

SECTION 33 32 20  
SUBMERSIBLE WASTEWATER PUMPING STATION

PART 1 GENERAL

1.1 SUMMARY

- A. The Contractor shall furnish all labor, materials, equipment and supplies and shall perform all work necessary for the complete constructions of submersible pumping station as shown on the plans and specified herein.
  
- B. Section Includes:
  - 1. Submersible public wastewater pumping station.
  - 2. Initial operation of packaged public pumping station.
  
- C. Related Sections:
  - 1. Section 03 30 00 - Cast-In-Place Concrete.
  - 2. Section 31 23 16 – Excavation and Fill.
  - 3. Section 31 23 17 – Trenching.
  - 4. Section 32 31 13 - Chain Link Fences and Gates.
  - 5. Section 33 05 14 - Utility Manholes and Structures.
  - 6. Section 33 05 17 - Precast Concrete Valve Vaults and Meter Boxes.
  - 7. Section 33 11 00 - Public Water Utility Distribution Piping.
  - 8. Section 33 12 13 - Water Service Connections.
  - 9. Section 33 31 00 - Sanitary Utility Sewerage Piping.
  - 10. Section 33 34 00 - Sanitary Utility Sewerage Force Mains.
  - 11. Division 26 – Electrical Section

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
  
- B. ASTM International:
  - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
  - 2. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
  - 3. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 4. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
  - 5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
  - 6. ASTM A709/A709M - Standard Specification for Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched-and-Tempered Alloy.
  - 7. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 8. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 9. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

- 10. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- 11. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- 12. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- 13. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- 14. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

- C. United States Department of Defense:
  - 1. US DoD W-C-375/1A NOT 1 - Circuit Breakers, Molded Case, Branch Circuit and Service, Type I, Series Trip, Single Pole (10 Through 70 Amperes).

1.3 SYSTEM DESCRIPTION

- A. Pumping Station: Duplex; field assembled; with precast concrete basin; submersible non-clog [ ] pumps; multiple automatic control for in ground [ ] installation.

1.4 DESIGN REQUIREMENTS

- A. Design influent conditions to pumping station are as follows:
  - 1. Parameter: Flow.
  - 2. Minimum: [ ] gpm
  - 3. Average: [ ] gpm
  - 4. Maximum: [ ] gpm

1.5 PERFORMANCE REQUIREMENTS

- A. Pumping Station: The pumps shall be duplex pumps supplied by constant speed drives having the necessary characteristics and properly selected to perform under the following operating characteristics:
  - 1. Number of Pumps [ ]
  - 2. Pump Capacity @ maximum speed (60 Hz) [ ] gpm @ [ ] feet TDH  
[ ] gpm @ [ ] feet TDH
  - 3. Pump Capacity @ minimum speed [ ] gpm @ [ ] feet TDH
  - 4. Static Head [ ] feet
  - 5. Minimum Shut-off Head [ ] feet
  - 6. Discharge Size (Nominal) [ ] inches
  - 7. Minimum Solids Handling Size [ ] inches
  - 8. Pump Horse Power [ ] Hp (Non-Overloading)
  - 9. Minimum Efficiency [ ]%
  - 10. Maximum Motor Speed [ ] rpm
  - 11. Electrical Service [ ] volt/[ ] phase/60 Hz
  - 12. Power Cable Required Continuous to panel w/o splices
  - 13. Float Switch Cord Required per Float Continuous to panel w/o splices
- B. Basin Wall: Sufficient to withstand water-saturated sand load of 120 pcf.
- C. Basin Cover: Support live load of 150 psf

1. Locate four mercury switch floats consisting of "pump off", "start lead", "start lag", and "high level" in basin. Start one pump automatically when "start lead" float is activated. Start second pump automatically when "start lag" float is activated. Signal alarm condition automatically when "high level" float is activated. Stop both pumps automatically when "common stop" float is activated. Set float elevations in accordance with Drawings. Set pumps to automatically switch operation from one pump to another after shut off of each pumping cycle.
- D. Sound, Vibration, and Thermal Control: Dampen or suppress noise, absorb vibration, accommodate thermal expansion and stresses, and adjust or correct for misalignment in piping systems.

#### 1.6 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
1. Outline drawings showing equipment and shipping dimensions and weights, location of accessories, and clearances required.
- C. Product Data: Submit for each type of pumping station.
1. Include catalog data for basin, cover, hinged door, slide rail assembly, lifting assembly, discharge piping, valves, junction box, level controls, and control panel.
  2. Include pump catalog data, performance curve, breakaway fittings data, and access frame data.
  3. Include control panel data and panel wiring schematic.
  4. Include recommended spare parts list.
- D. Test Reports:
1. Submit written report showing factory pump inspections and tests have been successfully performed.
- E. Manufacturer's Installation Instructions: Submit manufacturer's published instructions for basin, pump, and panel systems procedures.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- G. Manufacturer's Field Reports:
1. Submit report of each visit of manufacturer's representative to provide technical assistance during installation.
  2. Submit start-up report before final acceptance of [pump] [pumps] to document pumping station operation meets performance requirements.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.
- B. Record actual locations of pumping stations including basins and control panel.
- C. Submit two copies of executed certification of pumping stations after performance testing to the owner.

- D. Submit two copies of spare parts list and rebuild kits to the owner.
- E. Provide two copies of the Operations and Maintenance Manual containing operating and maintenance requirements for pumping station and schedule of recommended maintenance to the owner.

#### 1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing work of this section with minimum 5 years experience.

#### 1.9 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

#### 1.10 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping [system pieces] [systems] from entry of foreign materials and water by temporary covers, completing sections of work, and isolating parts of completed system.
- D. Accept system components on site in manufacturer's original containers or configuration. Inspect for damage.
- E. Store sensitive materials for field assembly in dry area in original shipping containers.
- F. Support basin with nylon slings to structural lift points during handling.
- G. Repair damage to basin according to manufacturer's instructions.

#### 1.11 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Do not install concrete basin base when bedding is wet or frozen. Dewater excavation to keep excavation dry.

#### 1.12 WARRANTY

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

- B. Furnish five year prorated manufacturer's warranty on pump seals.

#### 1.13 EXTRA MATERIALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for extra materials.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- A. Bedding, Ballast, and Backfill.

- 1. Bedding: Aggregate Type as specified in Drawings.

#### 2.2 WETWELL SYSTEM

- A. Concrete Basin:

- 1. Precast reinforced concrete basin conforming to ASTM C-478.
  - 2. Minimum wall thickness: 6 inches
  - 3. Diameter: 96 inches.
  - 4. Joints: Made to receive rubber gasket, butyl mastic rope sealer, or a non-shrink type grout especially made for this purpose.
  - 5. Base: Integrally cast with extended base conforming to ASTM C-478 or to minimum dimensions shown on the drawings.

- B. Concrete Cover: Reinforced concrete in accordance with Section 03 30 00

- C. Concrete Mortar: 3000 psi

- D. Access Hatch:

- 1. 1/4 inches aluminum with diamond pattern capable of withstanding 300 pounds per square foot, stainless steel hinges, anchor flange, drainage coupling, and snap lock.
  - 2. Hardware and hinges: Stainless steel with tamper-proof fasteners.
  - 3. Doors: Open 90 degrees and capable of locking in this position with a stainless steel positive locking arm and aluminum release handle.

- E. Junction Box: NEMA 250 Type 6 with cable grips for incoming direct burial cable.

- F. Electrical:

- 1. Provide cable grips for direct burial cable for field installation.
  - 2. Provide explosion proof equipment, supplies and fittings.

- G. Level Controls: Four mechanical float type or mercury type pilot duty liquid level controls with AWG 18-2 SJOW-A cable in polypropylene housing for mounting to cable bracket.

#### 2.3 VALVE VAULT SYSTEM

- A. Concrete Vault:

- 1. Precast reinforced concrete basin conforming to ASTM C-478.
  - 2. Minimum wall thickness: 6 inches

3. Dimensions: [ ] feet wide by [ ] feet long.
  4. Joints: Made to receive rubber gasket, butyl mastic rope sealer, or a non-shrink type grout especially made for this purpose.
  5. Base: Integrally cast conforming to ASTM C-478 or to minimum dimensions shown on the drawings.
- B. Concrete Cover: Reinforced concrete in accordance with Section 03 30 00
- C. Concrete Mortar: 3000 psi
- D. Access Hatch:
1. 1/4 inches aluminum with diamond pattern capable of withstanding 300 pounds per square foot, stainless steel hinges, anchor flange, drainage coupling, and snap lock.
  2. Hardware and hinges: Stainless steel with tamper-proof fasteners.
  3. Doors: Open 90 degrees and capable of locking in this position with a stainless steel positive locking arm and aluminum release handle.
- E. Valves General: To be the type, size, and class shown on the plans. Valves shall have a heavy cast iron body with standard flanged ends, Class 125 with operating devices as specified or shown. Valves shall be at least the same class as the pipe on which they are used. All exposed valves shall be shop primed. Insofar as possible, all valves shall be by the same manufacturer.
- F. Plug Valves:
1. Eccentric of the non-lubricated type with resilient faced plugs.
  2. Valve bodies: Conform to ASTM A-126 Class B cast iron according to AWWA C504
  3. Plugs: Resilient faced cast iron, ASTM A126 Class B
  4. Metal bearings: Sleeved and sintered, oil impregnated, and permanently lubricated stainless steel conforming to Type 316, ASTM A743, Grade CF-8M or AISI Type 317. Non-metallic bearings are not acceptable.
  5. Valve shaft seals: Conform to AWWA 504 and AWWA C507. Utilize a multiple v-ring that is externally adjustable and repackable under pressure.
  6. Valve actuators: Lever type for all valves 6 inches and smaller.
- G. Swing Check Valves: Shall be bronze mounted with rubber faced bronze clapper disc seated by a bronze clapper arm against a bronze seat ring. The clapper shall have a lever and spring to assist closure. The spring tension shall be adjustable to set the speed of closure of the valve to the operating conditions in field. The clapper shall be secured to a stainless steel shaft set in bronze bushings. Bushings shall be secured to the valve body with cap screws and sealed with O-rings.
- H. Pressure Gauge: Supply two (2) glycerin-filled pressure gauges for installation by the Contractor on each discharge pipe from the pump station inside the valve vault. Pressure gauge casing shall be black fiberglass reinforced thermoplastic, wetted parts shall be 316 stainless steel, and the dial indicator must be a minimum of 4" inches in diameter dial as manufactured by WIKA or an approved equal. Rated accuracy shall be 1% of full scale reading. Mounting of the gauge shall be 1/2" NPT. Range of the pressure gauge shall be zero to 100 psi or shall have a rated over range maximum pressure capacity greater than the rated capacity of the pumps. A diaphragm protector shall be supplied with each gauge to include a teflon O-ring seal at the gauge, liquid filled upper housing, flexible diaphragm, and a 1/2" process connection. Gauge installation shall be complete with all hoses and

fittings, including a 1/2" NPT brass cock valve for the gauge line at the point of connection to the discharge pipe.

## 2.4 PUMPS

- A. Manufacturers:
  - 1. ABS
  - 2. Substitutions: Section 01 60 00 - Product Requirements
  
- B. Product Description:
  - 1. Pumps: Submersible non-clog constant speed with horizontal discharge, fittings, piping, and pump brackets.
  - 2. Discharge Size: [\_\_\_\_\_] inches.
  
- C. Volute: ASTM A48, Class 40, cast iron, non-concentric design. Discharge shall have an ANSI bolt pattern for attachment of discharge bracket.
  
- D. Motor Housing: ASTM A48, Class 25, cast iron.
  
- E. Seal Plate: ASTM A48, Class 25, cast iron.
  
- F. Impeller:
  - 1. Design: single vane, enclosed, and non-clogging and have pump out vanes to prevent grit and other materials from collecting in the seal area. Capable of passing a minimum 3 inch solid and coated to improve efficiency. Dynamically balanced and slip fit to a tapered shaft and key driven. Impeller fastened to the shaft with a 300 series stainless steel washer and bolt. Impeller shall be constructed of cast iron ASTM-A48, Class 40. Provide a volute case wear ring constructed of 316 stainless steel and an impeller wear ring constructed of 304 stainless steel.
  
- G. Shaft
  - 1. Pump shaft and motor shaft shall be an integral unit. Each shaft shall be a one piece design constructed of 420 stainless steel.
  
- H. O Rings: Buna-N, rubber.
  
- I. Hardware: 300 Series stainless steel.
  
- J. Paint: All metal surfaces coming into contact with the pumped media (Other than stainless steel) shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a high solids two part epoxy paint finish on the exterior of the pump.
  
- K. Seal:
  - 1. Each pump shall have a tandem mechanical shaft seal system consisting of two totally independent mechanical seal assemblies. The upper set of the tandem seals shall operate in an oil chamber located below the moisture sensing chamber. The set shall contain one stationary silicon-carbide ring and one positively driven rotating silicon-carbide ring functioning as an independent secondary barrier between the pumped liquid and the stator housing. The lower tandem set shall function as the primary barrier between

- the pumped liquid and the stator housing. This set shall consist of a stationary ring and a positively driven rotating ring both being silicon-carbide.
2. Each seal interface shall be held in contact by its own spring system. The seals shall not require maintenance or adjustment but shall be easily replaceable.
  3. The pump shall be equipped with a seal leak detection probe and warning system. This shall be designed to alert maintenance personnel of seal failure without having to take the unit out of service for inspection or requiring access for checking seal chamber oil level and consistency.
  4. There shall be an electric probe or seal failure sensor installed in the moisture detection chamber. If the seal fails, contaminants which enter the seal chamber shall be detected by the sensor and send a signal to operate the specified warning device.
  5. Units equipped with opposed mechanical seals shall not be acceptable.
- L. Cable Entry: 30 feet cord. Pressure grommet for sealing and strain relief.
- M. Speed: [\_\_\_\_] rpm, constant.
- N. Shaft: 420 stainless steel designed with a sufficient diameter with a minimum overhang to reduce shaft deflection and bearing wear.
- O. Upper Bearing:
  1. Design: cylindrical, roller bearing.
  2. Lubrication: grease.
  3. Load: radial.
  4. Bearing Life: 100,000 hours
- P. Lower Bearing:
  1. Design: angular contact
  2. Lubrication: grease.
  3. Bearing Life: 100,000 hours.
- Q. Motor:
  1. Design: U/L listed, hermetically sealed, submersible type. Provided with thermal overload protection and moisture detection system. Designed for continuous duty, capable of sustaining a minimum of 10 starts per hour.
  2. Data: [\_\_] hp, [\_\_\_\_] rpm, for operation at [\_\_] volt, [\_\_] phase, [\_\_] hertz.
  3. Motor must be inverter duty rated.
- R. Rail Assembly: Pumps mounted on rail assembly for removal without entering the wetwell. Pumps connected to the stationary discharge elbow by use of a hydraulic sealing flange with no metal-to-metal contact. All assembly, brackets, support, and accessories, Schedule 40, 304 stainless steel.

## 2.5 CONTROL PANEL

- A. Power Supply:
  1. [\_\_] volt, [\_\_] phase, [\_\_] wire, [\_\_] hertz.
  2. For operation of [\_\_][\_\_] horsepower pumps.
- B. Enclosure



1. The controls will be housed in a free-standing, three door, NEMA 4X stainless steel enclosure. The enclosure shall be completely gasketed, hinged, and equipped with a padlockable latch. The stainless steel enclosure will be 304 type with 3-point latching.
  2. All installations requiring penetration of the control panel shall be made in such a manner and with approved devices that will maintain the panels' NEMA 4X rating.
- C. Inner Door
1. Provide a removable inner swing door for each door of the enclosure. Inner swing door must be 5052 brushed marine grade aluminum having a minimum thickness of .090 inches. The door shall have .5 inch flanges on three sides for increased strength. The door shall be adequately sized to enclose all panel-mounted components while having a vertical swing of a minimum 90 degrees. Inner doors shall be held closed with a durable 1/4-turn latch. The doors shall have a brushed high gloss luster. All inner door mounted components will be labeled with phenolic engraved nameplates.
- D. Sub-panel
1. Control sub-panel shall be 12-gauge steel with white enamel finish. Sub-panel shall have flanges on at least two sides. All mounting holes shall be drilled and tapped at least 8/32" and parts mounted with stainless steel machine screws. Self-tapping screws will not be accepted.
- E. Wiring and Labeling
1. Power wiring shall be properly sized MTW rated 90 degrees C. Control wiring shall be red #14 AWG, MTW, rated 90 degrees C. All panel wiring shall have polyester or vinyl-cloth numerically identified labels on each end to indicate wire number. Labels will be manufactured by Brady. Wire will be neatly routed in the panel through polyester wire duct except from the backplate to the inner door, which shall be wrapped in a separate bundled harness for control.
  2. A laminated "As-Built" wiring schematic shall be posted on the inside of the inner door. A data tag with panel and manufacturer information shall be provided on inside of enclosure door.
  3. All panel mounted components including control and power terminal strips will be clearly labeled according to provided wiring diagram.
  4. All UL labels shall be posted where required by 698 standards.
- F. Panel Components
1. Main disconnect
    - a. Main disconnecting means shall be installed in the control panel. The main disconnect shall consist of a 200 amp KAL type breaker with operator mechanism, both manufactured by Square D Company.
    - b. The disconnect operator shall be interlocked with the inner door to prohibit the door from being opened with the circuit breaker on. A concealed override mechanism shall allow qualified personnel to bypass the interlock allowing entrance without turning the circuit breaker off. The operator shall be lockable in both the on and off positions. It shall not be possible to open the door with the circuit breaker locked in any position.
  2. Pump Circuit Breakers
    - a. Circuit breakers shall be provided for each pump. Each pump breaker shall be 100 amp FAL type manufactured by Square D Company.

- b. The pump disconnect operators shall be interlocked with the inner door to prohibit the door from being opened with the circuit breakers on. Concealed override mechanisms shall allow qualified personnel to bypass the interlock allowing entrance without turning the circuit breakers off. The operators shall be lockable in both the on and off positions. It shall not be possible to open the door with the circuit breakers locked in any position.
- 3. Transient Voltage Surge Suppressor (TVSS) with a minimum surge current rating of 160,000A shall be provided. The TVSS shall have an LED indicator light and be mounted in a NEMA 4X enclosure.
- 4. A three phase voltage monitor shall be provided to protect against over-voltage, under-voltage, phase loss, phase sequence reversal, and load cycling. The monitor shall be plug-in type as manufactured by Diversified Corporation.
- 5. Climate Control
  - a. A properly sized climate control system to maintain a temperature between 50 and 90 degrees inside the control panel under any sequence of operation should be provided.
  - b. It shall be mounted in a manner that retains the 4X rating of enclosure.
- 6. Control Transformer
  - a. A 5 KVA stainless steel enclosed transformer manufactured by shall be provided for the control circuit and other auxiliary devices. It shall be mounted on the side of the control panel and shall maintain the 4x rating of the enclosure.
  - b. A 15 amp 2 pole FAL type circuit breaker shall be provided to protect the primary of the transformer.
  - c. A 40 amp 2 pole FAL type circuit breaker shall be provided to protect the secondary of the transformer.
  - d. Transformer and breakers shall be manufactured by Square D Company.
- 7. Protected Equipment
  - a. One 20 amp ground fault circuit interrupter (GFCI) type duplex receptacle shall be provided on the side of the control panel for operation of 115VAC devices. The GFCI shall be protected by a 20 amp QOU type circuit breaker.
  - b. Three spare 20 amp QOU type circuit breakers shall be provided for connection to future equipment.
  - c. All breakers shall be manufactured by Square D Company.
- 8. Pump Protection
  - a. Over-temperature protection shall be provided in the control panel to operate in conjunction with the over-temperature switch in each pump motor. The control shall provide pump lockout of operation upon occurrence of high temperature.
  - b. Pump seal failure protection shall be provided in the control panel to operate in conjunction with the moisture sensor or seal failure switch in each pump motor. Seal leaks shall be detected for in the motor housing and seal chamber. The circuitry shall include a red failure indicating light on the inner panel for each pump as an alarm indication. The pumps shall be allowed to continue to run.
- 9. A Square D premium M340 Programmable Logic Controller (PLC) or pre-approved equal in the control panel shall control the operation of the pumps based on wet well level.

10. Intrinsically safe relays shall be provided in the panel. They will be connected to two float type switches installed in the wet well as high and low alarm devices and backup pump control.
11. An interior panel light shall be provided and interlocked with enclosure door so that it illuminates when the door is open.

G. Indication and Operator Interface (mounted on panel inner doors)

1. A three-position 'P1-P2-Alternate' switch shall be provided to select lead pump.
2. Each pump will have a three-position switch to select 'Manual-Off-Automatic' position.
3. Each pump will have a two-position switch to choose 'Automatic-Manual Speed'
4. A 5-10K ohm potentiometer shall be provided to determine speed of each pump.

Green Pump Running lights shall be provided for each pump.

5. Red fault lights for each pump shall be provided for the following conditions:
  - a. Pump Over-Temperature
  - b. Pump Seal Failure
6. Amber indication lights shall be provided for the following conditions:
  - a. Backup Float Low Level
  - b. Backup Float High Level
7. Provide LED push-to-test transformer type indicator lights for all pilot lights.
8. All lights and switches shall be SKS type manufactured by Square D Company.
9. Each pump shall have elapsed time meter mounted on the inner door. Meters shall be wired to each starter, six digit, non-resettable, to indicate total run time in hours and tenths.
10. A Square D color touch screen operator interface or pre-approved equal shall be provided for visual display of tank level and adjustment of level setpoints and timer values.
11. Ultrasonic Liquid Level equipment shall operate on 120 VAC power and be fully compatible with Pump Control Centers specified below.
  - a. Ultrasonic control equipment shall consist of one (1) complete Hydro-Ranger 200 panel mount unit as manufactured by Milltronics; rack mount models are not acceptable.
  - b. The system shall include a separate hand-held, 20 key programmer and graphics LCD indicator screen.
  - c. The system shall also include one (1) non-contacting wet well mounted ultrasonic transducer, Echomax Model XPS-15, providing a one (1) foot to fifty (50) feet operating range with thirty (30) feet long cable. The transducer shall be contained within a chemical resistant polypropylene compound IP65 NEMA 4X enclosure measuring 7.7 x 7.1 x 3.0 inches as manufactured by Milltronics.
14. A Magnetic flowmeter shall be furnished consisting of a panel mounted transmitter and flow tube properly sized for the installation. The transmitter shall be Siemens MAG 5000 with a 5100 W flow tube or pre-approved equal.
15. The flowmeter and level controller shall be supplied by the control manufacturer to assure system compatibility.

H. Alarm System

1. A flashing alarm light with a minimum 40 watt light bulb shall be installed at the panel and located as to be readily visible from the main road. Alarm light

- shall be approved for vapor tight side installation and shall have a red lexan globe.
  - 2. A weatherproof alarm horn with back box shall be mounted below the alarm light on the side of the enclosure. Horn shall have a minimum 87 DBA output. The silencer shall be mounted on the front enclosure door and be labeled with a phenolic engraved name tag.
  - 3. SCADA connections shall be provided for all run, alarm, and analog signals.
- I. Experience and Rating
- 1. The pump control panel manufacturer shall have at least 20 years of experience and have at least 3000 similar installations.
  - 2. The control panel shall be UL listed and labeled as an industrial control panel under UL 698 procedures.
  - 3. The pump control panels shall be CPDPSV Series as manufactured by Control Interface, Inc.; Cincinnati, OH, or pre-approved equal.
- J. Lightning Arrestor:
- 1. Manufacturers:
    - a. Delta Lightning Arrestors, Inc.
    - b. Substitutions: Section 01 60 00 - Product Requirements
- K. Auxiliary Power Supply: Emergency standby electric generating system suitable to meet pump station power handling.
- 1. Manufacturers:
    - a. Kohler
    - b. Cummins-Atlantic
    - c. Detroit Diesel
    - d. Caterpillar
    - e. Substitutions: Section 01 60 00 - Product Requirements

## 2.6 PUMP HOIST

- A. Design: Stainless steel boom and winch assembly with a telescoping adjustable boom and winch with enclosed gears at a 4:1 ratio, removable from a mounting base permanently attached to the wetwell, containing 30 feet of stainless steel cable and safety hook.
- B. Capacity: 500 pounds or two times the weight of specified pump and motor, whichever is greater.

## 2.7 ACCESSORIES

- A. Sealant: Industrial silicon sealant for pipe penetrations in basin.
- B. Anchor Bolts, Nuts, and Washers: ASTM A709/A709M, Grade 36, bent anchor bolts; ASTM A307, Grade A, nuts; ASTM A126, gray iron washers. Galvanize bolts, nuts and washers in accordance with ASTM A153/A153M.
- C. Exterior Lighting: As indicated on Drawings and as specified in Section 26 56 00
- D. Fresh Water Supply: As indicated on Drawings.

## 2.8 SOURCE QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Perform the following field inspections and tests:
  - 1. Motor voltage and frequency check as shown on name plate.
  - 2. Motor and cable insulation test for moisture content or insulation defects in accordance with UL criteria.
  - 3. Submerged pump run test to determine pump meets hydraulic performance requirements.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verification of existing conditions before starting work.
- B. Verify inlet and discharge piping connection are size, location, and elevation on Drawings.

### 3.2 BASIN INSTALLATION

- A. Place, compact and level aggregate bedding to minimum 8 inches.
- B. Install basin at proper grade and to alignment on Drawings on aggregate base.
- C. Set cover frames and covers level without tipping, to correct elevations.
- D. Assemble basin components including inlet hub/fitting, discharge hub, cover, pump support rail system, level controls, and junction box.
- E. Connect to inlet and discharge piping with flexible connector.
- F. Seal joints water tight between inlet and discharge pipes and sump wall.
- G. Install fresh water supply system.

### 3.3 PUMP INSTALLATION

- A. Install pump including fittings, brackets, discharge piping, check valve to basin rail assembly, lifting device, and discharge. Wire pump to junction box.

### 3.4 CONTROL PANEL INSTALLATION

- A. Mount and wire control panel for pumping station operation including duplex motor controls, circuit breaker, starter, control transformer, fuse box, terminal block, alternator, alarm and running lights, and auxiliary power supply generator.
- B. Wire in accordance with requirements of National Electrical Code.
- C. Number each conductor.

- D. Tin ends of wires with 60/40 lead tin alloy solder.
- E. Locate and connect direct burial cable from control panel to basin junction box.

### 3.5 STATION STARTUP, INITIAL TESTING AND OPERATION

- A. Notify Engineer and Owner, 3 days prior to flow rate testing.
- B. Provide startup and initial testing of system. Coordinate and operate pumps in conjunction with other construction.
- C. Correct failures during test by repairing or replacing malfunctioning parts or equipment or faulty workmanship, regardless of cause, within 72 hours after notification from Engineer.
- D. After correcting failures caused by defective equipment, material, or faulty workmanship, retest until failures are eliminated.
- E. Confirm general sequencing of pump and float operations at basin and control panel are in accordance with performance requirements.
- F. Document and certify startup results in start up report.

### 3.6 MANUFACTURER'S FIELD SERVICE

- A. Section 01 40 00 - Quality Requirements: Requirements for manufacturer's field services.
- B. Furnish factory trained representative and field technical assistance during the following periods of pumping station installation:
  - 1. Unloading of station materials and components.
  - 2. Start-up, testing, and demonstration of station systems-basin, pump, and control panel.

### 3.7 ADJUSTING

- A. Adjust basin, pump, and control panel systems so station operates to performance requirements and in accordance with specifications.

### 3.8 DEMONSTRATION

- A. Demonstrate operation of pumping station - basin components, pump system, and control panel.

END OF SECTION