

## Section 16910

### **Control Panel Construction**

#### **PART 1: General**

##### 1.1 *Scope* –

1.1.1 The Systems Integrator shall furnish, test, and startup all furnished electrical control panels and control system components related to their furnished equipment.

1.1.2 Specifically included are the following control panels:

1.1.2.1 Lift Station Control Panel as indicated in electrical drawings, including equipment listed on equipment list in the indicated corresponding locations within the overall control panel.

##### 1.2 *Submittals* – Verification indicating compliance with the all aspects listed under the Systems Integrator Qualifications.

1.2.1 *Product Data* – For each type of product supplied. Include cut-sheet indicating rated capacities, weights, operating characteristics, furnished specialties, and accessories.

1.2.2 *Shop Drawings* – Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

1.2.3 *Connection Diagrams* – For each type of product supplied, provide a terminal connection diagram showing terminal numbers and corresponding function for each terminal connection. These same terminal references shall be utilized in the point-to-point wiring diagrams.

1.2.4 *Alterations to Design* – Any and all alterations to design, equipment, devices, instrumentation, layouts, etc. shall be indicated clearly in the submittal package. As part of the alterations, state the reason(s) for the alteration. No alteration shall occur without prior written approval, submitted and accepted by the Owner. Written approval shall be included with the indicated alterations.

#### **PART 2: Products**

##### 2.1 *General Requirements For Control Panels* –

2.1.1 All control panels shall be constructed in accordance with the following standards: National Electrical Manufacturers Association (NEMA), Institute of Electrical and Electronics Engineers (IEEE), Underwriter Laboratories (UL), Nation Fire Protection Association (NFPA), and Instrumentation Systems and Automation Society (ISA)

2.1.2 All control panels shall be constructed in a UL approved production facility and bare all applicable UL labels for panel construction.

- 2.1.3 The completed panel shall be factory tested prior to shipment. Field installation by the Contractor shall consist only of setting the panel in place and making necessary pneumatic and/or electrical connections.
- 2.1.4 All control panels shall be designed to operate at the service voltage as indicated in the project plans.
- 2.1.5 Refer to Equipment List on drawings for product data to be provided with control panel.
- 2.1.6 The main utility breaker within the panel shall be rated for service entrance, as required per NFPA 70.

## 2.2 *Control Panel Enclosures –*

- 2.2.1 The entire Control Panel Enclosure and assembly shall be rated NEMA 4X.
- 2.2.2 All enclosures, control panels, and associated hardware interior and exterior hardware shall be constructed of stainless steel (316L).
- 2.2.3 All interior components shall be clearly identified with plastic identification nametags. The tags shall be white with black lettering.

## 2.3 *Control Panel Wiring –*

- 2.3.1 Wiring, where required, shall be general-purpose open type, neatly bundled and laced or installed in plastic wiring troughs. Wire shall be stranded No. 14 AWG minimum, with thermoplastic insulation rated for 600V and 90°C.
- 2.3.2 Wiring colors shall be as follows:
  - 2.3.2.1 All ungrounded AC conductors operating at the supply voltage shall be “Black”
  - 2.3.2.2 All ungrounded AC control conductors operating at voltage less than supply shall be “RED”
  - 2.3.2.3 All ungrounded DC control conductors shall be “Blue”
  - 2.3.2.4 All ungrounded AC control conductors or wires that remain energized when the main disconnect is in the “OFF” position shall be “Yellow”
  - 2.3.2.5 All grounded AC current carrying conductors shall be “White”
  - 2.3.2.6 All grounded DC current carrying conductors shall be “White with a Blue stripe”
  - 2.3.2.7 All grounded AC current carrying conductors that remain energized when the main disconnect is in the “OFF” position shall be “White with a Yellow stripe”
  - 2.3.2.8 All ground conductors shall be “Green”
  - 2.3.2.9 A wiring color code legend shall be mounted inside the control panel door.

- 2.3.3 No terminal strip may be located closer than 8 inches from any side or bottom of the control panel. This is designed to allow for adequate wire bending radius for field terminations.
  - 2.3.4 All wiring shall be clearly marked with an identification number consistent with the wiring schematic.
  - 2.3.5 Devices mounted on the enclosure door or interior dead front panel shall be run in spiral wrap to avoid pinch points when opening and closing the enclosure door(s) or interior panels
- 2.4 *Miscellaneous* – Engraved laminated plastic nameplates shall be furnished for each front panel section of the Control Panel assembly. The Contractor shall coordinate with the Owner for nameplate color and naming conventions. All instruments and components shall be tagged on rear with embossed plastic tape labels.

### **PART 3: Execution**

#### 3.1 *Contractor's Responsibility* –

- 3.1.1 The Contractor shall coordinate the work of the service personnel during construction, testing, and acceptance of the work.
- 3.1.2 The Contractor shall receive final approval on all panel, enclosure, and equipment layouts by the Engineer and Owner prior to fabrication or installation.

#### 3.2 *Quality Assurance* –

- 3.2.1 All control panels shall be factory tested and certified prior to releasing for shipment. The testing shall consist of but not limited to the following:
  - 3.2.1.1 Point to point testing of all wiring prior to application of power
  - 3.2.1.2 The intended supply voltage shall be applied to the control panel and all components shall be tested for proper operation and calibration.
  - 3.2.1.3 The programmable logic controller and operator interface code shall be loaded, and each shall be tested for functionality.
  - 3.2.1.4 All components shall be checked to confirm that each device has been installed per the plans and specifications as well as the Manufacturer's recommendations.
  - 3.2.1.5 The enclosure shall be inspected for defects and shall be repaired or replaced if necessary.
  - 3.2.1.6 All labeling and identification tags shall be verified and be clean and visible.
- 3.2.2 Prior to shipment one copy of the control panel drawings shall be placed in the drawing pocket of the enclosure.

#### 3.3 *Installation* –

- 3.3.1 All equipment and devices for the work shall be installed in the locations shown on the drawings, in accordance with the Manufacturer's recommendations, and in compliance with the requirements of these specifications.
- 3.3.2 The Contractor shall be responsible for coordinating the installation of all equipment in the proposed locations with all other trades performing work on the project that may be affected.
- 3.4 *Final Inspection –*
  - 3.4.1 Include all changes and/or alterations in the control panels prior to final inspection and acceptance by the Owner.
  - 3.4.2 Any changes and/or alterations in the Control Panels shall be reflected/updated in all Control Panel Schematics prior to acceptance by the Owner. This includes all electronic copies delivered to the Owner.