DIVISION 11

EQUIPMENT

Scope of Work

Provide, install and test all equipment and appurtenant work in complete accordance with the Drawings and Specifications.

Contractor's Duties

Except as specifically noted, provide and pay for all labor, materials, equipment, tools, machinery, water, heat, other facilities and services necessary for proper execution and completion of Work.

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END OF SECTION

SECTION 11306

SEWAGE PUMP STATION REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section covers all pump stations with the exception of individual house pump stations, which do not fall under the jurisdiction of the Ogunquit Sewer District.

1.2 SUBMITTALS

A. Plans and Calculations - Submit five (5) sets of complete layout plans with all construction details and dimensions and support calculations for the proposed pump station(s) for review and approval by the Ogunquit Sewer District. Plans and calculations are to be prepared by a licensed professional engineer.

B. Shop Drawings - If the pump station(s) are to be operated and maintained by the Ogunquit Sewer District, prior to pump station construction submit five (5) sets of shop drawings for review and approval. The pump station manufacturer shall integrate all the required shop drawings into a common bound submittal package for each pump station. The shop drawings shall include sufficient information to verify compliance with the requirements herein and shall include equipment warranties and pump performance curves showing total dynamic head, pump input horsepower and pump efficiency over the rated capacity range of each pump.

C. Operation and Maintenance Manuals - If the pump station(s) are to be operated and maintained by the Ogunquit Sewer District, prior to pump station start-up, submit three (3) sets of complete O&M manuals for each piece of equipment. The manuals are to be in a single binder for each pump station and shall include detailed information on the installation, assembly, alignment, start-up, normal operation, shut-down, lubrication and maintenance and troubleshooting of all equipment along with parts lists and detailed drawings.

D. Manufacturer's Certification - If the pump station(s) are to be operated and maintained by the Ogunquit Sewer District, prior to start-up of the pump station the manufacturer is to submit certification that the equipment was properly installed and adjusted.

1.3 WARRANTY

A. If the pump station(s) are to be operated and maintained by the Ogunquit Sewer District, the supplier shall obtain a 5 year (10,000 Hr) prorated warranty from the pump manufacturers, in the name of the Ogunquit Sewer District, against defects in workmanship and materials, covering parts and labor. The terms of the warranty shall be as follows:

0-18 months (3,000 hours)	100%
19-39 months (6,500 hours)	50%
40-60 months (10,000 hours)	25%

The terms of the warranty shall be from the date of substantial completion as determined by the Ogunquit Sewer District.

B. The supplier shall also obtain a 5 year warranty from the access hatch manufacturer, in the name of the Ogunquit Sewer District, against defects in workmanship and materials, covering parts and labor.

1.3 DESIGN CRITERIA

A. References:

1. Maine State Plumbing Rules. Division of Health Engineering.
2. Guides for the Design of Wastewater Treatment Works, TR-16. New England Interstate Water Pollution Control Commission, 1980.
3. Design and Construction at Sanitary and Storm Sewers, WPCF MOP No. 9. Water Pollution Control Federation, 1969.
4. Design of Wastewater and Stormwater Pumping Stations, WPCF MOP No. FD-4. Water Pollution Control Federation, 1981.

B. Design Criteria:

1. Pump Station capacity shall be based on design flow rates as determined by the Maine State Plumbing Rules and by TR-16. The design flow rate shall include allowance for infiltration and a peaking factor.
2. The minimum pump capacity for pump stations shall be 100 gallons per minute per pump. In some cases where design flows are very low, the Ogunquit Sewer District may consider the use of a submersible grinder pump station with capacities down to 40 gpm.
3. Calculations of total dynamic head (TDH) for pump sizing shall generally conform to MOP No. FD-4. Complete calculations of TDH and manufacturer's pump curves shall be submitted to the District.
4. The pump station wetwell shall be sized in accordance with the following criteria:
   a. Maximum number of pump starts per hour:

Pump Motor HP	Starts Per Hour
1.0	6
5.0	5
5.0	4

   b. Pump stations without emergency power shall be sized to provide a minimum of 30 minutes of wetwell storage between high level alarm elevation and the invert of the lowest incoming sewer based on the average design wastewater flow rate.

2.2 MATERIALS

A. General - The following specifications are for pump stations which are to be operated and maintained by the Ogunquit Sewer District. For those stations which are to be privately owned and maintained, the District may give exception to some of the requirements.

B. Pump:

1. Non-clog sewage pump parameters:
   a. Function: Pump raw sewage.
   b. Number: Two (2)

c. Type: Vertical, single stage, non-clog, centrifugal pumps, with 3 inch minimum solids handling.
d. Capacity: Shall be based on design average flows and TDH requirements calculated in accordance with TR-16, MOP-9, MOP No. FD-4 and the Maine State Plumbing Rules.
e. Speed: 1750 RPM, maximum.
f. Control: Wet well liquid level and manual control.
g. Suction and Discharge: 4-inch diameter minimum with flanged connections.
h. Acceptable Manufacturers:
(a) Peabody Barnes, Inc., Mansfield, Ohio.
(b) Or equivalent.

2. Installation (Submersible Pumps):
a. Pumps shall be mounted on a substantial guide rail system, non-sparking type, with slide away coupling base/discharge elbow.
b. The lower guide holders shall be integral with the discharge connection and shall be anchored to the wet well floor by stainless steel anchors.
c. Sealing of pump to discharge connection shall be by metal to metal contact.
d. No portion of the pump shall bear directly on the floor.
e. There shall be two guide rails per pump which shall be a minimum of 2-inch diameter stainless steel pipe.
f. Slide-away coupling shall be designed so that when pump is idle, the pump may be removed for service or inspection and then returned to service without entering the wet well to unbolt or unlock the connection between the pump and piping.
g. Exposed hardware shall be stainless steel.

3. Pump Casing:
a. Constructed of gray cast iron, Class 30 (ASTM A48-Latest Rev.).

4. Impeller:
a. The non-clog, sewage pump imepller shall be enclosed, non-clog, symmetrical, dynamically balanced with a minimum of vanes or blades, made of gray cast iron, Class 30 (ASTM A48-Latest Rev).
b. The impeller hub shall not have ports for the reduction of thrust on the impeller.
c. Impellers shall be key seated and securely attached to shaft.
d. Clearance shall be maintained by external shaft adjustment at the outboard bearing.

5. Shaft:
a. The pump-motor shaft shall be stainless steel.

6. Seal:
a. The pump shaft seal shall be of the double mechanical type, with a pump seal leak detection system.

7. Motor:
a. Motors shall be U.L. Class I, Group D, squirrel-cage, induction, shell type design, water tight chamber, NEMA Design B.
b. Pump motors shall be furnished with ball bearings.

c. Vertical motors shall be provided with radial keyways to absorb thrust caused by the shaft.
d. Leads shall be terminated in a cast connection box and shall be clearly identified.
e. The motor shall be fitted with heavy lifting eyes, each capable of supporting the entire weight of the pump and motor.
f. An electric sensing probe shall be mounted in the seal chamber, and be connected to a red signal light on the control panel, to detect any water leakage past the lower seal.
g. A heat sensor thermostat shall protect motor against excess heat in compliance with its U.L. Class I, Group D rating. Sensor shall reset automatically at the motor when motor cools with manual reset at the control panel.

8. Lifting Chain - Submersible Pumps:
   a. Each pump shall be equipped with a galvanized steel lifting chain.

B. Wet Wells, Dry Wells and Valve Pit
1. The wet wells, dry wells and separate valve pits shall be constructed of reinforced precast concrete, meeting or exceeding the requirements of ASTM C478, and shall be designed for HS-20 wheel loadings.
2. Concrete shall have a minimum compressive strength at 28 days of 4000 psi.
3. Precast concrete sections shall be installed with flexible self-seating butyl rubber joint sealant.
4. The wet wells, dry wells and valve pit shall contain safety type manhole steps spaced on 12-inch centers and capable of supporting a concentrated live load of 300 lbs.
5. The entrance hatches, vent fittings, and electrical conduits shall be cast into the wet well and valve pit covers.
6. Wall penetrations for pipes shall be by means of integrally cast watertight, flexible manhole type joint, steel pipe sleeve, or cast iron wall casting.
7. Access Hatch
   a. Aluminum cover and frame. Cover shall open to 90° and lock automatically in the open position. A vinyl grip handle shall be provided to release the cover for closing. Covers shall be constructed for a minimum live load of 300 pounds per square foot and equipped with a snap lock with removable handle and exterior lock system.
   b. Door leaf(s) and channel frame to be constructed of ¼-inch aluminum. Door leaf(s) to be equipped with spring operators for easy opening.
   c. Hardware - Stainless steel hardware throughout, including hinges, pins, spring operators, automatic hold-open arm with release handle.
   d. The cover frame shall be integrally cast in the top concrete slab.
   e. Submersible pump stations shall contain upper guide rail supports fastened to the cover frame.

f. Acceptable Manufacturers:
(1) The Bilco Co., Norwalk, CT - Type J or JD
(2) Or equivalent.

8. A welded steel vent line shall be installed in the top of wet well cover. The vent shall terminate 3 feet above the top slab, and have a 1/4-inch mesh SS screen sturdily mounted on the above ground opening.
9. Strainer Basket (to be provided as required by the District).
   a. Stainless steel strainer basket shall be approximately 10" wide x 15" long x 20" deep and be constructed of 3/16" diameter minimum 304 stainless steel rod welded construction with 2 inch mesh.
   b. Guide rails shall be a minimum of 1-inch diameter stainless steel pipe.
   c. Lifting chain shall be galvanized steel construction.
10. A backwater valve shall be installed on a drain line from the valve pit to the wet well. The backwater valve shall be an iron body, bronze mounted, flap valve, Clow model F-3012 or equivalent.

C. Piping and Valves
1. Piping carrying sewage within the pumping station shall be flanged Class 53, double cement lined ductile iron pipe and fittings.
2. Check valves in the sewage discharge pipes shall be horizontally mounted, 125 pound class, cast iron, bronze-mounted, swing check valves with outside lever and weight.
3. Valves in the discharge piping shall be horizontally mounted, 125 lb. flanged, eccentric plug type valves with lever actuators.
4. All buried pipe connections to the pump station shall have a sleeve type flexible connection 4'-0" from the pump station.
5. The end of the pump discharge header in the valve pit shall be provided with a valved flushing hose connection.

D. Automatic Controls:
1. The control of the operation of the pumps shall be by means of a non-contacting ultrasonic system (Milltronics ~~Multi-Ranger~~). Enviro Ranger
2. An acoustic sensor/transducer mounted in the wet well shall continuously monitor wet well level and transmit a signal to a controller which shall activate the following functions: high water alarm, low water alarm and pump cutout, lead pump on, lag pump on, and pumps off.
3. Intrinsically safe relays shall be supplied to operate with the level controls to reduce energy to a level where a spark is not created.
4. Thermal-magnetic circuit breakers shall be provided for each motor control and auxiliary circuit and main power.
5. Motor starters shall be combination starter/disconnect type, employing magnetic starter, rated to match the equipment served, with thermal overload protection for each phase and with a thermal-magnetic circuit breaker/disconnect sized per the circuit breaker manufacturer's recommendations for coordination with the thermal overload protection. Combination starters shall be provided with a 120 volt control transformer rated 1.0 kva in excess of actual control load.
6. All starters shall have thermal overload protection in each phase and through the door manual reset.

7. An automatic solid state alternator shall be provided to reverse the sequence of lead, lag operation on the completion of each pumping cycle.
8. The automatic alternator shall be designed so that failure of the alternator will allow at least one pump to continue operating and allow the stand-by pump to operate should the lead pump fail to start.
9. The pump controls shall include a solid state, adjustable time delay relay to prevent both pumps starting simultaneously after a power failure.
10. A six digit, non-resetable, run time meter reading 0.1 hour increments shall be furnished for each pump.
11. All of the above electrical control equipment shall be mounted within a common NEMA Type 3R enclosure with stainless steel hardware. Provide a suitable lockable hinged access door and quick open latching devices (screwed or bolt type devices unacceptable). Control panel shall have a hinged dead front with separate inside hinged door (NEMA 1) to provide for mounting control switches, lights, overload reset buttons, etc. Grouped together on the inside, convenient to the operator, shall be all circuit breaker handles, a Hand-Off-Auto selector switch for each pump, alarm silence switch, alarm light/bell on/off test switch, run lights, indicator light for each alarm condition, telephone line alarm circuit test switch, overload reset buttons, run time meter for each pump, and convenience outlet for 120 volt power.
12. Main circuit breaker shall be mounted with operating handle through the inner door and shall have a lock arrangement that prevents inner door from being opened when breaker is in the on position. When breaker is off all power shall be killed to the control elements.
13. A terminal strip with box type connectors shall be supplied to make all power and control connections. All terminals shall be marked for easy identification. A ground terminal strip shall also be provided.
14. Receptacle
    a. Provide a 120 volt, 20 ampere duplex ground fault type weatherproof receptacle on the outside of the panel to be supplied through a separate circuit breaker.
15. Control panel shall be mounted securely to a power pole or wet well mounted pedestal.
16. All switches shall be labeled.
17. A wiring diagram with all wires color coded and numbered shall be provided.
18. Control panel shall come equipped with a built-in heater and adjustable thermostat of sufficient size to maintain 40°F inside panel.
19. Control panel shall be equipped with lightning protection.
20. Surge Arrester: Provide a surge arrester on the electric service equal to Square D Secondary Surge Arrester Model J9200-9A.
21. Automatic controls shall prevent the simultaneous operation of both pumps when the power source is obtained from the emergency generator mode.

22. Spare Parts for each pump station electrical controls:
    (1) 1 Control Switch with Contact Blocks.
    (2) 10 Indicator Bulbs.
    (3) O/L Blocks.
    (4) 1 Strobe Bulb.
23. 20 percent spare terminals shall be provided for each pump station.

E. Wiring
1. The pump station shall be completely wired at the factory in accordance with the latest edition of National Electrical Code.
2. All wiring in the pump station shall be color coded and numbered and indicated on the wiring diagram, by the manufacturer.
3. All wiring outside the panel shall be in rigid conduit to the wet well. Provide insulated connecting cable consistent with Class I Division 1, Group D hazardous locations by the manufacturer. Conduit seals shall be installed at the control panel outlet. Sewage pump motors shall have leads installed in liquid-tight flexible cable.
4. Sufficient flexible conduit shall be provided on the motors to allow the motor to be removed without detaching its power leads.

F. Emergency Power - For those pump stations which are to be operated and maintained by the Ogunquit Sewer District, either an enclosed emergency power generator or a receptacle system for the District's portable emergency generator will be required as determined by the Ogunquit Sewer District.

G. Alarm System
1. A manual reset and silence alarm system shall be furnished and installed.
2. The alarm system shall activate indicator lights located in the control panel with a flashing outside light and bell for any of the following conditions:
    a. High water - Wet Well
    b. Low water - Wet Well
    c. Loss of power supply
    d. Pump seal failure
    e. Motor thermal overload

    An indicator light shall be provided for each of the above conditions. The bell shall be mounted on the bottom of the control panel and the alarm light mounted on the top of the control panel.
3. The exterior alarm light shall be powered by means of a suitable 12 volt D.C. power supply with standby battery pack. The battery pack shall have sufficient capacity to power the lights for a period of 8 hours. Lead-acid type batteries shall be supplied. Connect power supply to dedicated 120V, 20 A circuit.
4. The outside light shall be a weatherproof, vandalproof bracket fixture with red lexan globe. Metal globe guard shall be a strobe type, 12 volt.
5. Indicator lights within the control panel shall be heavy-duty, oil tight type with glass lenses. They shall be provided with chrome-plate metal or anodized aluminum mounting rings, and name plates.

6. Each alarm point shall be provided with auxiliary dry contacts and all contacts shall be wired in parallel to a terminal strip to activate a radio telemetry alarm circuit. The terminal strip shall provide terminals for the incoming telemetry wiring and a test switch to simulate an alarm condition.
7. Coordinate the installation and operation of the radio alarm system with the Oqunquit Sewer District.

H. Painting and Waterproofing
1. All precast concrete shall be waterproofed.
2. The pumps shall be factory finished with coats of paint filler and enamel or other acceptable treatment customary with the manufacturer and suitable for the intended service.
3. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating.
4. Above grade ferrous surfaces including the wet well vent and control panel shall receive at a minimum one coat of a rust inhibitive primer with a minimum dry film thickness of 1.5 mils and two coats of an alkyd coating with a minimum dry film thickness of 2 mils per coat.
5. Other ferrous surfaces including piping and fittings shall receive one shop coat of a rust inhibitive primer and two field coats of a polyamide epoxy with a minimum dry film thickness of 5 mils per coat. m e polyamide epoxy shall be 200HB epoxy made by Koppers Co., Inc. or 60 Series Hi-Build Epoxoline made by Tnemec or equivalent. The rust inhibitive primer shall be compatible with and made by the same manufacturer of the field coats.
6. All coatings shall be applied in accordance with the manufacturer's written instructions.
7. Coatings damaged in shipment or installation shall be cleaned and touched up in the field with the same materials as original coatings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation of the non-clog pump station and related appurtenances shall be done in accordance with written instructions provided by the non-clog pump station manufacturer.

B. The Contractor shall provide for the supervisory service of the non-clog pump station manufacturers factory trained engineer and other personnel, who are specifically trained on the type of equipment supplied, to assist the Contractor in installation of the pump station, and related appurtenances, and to assist in start-up.

C. The completed pump station shall be given a test of all equipment to check for excessive vibration, for leaks in the piping or seals, and for correct operation of all auxiliary equipment. All adjustments shall be made so that the station is ready for operation.

D. A factory trained engineer shall instruct operating personnel in the operation and maintenance of the equipment.

E. Exfiltration Tests Prior to Backfilling:
1. All testing must be performed in the presence of an agent of the Oqunquit Sewer District.

2. Suitably plug all pipes entering the pump station and brace plugs to prevent blow out.
3. Fill the pump station with water to 3-feet below the top of the cover.
4. A period of up to 2 hours may be permitted, if the Contractor so wishes, to allow for absorption.
5. At the end of the absorption period, refill the pump station with water to 3-feet below the top of the pump station cover and begin the 4-hour test period.
6. At the end of the 4-hour test period, refill the pump station to 3-feet below the top of the pump station cover and measure the volume of water added. The leakage for the pump station shall not exceed ten gallons per 100 cubic feet volume per 4-hour period.
7. Correct leakage by reconstruction, replacement of gaskets and/or other methods as approved by the District.
8. The use of lead-wool or expanding mortar will not be permitted.

3.2 FIELD QUALITY CONTROL

A. After installation of the equipment is complete, the Contractor will operate and test each unit in the presence of an agent of the Ogunquit Sewer District.
B. The Contractor shall provide all labor, piping equipment, and materials necessary for conducting tests.
C. The Contractor shall check the motors and insulation for moisture content and defects.
D. The Contractor shall operate each pump unit to demonstrate its ability to pump without excessive vibration, motor overloading, or overheating. During the test the Contractor shall record pump capacity and motor input.
E. Each pump shall be operated for a sufficient period to permit thorough observation of all pump components and controls.
F. Since sufficient sewage may not be available for the test, Contractor shall provide sufficient water for testing.
G. After installation, all piping shall be tested for tightness in an acceptable manner. Should leaks be found, faulty joints shall be repaired, even to the extent of disassembling and remaking the joint, and all defective pipe and fittings shall be removed and replaced in a manner satisfactory to the District.
H. Repeat tests until results obtained meet the District's approval.

END OF SECTION