lightning protection conductors shall be sized in accordance with NFPA 780 and 70 codes, minimum Class II material.
- D. Hardware: Hardware shall meet the following requirements:
 - 1. Fasteners: Roof and down conductors shall be fastened at intervals not exceeding 3 feet. Fasteners shall be of the same material as the conductor base material or bracket being fastened, or other equal-ly corrosion resistant material. Galvanized or plated materials shall not be used.
 - 2. Fittings: Bonding devices, cable splices, and miscellaneous connectors shall be suitable for use with the installed conductor with mechanical connectors or high compression crimp. Bolt pressure connections of secondary conductors may be acceptable where indicated on drawings. Exothermic welds shall not be used in roof areas subject to potential damage.
- E. Guards: Guards shall be provided for down conductors located in or next to driveways, walkways, or other areas where they may be displaced or damaged. Guards shall extend to 6 feet above grade level, and 1 foot below grade level. Guards shall be schedule 40 PVC.

26 4113 - Lightning Protection for Structures**PART 3 - EXECUTION****3.1. EXAMINATION**

- A. Examine surfaces and conditions, with Installer present, for compliance with installation tolerances and other conditions affecting performance of lightning protection System. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2. INSTALLATION

- A. Installation shall conform to UL standard 96A.
- B. Comply with UL 96A, NFPA 780.
- C. Conform to the most stringent requirements when more than one standard is specified.
- D. Conductor and conduit routing: Roof and down conductors shall maintain a horizontal or downward course. No bend in a roof or down conductor shall form an included angle of less than 90 degrees, nor shall it have a bend radius of less than 8 inches. Conductors shall be routed external to buildings and 6 feet or more from power or signal conductors.
- E. Down conductor terminations: Down conductors used to ground air terminals and roof conductors shall terminate on buried ground rods eighteen (18) inches vertically below ground level, and from 2 feet to 6 feet outside the foundation or exterior footing of the building. Down conductors shall be connected to the ground rods by exothermic welding. Provide number of down conductors indicated on drawings.
- F. Route down conductors outside of building facade in PVC conduit. Submit system plan which indicates exact location of down conductors, as well as intended equipment locations, to Project Manager or Engineer of Record for approval prior to installation.
- G. Notify Project Manager at least 24 hours before concealing lightning protection system components.
- H. Air Terminal attachment: All air terminals shall be secured against overturning either by attachment to the object to be protected, or by means of braces that are permanently and rigidly attached to the building.

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- I. Metallic bodies subject to induced charges: Metallic bodies, on or below roof level, that are subject to in-duced charges from lightning include roof drains, plumbing vents, metal coping, metal flashing, gutters, downspouts, small metal wall vents, door and window frames, metal balcony railings, and generally, any isolated metallic body within 6 feet of an exposed lightning protection system element. These metallic bodies shall be bonded to the lightning protection system using UL approved splicers, fittings, and conduc-tors. Conductors used for bonding these metallic bodies shall be Class II secondary conductors in accord-ance with NFPA 780 and 70 codes latest edition.
- J. Metallic bodies subject to direct lightning discharge: Metallic bodies on roofs subject to direct lightning dis-charge are generally any large metallic body whose size causes it to protrude beyond the zone of protection of the installed air terminals. This includes antenna support structures, exhaust fans, flues, ladders, railings, and roof hatches. When these metallic bodies have a metal thickness of 3/16 inches or greater, they shall be bonded to the nearest main lightning protection system conductor with UL approved fittings and con-ductors meeting the requirements of NFPA 780. These bonding fittings shall provide surfaces of not less than 3 square inches. Provisions shall be made to prevent corrosive effects introduced by galvanic action of dissimilar metals at bonding points. If the metal parts of these units are less than 3/16 inches thick, addi-tional approved air terminals, conductors, and fittings, providing a two-way path to ground from the air terminals, shall be installed.
- K. 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 do basic structure, taking care not to penetrate any adja-cent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vi-bration is not transmitted to rigidly mounted equipment.
- L. Exothermically welded connections are not acceptable at locations subject to physical damage. Only me-chanical connections and hydraulically crimped are acceptable.

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 the junction of such materials.
- B. Use conductors with suitable protective coatings where conditions would cause deterioration or corrosion of conductors.

26 4113 - Lightning Protection for Structures**3.4. FIELD QUALITY CONTROL**

- A. Periodic Inspections: Provide the services of a qualified inspector to perform periodic inspections during construction and at its completion, according to LPI-175.
- B. ETL Inspection: Provide the services of ETL to inspect completed system for conformance with specified requirements.
- C. Prepare test and inspection reports and certificates.

3.5. TESTING

- A. Upon completion of installation of lightning protection system, test resistance-to-ground with resistance tester. Where tests show resistance-to-ground is over 10 ohms, take appropriate action to reduce resistance to 10 ohms, or less, by treating soil proximity to ground rods with sodium chloride, copper sulfate, or magnesium. Then retest to demonstrate compliance. Submit results to Project Manager.
- B. Make a visual inspection to verify that all connections have been made firm (i.e. not loose causing high resistance).

End of 26 4113 - Lightning Protection for Structures