

SECTION 02740

PUMP STATIONS

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SECTION 02740

PUMP STATIONS

PART 1 - GENERAL

1.01 SUMMARY

The work of this section includes all labor, materials and equipment necessary for the furnishing, installation, startup and testing of a sewage pump station(s) including separate valve pit chamber and associated electrical work.

The work of this section shall comply with local, state and federal electrical and sanitary codes.

1.02 SHOP DRAWINGS

Shop drawings for all pump stations shall be submitted to the City of Saco for approval prior to installation. The shop drawing submittal shall include descriptive data, design basis, performance characteristics, material specifications, wiring diagram, and drawings of each pump station in plan/elevation and site work layout. An equipment setting drawing shall also be provided. Electrical control wiring diagram shop drawings shall be submitted with electrical equipment shop drawings in accordance with Sections 8 and 9.

1.03 QUALITY

Equipment and appurtenances shall be designed in conformity with ASA, ASME, AIEE, NEMA, and other generally accepted applicable standards and shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation, and all conditions of operation. All bearings and moving parts shall be adequately protected by bushings or other approved means against wear, and provision shall be made for adequate lubrication by readily accessible devices. Details shall be designed for appearance as well as utility.

Protruding members, joints, corners, gear covers and the like shall be smooth and the corners of structural shapes shall be rounded or chamfered.

Machinery parts shall conform within allowable tolerances to the dimensions shown on the working drawings. In setting up a machine, there shall be no more fitting or adjusting than is ordinarily necessary in assembling high-grade apparatus of standard design. The corresponding parts of identical machines shall be interchangeable.

1.04 OPERATING INSTRUCTIONS

The Contractor, through an authorized manufacturer's service representative, shall adequately instruct designated employees of the City in the operation and care of equipment installed hereunder.

The contractor shall also furnish and deliver to the City prior to initial operation, three (3) complete sets of instructions, technical bulletins, and any other printed matter, such as diagrams, prints or drawings, containing full information required for the proper operation, maintenance and repair of the equipment. Included in this submission shall be a spare parts diagram and complete spare parts list. These requirements are a prerequisite to the operation and acceptance of equipment.

1.05 TOOLS AND ACCESSORIES

The Contractor shall furnish with each type, kind or size of equipment and special suitably marked high-grade tools and appliances, which may be needed to adjust, operate, maintain, or repair the equipment. Such tools and appliances shall be properly labeled and delivered to the City prior to the initial operation of the equipment.

1.06 IDENTIFICATION AND NAMEPLATES:

Each piece of equipment shall be provided with a substantial brass or stainless steel nameplate, securely fastened in a conspicuous place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data.

These nameplates shall not be painted over.

Either on the same nameplate, or on a similar nameplate, the pumps shall clearly indicate in which pumping station the pump shall operate.

Duplicate pump nameplates shall be installed on the control panel door.

1.07 ANCHORS AND SUPPORTS

The Contractor shall furnish, install, and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of the devices included in the equipment specified. Anchor bolts shall be made of 316 stainless steel and be of ample size and strength for the purpose intended. Working drawings for installation shall be furnished by the equipment manufacturer and suitable templates shall be used by the Contractor when required in the detailed equipment specifications.

1.08 INSTALLATION OF EQUIPMENT

The Contractor shall have on hand sufficient proper construction equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, units shall be factory assembled insofar as practical.

Units shall be erected in a neat and workmanlike manner on the foundations, at the locations and elevations shown on the Contract Drawings, unless directed otherwise by the City during installation. The Contractor shall furnish all materials and labor to properly bed each piece of equipment based on concrete or masonry foundations using non-shrink cement grout. The grout shall fill completely the space between the equipment base and the foundation.

For equipment such as pumping units which require field alignment and connections, the Contractor shall provide the services of the manufacturer's qualified mechanic, millwright, or machinist to align the pump and motor prior to making piping connections or anchoring the pump base.

In addition, alignment shall be checked again after 30 days of operation by the manufacturer's mechanic and written statements covering initial and final inspection shall be submitted to the City.

1.09 SERVICE OF MANUFACTURER'S REPRESENTATIVE

The contract prices for equipment shall include the cost of furnishing a competent authorized manufacturer's service representative who shall represent the manufacturer and shall assist the Contractor, when required, to install, adjust, and test the equipment in conformity with the

Contract Documents. When the equipment is placed in permanent operation by the City, such representative shall be on hand to make all adjustments and tests necessary or required by the Specifications and the City Engineer to prove that such equipment is in proper and satisfactory operation condition. The manufacturer's representative shall also instruct the City's operating personnel in operation and maintenance of equipment. Two copies of written reports by the representative covering inspection, testing, and instruction shall be sent directly to the City. An additional copy shall be sent to the Contractor.

1.10 FIELD TESTS

Upon completion of the work and prior to acceptance and final payment, all equipment and appliances installed under this Contract shall be subjected to acceptance tests, as specified or required, to prove compliance with the Contract Documents. The Contractor shall furnish labor, fuel, lubricants, energy, water, and all other materials, equipment, and instruments necessary for all acceptance tests.

1.11 FAILURE OF TESTS

Any defects in the equipment or failure to meet the guarantees or requirements of the Specifications shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the City as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to meet those corrections, or if the improved equipment when tested shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacture of said equipment, may reject said equipment and order the Contractor to remove it from the premises at the Contractor's expense.

In case the Owner rejects said equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him for said rejected equipment on progress certificates or otherwise on account of the lump sum prices herein specified. Upon receipt of said sums of money, the Owner will execute and deliver to the Contractor a Bill of Sale of all his rights, title, interest in and to said rejected equipment; provided, however, that said equipment shall not be removed from the premises until Owner obtains from other sources other equipment to take the place of the rejected. Said Bill of Sale shall not waive the Owner's right to recover damages for delays, losses or other conditions arising out of basic contract. The Owner hereby agrees to obtain said equipment within a reasonable time and the Contractor agrees that the Owner may use the equipment furnished by him without rental or other charge until said other new equipment is obtained.

1.12 RESPONSIBILITY DURING TESTS

The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage, which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

1.13 GUARANTEE

All equipment shall be guaranteed in accordance with the Contract, including time requirements for one (1) year after the system has been accepted by the City.

1.14 SPARE PARTS

The Contractor shall obtain from each equipment supplier, a list of spare parts for the equipment furnished, including the manufacturers recommendation for parts which are required or

recommended to be replaced during the first year of operation. This listing shall be included in the shop drawing submittals. The parts required for first year replacement shall be supplied as part of the contract.

PART 2 - PRODUCTS

2.01 GENERAL

The pumping equipment specified herein shall be utilized for the Pump Stations.

2.02 PUMPS

- A. All pumps shall be supplied by a single manufacturer and shall be manufactured by Flygt, Hydromatic, or Davis EMU Type "B" unless approved by the City of Saco.
- B. Pumps shall be non-clogging centrifugal pumps suitable for operation in a completely submerged environment and performed as outlined on the Contract Drawings.
- C. Casings and Discharge Couplings: Shall be one piece cast iron with tangential discharge and integral discharge couplings designed to provide a self cleaning seal when lowered onto the discharge base.
- D. Impellers: Shall be cast iron sized to perform as outlined on the Contract Drawings.
- E. Shafts: Shall be high quality alloy steel or stainless steel accurately machined to connect to both pump and motor.
- F. Slide-Away Couplings: A slide-away coupling shall be provided for each pump to allow the pump to be installed or removed without requiring personnel to enter the wet well. The coupling shall consist of a discharge elbow securely fastened to the floor of the wet well, a movable bracket that bolts to the pump discharge flange, and mates with the discharge elbow, and a system of guide pipes to guide the pump and movable bracket from the discharge elbow to the access cover in the top of the wet well. Mating of the moveable bracket to the discharge elbow shall be dissimilar materials; one being cast iron, the other stainless steel, to prevent corrosion from causing the faces to stick. The faces shall be wedged together by an inclined plane bearing on the back of the moveable bracket face. This bearing surface shall be a point contact to prevent from sticking. The entire weight of the pump shall rest on this connection to assure maximum sealing. The slide-away coupling, brackets and hardware shall be of stainless steel construction.
- G. Guide Pipes: The guide pipe system shall consist of two non-sparking pipes. These pipes shall terminate on the discharge elbow and a bracket provided by the manufacturer attached to the access cover. The moveable bracket shall engage a minimum of 20 inches of the guide pipes in excess of 180 degrees. None of the pump weight shall bear on the guide pipes. This arrangement shall allow installation of the guide pipes with no intermediate supports. The guidepipes, brackets and hardware to secure and anchor to the pump station structure shall be of stainless steel construction.
- H. Lifting Chain: A stainless steel lifting chain shall be provided for each pump of the design and length recommended by the pump manufacturer.
- I. Motors: Motor horsepower, speed, voltage phase, and hertz are summarized on the Contract Drawings.

The submersible pump motor shall be explosion proof and designed for a totally submerged condition. All electrical parts shall be housed in an air-filled cast iron, watertight enclosure. The enclosure shall be sealed by the use of "O" rings and shall have rabbet joints with a large overlap. Cable leads shall be epoxy sealed. The motor shaft shall be stainless steel, impervious to the liquid and waste materials being handled. All external hardware including the motor nameplate shall also be made of stainless steel.

Tandem seals, one inside and oil chamber and one outside, shall provide double protection for the electrical parts. Two thermal sensing probes shall be used to detect any influx of conductive liquid past the outer seal and provide ample warning of first seal failure.

Bearings shall be prelubricated at the factory and designed for B10 life of 40,000 hours. Shaft extension bearings shall be locked to prevent shaft movement and to take high thrust loads.

Motor winding shall have a special Class B insulation system with Class F materials for extended motor life. Automatic reset, normally closed thermal overloads shall be installed in adjacent phases of the motor winding to provide the over-heating protection.

Lifting eyes shall be cast into the motor housing and shall be of adequate strength to lift the entire pump motor assembly.

- J. Each discharge shall have a one inch with tap valve and shut-off pressure gauge on each pump discharge next to check valve, 2 inch gauge face with 1 inch x ¼ inch S.S. isolation diaphragm and ½ inch quick disconnect flush connection.

2.03 PIPING AND VALVES

The station manufacturer shall furnish, install, and properly support all piping and valves inside the station. The pipe, fittings and valves shall meet the requirements of Section 4 of these Specifications and shall be painted in accordance with TR-16.

2.04 CONCRETE COMPONENTS

All concrete shall meet the material, installation, and test requirements of Section 5 of these Specifications. All exposed portions shall rub finished.

2.05 ACCESS COVERS

All access covers shall be a single leaf design, aluminum plate, designed for a live load of 300#/s.f. Hinges shall be concealed, spring type, opening to 175 degrees. Locks shall be key operated and recessed in the cover. Frame shall be cast in the cover flush with the concrete top slab.

2.06 MISCELLANEOUS

- A. A durable "No Smoking" and a "Confined Space Entry Permit Required" sign shall be attached to the inside of the access cover.
- B. An OSHA approved removable safety net shall be installed within the opening of each access casting/hatch. The safety nets shall be the Hatch Net 121 as manufactured by Safe Approach, Inc. of Auburn, Maine or as otherwise approved by the City.

2.07 CONTROL PANELS

- A. Scope: The Contractor shall provide a control system to control the constant speed sewage pumps at each pump station. The system shall initiate the starting and stopping of the pump motors as shown on the Contract Drawings and provide high and low level alarm and pump failure.
- B. General: For purposes of system responsibility, all of the equipment listed herein shall be furnished by a single supplier, experienced in comparable system requirements. The manufacturer of the control system shall provide five complete sets of wiring diagrams, dimensional prints, bills of material and operation summaries for submittal to the City for approval prior to manufacture of the control system. Five complete instruction manuals containing the above information shall be provided to the City at the time the control system is shipped. The selected supplier shall be responsible for the correct operation of the equipment as specified after installation.

The control manufacturer shall warrant the control system to be free from any defective material and workmanship for a period of one year from date of acceptance by the City. The manufacturer shall replace any defective materials or units during this period at no cost to the customer.

The system shall be completely tested and inspected at the factory prior to shipment.

The pump manufacturer shall perform the following inspections and tests on each pump before shipment from factory:

1. Impeller, motor rating and electrical connections shall first be checked for compliance to the customer's purchase order.
2. A motor and cable insulation test for moisture content or insulation defects shall be made.
3. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
4. The pump shall be run submerged in water to a minimum of six (6) feet.
5. After operational test No. 4, the insulation test (No. 2) is to be performed again.

A written report stating the foregoing steps have been done shall be supplied with each pump at the time of shipment.

C. Ultrasonic Level Control

At each pump station, the Contractor shall furnish and install a non-contacting, ultrasonic level measurement system designed specifically for use with raw sewage wastewater. The work shall include providing and installing all instrumentation, cables and remote transducer sensor equipment to produce a 4-20 mA signal output.

The ultrasonic level control unit shall be the Milltronics HydroRanger I, equipped with ST-H transducer sensor unless otherwise approved by the City.

The electronic control unit shall be installed in the electronic control module, while the remote transducer sensor shall include adequate stainless steel support brackets designed to suspend the sensor away from the pump station wet well walls and provide unobstructed sensing area to liquid level.

The ultrasonic level control unit shall be designed for the purpose of accurately detecting the liquid level within the wetwell and transmitting a 4-20 mA signal proportional to the wet well level to provide the following:

1. Control the lead and lag sewage pump operation
2. Detect high and low water level alarm conditions

The Contractor shall furnish and install contact closure inputs to a single terminal strip for use with the local alarm panel. Low level alarm shall stop all pumps from operating.

- D. Pump Failure Alarm: The Contractor shall furnish for each pump a pump failure alarm which shall sense unusually high and low current demands for the pump. The Contractor shall furnish and install contact closure inputs to a signal terminal strip for use with the local alarm panel. This alarm shall also be connected to the pump control panel to allow shutdown of the pump.
- E. Electrical Control: Furnish and install at each pump station an automatic pump control center in an NEMA 3R enclosure for the voltage and phase required for the pump station. For each pump motor, there shall be included: a combination circuit breaker/overload unit providing overload protection, short-circuit protection, reset and disconnect for all phases; operations selector switch; overload device to be precalibrated to match motor characteristics, and factory sealed to insure trip setting is tamper proof; 120 volt control panel pilot circuitry. A 24 volt control circuit transformer with disconnect circuit breaker and overload protection, for

external pilot circuitry shall be included with an automatic electric alternator for duplex and triplex pump stations (providing alternating operation of pumps under normal conditions, or in cases of high level, allowing multiple pumps to operate simultaneously). All pumps shall have time delays to prevent simultaneous starting. All alarms shall have indicator lights on the inner control panel door. Terminal boards for connection of line, pump and ultrasonic level control unit shall be provided.

F. The following additional items shall also be furnished and installed for each pump station:

1. Lighting arrestor.
2. Elapsed time meter for each pump.
3. Running lights.
4. 100 watt thermostically controlled condensation heater for control panel.
5. AMP meter for each pump.

---END OF SECTION 02740---