

## SECTION 40 95 73 –CONTROL CABLES

### 1.01 SUMMARY:

- A. **Scope:** This Section covers the performance requirements, supply, installation, and commissioning of control cables required for electrical controls and Process Control Systems (PCSs) **as part of the Works**. This Section of the Employer's Requirements shall be read in conjunction with the Sections listed in Table 40 95 73-1.
- B. **Related Sections:**

Table 40 95 73-1: RELATED SECTIONS		
1.	Section 01 81 26	- Communications, Control, Safety, and Security Systems.
2.	Section 26 05 53	- Identification for Electrical Systems.
3.	Section 26 20 00	- Electrical Low Voltage Distribution Work.
4.	Section 40 00 00	- Process Systems Integration.
5.	Section 40 95 13.13	- Process Control Hardware for Locks Machinery Control Systems.
6.	Section 40 95 13.16	- Process Control Hardware for Fire Fighting Control Systems (FFCSs).
7.	Section 40 95 13.19	- Process Control Hardware for Electrical Distribution Control Systems (EDCSs).

### 1.02 REFERENCES:

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

### 1.03 REQUIREMENTS:

A. **General:**

1. The Contractor shall meet all applicable requirements of Section 01 81 26 (Communications, Control, Safety, and Security Systems), Paragraph 1.03.
2. All cables and cable identifiers shall be suitable for use in wet, dry, and non-ventilated locations. Cable jackets shall be resistant to sunlight, oil, and moisture.
3. All cables shall be suitable for installation outdoors or indoors in industrial applications.
4. Cable insulation shall be rated for 75°C or better at normal operating voltages.

B. **Cable Identifiers:**

1. The Contractor shall submit for review of the Employer's Representative, identifiers for control cables following the guidelines of Section 26 05 53 (Identification for Electrical Systems).

**C. Control Cables:**

**1. General:**

- a. Unless otherwise specified, control cables shall be twisted-pair or multi-conductor cable, shielded, with PVC jacket.
- b. Conductors shall be stranded copper, sized as required to minimize voltage drop.

**2. Control Cables for Conduits and Ducts:**

- a. Conductor insulation shall be XHHW type conforming to NEMA WC-7.

**3. ControlNet Cables:**

- a. These cables shall be suitable to work in ControlNet networks, and shall be RG-6/U type coaxial cable, continuously corrugated aluminum-armored construction, #18 AWG solid bare copper-covered steel with foam polyethylene insulation and with inner and outer PVC jacket.
- b. These cables shall be suitable for industrial control applications.

**4. DeviceNet Cables:** These cables shall be suitable to work in DeviceNet networks, and shall be #20 and #18 AWG stranded tinned copper conductors with PVC insulation for power and FPE insulation for data, individually foil shielded and an overall tinned copper braid, sunlight/oil-resistant PVC jacket.

**5. Multi-Conductor Control Cables:**

- a. These cables shall be used to wire electric control panels and control signal circuit applications. <sup>A16</sup>These requirements cover copper conductors only. <sup>A16</sup>Aluminum conductors are not acceptable.
- b. <sup>A10</sup>Control cables shall comply with the requirements of NEMA WC-7. The minimum wall thickness at any one point shall be in accordance with NEMA WC-5. <sup>A10</sup>
- c. Conductors shall be Class B, 19- strand copper or better and meet the design requirements specified under ASTM B 8.
- d. <sup>A10</sup>Control cables shall be shielded wherever is required and shall meet the requirements of NEMA WC-5. <sup>A10</sup>
- e. The control cables shall be clearly and permanently identified on the outer jacket, indicating conductor size, number of conductors, voltage rating, type of insulation, consecutive footage marked, date manufactured and others relative information.

**D. Installation:**

1. **Cable Identifiers:** Identifiers shall be installed in all control cables at all manholes and terminals, as well as in cable trays at intervals not to exceed 50 m (164'). Tag or/and tie type identification shall be used to identify the cables, and shall be easy to read in hard to reach areas.
2. **Cables:**
  - a. Control cables shall be placed in conduit, ducts, or on cable tray, as required. Control cables that go out of a machinery room or building shall be installed in outside plant ducts encased in concrete, with the concrete top 1 m deep as a minimum.
  - b. In areas where high induction is likely, control cables shall be installed in Rigid Galvanized Steel Conduit (RGSC) in order to shield the system from induced voltages.

**1.04 DESIGN CRITERIA / SYSTEM PERFORMANCE:**

**A. General:**

1. **Problem to be Solved:**
  - a. Clearly identified control cable system that provides high noise immunity for the respective signal types.
2. **Restrictions to be Considered:** (Reserved)

**B. Design Criteria:** (Reserved)

**C. System Performance:** (Reserved)

**1.05 SUBMITTALS:** Shall be in accordance with Section 40 00 00 (Process Systems Integration), Paragraph 1.05.

**1.06 QUALITY ASSURANCE:** Shall be in accordance with Section 40 00 00 (Process Systems Integration), Paragraph 1.06.

**END OF SECTION**

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