SECTION 405080 INSTRUMENT CONTROL PANEL (ICP)

PART 1 - GENERAL

A. Description

This section includes requirements for materials, testing, and installation of the cabinets and consoles to be provided by the system contractor under Section 405000.

PART 2 - MATERIALS

A. Free-Standing Instrument Control Panel

1. The panel shall be a floor-mounted NEMA 4 enclosure and shall be constructed from 14-gage formed steel throughout. Access door shall have door bars on inside surface and continuous hinges. All exposed edges and welds on the enclosure shall be ground smooth. No penetration through the cabinet door or exterior with rivets, screws, bolts, or back of panel nuts shall be allowed. The enclosure shall provide protection against dirt, dust, oil, and water. The interior shall be provided with a formed 12-gage subpanel for attaching surface-mounted components. All components shall be attached with screws, and the subpanel shall be threaded.

2. Rivets or back of panel nuts, screws, or bolts shall not be allowed. No panel penetration is allowed, except for the conduit entry.

3. Provide a fluorescent lamp in the panel. Each interior shall be equipped with a 120 V, 20 A duplex utility outlet and a dedicated single-pole, 20 A, 120 V circuit breaker protecting the outlet and the lamp. The utility outlet and the lamp shall be powered by utility power.

4. Power distribution system shall include a UPS to be powered from a designated "UTILITY POWER FOR UPS" receptacle. The power distribution system shall be connected to the UPS output by a cord with a plug matching the UPS outlet. Provisions shall be made to allow the UPS to be bypassed, i.e. power distribution system to be powered from the utility power by the power cord connected to the "UTILITY POWER FOR UPS" receptacle. The receptacle shall be protected by a designated circuit breaker.

5. A folding shelf at least 18 inch wide and a documentation pocket shall be provided at the panel. The shelf shall be secured to the door bars in a way to allow vertical adjustment of the shelf location.

6. Refer to instrument drawings for enclosure size and installation details.

7. Temperature Control:

   a. Contractor shall provide temperature control features, to maintain internal cabinet temperature within the limits required by the equipment installed in the cabinet.

   b. Submit cooling system sizing calculations, as part of the enclosure submittal.

8. The enclosure shall be customized Hoffman NEMA 4 Quote #144591, or equal.

B. Panel Control Circuit Devices and Components

1. General: All components, except those on the front panels, shall be mounted behind on fixed or swing-out panels; terminal blocks for field connections shall be mounted on fixed channels located near the bottom of the sections but clear of the conduit entry area. Fixed panels shall be located so as not to prevent access within the cabinets to other components, wiring, and terminal blocks on fixed panels or front panels.

2. All electrical devices within the panel shall be identified by tag number, machine printed on a label visible from the panel interior. Labels shall be made of durable plastic tape with an adhesive backing. The labels shall have rounded corners and shall be consistent in size throughout the panel.

3. Control Relays:

   a. Control relays shall have 120-volt AC or 24-volt DC coils, except as noted; contacts shall be rated for the various circuit applications shown on the drawings. Control relays shall be 10-ampere, multiple-contact, 300-volt, plug-in type with dust cover and sockets. The relays shall be equipped with the following features:

      (1) Retaining clip.

      (2) Test button lockable in "ON" position.

      (3) Mechanical flag for contact status indication.

      (4) Pilot light for coil power indication.

   b. If additional contacts are required, they shall be ganged.

   c. The relays shall be Releco General Purpose Relays, Allen-Bradley Bulletin 700-HA, IDEC series RU, Telemecanique RXM relay (Zelio

Plug-in), or equal. All control relays shall be products of one manufacturer.

4. Circuit Breakers: Circuit breakers shall be single-pole, 120-volt, 15-ampere rating.

5. Feed-Through Terminal Blocks: Feed-through terminal blocks shall be modular DIN rail mounted with plastic insulating housings and screw secured cage clamp wire termination and shall be rated 20 amperes at 300 volts. Current carrying parts shall be made of at least an 85% copper alloy, nickel-plated for maximum conductivity and resistance to corrosion. Terminal blocks shall provide a secure oxide-film free connection to the wire without the use of spades, ring tongues, or ferrules. Terminals blocks shall have captive screws and a built-in vibration resistance mechanism, which locks the screw connection in place after the wire has been terminated. A bridge bar for cross connection shall be provided. A test adapter for a banana jack shall be provided. The test adapter shall provide a positive test connection to the terminal block and shall lock into place for hands free operation. White marking strips, fastened securely to the molded sections shall be provided and wire (terminal) numbers or circuit identifications shall be marked thereon with permanent marking fluid. Feed-through terminal blocks shall be Phoenix Contact Type UK 4, Allen-Bradley Series 1492-W, ABB (Entrelec) Series M4/6.NC, Sprecher+Schuh Cat. No. V7-W4, or equal.

6. Fuse Terminal Blocks: Fuse terminal blocks shall be the same profile, but different color as the feed through terminal blocks, and shall have blown fuse light indicator. Fuse terminal blocks shall be Phoenix Contact Type UK 4-TG, or equal.

7. Disconnect Terminal Blocks: Disconnect terminal blocks shall be of knife disconnect type. The blocks shall have a universal foot for mounting on DIN rail and a width of the feed through block. Disconnect terminal blocks shall be Phoenix Contact Type UK 5-MTK-P/P, or equal.

8. DC Power Supplies: Provide DC power supplies as required for analog loops and DC circuits. Each power supply shall be enclosed and include internal short-circuit protection. Current requirements shall not exceed 75% of manufacturer maximum rating.

9. Receptacles: Duplex receptacles shall be molded composition, ivory, specification grade, with finder groove face. Duplex receptacles for 120-volt, single-phase, 3-wire service to be rated 20 amperes, 125 volts, back or side wired, NEMA Type 5-20R. Duplex receptacles shall be Arrow-Hart No. 5352I, Bryant No. BRY5362-I, Hubbell No. CR5362-I, or equal.

10. Indicating Lights: Indicating light shall be push-to-test transformer type with LED.

C. Panel Control Circuit Wiring

1. Wire Type and Size: Instrumentation signal cables shall be of the type used for process control with shielded pairs or triads with polyvinyl jacket and overall shield over the multiple pairs or triads. The instrumentation cable shall be rated 300 volts at 90 °C or better. The size of the instrumentation cable shall be AWG No. 18 with seven strands minimum, unless otherwise specified elsewhere.

2. 120-volt AC wiring within the panel shall be AWG No. 14 THHN. Main power (120-volt AC) to the panels shall be wired using color coded AWG No. 12. AC power to all system power supplies. Wires shall be color coded in accordance with the following table:

| | |
|---|---|
| Black | L1 (hot) |
| White | L2 (neutral) |
| Red | AC control circuits |
| Blue | DC circuits |
| Yellow | Interlock control circuits wired from an external power source |
| Green | Equipment ground |

3. All interfacing between the cabinets and the field shall be accomplished at a terminal strip (TB-1). No internal panel wiring shall be connected to terminals on the "field side" of TB-1. Likewise, no field wiring shall be connected to terminals on the "panel side" of TB-1.

4. All intentionally grounded, grounding, and bonding conductors shall be sized by NEC Article 250 as required.

5. Wires carrying voltage from external devices and one wire from an analog loop shall be terminated at the disconnect terminal block.

6. Only one wire shall be terminated at each side of a terminal block. A bridge bar shall be used for cross connection.

7. Wiring run from components on a swing-out panel to other components on a fixed panel shall be made up in tied bundles. These shall be tied with nylon wire ties and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at terminals.

8. Wiring run to control devices on the front panels shall be tied together at short intervals and secured to the inside face of the panel using Panduit adhesive mounts with Eastman No. 910 adhesive.

9. Wiring to rear terminals on panel-mount instruments shall be run in plastic wireways secured to horizontal brackets run above or below the instruments in about the same plane as the rear of the instruments.

10. Conformance to the above wiring installation requirements shall be reflected by details shown on the shop drawings for the Engineer's review.

11. Signal conditioners and control interface relays shall be provided wherever proper instrument interfacing dictates use of these components. Each auxiliary device shall be assigned a tag number and shall appear on the panel shop drawings.

12. Wire Marking:

    a. Each signal and circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall be marked on all conductors at every terminal.

    b. For field distribution of a common potential, wire number to each field device shall consist of a common (group) number and individual number, ex. if a wire connected to a “hot” potential on a panel side of a terminal block has tag “5”, then field wires should be tagged “5-1”, 5-2”, etc.

    c. The markers shall be permanent sleeve type with machine printed black markings. Markers shall be Thomas & Betts Series EZS, Tyco Series RPS, or equal.

13. Terminal Marking: Each terminal shall be identified by a single unique number. Hand-written labels shall not be allowed. The match between the terminal identification and the wire identification is not required.

14. All electrical devices within the panel shall be identified by tag number, machine printed on a label visible from the panel interior. Labels shall be laminated plastic with an adhesive backing. The labels shall be consistent in size throughout the panel.

D. <u>Spare Parts</u>

1. The Contractor shall furnish to the Owner all necessary spare parts of components required to maintain the system. Prior to final acceptance of work, the Contractor shall provide a spare parts listing of all necessary spare parts and quantities for review by the Owner's Representative. The spare parts shall include, but not be limited to, the following minimum requirements:

| MINIMUM SPARE PARTS LIST | |
|---|---|
| **Part Description** | **Quantity** |
| 1. Power supply | 1 each type |
| 2. Relays | 2 each type |

2. The Contractor shall deliver to the Owner all the required spare parts upon final acceptance of the work. The spare parts shall not be used as replacement parts during the guarantee period.

PART 3 - EXECUTION

Refer to Section 405000

END OF SECTION