

## SECTION 26 41 16 – LIGHTNING PREVENTION AND DISSIPATION SYSTEMS

### 1.01 SUMMARY:

- A. <sup>A17</sup>**Scope:** Scope of work shall be in accordance with Paragraph 1.01 D. of Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), as required, for protection of life and property during the execution of the Works and after Taking Over. This Section of the Employer's Requirements shall be read in conjunction with the Sections listed in Table 26 41 16-1. <sup>A17</sup>

B. **Related Sections:**

Table 26 41 16-1: Related Sections			
1.	Section 01 81 26	-	Communications, Control, Safety, and Security Systems.
2.	Section 13 49 00	-	Radiation Protection Systems.
3.	Section 26 05 26	-	Grounding and Bonding for Electrical Systems.
4.	Section 26 43 13	-	Transient Voltage Surge Suppressors.
5.	Section 33 81 13	-	Communications Transmission Towers.

### 1.02 REFERENCE:

- A. **Applicable Publications:** Refer to Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), Paragraph 1.02.

### 1.03 REQUIREMENTS:

A. **General Requirements:**

1. The Contractor shall meet all applicable requirements of Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), Paragraph 1.03.
2. Equipment and materials shall be LPI or UL listed for the intended use, and shall have the size, composition, and weight required by NFPA and UL.
3. Unless otherwise specified,
  - a. Materials shall be Class II, copper or copper-bronze.
  - b. Bolts, nuts, screws, and miscellaneous hardware shall be bronze or stainless steel.

- B. **Equipment and Materials:** Shall include, but not be limited to the following, as required:

1. **Air Terminals:** Shall be Franklin type, with solid tubular rod with diameter no less 12 mm (1/2"), base adaptor, and minimum length of 300 mm (1'). Terminals with nickel finish or radioactive materials are unacceptable.
2. Cable fasteners and holders.
3. **Conductors:** <sup>A10</sup>Shall be solid copper with rectangular cross section for low resistance and low inductance. Ampacity shall be equal or larger than a #2/0 copper conductor. <sup>A10</sup>
4. **Connectors:** Shall be UL listed.
5. **Ground Rods:** Shall be copperweld type, with 16 mm (5/8") or larger diameter and 3,050 mm (10') or larger length, and shall meet the requirements of UL 467. Minimum copper thickness and other characteristics shall be in accordance with Section 26 05 26 (*Grounding and Bonding for Electrical Systems*).
6. Sealing materials.
7. TVSSs shall be in accordance with Section 26 43 13 (*Transient Voltage Surge Suppressors*).

C. **Installation:**

1. **General:**
  - a. Lightning protection shall be installed in buildings, electrical substations, and radio communications towers in the third set of locks areas.
  - b. The installation shall be as dissimulated as possible to keep aesthetics.
  - c. The following practices are unacceptable:
    - 1) Banging, cutting, damaging, drilling, or welding of or to radio tower members.
    - 2) Making abrupt conductor bends.
    - 3) Passing lightning protection cables through metal conduits.
    - 4) Using a combination of materials that cause electrolytic coupling in a way that accelerates corrosion in the presence of humidity.
    - 5) Using down-conductors along metallic towers.
    - 6) Using dissimilar metals.
2. **Grounding and Bonding:** Shall be in accordance with Section 26 05 26 (*Grounding and Bonding for Electrical Systems*).
3. **Ground Rods:** Whenever possible, 100% of the rod's length shall be buried vertically in non-perturbed soil.

4. **Soil Treatment:** May be used if required to increase soil conductivity near ground rods.
5. **Underground Connections:** All underground connections shall be made with exothermic welding.

#### 1.04 DESIGN CRITERIA/SYSTEM PERFORMANCE:

##### A. General:

1. **Problem to be Solved:** Lightning protection systems shall solve the following business needs:
  - a. Prevent damage to occupants, structure, services, and contents due to lightning strikes.
2. **Restrictions to be Considered:** (reserved)

##### B. Design Criteria:

1. Systems shall be designed and installed to provide protection in accordance with IEC 62305, IEEE 142, IEEE 1100, LPI 175, NFPA 70, NFPA 780, UL 96, and UL 96A.
2. Underground devices shall be suitable for the acidity or basicity (ph) as well as resistivity of the soil in the area of installation.

##### C. System Performance:

1. Lightning protection systems shall withstand multiple direct lightning hits without performance degradation.
2. A series of ground rods shall provide a path of low resistance and low inductance to protect against lightning damages. Resistance to earth shall not exceed one half (0.5) Ohm, regardless of the time of the year.

#### 1.05 SUBMITTALS: The following shall be submitted for substantiation purposes:

- A. **Design:** The following shall be in accordance with Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), <sup>A10</sup>Subparagraph 1.05 D.: <sup>A10</sup>
  1. CPM diagram, with monthly updates.
  2. Descriptive literature.
  3. Drawings.
  4. Protection methods for corrosion, ESD, fungus/humidity, lightning/surge, power distortion and harmonics, [radio-frequency interference/electromagnetic interference \(RFI/EMI\)](#), thermal, and vibration.
  5. Quality assurance and control plans.
  6. Specifications.

- B. **Re-submittals Just Prior to Purchasing Materials:** All items in A. above that have changed from original submittal shall be resubmitted in a Design Conference in accordance with Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), Paragraph 1.05.
  - C. **Right After FQCT and FIT:**
    - 1. QC and FIT reports.
  - D. **Upon Receipt of Shipped Items in Panama:**
    - 1. Instruction manuals for administration, installation, maintenance, and operation.
    - 2. Packing lists.
  - E. **Prior to Issuance of Taking Over Certificate:**
    - 1. As-built drawings.
    - 2. List of recommended spare parts.
    - 3. FFIT reports.
    - 4. <sup>A17</sup>Ground resistance measurement reports.<sup>A17</sup>
- 1.06 QUALITY ASSURANCE:** Shall include the following in accordance with Section 01 81 26 (*Communications, Control, Safety, and Security Systems*), Paragraph 1.06:
- A. **Factory Quality Control Tests (FQCT).**
  - B. **Final Field Inspection Tests (FFIT):**
    - 1. Electrical continuity measurements.
    - 2. **Ground Measurements:** Shall be made using three test rods and a Megger type instrument in accordance with the voltage drop method described in IEEE 81 and 142. Test shall not be made earlier than 48 hours after rainfall.
  - C. **Warranty.**

**END OF SECTION**