

SECTION 11310

SUBMERSIBLE GRINDER PUMP

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope

1. Furnish and install two (2) single-stage vertical submersible grinder pumps for the treatment plant wastewater disposal system: WWP-1 and WWP-2
 - a. The pumps shall be installed in the dedicated wet well in the Pumping and Disinfection Building
2. Furnish and install one single-stage vertical submersible pump for the Pumping and Disinfection Building pump room drainage system: SP-1
 - a. Located in open sump with trench drain in Pump Room
3. Provide electric motors, couplings, anchor bolts, suction fitting, guide rail support and access system and all appurtenances

B. Additional Requirements Specified Elsewhere

1. Section 01340: Shop Drawings, Product Data, and Samples
2. Section 01400: Quality Control
3. Section 01600: Materials and Equipment
4. Section 01730: Operating and Maintenance Data

C. Related Requirements Specified Elsewhere

1. Section 03300: Cast-In-Place Concrete
2. Section 03600: Grout
3. Section 05500: Metal Fabrications
4. Section 05501: Anchor Bolts and Expansion Anchors
5. Section 13300: Utility Control System
6. Section 15060: Pipe and Pipe Fittings
7. Division 16: Electrical

D. Definitions: Definitions of terms and other hydraulic considerations as set forth in the Hydraulic Institute Standards

1.2 QUALITY ASSURANCE

A. Design Basis

1. Vaughan Co., Inc.
2. Hydromatic Pumps
3. ABS
4. Fairbanks Morse
5. Goulds

6. Crane, Barnes Division
7. Equivalent products of other manufacturers may be accepted subject to compliance with design, function, materials, and performance of the specified items

B. Reference Standards

1. Hydraulic Institute Standards

1.3 SUBMITTALS

A. In accordance with Section 01340

B. Shop Drawings and Product Data

1. Submit complete fabrication, assembly, foundation, and installation drawings
2. Submit detailed specifications and data describing materials, parts, devices, and accessories
3. Pump
 - a. Name of manufacturer
 - b. Type and model
 - c. Rotative speed
 - d. Size of fittings
 - e. Weight
 - f. Complete performance curves showing capacity versus head, NPSH required, pump and overall efficiency, and brake horsepower
 - g. Guide rail system
 - h. Assembly drawings
 - i. Rated size of motor (hp)
 - j. Motor voltage, phase, and Hz
 - k. Motor insulation
 - l. Data on shop painting

C. Certificate of Compliance

1. Manufacturer's affidavit of compliance certifying
 - a. All tests have been performed
 - b. All equipment and materials comply with these specifications
 - c. Pumps have been properly installed and are operating within specification tolerances

D. Operating and Maintenance Manuals in accordance with Section 01730

1.4 JOB CONDITIONS

A. Submersible Grinder Pump: WWP-1 and WWP-2

1. Pumped liquid
 - a. Wastewater from treatment plant sanitary waste pumping fixtures and floor drains

- b. Altitude: 5,380' above sea level
- c. Temperature range: 50° – 70°F
- d. Solids Concentration: 5% maximum

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN REQUIREMENTS

A. General

1. Stable and free from cavitation and noise throughout the specified operating head range
2. Minimum hydrostatic test pressure: 1.5 x shutoff head plus suction pressure
3. Performance requirements based on previously reported liquid characteristics and elevation

B. Submersible Grinder Pumps: WWP-1 and WWP-2

1. Number of units: 2
2. Configuration: Vertical
3. Rated total head: 70 feet
4. Capacity at rated head: 40 gpm
5. Minimum shutoff head: 80 feet
6. Maximum shutoff head: 100 feet
7. Normal operating head range: 70 to 75 feet
8. Minimum capacity at high end of operating head range: 40 gpm
9. Maximum capacity at low end of operating head range: 55 gpm
10. Maximum pump operating speed: 3,485 rpm
11. Maximum bhp required at input shaft of pump for any point in the operating head range: 5
12. Maximum motor nameplate horsepower: 5.0 hp
13. Maximum required NPSH at the centerline of the pump shaft at any point in the operating head range: 20 feet

C. Submersible Sump Pump: SP-1

1. Number of units: 1
2. Configuration: Vertical
3. Rated total head: 19.5 feet
4. Capacity at rated head: 25 gpm
5. Minimum shutoff head: 23 feet
6. Maximum shutoff head: 26 feet
7. Normal operating head range: 19 to 20 feet
8. Minimum capacity at high end of operating head range: 19 gpm
9. Maximum capacity at low end of operating head range: 23 gpm
10. Maximum pump operating speed: 1,750 rpm
11. Maximum bhp required at input shaft of pump for any point in the operating head range: 0.5
12. Maximum motor nameplate horsepower: 0.5 hp

13. Maximum required NPSH at the centerline of the pump shaft at any point in the operating head range: 20 feet

2.2 MATERIALS

A. Submersible Grinder Pumps: WWP-1 and WWP-2

1. Casing and frame: Gray iron, ASTM A48
2. Impeller: Cast iron
3. Shaft: 416 stainless steel
4. Mechanical shaft seals
 - a. Seal adjacent to impeller: Single with ceramic and carbon faces
 - b. Seal adjacent to motor bearing: Single with ceramic and carbon faces
 - c. Mechanical seals shall be locally available
5. Bearings: Antifriction, heavy-duty
6. Grinder cutters
 - a. Located on suction side of pump impeller
 - b. Grinder to be made of 440C stainless steel hardened to Rockwell 60C
 - c. The grinder shall be capable of grinding all material found in normal domestic sewage to a slurry with particles no greater than 1/4" in diameter
7. Guide rail components: Stainless steel

B. Submersible Sump Pump: SP-1

1. Casing and frame: Gray iron, ASTM A48
2. Impeller: Cast iron
3. Shaft: 416 stainless steel
4. Mechanical shaft seals
 - a. Seal adjacent to impeller: Single with ceramic and carbon faces
 - b. Seal adjacent to motor bearing: Single with ceramic and carbon faces
 - c. Mechanical seals shall be locally available
5. Bearings: Antifriction, heavy-duty
6. Materials per design equipment: Barnes Series SE
7. Guide rail system not required

C. Anchor Bolts, Nuts, and Washers: Refer to Section 05501

2.3 FABRICATION AND MANUFACTURE

A. Pump and Pump to Motor Assembly

1. Hydraulic end
 - a. Accurately machined and balanced nonclog impeller
 - b. No more than two vanes fastened directly to the submersible motor shaft
 - c. Volute casing
 - d. Separate packing box cover
2. Separate pump from motor cavity by means of an oil filled chamber containing a moisture sensing probe
3. Attach impeller to shaft to allow removal without loss of oil from the oil filled chamber

4. All external bolts to be stainless steel
 5. Provide single mechanical seal to prevent liquid being pumped from flowing into oil cavity
 6. Additional mechanical seal to separate oil cavity from motor cavity
- B. Rail System: WWP-1 and WWP-2
1. Provide for easy removal and replacement of pump
 - a. Requires no bolts, nuts, or other fastenings to be removed
 - b. No need for personnel to enter wet well
 2. Rails
 - a. Sufficient strength to span depth of sump or provide intermediate supports
 - b. Secure rails to bottom of sump with lower plate
 3. Provide stainless steel lifting chain
 4. Provide rubber seal between pump discharge and stationary discharge flange
 - a. Metal to metal contact at this point is not acceptable
- C. Access Cover
1. Size as indicated on drawings
 2. Manufacturer's standard
 3. Gastight
 4. Not required for SP-1
- D. Balance
1. Accurately machine all rotating parts
 2. Place pump in as near perfect rotational balance as practicable
 3. Equipment which vibrates excessively will be rejected
 4. The mass of the unit and its distribution shall preclude resonance at any operating speed
 5. Limits
 - a. Maximum peak to peak vibration displacement at any point on the machine: 3.5 mils
 - b. Maximum peak to peak vibration displacement of shaft at face of seal: 2.0 mils
- E. Motor: WWP-1 and WWP-2
1. Induction type
 2. 480 volt, 3 phase, 60 Hz
 3. Suitable for continuous operation in totally non-submerged conditions
 4. Rigidly cast upper bearing housing into motor casing
 - a. Do not support from within
 5. Provide wiring junction box to allow for replacement of damaged wiring without disassembling the motor
 - a. Seal top and bottom with epoxy or stator-lead sealing gland
 6. Air-filled motor
 - a. Air-filled, watertight casing
 - b. Moisture resistant Class F insulated windings

- c. Nema Design B rated 155°C maximum
- d. Designed for submerged service
- 7. Oil filled motor
 - a. Open windings
 - b. Operate in clean, dry, dielectric oil for cooling winding and lubrication motor bearings
 - c. Designed for submerged service
- 8. Close coupled

F. Motor: SP-1

- 1. Induction type
- 2. 115 volt, single-phase, 60 Hz
- 3. Suitable for continuous operation in totally non-submerged conditions
- 4. Rigidly cast upper bearing housing into motor casing
 - a. Do not support from within
- 5. Pressure grommet for sealing and strain relief in motor casing
 - a. Seal top and bottom with epoxy or stator-lead sealing gland
- 6. Oil filled motor
 - a. Open windings
 - b. Operate in clean, dry, dielectric oil for cooling winding and lubrication motor bearings
 - c. Designed for submerged service
- 7. Close coupled

G. Motor Seal Sensor Relay

- 1. Provide for mounting in motor control center
- 2. Normally open and normally closed contact for remove annunciation
- 3. Terminal points for sensor cables
- 4. 120 volt AC power supply

H. Shop prime and paint in accordance with Section 01600

2.4 SPARE PARTS

- A. Complete set of bearings
- B. One set of each type of shaft seal

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Use procedures recommended by pump manufacturer and Hydraulics Institute
- B. Accurately locate expansion anchors
- C. Level, plum, and align units into position to fit connecting piping

D. Do not shim between machined surfaces

3.2 FIELD QUALITY CONTROL

A. Provide Manufacturer's Field Services

END OF SECTION