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SECTION 16482
PUMP MOTOR STARTERS AND DRIVES

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SECTION 16482

PUMP MOTOR STARTERS AND DRIVES

PART 1 – GENERAL

1.01 GENERAL

- A. Pump motor starters and pump motor drive sub-system(s) shall be three pole devices which, as part of the station pump control system, shall be designed to connect the pump primary power source to the pump main power leads when it is necessary to run the pump and to remove that power when it is necessary for the pump to stop running.
- B. These sub-systems are defined as across- the- line (ACL), variable speed drive (VFD), or reduced voltage solid state (RVSS) starters. These devices shall be one of the following types as shown in the Contract Drawing(s):
 - 1. NEMA STANDARD contactor style with 120VAC start/stop command and control (ACL).
 - 2. Solid state ramping voltage and current style starters (RVSS).
 - 3. Solid state variable motor speed control style starter/ run device (VFD).
- C. Autotransformer type reduced voltage starters are not acceptable.
- D. The only power source(s) that any of these starter devices shall require for proper operation shall be the associated pump motor main power and a single phase 120VAC control power source. Any starter device which requires any other separate power source(s) for command and control or I/O logic functions to operate correctly are not be acceptable.

1.02 CODES AND PERMITS

All electrically related work, installations, equipment, and devices shall conform to the requirements of the following listed standards as a minimum. The electrical design engineer shall be permitted to increase/enhance the requirements but SHALL NOT decrease/reduce these requirements.

- A. NFPA 70 National Electrical Code
- B. NEMA Standards Publication 250-2008
- C. Local utility company standards and installation guidelines with respect to service entrance and metering

1.03 RELATED DOCUMENTS

The below listed documents shall be used in conjunction with this section. In the event of conflict between the requirements of this document and the related documents and/or additional requirements outlined in this document; this specification document shall govern.

1. Specification Section 11100
2. Specification Section 16000
3. Specification Section 16400
4. Specification Section 16620

The most current revision at the time of project approval shall apply. Specification revisions become official once posted on the City of Savannah web site.

1.04 SUBMITTALS

The below listed shop drawings and product data shall be submitted:

- A. Equipment outline drawings showing elevation, plan, and interior views, weight, cable/wire entry points, and mounting bolt patterns.
- B. Power and control schematics to include external connections and wire terminal identification markings.
- C. Device specifications to include performance data and code compliance certification information related to NFPA 70, IEEE Standards, and IEC/EN Standards.

1.05 QUALITY ASSURANCE AND PRODUCT TECHNICAL SUPPORT

- A. All devices shall be the manufacturer's most recent production model which meets the performance requirements of this specification.
- B. The product selected for installation shall have a parts and factory certified service organization located within 250 miles of the project location. Contractor shall provide the name and address of this factory certified service and parts organization to the Wastewater Conveyance Maintenance Superintendent.
- C. All equipment shall be UL approved and be installed in compliance with NFPA 70 and IEEE Standards.

PART 2 - EQUIPMENT DESCRIPTION

2.01 ACROSS THE LINE (ACL) MOTOR STARTERS

- A. The starter shall be a NEMA AC Magnetic Starter assembly with the features listed below:
1. A 120VAC coil
 2. An integrated solid state overload protection assembly appropriately sized for the motors installed. This assembly shall be resettable by means of pushing a non-conductive push-rod mechanism which resets all three phase lines simultaneously.
 3. Provide Square D Te Sys T motor management system.
 4. The assembly shall be equipped with alarm contacts (one normally open and one normally closed) which shall change state when the assembly is tripped.
 5. The starter sub-assembly shall be equipped with field replaceable contacts.
 6. The starter assembly shall have a minimum of one (1) normally open and one (1) normally closed auxiliary contact set.
 7. The starter assembly shall be equipped with field replaceable mechanical lugs for main power wiring connections.
 8. In order to minimize the number of ACL starter spares which the end-user must maintain in inventory, the minimum starter size shall be NEMA Size 2.
- B. ACL type motor starter shall not be used for pumps sized greater than 19 HP.
1. Provide products of Square D, no substitutions permitted.

2.02 REDUCED VOLTAGE SOLID STATE STARTER (RVSS) MOTOR STARTER ASSEMBLIES

- A. The starter shall be designed and installed to operate with a non-reversing shorting contactor configuration which shall automatically transfer the pump motor main load from the electronic controller to the contactor following the ramp-up time period of starting the motor.

The electronic controller shall continue to monitor data such as pump load amps and shall control such functions as shut-down of the pump motor in response to over-current, single-phasing, and other conditions which may cause damage to the pump motor/control system.

- B. The controller shall be equipped with terminal connection points (terminal strip) which shall accept stranded copper THHN wire for the commands listed below, control, and annunciation signals as a minimum:
1. Pump "run" command
 2. Pump "stop" command
 3. Activate the shorting contactor sub-assembly. (Full-Speed Contact)

4. Pump motor failure (overload, phase failure, and etc.) condition to activate external fault devices
 5. Pump is running condition external annunciation
 6. Pump running amps proportional to a 4-20ma signal output, (shielded pair)
 7. Digital I/O logic data signals
 8. Remotely mounted graphic display device
- C. The controller shall be equipped with mechanical wire lugs to accept the pump motor input power conductors which shall be readily accessible to field maintenance personnel.
- D. The controller shall be equipped with a graphic display and input programming device for observation of status and programming of the controller by field personnel. This shall be mounted in the control panel inner door.
- E. This type motor starter assembly shall be used for pumps sized 20 HP and larger.
- F. Provide Square D Altistart 48 series, no substitutions permitted.

2.03 VARIABLE FREQUENCY DRIVE CONTROLLER ASSEMBLIES (VFD)

- A. Variable Speed Drive (VFD) systems shall be employed at lift stations where:
1. The wet well effluent wastewater exiting the station into the force main system is operationally required to be kept at a relatively constant rate-of-flow regardless of the influent rate-of-flow under “normal” conditions.
 2. The wastewater pumping station primary power from the utility is not three-phase, four-wire configured, (the standard pumps utilized by the Wastewater Conveyance Department shall ordinarily require three-phase power for proper operation).
- B. VFD equipment assemblies shall have the below listed features/capabilities as a minimum:
1. Harmonic reduction (filtering) of both the input and output power of the VFD designed to mitigate the introduction of electrical “noise” into associated control and monitoring circuitry.
 2. The capability to generate a third phase for the pumping assembly at the appropriate voltage and load current levels for the normal operation of three-phase pump assemblies.
 3. A graphic display device which shall provide for observation of status and programming of the controller by field personnel.
 4. The controller shall be equipped with terminal connection points (terminal strip) to accept stranded copper THHN wire conductors for routing the below listed command, control, and annunciation signals as a minimum:
 - a. Pump “run” command
 - b. Pump “stop” command

- c. Pump motor failure (overload, phase failure, and etc.) condition activating external controls
 - d. Pump is running condition annunciation
 - e. Digital I/O logic data signals
 - f. Pump running (AMPS 4-20mA) signal
 - g. Analog (4-20mA) speed control signal input, where applicable
 - h. Selectable manual speed control
 - i. Remotely mounted graphic display device
5. The controller shall be equipped with wire lugs for power in and out that are readily accessible to field maintenance personnel.
 6. Provide Square D Altivar 61 series, no substitutions permitted.

PART 3 – TESTING, INSPECTION, AND FINAL ACCEPTANCE

3.01 EQUIPMENT START-UP/PROGRAMMING

- A. The Contractor shall coordinate and retain the technical services of factory certified personnel to ensure that all assemblies/sub-assemblies are correctly installed, programmed per the owner's requirements, and acceptable for commissioning and warranty purposes.
- B. The equipment systems and sub-systems operational capabilities shall be demonstrated at the operational site to the satisfaction of the Inspector or his/her representative as well as the Wastewater Conveyance Maintenance Superintendent or his/her representative.

3.02 DOCUMENTATION AND END-USER O&M PERSONNEL TRAINING

- A. A minimum of one (1) copy of operating and maintenance instructions shall be provided to the Wastewater Conveyance Department Maintenance Superintendent or his/her representative in printed form as an integral part of the final acceptance inspection and acceptance. Also provide electronic PDF file on digital CD.
- B. A minimum of one (1) copy of blueprints, Red Line (hand) drawings with field notes, installation and programming mark-up notes and interconnection wiring diagrams utilized in this installation shall be provided to the Wastewater Conveyance Maintenance Superintendent or his/her representative as an integral part of the final inspection and acceptance. Also provide PDF of information on CD.
- C. A printed copy of all settings for the variable frequency drive or reduced voltage solid state starter shall be provided to the Wastewater Conveyance Maintenance Superintendent or his/her representative as an integral part of the final inspection and acceptance. Also provide PDF of information on CD.

- D. The Contractor shall coordinate with all applicable vendors and the City of Savannah Wastewater Conveyance Department Maintenance Superintendent to schedule and provide on-site operating and maintenance training for city personnel.

PART 4 – WARRANTY

Warranty provisions shall be as described in Specification 11100.

END OF SECTION 16482