

DIVISION 40 - ELECTRICAL

SECTION 40 61 96 – PROCESS CONTROL DESCRIPTIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. General Requirements and Process Control Description for Duplex Submersible Pump Stations.
 - 2. Refer to Related Sections for specific component requirements.
- B. The Authority's Duplex Submersible Pump Station control panels shall be similar in design and construction to provide operations with an easy to maintain and service product. The panels shall meet the following requirements and shall include the features described.
- C. Related Sections:
 - 1. Division 26
 - 2. Division 40
 - 3. Division 43

1.02 SYSTEM DESCRIPTION

- A. General:
 - 1. Wastewater Pump Station control panels shall be constructed within a stainless steel NEMA 4X enclosure which shall include a dead front. Each panel shall include a lamp with door actuated switch, convenience receptacle, thermostatically controlled heater and fan. The face of panel shall include the following devices and instruments:
 - a. Main Circuit Breaker Operator
 - b. Individual Circuit Breaker Operator For Each Pump
 - c. Control Power Circuit Breaker
 - d. OIT
 - e. VFD Key Pad
 - f. HAND / OFF / AUTOMATIC (HOA) Selector Switch For Each Pump
 - g. Run Time Meter For Each Pump
 - h. Amperage Meter for Each Pump
 - i. Pump Run Lamp

- j. Pump Motor Fail Lamp
- k. Pump Motor High Temp Lamp
- l. Pump Motor Seal Fail Lamp
- m. Back Up Level Engaged Lamp
- n. Normal / Back Up Level Control Selector Switch

B. Control Hardware

- 1. Except for back-up level control, all logic shall be executed by an Allen Bradley (AB) Programmable logic controller (PLC). The PLC shall be a CompactLogix 1769 PLC to match other Authority panels.
- 2. Each panel shall also include an operator interface terminal (OIT). The OIT shall be an AB Panelview 1000 color graphic terminal with color touch screen. The Panelview OIT shall have a 10 inch display. The OIT display shall be mounted on the face of the inner door panel. The OIT and PLC shall communicate via Ethernet.
- 3. An Ethernet switch with at least 5 ports shall be included in the panel.

C. Communication

- 1. The Authority has standardized on two methods of communication for wastewater pump station control panels. The Authority will identify which communication mode will be used based on expected reliability. The Authority uses either cellular modems or General Electric / Microwave Data Systems Ethernet spread spectrum radio to facilitate communication between system sites.
- 2. A record of the contiguously assigned registers which shall be available to transmit to the Authority SCADA system shall be prepared and shall be submitted to the Authority for review and approval.

D. Pump Motor Controllers

- 1. Variable Frequency Drives (VFD) (Allen Bradley PowerFlex 400) shall be provided to control each pump. The VFD shall be rated for the incoming power (240 VAC or 480 VAC).
- 2. Where incoming power is limited to 240 V, single phase, the drive shall convert single phase to three phase and be oversized per the manufacturer's recommendations to support phase conversion.

E. Pump Control

- 1. The wastewater pump station control panel shall accomplish wet well level control by:
 - a. Cycling pumps on and off if constant speed pumps are used
 - b. Cycling pumps on and off and adjusting the speed of the pump(s) if variable speed pump control is being implemented

2. Each control panel shall incorporate primary level control based on a submersible level transducer. Back up level control shall be accomplished by use of five (5) float switches (Low Alarm, Pump Shut Down, Lead Pump On, Lag Pump On, High Water Alarm), which shall actuate completely independent from the PLC, OIT and submersible level transducer. Back up level control shall be executed by relays. Both primary and back up level control shall be intrinsically safe. The primary level control shall be the normal mode of pump control. If the high level float of the back-up system actuates, the back-up level control system shall take over the control of the pumps. The back-up level control system shall remain in control until an operator selects primary level control to again assume control of the station.
 3. Pump motor controllers shall be included in the pump control panel. The pump control panel logic shall include monitoring of pump fail as well as monitoring of the MiniCAS module supplied with each pump. The MiniCAS module monitors seal and pump motor temperature. The pump shall be inhibited from running if a high temperature is sensed. An alarm shall be generated if a pump seal is sensed but the pump will be allowed to run.
 4. Back-up level control shall include five float level switches which shall have the following level assignments:
 - a. High Level
 - b. Lag Pump Start
 - c. Lead Pump Start
 - d. Pumps off
 - e. Low Level
 5. If the high level switch is actuated, the back-up level system shall take over level control from the primary level control system.
- F. Other Panel Features and Functions
1. The Pump Station control panel shall be the marshalling location for all pump monitoring and control. The following alarm contacts shall be available on a customer terminal strip located within the pump control panel:
 - a. Generator Run
 - b. Generator Fail
 - c. Fuel Tank Low
 - d. Fuel Tank Rupture
 - e. Commercial / Utility Power Fail
 2. The control panel shall accept the incoming power available at the site. The panel shall include a main circuit breaker properly sized for the pump loads and associated circuits. The main circuit breaker shall include an operator that can be locked out. The Authority personnel shall be able to lock out pumps without opening the deadfront door. The

control panel shall include a control power transformer to reduce incoming power to 120 vac. The 120 vac power shall be used to power panel devices. The control panel shall include an uninterruptible power supply (UPS) to power control power devices with the exception of convenience receptacle, fan, heater, and lamp. The UPS shall be sized to operate all panel devices for a minimum of 12 minutes.

3. The panel shall include a secondary surge suppresser (TVSS) for incoming power.
4. Provide 24 vdc power supply as necessary for PLC, OIT and for I/O.
5. Fuse or otherwise protect circuits within the panel. All 24 volt power supplies shall be fused on the line and load side.
6. Discrete (control) outputs shall be isolated from the PLC output by use of a relay. Each point discrete output point shall include a isolating relay. All discrete inputs shall be fused. It is acceptable to fuse up to four (discrete) inputs on the same fuse.
7. Pilot lamps shall be 30 MM LED type lamps. Selector switches and pushbuttons shall be 30 MM devices.

G. Spares

1. Install and wire spare I/O points for each type of I/O included in the panel (Analog inputs, discrete inputs and control outputs). Installed spares shall be wired and labeled. Provide 10 percent spare I/O minimum 1 point. Provide spare terminal blocks, installed in the panel and available for use by the customer.
2. Provide one spare of each type relay for every ten relays installed in the panel.
3. Provide one spare of each face of panel mounted operator of each type for selector switches and pushbuttons. Provide two spare (total) of each type of contact block used. Provide one spare pilot lamp and one lense of each color used in the panel.

H. Marking and Labeling

1. All wires shall be labeled. Terminal numbers shall be applied to all terminals. All panel devices shall be identified with a label. All face of panel devices shall be labeled with two color lamicoïd lables.

I. Documentation

1. Provide complete as built documentation for each panel. Provide documentation in electronic (.PDF file) and paper format.
2. Provide all application software configured for the PLC and OIT. The application software shall be provided in paper format and in electronic format. In addition, after start-up and testing, the final software configuration shall be provided to the Authority in an electronic form that shall be loadable into a replacement PLC or OIT in the event the currently configured unit fails.

1.03 SUBMITTALS

- A. Submit in accordance with requirements of Section 01 33 00.
- B. Product Data:
 - 1. Record of the contiguously assigned register which shall be available to transmit to the Authority SCADA System.
- C. Shop Drawings:
 - 1. Submit panel layout
 - 2. Submit panel wiring diagrams
 - 3. Submit panel component list
- D. Documentation:
 - 1. Submit all application software (paper and electronic format).
 - 2. Final software configuration in electronic format.

PART 2 - PRODUCTS – Not Used

PART 3 - EXECUTION – Not Used

END OF SECTION