

SECTION 22

LIGHTNING PROTECTION SYSTEM

22.01 SCOPE:

- A. These Specifications shall form a part of the Contract Documents and shall govern construction work for all buildings to be built or modified for the Board of Water and Sewer Commissioners of the City of Mobile, Alabama. The work covered by this section includes the furnishings of all parts, labor, equipment, appliances and materials and performing all operations in connection with the installation of lightning protection hardware. This shall include lightning rods that are bonded to ground rods.
- B. All new construction of buildings or revisions to existing building shall include lightning protection. This shall apply to the following types of architecture:
 - 1. Brick with Composition roof
 - 2. Brick with Metal roof
 - 3. Metal Clad
 - 4. Metal frame with fiberglass siding
 - 5. Concrete with metal framing
 - 6. Steel Structures
 - 7. Flat roofs
 - 8. Sloped roofs
- C. The Contractor for the installation of lightning protection equipment shall follow these Specifications, the Underwriters Laboratories UL 96 Standards for Safety, Lightning Protection Components, UL 96A and the National Fire Protection Agency 780 Standards for the Installation of Lightning Protection Systems.
- D. There shall be one common ground established for each building at or near the power source entering the building. The lightning protection system air terminals, electrical system, telephone, antennas, computers, remote telemetry, and radios shall have their grounds bonded together at this common ground.

22.02 SUMMARY:

- A. The scope of work is to provide and install an effective, aesthetically acceptable lightning protection system employing the latest technology.

- B. The purpose of the system shall be to provide a Faraday cage of protection around the structure, and a path to ground for all lightning protection hardware. This shall include:
 - 1. Air terminals to intercept the lightning strikes.
 - 2. Down conductors to carry lightning from the air terminals to the ground.
 - 3. Ground rods to pass the lightning current into earth ground.
- C. The system shall require no external power, shall not contain radioactive components, and shall require no scheduled maintenance.
- D. The installation of equipment shall all be done as per NFPA 780, and UL96A.

22.03 DESCRIPTION OF WORK:

- A. All new construction or revisions to buildings for the Board of Water and Sewer Commissioners of the City of Mobile, Alabama shall include lightning protection. Contractor shall provide equipment that is UL approved, and install lightning protection equipment on all buildings and structures. This shall include bonding, grounding, and the installation of lightning rods as described in Section 22 of the Specification. Contractor shall also include the installation of surge suppressors as specified in Section 23 entitled "Transient Voltage Surge Suppressors"
- B. All construction for lightning protection shall conform to Section 24 entitled "Electrical Materials and Methods".

22.04 SUBMITTALS:

- A. Shop Drawings: Submit the type, size, and location of all equipment, grounds, and conductor routing to be furnished by the system supplier.
- B. Manufacturer's catalog data sheets for all components.
- C. Any departure from the submittal drawings as deemed necessary by the Contractor shall have all details of such departures and reasons therefore submitted as soon as practicable to the Owner for approval. No such departures shall be used in construction without the prior approval of the Engineer.

22.05 MANUFACTURER REQUIREMENTS:

- A. The manufacturer of the products employed in the system shall be regularly engaged and experienced in the design and manufacture of lightning protection products and systems, and have proof of successfully installed lightning protection system performance.
- B. Product and technical support shall be provided by the manufacturer or its authorized representative.

22.06 INSTALLER REQUIREMENTS:

- A. All installations must be performed by an experienced Underwriters Laboratories Master Label Installer.
- B. The installer shall carry appropriate liability and vehicle insurance in the minimum amount of one million dollars and worker's compensation insurance in at least the minimum amount required by law. Certificates of insurance shall be provided as requested to the Owner or his representative before work is begun.
- C. The installer shall be responsible for accompanying the Owner or his representative on a walk through each structure as the installation on that structure is completed, and on a walk through of each facility after completion of the project.
- D. The installation shall be done in a manner that will allow the Owner to obtain an Underwriters Laboratories Master Label for each site upon completion of the installation of the system.

22.07 GENERAL:

- A. The system shall be designed for installation to provide a Faraday Cage to delay or dissipate the formation of lightning strikes.
- B. The system shall be designed in such a manner that it affords protection to the structure upon which it is installed in the event a direct lightning strike to the structure does occur.
- C. The system shall require no external power and shall require no extraordinary maintenance.
- D. The system shall not be mounted in such a manner as to impose limitations which may interfere with utility use of structure space or otherwise preclude or limit the intended use of the structure or equipment within the structure, around the perimeter, or on top of the structure.
- E. The system shall be designed to impose minimum weight and low wind loading burden on the structure upon which it is installed.
- F. The lightning protection system shall be grounded at intervals not to exceed one hundred feet, and at no less than two points, around the perimeter of each structure. In the event a separate grounding system is provided on the structure, the lightning protection system shall be additionally bonded to that grounding system. This ground shall qualify as a lightning protection system ground. All connections for wires at the ground rod shall be CAD welded as per 4014 of NFPA 780.
- G. If installed on a metallic or otherwise electrically conductive structure, the system shall be electrically bonded to structure upon which it is installed through its mounting clamps and brackets, with additional bonding jumpers to grounded objects or structural members, as required.

- H. Individual air terminals shall be mounted on all outside corners of each structure, around the perimeter of each structure at intervals not to exceed twenty feet, and on the interior of each structure in such a manner that no two air terminals are separated by a distance of more than fifty feet. In the event this is not practical, such as on a large open tank, air terminal spacing around the perimeter shall be decreased to not more than fifty feet, with a total number around the perimeter not less than the total of the normally required perimeter air terminals, plus the additional number of air terminals normally required on the interior of the structure.
- I. Each air terminal shall be provided with two contiguous, electrically conductive paths to ground. A short, single path jumper between the air terminal and the main conductor system may be employed.
- J. All equipment that protrudes above the roof line of a building must have its own air terminals that are properly bonded to the ground rods for that building. This shall include air conditioners, air handlers, vents, air conditioning ducts, aerators mixer motors, relief valves and control houses such as for filter galleries. Air terminals shall extend into the air and be at least 18" higher than the equipment.
- K. On structures with handrails, exposed structural members, or other conductors exposed or hidden, it is permissible to employ those conductors as part of the lightning protection system, provided they meet the minimum requirements for conductors listed in Underwriters Laboratories UL 96 or 96A.
- L. In the case of a structure or a portion of the structure where the structure itself is electrically conductive, such as a light pole, tower, steel superstructure, etc., that structure or portion of the structure itself may be employed as part of the lightning protection system, provided it meets the minimum requirements of UL 96 or UL 96A, and dedicated conductors are specifically not required on such structures. In such cases contractor shall ensure complete continuity exists between all metal parts that will be used as a pathway to ground. On steel towers that are subject to corrode or rust, such as those used to support radio antennas, a separate wire shall be installed from the lightning rod to the ground rod.
- M. Use of metal downspouts for conductors between the air terminals and ground rods shall not be allowed.
- N. On buildings with painted metal roofs, the roofing material itself may be used as a conductor, if it is at least 3/16" thick, but air terminals shall still be required. Installer shall confirm that there is continuous continuity between metal roofing panels or install individual wiring to bond panels together.
- O. All equipment shall be installed in accordance with Underwriters Laboratories UL 96A and NFPA 780 to the maximum extent practicable.

- P. All equipment shall be installed in a neat, workmanlike manner in the most inconspicuous manner possible.
- Q. Dissimilar metals shall not be allowed to be in contact, except lightning rods. Aluminum fittings shall be mounted on aluminum where necessary, and bonded to the main system using bi-metal connectors. Lead coating shall not be acceptable as a bi-metal transition.
- R. Contractor shall adhere to minimum bending radiuses when routing wiring from the roof line to ground level. On buildings with an eave greater than 6", Contractor shall not bend wire around eaves. Contractor shall instead drill holes in the roof of the building eave and route wire down the side wall. Contractor shall be responsible for sealing all holes in the roof to be water tight upon completion of wiring. Vertical wires down side walls shall be installed in grey colored plastic conduit.
- S. The installer shall coordinate the lightning protection work to ensure a correct, neat, and unobtrusive installation. Care shall be taken to ensure that equipment to be protected is not obstructed or made inaccessible by the installation of the lightning protection equipment.
- T. Buildings with fiberglass or other non metallic material on the roof and sides are typically supported by steel. All pieces of steel must be bonded together with metal strapping or electrical wire as per NFPA 780 Standards.
- U. The installer shall coordinate his work in such a manner as to not interfere with the normal operation of the structure or facility upon which the installation is performed.
- V. All services to each structure upon which air terminals are installed shall be provided, to the maximum extent practicable, with a common connection (single point) at which they are grounded. Any metallic water or other service piping to the structure shall be electrically bonded to the lightning protection system.
- W. Upon completion of the installation, the Contractor shall furnish the Owner a certificate for each building stating the work and equipment meets U.L. standards, and that site is ready for the Owner to obtain an Underwriters Laboratories Master Label.
- X. Contractor is advised that there are power lines, water lines, sewer pipes, fiber optics, telephone lines, conduit, and instrument signal lines underground. Contractor shall contact the management before doing any trenching or digging to bury ground rods or cabling, or wiring. Site management shall have the option of telling Contractor that certain areas must be dug by hand only to protect the wiring and piping and thereby keep the equipment in operation.
- Y. Contractor must repair and/or replace any piping, power lines, fiber optics, or anything else that is damaged during the trenching, digging, or installation of any equipment or materials.
- Z. Locations with buildings for sewer lift stations and water booster pumps will typically have a radio for transmitting data back to a central location. These sites will include a pole mounted

antenna for the radios. Streamer delaying air terminal rods shall be installed on all poles or towers used for radio antennas. The lightning rod shall be installed in a manner that does not place it in the path of radio waves between that radio, and the radio it is sending data to. The lightning rod must be mounted with its elevation at least 2' taller than the antenna. The lightning rod should be mounted on a 2" Galvanized pipe, and then strapped to the pole.

- AA. A lightning rod installed on a pole or tower to protect a radio antenna provides a zone of protection that extends outward and down at a 45° angle from the top of the lightning rod. If there is a building adjacent to the antenna pole that is completely within the zone of protection provided by the antenna pole lightning rod, it is not necessary to install lightning rods on the building. This is typically true only where the antenna poles are very tall, and the adjacent structures are relatively small. An example of this would be a 50' pole adjacent to a one story building that was 12' wide and 12' long, and 10' high.
- AB. Lightning protection for special structures shall be designed as per the NFPA 780 Standard for the installation of Lightning Protection Systems. This includes:
 - 1. Floating Roof Tanks
 - 2. Metallic
 - 3. Fixed Roof Tanks
- AC. Lightning protection for water towers shall include the installation of a ground rod at each leg of the tower. There shall be a number 4 wire buried 1'-6' deep in a ring around the base of the tower. All ground rods shall be bonded together by cad welding this wire to each rod.
- AD. Lightning protection for pump motors that are mounted outside shall be installed as follows:
 - 1. Install a 2" pipe vertically beside the pump motor that will allow the mounting of an air terminal. Final height of lightning rod shall be 18" higher than pump motor, or piping attached to motor. Final location of pipe shall be approved by building supervisor.
 - 2. Attach #4 base copper wire to motor casing. Bury wire 18" deep, and connect wire from lightning rod and motor casing to common ground for motor control center.

22.08 COMPONENTS:

- A. All equipment and components shall be of a design and of construction to suit the application for which it is used, in accordance with accepted industry standards.
- B. Each component which may be so listed shall be listed under Underwriters Laboratories UL 96, and have the appropriate UL label affixed thereto.
- C. All lightning rods shall be long enough to provide a height of 18" above the item it is to protect.

22.09 LIGHTNING RODS (AIR TERMINALS) FOR BUILDINGS:

A. Buildings or Metal Structures

1. All air terminals for pump stations, water booster stations, and administration buildings, water plants, or sewer plants shall be streamer delaying dissipaters with 500 dissipation electrode wires of .0080" diameter 300 series stainless steel as manufactured by Lightning Master or equal.
2. Air terminal Electrode shall be high quality 316 stainless steel, ½" diameter. Air terminals shall be shipped to the installer ready to install, with no assembly or other set-up required.
3. Air terminals over 24 inches high shall be supported at a point not less than one half of the height of the terminal.
4. All other components such as bonding clamps shall be U.L. labeled and approved. Clamps shall be bolted type.

B. Acceptable Brands

1. Streamer-delaying air terminals shall be manufactured by Lightning Master Corporation, 1920 Sherwood Street, Clearwater, FL 34625 USA
Tel. (813) 447-6800
Fax (813) 461-3177

END OF SECTION