Special Specification 6398
Lighting Protection System

1. DESCRIPTION

This Special Specification governs the design and installation of Lightning Protection System (LPS) for Electronic Toll Collection (ETC) sites.

2. MATERIALS

Furnish new material in accordance with the details shown on the plans, the requirements of this Item, and the pertinent requirements of the following Items, references and standards, except for measurement and payment:

- Item 416, “Drilled Shaft Foundations”
- Item 618, “Conduit”
- Item 620, “Electrical Conductors”
- Item 624, “Ground Boxes”
- Item 628, “Electrical Services”
- Item 650, “Overhead Sign Supports”
- TXDOT Traffic Engineering Standard Sheets – (ED) Electrical Details

2.1. **Standards**. LPS components must comply with the requirements of the following standards unless otherwise specified in the plans or approved by the Engineer:

- National Fire Protections Association (NFPA) 70, National Electrical Code (NEC): Latest edition at the time of construction.
- NFPA 780 Standard for Installation of Lightning Protections Systems: Latest edition at the time of construction.
- Underwriters Laboratory Standard UL 96

2.2. **Products**. Air terminals will be solid aluminum or copper-clad steel, or as shown on the plans.

Ground Rods, Ground Loop Conductors, and Concrete-Encased Electrodes must comply with the plans, specifications, and applicable portions of the standards listed in this specification. Plan requirements must govern over standards. The Engineer may approve alternate equivalent materials when proposed by the contractor.

Copper-Aluminum connections must be made with UL listed connectors intended for the purpose.

Exothermic welded connections, when shown on the plans, must be made in accordance with manufacturer’s instructions. Bolted connections embedded in concrete must be UL listed for the purpose.

3. CONSTRUCTION

Install LPS components and systems according to the plans, specifications and the standards listed in this specification.

3.1. **Conduit**. Install conduits of the type and size shown on the plans. Conduits must be embedded in concrete columns when shown on the plans.

3.2. **Air Terminals**. Install LPS air terminals at locations shown in the plans. Steel trusses and columns with thickness greater than 3/16" need not be equipped with air terminals unless shown on the plans.

3.3. **Conductors**. Install LPS cross-run and down conductors of the type and size required. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends and narrow loops. Conductor location, mounting or attachment, type and size as required by the plans or as approved by the Engineer.

- Install ground rings, ground rods, test wells, and other components as shown in the plans. Path/route modifications may be made to accommodate field conditions. Bond rebar to down conductor/ground ring at top and bottom of all columns and at top of all drill shafts a minimum of two places on opposite sides of the column/shaft.
- Bond trusses that are mounted on concrete columns to down conductors in two places. Trusses mounted to metal columns/sign bridge legs need not be bonded unless shown on the plans. Bond steel columns/sign bridge legs to the ground rings.
- Bond all metal parts, such as hand rails and guard rails, within 6 ft. of ground ring to the ground ring whether or not the connection is shown on the plans. All bonding must be done with lugs, clamps, exothermic welds, or other UL listed hardware.

3.4. **Bonding**. Ensure that LPS is bonded to the equipment grounding conductor provided with the wiring from the electrical service. This connection should be made by bonding the LPS to the grounding bus in the Toll Equipment Cabinet (TEC).

3.5. **Ground Test Well**. Install LPS ground test well of the type and size shown on the plans.

3.6. **Quality Control**. Quality Control requirements:

- LPS Installer Qualifications: Engage experienced installer who is NRTL listed or who is certified by LPI as Master Installer and Designer.
- LPS Listing and Labeling: As defined in NFPA 780, Article 2-2, "Definitions." All components must Labeled and Listed as required by NFPA 780.
- LPS Quality Control Field Inspections: Provide reports indicating compliance with plans & specification requirements.
- LPS UL Inspection: Apply for inspection by UL as required to obtain UL Master Label for system.
- LPS UL Master Label: Provide UL Master Label.
- LPS: Provide as-built drawings of Lightning Protection System.

4. MEASURMENT

This Item will be measured by the lump sum of Lightning Protection System complete in all respects including furnishing, installation, testing, and affixing a UL Master Label.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Lightning Protection System" of the type and size specified and the installation method specified as applicable. This price is full compensation for furnishing and installing the Lightning Protection System, including but not limited to, strike termination devices, conductors, ground electrode system, bonding to metal objects, all connections, conduit, hanging, strapping, drilling, tunneling, excavating, and furnishing and placing backfill; replacing pavement structure, sod, riprap, curbs, or other surface, marking location of conduit (when required), furnishing and installing fittings, junction boxes, and expansion joints; and equipment, labor, tools and incidentals. Unless otherwise shown on the plans, no payment will be allowed under this Item for conduit used on or in walls, columns or foundations for encasing LPS conductors.