

SECTION 11316  
SUBMERSIBLE PUMPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope

1. Furnish and install two (2) removable nonclog submersible pumping units at the aeration basin drain pump station
  - a. Located in Pumping and Disinfection Building dedicated wet well
2. Provide submersible electric motor, multiconductor cable, flanged discharge elbow, guide rail system for removal of pumps without entering wet well, and all other necessary appurtenances

B. Additional Requirements Specified Elsewhere

1. Section 01340: Shop Drawings and Product Data
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 02615: Ductile Iron Pipe
2. Section 05501: Anchor Bolts and Expansion Anchors
3. Section 09900: Painting
4. Section 13300: Utility Control System
5. 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. Pacific Pump Co. (PACO)
2. ABS
3. Goulds
4. Grundfos
5. Fairbanks Morse
6. 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. 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 for each unit
  - a. Name of manufacturer
  - b. Type and model
  - c. Design rotative speed
  - d. Size of fittings
  - e. Weight
  - f. Complete performance curves showing capacity, head, NPSH requirements, efficiency, and bhp requirements
  - g. Guide rail system
  - h. Assembly drawings
  - i. Motor horsepower
  - j. Motor voltage, phase, and Hz
  - k. Motor insulation
  - l. Data on shop painting

### B. Certification 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
2. Operating and Maintenance Manuals

## 1.4 JOB CONDITIONS

### A. Submersible Pumps

1. Pumped liquid
  - a. Activated sludge aeration basin contents to be pumped to Manhole MH-03 upstream of the aeration basin splitter structure by the submersible pumps
  - b. Altitude: 5,380 feet above sea level

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE AND DESIGN REQUIREMENTS

#### A. General

1. Stable and free of cavitation and noise throughout the specified operating head range

2. Performance requirements based on previously reported liquid characteristics and 5,380' elevation

#### B. Submersible Pumps

1. Number of units: 2
2. Rated total head: 26.5 feet
3. Capacity at rated head: 546 gpm
4. Minimum shutoff head: 26.5 feet
5. Maximum shutoff head: 29.2 feet
6. Normal operating head range: 24.5 to 27.5 feet
7. Minimum capacity at high end of operating head range: 280 gpm
8. Maximum capacity at low end of operating head range: 695 gpm
9. Maximum pump operating speed: 875 rpm
10. Maximum bhp required for any point in the operating head range: 7.5
11. Minimum size of pump discharge: 2 inches

## 2.2 MATERIALS

#### A. Submersible Pumps

1. Pump casing and casing head: Cast iron, ASTM A48
2. Impeller: Cast iron, ASTM A48
3. Mechanical shaft seals
  - a. Seal adjacent to impeller: Single with silicon carbide and tungsten carbide faces
  - b. Seal adjacent to motor bearing: Single with carbon and ceramic faces
4. Motor shaft: 416 stainless steel
5. Motor bearing: Antifriction
6. Guide rail components: Stainless steel
7. Shop paint
  - a. Epoxy primer: Amercoat "83 Epoxy Primer", Mobil "78-D-7 Tank Lining Epoxy", or equivalent
  - b. Epoxy finish coat: Amercoat "84 Epoxy Topcoat", Mobil "78-W-3 Tank Lining Epoxy", or equivalent

- B. Anchor Bolts and Expansion Anchors: 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

1. Provide for easy removal and replacement of pumps
  - 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 a lower plate
3. Provide stainless steel lifting chain
4. Provide bronze seat between pump discharge and stationary discharge flange

C. Access Cover

1. Size as indicated on drawings
2. Manufacturer's standard

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

1. Induction type
2. 460 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 lubricating motor bearings
  - c. Designed for submerged service
- 8. Close coupled

F. Motor Seal Sensor Relay

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

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, plumb, 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