ITEM 634.84----09 – SANITARY SEWER PUMPING STATION

DESCRIPTION

The work shall consist of providing a sanitary pumping station complete with submersible pumps; flow meter; piping; fittings; valves and specials; customer power pole; precast structures; hatches; control enclosure; electrical equipment; pump controls; alarm system, remote alarm equipment; automatic transfer switch, and all appurtenances in accordance with Plans and Specifications or as directed or as approved by the Engineer.

The Contractor shall provide all labor, materials and equipment for a complete installation and a ready for operation sanitary sewer pumping station.

MATERIALS

1. General -
All materials and appurtenances required for the work shall be new and of quality matching that specified herein. Where no specific kind or quality of material is given, a first class standard article as accepted by the Engineer shall be furnished.

2. Sanitary Pump Wet Well and Valve Chamber –
   
   a. Bedding Material: Bedding material for the wet well shall be crushed stone meeting the requirements of NYSDOT Material Designation 703-0201 (No. 1 Stone) and/or as directed or as approved by the Engineer.

   b. Structures: The wet well and valve chamber shall be of pre-cast reinforced concrete construction meeting the requirements of Subsection 704-03, except as noted herein. Precast concrete shall attain a minimum 28-day compression strength of 28MPa. The Engineer reserves the right to reject any pre-cast units that show evidence of poor workmanship or subsequent damage. All tie wires, spreaders, conduit openings, etc., shall be cut back at openings, at least 40 mm then repaired in accordance with Subsection 704-03. The manufacturer shall comply with all recommendations of the waterproofing company so as to produce a completely waterproof structure. The Precast Sanitary Pump Wet Well and Valve Chamber shall be:


Or equal, as directed or as approved by the Engineer.
ITEM 634.84----09 – SANITARY SEWER PUMPING STATION

Wall thickness, floor thickness, together with length, width and height of the pump station shall be as shown on the Drawings.

If shown on the Drawings, a counter flotation ring of concrete shall be poured in place.

The joint between each section of the structure shall be fitted with a 50 mm butyl rope.

c. Access Hatches:

1) Heavy Duty with Safety Grate: Where shown on the Contract Drawings, an access hatch shall be furnished and installed on the wet well and valve chamber structure top slabs. The access hatch shall be constructed of 1/4 inch aluminum channel frame with an anchor flange around the perimeter. The access door shall be 1/4 inch aluminum diamond shape pattern designed and constructed to withstand a live load of 300 pounds per square foot and shall be equipped with stainless steel hardware throughout and automatic hold open arm(s) with release handle. A snap lock with a removable handle with a recessed hasp covered by a hinged lid flush with surface shall be provided. A bituminous coating shall be applied to the exterior of the frame. A 1-1/2 inch drainage coupling shall be located in the front right corner of channel frame. The device shall be provided with an 8-inch minimum curb. An integral powder coated aluminum safety grate with hinged mechanism shall also be included. When closed, the grate shall conform with OSHA 1910.23 for fall protection. The access hatches shall be:

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<th>Access Hatch w/Safety Grate</th>
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<tr>
<td>Manufactured By:</td>
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<td>Manufactured By:</td>
</tr>
<tr>
<td>SYRACUSE CASTINGS, Cicero, NY</td>
<td>NYSTROM BUILDING PRODUCTS, Brooklyn Park, MN</td>
<td>HALLIDAY PRODUCTS, Orlando, FL</td>
</tr>
</tbody>
</table>

Or equal, as directed or as approved by the Engineer.

d. Piping, Fittings, Valves and Specials, Etc.: The Contractor shall furnish and install all necessary piping, fittings, valves and specials, etc. at the pump station, as required and as shown on the Drawings.

1) Plug Valve, 4 Inches and Larger

a) Valves shall be nonlubricated, tapered type.
b) Type: Cast iron body.
ITEM 634.84----09 – SANITARY SEWER PUMPING STATION

c) Plug: Drip-tight, steel with resilient facing bonded to sealing surface and suitable for sewage application.
d) Packing: Nitrile-Butadiene.
e) Bearings: Heavy duty stainless steel.
f) Pressures: Working Pressure: 125 psi CWP.
g) Valve Actuator:
   Lever-type with lift, turn, and reset action.
   Locking device to hold plug in desired position.
   Adjustable memory stop with valve position indicator.
   2-inch square actuating nut.
h) Flanged Joint: ANSI B16.1; Class 125, 250 psi working pressure minimum.
i) Coatings: All internal surfaces, except finished surfaces, gaskets, or bearing surfaces shall be epoxy coated in accordance with AWWA C550.
j) Eccentric plug valves shall conform to current AWWA standards and shall be opened and closed with wheel operators. The eccentric plug valves shall be:

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<th>Eccentric Plug Valve</th>
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<tr>
<td>Manufactured By:</td>
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</tr>
<tr>
<td>KENNEDY VALVE COMPANY</td>
<td>PRATT</td>
<td>DEZURIK</td>
</tr>
<tr>
<td>Elmira, NY</td>
<td>Aurora, IL</td>
<td>Sartell, MN</td>
</tr>
</tbody>
</table>

Or equal, as directed or as approved by the Engineer.

2) Check Valves

a) Check valves shall be a non-clog, unobstructed, free flow rolling ball type. The ball shall be out of the flow in the open position and be directed to and from the body seat by guiderails integral with the valve body. The ball shall be actuated by the flowing medium, without the use of springs, levers, weights, etc. The body shall be flanged, cast iron and the ball shall be a hollow steel sphere with a smooth covering of nitrile rubber. The valve shall be suitable for 1030 kPa (150 psi) working pressure. Flanges shall be flat faced and drilled to ANSI B16.1, Class 125 cast iron. The check valve shall be:

<table>
<thead>
<tr>
<th>FLYGT HDL Check Valve</th>
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<tr>
<td>Manufactured By:</td>
<td>Manufactured By:</td>
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<tr>
<td>ITT FLYGT CORPORATION</td>
<td>CLOW VALVE COMPANY</td>
<td>KENNEDY VALVE CO.</td>
</tr>
<tr>
<td>Rochester, NY</td>
<td>Oskaloosa, IA 52577</td>
<td>Elmira, NY</td>
</tr>
</tbody>
</table>

Or equal, as directed or as approved by the Engineer.
3) Pipe Joints
   
a) Flanges – Specials, Companion, and Adjustable:
   
Flange shall conform with ANSI B16.1, Class 125.
Material shall be ductile iron.
Threading shall conform with National Standard Pipe Thread.

b) Adaptor Flanges:

Adaptor flanges for ductile iron or steel pipe shall be manufactured of high strength ductile iron, ASTM A536, Grade 65-45-12. Flange dimensions and drilling shall be in accordance with ANSI B16.1, 125 pound pattern for cast iron, and/or ANSI B16.5, 150 pound pattern for steel. Gaskets shall be BUNA-S (SBR) in accordance with ANSI/AWWA C111/A21.11 and shall be included with the flange. Set screws shall be of AISI 4140, high strength, low alloy steel, 190,000 psi minimum tensile strength, heat treated and zinc plated for corrosion resistance. Set screws shall be of square-head design and coincide with the manufacturers torque installation requirements for all pipe thicknesses.

Adaptor flanges shall be UL listed and FM approved and shall be Uni-Flange TM Series 200/400, as manufactured by Uni-Flange Corporation, or as directed or as approved by the Engineer.

4) Pipe Supports:

a) All piping, fittings, valves and specials, etc. shall be adequately supported and/or restrained in the pumping station with the use of wall brackets, pipe stands, threaded rod, etc. All hardware shall be constructed of non-corrosive materials and be of a type capable to support and/or restrain the piping, etc. at twice the normal working pressure. Vertical supports shall be placed under each valve, tee, and bend and/or cross.

5) Pipe & Fittings:

a) Working Pressure:

All pipe, fittings, and joints shall be rated for a 150 psi minimum working pressure.
b) Ductile Iron:

- Ductile iron, AWWA C-151, Thickness Class 52.
- Fittings: Ductile iron, AWWA C-110.
- Pressure Rating – Class 350.
- Joints: Above grade, flanged.

c) Steel: Stainless Welded Steel, ASTM A778.

- Thickness Class: Schedule 40 conforming to ASTM A778.
- Fittings: Type 304.

d) All piping, fittings, valves and specials, etc. shall be of equal or greater quality than those specified herein. All piping fittings, valves and specials, etc. shall be compatible with the submersible pumps, pump controls, and liquid level sensor system associated with the pump station.

e) Asphaltic Touch-Up Paint for Pipe Fittings and Bolts

- Material shall be a self-priming, heavy-duty, cold-applied, water resistant coating made from pitch derived from suitable tars, selected solvents, and mineral fillers.

e. Slide Rail System: A corrosion resistant slide rail base complete with lower guide bar, holder, discharge elbow, and hydraulic sealing flange shall be bolted to the floor of the pump chamber with stainless steel bolts. Each slide rail shall be sized per pump manufacturer’s recommendations and shall be anchored to the wet wall with stainless steel anchors at 3-meter (10 feet) (maximum) intervals to prevent deflection. All mounting brackets and hardware shall be stainless steel.

3. **Submersible Pumps:** Submersible pumps shall be as identified as on the Drawings. The Contractor shall furnish all labor, materials, equipment, and incidentals required to provide two submersible sewage pumps for each NEC Class I, Division 1, Group D, Hazardous location, as specified herein. Each pump shall be a heavy duty non-clog sewage pump with characteristics specified herein. Equipment furnished under this section shall be warranted against defective parts or workmanship and normal wear and tear for a period of 5 years, and shall include full parts and labor. Prior to installation into the new pumping station, the Contractor shall inspect the submersible pumps for any damage. Should the Contractor find any damage, the Contractor shall make any necessary repairs or replacements. Installation shall be in accordance with the recommendations of the Manufacturer. The Contractor shall make preliminary field tests of the new pump station to ensure that the installation of the submersible pumps are correct. Pump shall be ITT Flygt Model CP-3102, 433 MT impeller, 7.5 HP motor, 230V, 3-phase, or equal, as directed or as approved by the Engineer.
Once the Contractor correctly installs the submersible pumps and has performed field tests to ensure the station is in operable condition, the Contractor shall connect the new 100 mm (4 inch) force main to the pump station discharge piping at the location noted on the Drawings.

a. General Requirements:

1) Each pump station shall be equipped with the following:

   a) Compatible guide bar mounting system.

   b) Each pump shall be equipped with a flush valve or equivalent approved system in order to control the accumulation of debris and sludge in the wet well sump.

   c) Contractor shall furnish three (3) identical pumps for each pump station:

      Two (2) for installation, and
      One (1) to be delivered to the Engineer for use as a spare pump. Engineer will turn over the spare pump to the municipality.

   d) The pump shall be automatically and firmly connected to the discharge connection, guided by no less than two stainless steel guide bars extending from the top of the station to the discharge connection. Each pump shall be fitted with stainless steel lifting chain. The working load of the lifting system shall be 50 percent greater than the pump unit weight.

   e) Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring, or profile gasket will not be acceptable.

   f) No portion of the pump shall bear directly on the basin floor.

2) Construction:

   a) Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI Type 304 stainless steel or brass construction. All metal surfaces coming into contact with the pumpage other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

   b) Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be
machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

c) Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

3) Cable Entry Seal:

   a) The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

4) Motor

   a) The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 155 degrees C (311 degrees F). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40 degrees C (104 degrees F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125 degrees C (260 degrees F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed form the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. Wire nuts or crimping type connection devices are not acceptable. The motor and pump shall be designed and manufactured by the same source.
b) The combined service factor (combined effect of voltage, frequency, and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10 percent. The motor shall be designed for operation up to 40 degrees C (104 degrees F) ambient and with a temperature rise not to exceed 80 degrees C (176 degrees F). A performance chart shall be provided showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

c) The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

d) The motor horsepower shall be adequate so that the pump is nonoverloading throughout the entire pump performance curve from shut-off through run-out.

5) Bearings:

a) The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces.

6) Mechanical Seal

a) Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary tungsten-carbide ring and one positively driven rotating ceramic ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary ceramic seal ring and one positively driven rotating carbon seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment or depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable.

b) Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to
provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load. Seal lubricant shall be FDA approved, nontoxic.

7) Pump Shaft:
   a) Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be AISI Type 431 stainless steel.

   b) If a shaft material of lower quality than 431 stainless steel is used, a shaft sleeve of 431 stainless steel is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

8) Impeller:
   a) The impeller(s) shall be of grey cast iron, class 35B, dynamically balanced, single shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling raw sewage. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller(s) shall be taper collet fitted and retained with an Allen head bolt. All impellers shall be coated with an acrylic dispersion zinc phosphate primer. Grinder pump impellers shall be designed to handle fine slurry from the rotary cutters.

9) Volute
   a) Pump volute(s) shall be single-piece grey cast iron. Class 35B, nonconcentric design with smooth passages large enough to pass any media that may enter the impeller. Minimum inlet and discharge size shall be as specified.

10) Motor Protection
    a) All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125 degree C (260 degrees F) the thermal switches shall open, stop the motor and activate an alarm.

    b) A leakage sensor shall be provided to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will send an alarm.
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and, if desired, stop the motor. USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125 DEGREE C (260 DEGREE F) SHALL NOT BE ALLOWED.

c) The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS is designed to be mounted in any control panel.

11) Spare Parts

a) Contractor shall furnish to the Owner the following spare parts:

One (1) set of wearing rings for each pump.
One (1) set of special tools required for maintenance of the pumps.
One (1) complete set of mechanical seals for each pump.
Two spare liquid level sensors for each pump station.
One (1) spare flush valve.

4. Pump Control Panel: The motor control panel shall be assembled and tested by a shop meeting U.L. Standard 508 for industrial controls. All motor control panels shall be assembled and tested by the same manufacturer so as to insure suitability and assurance of experience in matching controls to motors and to insure single source responsibility for the equipment. All control panels shall be furnished by the pump supplier.

a. General Requirements:

1) The control panel will operate the electrical pump motors at the power characteristics noted on the plans.

2) The control function provides for the lead pump under normal conditions. If the incoming flow exceeds the pumping capacity of the lead pump, the lag pump will automatically start and pump the station to the "ALL OFF" elevation as shown on the plans.

3) Provide necessary relays and terminal blocks for the proper performance of the telephone dialer. Signals shall be provided for alarm conditions specified in Paragraph 7.d.1 of this section.

4) Electrical systems and components (e.g., motors, lights, cables, conduits, switchboxes, control circuits, etc.) in raw wastewater wet well, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present, shall comply with the National Electrical Code requirements for Class I Group D, Division 1 locations. In addition, equipment located in the wet well shall be suitable for use under corrosive conditions. Each flexible cable shall
be provided with a watertight seal and separate strain relief. A fused disconnect switch located aboveground shall be provided for the main power feed for the pumping station. When such equipment is exposed to weather, it shall meet the requirements of weatherproof equipment NEMA 3R. Ground fault interruption protection shall be provided for all outdoor receptacles.

5) Adequate space shall be provided for mounting of the dialer (Section 16700) inside the control panel enclosure.

b. Construction:

1) The control enclosure shall be a NEMA 3R steel. The door shall be gasketed with a rubber composition material around the perimeter and shall be installed with a retainer to assure a positive weatherproof seal. The door shall open a minimum of 180 degrees. A padlock hasp shall be provided.

2) A polished aluminum inner dead front door shall be mounted on a continuous aluminum aircraft type hinge and shall contain cutouts for the protrusion of the control breakers and provide protection of personnel from internal live voltages. All control switches, pilot indicator lights, elapsed time meters, duplex receptacle and other operational devices shall be mounted on the external surface of the dead front. The dead front door shall open a minimum of 150 degrees to allow for access to the equipment for maintenance. A 3/4" break shall be formed around the perimeter of the dead front to provide rigidity.

3) The back plate shall be manufactured from 12 gauge sheet steel and be finished with a primer coat and two (2) coats of baked-on white enamel. All hardware shall be mounted using machine thread screws. Sheet metal screws shall not be acceptable. All installed devices will be permanently identified.

4) The panel power distribution shall include all necessary components and be wired with stranded copper conductors rated at 90 degrees "C". Conductor terminations shall be as recommended by the device manufacturer.

5) The control system shall contain motor breakers (MB), control circuit breaker (CCB), and any other devices as shown on the drawings.

6) All circuit breakers shall be heavy duty thermal magnetic or motor circuit protector similar and equal to square "D" type "FAL". Each breaker shall be sized to adequately meet the operating conditions of the load and have a minimum interrupting capacity of 22,000 amps at 240 vac.
7) Breakers shall be indicating type, providing "ON-OFF-TRIPPED" positions of the handle. They shall be quick make-quick break on manual and automatic operation and have inverse time characteristics.

8) Breakers shall be designed so that tripping of one pole automatically trips all poles.

9) Motor starters shall be solid state, soft-start type.

   Product shall be Altistart as manufactured by ABB Inc., Square D Company, or equal, as directed or as approved by the Engineer.

10) A lightning-transient protector with tell-tale operational indicators on each phase shall be provided. Indicators shall indicate loss of protection for that phase. The device shall be a solid state device with a response time of less than 5 nano-seconds with a withstand surge capacity of 6,500 amperes. Units shall be instant recovery, long life and have no holdover currents.

c. **Equipment:** The control panel shall include but not be limited to the following equipment. The below list is to determine the required devices for the proper operation of the system.

1) Control transformers shall be provided to provide the 120 vac and/or 24 vac for control circuits. Transformers shall be fused on the primary and secondary circuits. The secondaries shall be grounded.

2) A line voltage rated, adjustable phase monitor shall be installed to sense low voltage, loss of power, reversed phasing and loss of a phase. Control circuit shall de-energize upon sensing any of the faults and shall automatically restore service upon return to normal power.

3) A solid state ground check relay shall be provided that will constantly monitor the condition of the ground wire and connection in the pump housing. In the event the resistance of the cable or terminations exceed 500 ohms resistance the relay shall change state, indicated and alarm condition with an LED and shut down the pump. An indicator shall be mounted on the dead front to indicate the condition. The relay shall assure that the resistance joint between the ground wire and the ground check wire in the pump cable where they are attached in the pump housing shall not exceed 500 ohms.

4) A solid state relay that will differentiate between a moisture condition and an over temperature condition occurring in the pump shall be supplied. When moisture is detected in the pump chamber, an indication shall be activated. The indication shall require reset function. New pumps (by others) stator windings shall have temperature switches imbedded in the stator. In the event of an over temperature
condition, the pump shall shut down and an indicator shall be provided to indicate the condition.

5) Immediately prior to the activation of the pump on a pump call signal, an automatic resistance check of the motor winding shall be performed using a minimum of 500 vac to determine if the motor windings are defective. A resistance reading of less than 1 megohm shall cause the solid state relay to shut down the pump and indicate the failure.

6) A green run pilot indicator shall be mounted on the dead front door.

7) An elapsed time meter for each pump shall be mounted on the dead front door. The meter shall operate on 120 vac, shall indicate in hours (6 digits) and tenths and shall be non-resetable.

8) A final as built drawing encapsulated in mylar shall be attached to the inside to the front door. A list of all legends shall be included.

9) All component parts in the control panel shall be permanently marked and identified as they are indicated on the drawing. Marking shall be on the back plate adjacent to the component. All control conductors shall be identified with wire markers at each end as close as practical to the end of conductor.

10) All panels shall be tested to the power requirements as shown on the plans to assure proper operation of all the components. Each control function shall be activated to check for proper operation.

11) Provide a strip heater inside the control panel to eliminate condensation. Hoffman Model #D-AH1001A, 100W-115V, or equal, as directed or as approved by the Engineer.

5. **Level Sensors:**

a. Pump operation shall be controlled by a submersible pressure transducer. The control system shall meet the requirements of the National Electrical Code as being intrinsically safe.

1) The system shall provide for the automatic and manual control and alternation of the pumps to maintain a pumped down condition of the wet well. Levels shall be sensed by non-fouling pressure transducers continuous 4-20 m ADC signal adjusted to the level shown on the plans. Each pump’s operation shall be controlled by a field adjustable Duplex Pump Controller, Model 2411, as manufactured by Essex Engineering Corp., or equal, as directed or as approved by the Engineer. Controller shall be mounted 48 inches above finish floor within the pump control panel to
accommodate operator use. The pump(s) shall remain "ON" until a common "OFF" level is reached. At the conclusion of each pump cycle, an alternator shall switch the pumps on the next cycle to equalize run time on the pumps. The system shall provide indication for the levels and indicate a failure of the "OFF" unit. Submersible transducer Series 750 as manufactured by KPSI, or equal, as directed or as approved by the Engineer. The transducer shall have a welded 316 stainless steel internal diaphragm with a PTFE outer diaphragm. The housing, threaded coupling, hanger pipe, and suspension cable shall all be corrosion resistant stainless steel.

2) The transducer cable shall be protected from moisture and condensation by providing a compatible aneroid bellows mounted in the control panel.

b. Redundant Level Controls:

1) Mercury tube type switch level controls, sealed in a leak-proof and shock-proof polyurethane float, shall be provided for backup pump "off" controls. High wet well level warning alarm shall also be provided.

2) Floats shall be Type S-M, manufactured by F.E. Myers, or equal, as directed or as approved by the Engineer. Two (2) mercury switch level controls shall be supplied. One shall operate to close circuit for high water level alarm activation indicated and the other provides a redundant “ALL OFF” control for both pumps and a “LOW WATER” alarm.

3) Provide a manual override switch in the control panel for each float level sensor.

6. Alarm Light: An alarm-activated red 4 watt shatterproof light shall be furnished in a weatherproof enclosure. This light shall be located on the control enclosure as shown on the drawings.

7. Telephone Dialer System:

a. Quality Assurance:

1) Supplier/Installer: Company specializing in the phone dialer communication system, with a minimum of three years documented experience, and authorized by the equipment manufacturer.

b. Acceptable Manufacturers: Specification is based on Sensaphone Model 4100 Monitoring System. This product is recognized as a standard product utilized by the Village of Bainbridge. No substitutions will be considered.
c. Construction:

1) Central Control:
   a) Rotary pulse or tone dialing, keyboard selectable.
   b) Dials up to 8 different numbers, each up to 32 digits long.
   c) Microphone to enable remote monitoring of sounds.
   d) AC power failure sensing.
   e) Alarm Acknowledgement: Touch tone key or by calling back.
   f) Clock.
   g) Temperature Sensing: -20 to 150 degrees F.
   h) Communicates in simple voice – synthesized English.
   i) Environmental: Temperature Range: 32 to 120 degrees F.
   j) 120V power supply.
   k) 8-user selectable inputs, temperature or dry contact.
   l) Surge protection.
   m) Local alarm relay output.
   n) Keypad for local programming and status report. Nonvolatile memory.
   o) Telephone Interface: Approved RJ-11 plug-in connector with 6 foot cord.

2) Batteries
   a) (6) 1.5 volt “D” cell alkaline batteries.
   b) Battery condition monitor.

3) Enclosure
   a) To be mounted 48 inches above finish floor in space allocated inside the pump control panel to accommodate operator use.
   b) Size: 2" H x 7.5" W x 8.5" D nominal.

d. Sequence of Operations:

1) System will alarm five (5) separate inputs plus power failure.
   a) Lag pump is on.
   b) High level in wet well.
   c) High pump temperature.
   d) Lead pump does not start.
   e) Low water level in wet well.
   f) Power failure: Provide 10 second (adjustable) time delay.

2) Each alarm will initiate the phone dialing sequence and a voice message.
3) Phone Dialing Sequence
   a) Call each number sequentially until call is acknowledged.
   b) Allow each phone to ring 9 times (adjustable) before dialing next number.
   c) All numbers shall be furnished by Owner during setup.

8. Electromagnetic Flow Meter:
   a. Operating Conditions:
      1) Head tube sensor is to be installed in discharge force main of raw sewage pumps at
         the location shown on the plans.
   b. General Requirements:
      1) The electromagnetic flow meter shall be a solid state, obstructionless flow rate
         measuring device which is capable of measuring raw sewage with high accuracy
         that is unaffected by the liquids physical characteristics (density, temperature, pH,
         pressure, etc.).
      2) The sensor shall be coupled with remote signal converter to power the sensor coils
         and convert voltage into flow data. The converter with visual display shall be
         mounted as shown on the plans.
   c. Construction:
      1) Sensor
         a) The flow tube shall be the wafer body style utilizing pulsed direct current field
            coil excitation. The unit shall produce an output signal of 0-10 kHz
            proportional to flow rate and provide a factored and/or scaled pulse output.
            Low power consumption of approximately 15 watts. All wiring compartments
            shall be sealed and coil housings potted for environmental protection.
         b) Flow tube shall be TEFZEL or PTFE lined. Electrodes shall be 316 stainless
            steel. Additional grounding rings to prevent grounding problems shall be
            provided.
         c) Acceptable Manufacturer FM626-04-412-60, or equal, as directed or as
            approved by the Engineer.
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<tr>
<td>Manufactured By: SPARLING INSTRUMENTS</td>
<td>Manufactured By: SIEMENS</td>
<td>Manufactured By: McCROMETER</td>
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<tr>
<td>El Monte, CA</td>
<td>Springhouse, PA</td>
<td>Hemet, CA</td>
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Or equal, as directed or as approved by the Engineer.

2) Remote Electronics

   a) Panel-mounted microprocessor based transmitter used to convert low level signals from the flow tube to 4-20 mA output. Local operator interface keypad and display to allow review and changing of transmitter settings. Capable of displaying present flow rate in gallons per minute as well as totalized flow. NEMA-4X transmitter enclosure and NEMA-7 rated junction box on meter for sensor connections.

      i) Mount enclosure 48 inches above finish floor to accommodate operator use.

   b) Accuracy ± 0.5 percent of rate. Automatic zero. Continuous self-diagnostics with fault messages in English. Battery backup of totalizer.

   c) Manufacture – Must be supplied by and compatible with the same manufacturer as the flow meter sensor.

9. Miscellaneous:

   a. Pipe Supports:

      1) Black steel welded construction with stainless steel expansion bolts and hardware. Coat all ferrous surfaces with two coats of coal tar epoxy.

   b. Floor Drain and Drain Pipe:

      1) Floor drain shall be single-body coated cast iron, equipped with bottom outlet, square top, round hinged grate, or as approved.

      2) Drain pipe shall be ductile iron pipe, or grey cast iron or cast standard weight, plain end, unlined, conforming to CISPI Standard 301. Grey cast iron fittings shall be beaded end.
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3) Acceptable Manufacturers
   a) J.R. Smith Manufacturing Co.
   b) Josam Manufacturing Co.
   c) Or equal, as directed or as approved by the Engineer.

4) Refer to plans for location(s) of combination floor drain with integral backwater valve and trap.

c. Backwater Valve:
   1) PVC construction.
   2) Noncorrosive flexible PVC flapper.
   3) Removable plastic access cover secured with stainless steel bolts.
   4) Refer to plans for location(s) of combination floor drain with integral backwater valve and trap.

d. Wall Sleeves and Seals:
   1) All penetrations shall be provided with a precast sleeve or cored opening. Sleeve size shall be a minimum of 2 inches larger than the piping outside diameter.

2) Penetrations shall be sealed using a modular link style rubber seal. Manufactured by Thunderline Corp., or equal, as directed or as approved by the Engineer.

10. General Requirements – Electrical: Secure necessary permits and pay all required fees applicable to the work. Obtain NYBFU, or equivalent, Inspection Certificate.

11. Electrical Distribution Equipment: All equipment shall be in dead front NEMA 3R enclosures. Manufactured by Square D, Cutler Hammer, General Electric, or equal, as directed or as approved by the Engineer.

   a. Service Disconnect: Disconnect shall be fused, heavy duty and labeled for use as service equipment.

   b. Distribution Panel: Panel shall be circuit breaker type with thermal magnetic, molded cast breakers, 22 KAIC.

   c. Manual Transfer Switch: Switch shall be double throw, heavy duty, non-fused, padlockable.
CONSTRUCTION DETAILS

1. General Product Delivery, Storage, and Handling –
   a. Fittings, valves, pipe, controls, equipment, and other accessories shall be handled in such a manner as to ensure delivery to the site in sound, undamaged condition. Take special care not to injure factory finishes. Replace or make satisfactory repairs to pipe or fittings with damaged coatings or linings. Store pipe, valves, and other accessories in conformance with manufacturer's recommendations.

2. Shop Drawings. A complete set of shop drawings covering all aspects of the pumping station, valve chamber and emergency generator shall be submitted to the Engineer as a package. Separate submittals of various components will not be accepted.

3. Manufacturer’s Representative. The Contractor shall arrange for a qualified service representative(s) from the company(ies) manufacturing or supplying the pumping, controls, dialer, flow meter, and related equipment to perform the duties herein described. Service representative shall be responsible for all start-up and programming functions.

The manufacturer’s representative shall supervise the installation of all submersible pump equipment. After installation of the equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the manufacturer’s representative shall inspect, operate, pretest and adjust the equipment. The Contractor shall assist in the pretest. The Engineer shall be notified one (1) week in advance so he may attend and make notification to the municipality’s operator or representative to be present for all testing. Engineer will notify three (3) work days prior to pre-test. The inspection shall include, but not be limited to, the following points as applicable:

   a. Soundness (without cracked or otherwise damaged parts).
   b. Completeness in all details as specified.
   c. Correctness of setting, alignment and relative arrangement of various parts.
   d. Adequacy and correctness of overall installation and performance.

The operation, testing and adjustment shall be as required to provide that the equipment is left in proper condition for satisfactory operation under the conditions specified.

On completion of his work, the manufacturer’s or supplier’s representative shall submit in triplicate to the Engineer a complete signed report of the results of his inspection, operation, adjustment and tests. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified and a certificate that the equipment conforms to the requirements of the Contract and is ready for permanent operation and that nothing in the installation will render the manufacturer’s warranty null and void.
e. Provide on-site startup and training for system operator. Eight (8) hours minimum required, unless otherwise directed or approved by the Engineer after consultation with the system operator.

4. Electrical Installation:

The Contractor shall make preliminary field tests to ensure that the reconnection of the electrical pump control panel is correct.

5. Meter Installation:

a. The electromagnetic flow meter shall be installed in accordance with the manufacturer's recommendations.

b. The flangeless wafer body sensor shall be installed between ANSI 150 flanges and tightened with all-thread rods or long bolts. The center of the meter shall be mounted a minimum of 3 straight pipe diameters on each end to any fitting or flow obstruction.

c. The remote transmitter panel shall be securely mounted in the control enclosure structure. Provide adequate length of cable to sensor.

d. Provide on-site startup and training for system operator.

6. Pipe And Fitting, Installation:

a. Inspect the pipe, fittings, and other materials for damage and other defects. Reject all unsound or damaged material.

1) Cleanliness:

a) Foreign material shall be prevented from entering the pipe and fittings while they are being placed.

2) Cutting of Pipe:

a) Cut pipe in a neat workmanlike manner.

b) Ductile iron pipe may be cut with an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, or milling wheel saw. Avoid damage to cement mortar lining.

c) Smooth all cut ends and edges by grinding.
3) Joints
   a) Assemble joints in strict accordance with manufacturer's instructions using recommended lubricants, gaskets, and sealing tape.

4) Painting
   a) Paint all piping and accessories as specified or noted on plans.
   b) Touch Up: Paint any previously uncoated bolts, fittings, tie rods, clamps, or other accessories and touch up any scraped areas of the pipe.

7. Valves:
   a. Valves
      1) Set plumb unless otherwise noted on drawings.
      2) Valves and other fittings shall have flanged joints unless otherwise specified.
      3) Valve components shall be carefully inspected prior to installation. Valve discs shall be opened and closed to make sure the valve operates properly, that stops and limiting devices are properly set, and that the valve seats properly.
      4) Strictly adhere to manufacturer's installation requirements.

8. Drain, Waste, and Vent Piping:
   a. All drain and vent piping shall be installed as shown on the plans.
   b. Install all necessary piping and appurtenances in order to provide a properly functioning drain and vent system.

9. Painting
   a. Paint all piping, valves, and applicable accessories.
   b. Touch Up: Paint any previously uncoated bolts, fittings, tie rods, clamps, and accessories.
   c. Painting includes field painting of exposed bare and covered pipes, hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
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d. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

e. Follow paint manufacturer’s instructions for storage and application of paint products.

f. Primer: Metal surfaces not factory primed shall receive a field application of a quick-drying, rush-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the paint manufacturer. One coat required.

g. Finish Coat – Apply two coats of semi-gloss acrylic-latex enamel (interior or exterior, depending on location). Follow manufacturer’s recommendations for application. Color to be selected by system operator.

10. Pump Station Installation:

a. Install the duplex pumps, piping, valves, control panel and alarm devices as shown on the Contract Drawings and in strict accordance with the manufacturer's recommendations. Operationally test the system for plumbing leaks, operation of valves and controls. Check the pumping rate by timing the cycle time between on-off levels.

b. Electrical work shall conform to all applicable State and Local Codes and the National Electrical Code (N.E.C.).

c. Items of specific manufacturers shall be installed in strict accordance with manufacturer's printed instructions and/or manufacturer's representative's directions.

d. Provide grounding system as per the N.E.C.

e. All power and control cables from control panel to the pump station shall be continuous. No splices or junction boxes shall be used in wet well. The wet well shall be considered a Class I, Division 1, Group D, location.

f. All access hatches shall be installed per manufacturer's instructions.

g. Provide intermediate platform with removable corrosion-resistant grating where required. Flygt “TOP” Fiberglass basin insert shall be sized for each pump installation.

h. Immediately after the placing of one section on another, the exterior portion of the joint shall be filled with Axpandercrete RM, or equivalent. After completing the joint, the entire exterior surface of the station shall be coated with two heavy, troweled bitumastic coatings. The interior of the joint shall be filled with “Anti-Hydro” mortar and give a smooth finish.
11. **Field Test.** After installation of the unit together with all accessories, it shall be put in first class operating condition; and after inspection, testing, operation and adjustments have been completed by the manufacturer’s representative and after the manufacturer’s representative has submitted his report to the Engineer, the pumping equipment shall be field tested by the Contractor in the presence of the Engineer to demonstrate the ability of the unit to operate properly without vibration or overheating.

All defects or defective equipment shall be corrected or replaced at the expense of the Contractor and, if necessary, the tests shall be repeated until satisfactory results are obtained. The Contractor shall furnish all labor, piping, equipment, water, power and materials necessary for testing.

12. **Operating Instructions and Training.** The Contractor shall furnish five (5) bound copies of instruction manuals covering operation and maintenance of all equipment furnished. The manuals shall be complete with wiring diagrams, lubrication schedules, drawings, functional descriptions, cuts, trouble shooting recommendations, parts lists and other information required for the proper operation, maintenance, repair and adjustment of the equipment. All parts shall be numbered or otherwise clearly identified to facilitate ordering of replacements.

Upon completion of all work and all tests, the Contractor shall furnish the necessary skilled labor and helpers for operating the system and equipment for a period of one (1) day. During this period, he shall instruct the Owner or his representative fully in the operations, adjustment and maintenance of all equipment furnished.

13. **General**

a. Provide conduit seals in all conduits between control panel and wet well.

b. Provide separate conduit for 4-20ma wiring to the pressure transducer. Do not run with any other wiring (including the control wiring for the redundant level control system).

c. Provide one spare control conduit from the wet well equal in size to those used. Terminate this spare conduit below the control panel with sufficient space to add a seal and connection to the control panel in the future.

d. The Contractor shall furnish and install new submersible pump electric supply cables with sufficient length to reach the electric control panel. Under no circumstance will splices in this cable be permitted. Each electric supply cable will be housed individually in their own conduit running from the sanitary pump station wet well to the electric control panel. The electric cable installation shall be done by the qualified service representative and shall be included in their duties as described under the Construction Details, Section 2.
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14. **Warranty.** Contractor shall provide a warranty for the work covered by this special specification, transferrable to the municipality/system operator, upon completion of the work. This warranty shall insure that defects not due to improper use that develop within two (2) years from the date the completed project is turned over to the municipality/system operator are corrected. Warranty includes full parts, labor, materials, and other necessary expenses.

**METHOD OF MEASUREMENT**

There will be no measurement under this item, the work described herein to be paid for on a lump sum basis.

**BASIS OF PAYMENT**

Payment for Sanitary Sewer Pumping Station will be made on a lump sum basis.

The Lump Sum price bid for this item shall include the cost of all equipment, materials and labor required for a complete installation of a Sanitary Sewer Pumping Station, (including all fees for inspection, service connections, licenses, electrical energy, excavation, backfill, sheeting and any other cost that may incur in constructing/installation of the Sanitary Sewer Pumping Station) ready for its intended use.