

## SECTION 13 49 00 – RADIATION PROTECTION

### 1.01 SUMMARY:

- A. <sup>A19</sup>**Scope:** This Section covers performance requirements, design, supply, installation, and commissioning for electrical shield and radiation protection systems and for communications and process control system (PCS) equipment rooms in main control buildings, as required for the Works.<sup>A19</sup> <sup>A16</sup>This Section of the Employer's Requirements shall be read in conjunction with the Sections listed in Table 13 49 00-1.<sup>A16</sup>
- B. **Related Sections:**

TABLE 13 49 00-1: Related Sections			
1.	Section 01 81 26	-	Communications, Control, Safety, and Security Systems.
2.	Section 26 05 26	-	Grounding and Bonding for Electrical Systems.
3.	Section 26 41 16	-	Lightning Prevention Systems.
4.	Section 26 43 13	-	Transient Voltage Surge Suppressors.

### 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.
- B. **Interoperability and Coordination:** Radiation protection systems shall be coordinated with an appropriate combination of the following:
1. Bonding and grounding, in accordance with Section 26 05 26 (*Grounding and Bonding for Electrical Systems*).
  2. Lightning prevention systems, in accordance with Section 26 41 16 (*Lightning Prevention and Dissipation Systems*).
  3. Surge protection, in accordance with Section 26 43 13 (*Transient Voltage Surge Suppressors*).

4. All incoming conductors, including communications and power cables, and radio transmission lines and waveguides.
- C. **Equipment and Materials:** Shall include, but not be limited to the following, as required:
1. Conducting material shall be made of copper.
  2. <sup>A19</sup>Doors, EMI (electromagnetic-interference) gaskets, and feed-throughs shall be furnished as required. <sup>A19</sup>
- D. **Installation:**
1. **General:** A Faraday cage shall be installed in communications and data processing equipment rooms in main control buildings of the third set of locks, and shall be connected to earth ground.

#### 1.04 DESIGN CRITERIA/SYSTEM PERFORMANCE:

- A. **General:**
1. **Problem to be Solved:** Radiation protection systems shall solve the following business needs:
    - a. Provide a *Faraday Cage* for sensitive equipment in PCS and telecommunications equipment rooms to protect from potentially damaging electrical fields.
    - b. <sup>A19</sup>Provide limited shielding as required for EMI/RFI (electromagnetic interference/radio-frequency interference) sensitive equipment provided for the third set of locks, without making **difficult or impossible** to communicate via mobile and portable radios from/to these cages. <sup>A19</sup>  
**Such communications shall be possible and easy.**
    - c. Provide grounding systems for all shielding systems.
  2. **Restrictions to be Considered:** (reserved)
- B. **Design Criteria:**
1. Shielding effectiveness shall be determined in accordance with IEEE 299 and <sup>A10</sup>MIL-STD-461. <sup>A10</sup>
- C. **System Performance:**
1. Conducting material or a mesh of such material shall enclose each applicable room forming a shielded room or *Faraday cage* (doors and feed-throughs included) which blocks out external static electrical fields.

2. Electrical charges in the enclosing conductor shall always reside on the outside surface of the cage. The electrical field's effect in the cage's interior shall be null, protecting electronic equipment from direct lightning strikes and electrostatic discharges. Such strikes and discharges shall be safely conducted to earth ground.
3. Faraday cages are required to provide some shielding from external electromagnetic radiation (EMI/RFI) and containment from internal electromagnetic radiation by causing significant attenuation at all frequency bands. However, such attenuation shall be small enough to allow desirable radio-communications of Employer personnel, including those at frequencies of interest allowed to come in and get out via the applicable filters, transmission lines and waveguides.

**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, RFI/EMI, thermal, and vibration.
  5. Quality assurance and control plans.
  6. RFI/EMI study for each applicable site with Faraday cage.
  7. 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. **Upon Receipt of Shipped Items in Panama:**
  1. Instruction manuals for administration, installation, maintenance, and operation.
  2. Packing lists.
- D. **Prior to Issuance of Taking Over Certificate:**
  1. As-built drawings.
  2. List of recommended spare parts.

**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. Warranty.

**END OF SECTION**