

## SECTION 02731

### SEWAGE LIFT STATION

#### PART 1 GENERAL

##### 1.01 SCOPE OF WORK

- A. The lift station shall be designed at a minimum in accordance with standards and references set forth by the Georgia Department of Natural Resources, and in accordance with the TOWN's minimum requirements as well.
- B. For subdivisions, apartment complexes, shopping centers, and similar developments, the TOWN requires the use of submersible-type lift stations. All wastewater lift stations shall be reviewed by the TOWN and the Georgia Department of Natural Resources on a case-by-case basis. All wastewater lift stations, regardless of size, shall be submitted to the Department of Natural Resources for review and approval.
- C. For the TOWN's review, the DEVELOPER-CONTRACTOR shall submit Detail Sheet PS-1 completed with all pertinent data, and documentation showing all necessary calculations for appropriate lift station and wetwell design. The TOWN may require any additional information at its discretions in order to complete its review.
- D. Each lift station design and site is unique, and shall be reviewed by the TOWN as such. This includes site layout, access, electrical requirements, appearance, controls, etc. These standards are presented as a minimum requirement and guideline only; changes or additional requirements to each station may be required by the TOWN at their discretion as a result of review during plan submittals and/or construction.

##### 1.02 PUMPS

- A. The TOWN accepts only submersible sewage pumps: heavy duty, vertical shaft, non-clog type, submersible centrifugal pumps. The following manufacturers are approved: Flygt, HOMA, and Yeomans. Minor deviations may be allowed if approved in writing by the TOWN prior to construction.
- B. The pumps furnished under this Section shall be the product of the same supplier to ensure maximum compatibility and interchangeability of parts. The DEVELOPER-CONTRACTOR shall assign unit responsibility to the pump supplier or manufacturer for the equipment specified in this section in order to enhance compatibility, ease of construction, and efficient maintenance of the components of each pumping system. The pump manufacturer shall coordinate pump controls so that a complete and operable system is achieved.
- C. Refer to Section 16000, Electrical Plans for electrical equipment requirements.

### 1.03 MINIMUM GENERAL REQUIREMENTS

- A. All stations shall be a duplex at minimum.
- B. All stations shall be designed as submersible non-clog lift station complete with paved access drive, maintenance friendly layout and grading, motors, permanent discharge elbows, guide bars, intermediate, upper and lower guide bar brackets, power cables, lifting chains, pump controls, level sensor, generator, lighting and pole, yard hydrant, anchor bolts, valve vault, wetwell, aluminum access hatches, fence, site work, spare parts and other accessories including all necessary labor, supervision, materials, tools, and appurtenances.
- C. Minimum wetwell diameter shall be 10-feet.
- D. Wetwell shall be coated as per specification section 02601.
- E. Each station shall be furnished and installed with a permanent standby generator in accordance with specification section 16621.
- F. Each lift station shall be furnished and installed with the TOWN's most current SCADA. Contact the TOWN's sewer department for the latest requirements.
- G. SCADA shall monitor the following events: on-off-failure status of each pump, runtime for each pump, generator status-running or failure, high level alarm.
- H. Check valves shall weighted type.
- I. See lift station details for reference.
- J. All phases of construction shall be inspected as per the TOWN's requirements.

### 1.04 WORKMANSHIP AND MATERIALS

All equipment and materials furnished under this Contract shall be new, suitable for the conditions of service to which they will be subject and equal to the best of their respective classes. Grade and quality shall meet the applicable cited specifications and standards.

Workmanship shall be of the highest quality and shall be carried out by competent and experienced workmen.

### 1.05 SUBMITTALS

Shop drawings, minimum 3 copies each, for the pumping station, associated equipment, and generator shall be submitted to the Town for review and comment prior to installation by the DEVELOPER-CONTRACTOR. The shop drawings must bear the stamp and approval of the design engineer prior to submitting to the Town. The DEVELOPER-CONTRACTOR shall provide TO THE TOWN as a minimum the submittals listed below. Submittals shall be submitted to the TOWN and approved prior to fabrication, shipment or work specified under this section begins.

- A. Manufacturer's data including materials of construction and equipment weight.
- B. Predicted performance curves developed for the specific application. Performance curves shall plot speed, capacity, head, horsepower, efficiency, and NPSH requirements over the manufacturer's recommended range of operation.
- C. Motor submittal data.

- D. Shop drawings including dimensions and cross sectional views of all equipment showing details of construction.
- E. Shop drawings including plan and sectional views of the pumps in the sump.
- F. A written report on the factory test results as specified in this Specification.
- G. A written report on the field test results, as specified in Section 3.06 of this Specification.
- H. Extended warranty as specified in this Specification.

The DEVELOPER-CONTRACTOR shall also include complete working details, dimension, assembly, and installation drawings, catalog and other data, and manufacturer's specifications and data indicating all parts, accessories and appliances, all piping, valves, motors, conduit, wiring and equipment, methods and material of construction, location, and installation, support, anchorage and connections and wiring diagrams, surface finishes and other information as may be required, complete in every detail, to define the articles to be furnished and indicate whether or not they comply with the Specifications.

A tabulated list of all motors and electrical devices shall also be furnished. Include ampere and voltage operating characteristics for all devices. For motors, include full load amperes, locked rotor amperes, power factor, efficiencies, slope and temperature rise. Process the tabulated list, plus all special wiring diagrams as shop drawings and as soon as possible in order to expedite the electrical work.

The DEVELOPER-CONTRACTOR shall also furnish under this section six (6) bound copies of complete and detailed instructions for the installation, operation, lubrication, and maintenance of all equipment furnished and installed hereunder. The manuals shall be furnished after final approval of all shop and working drawings but prior to shipment of equipment. Manuals shall be complete with wiring diagrams, lubrication schedules and recommended lubricants, drawings, cuts, parts lists, and other necessary data. All parts shall be numbered or otherwise clearly identified to facilitate ordering or replacements. Descriptions of all operations control devices and their specific functions shall also be included.

#### 1.06 EXPERIENCE QUALIFICATIONS

The equipment to be furnished hereunder shall be made by a manufacturer regularly engaged in such work, and who has furnished similar installations and had them in successful and continuous operation for a period of 10 years.

#### 1.07 FACTORY TESTS

Each pump to be delivered under this Section shall be tested for performance at the pump manufacturer's factory to determine head versus capacity, efficiencies, and kilowatt draw required for the operating points that are specified. All tests shall be run in accordance with the latest edition of the American Hydraulic Institute Standards and Submersible Wastewater Pump Association and at the appropriate voltage and frequency. Testing shall also include, but not be limited to, the following:

1. Head vs. flow with five (5) equally spaced points including shutoff and maximum flow shall be certified.

2. The input KW, speed, power factor, no load current, and torque characteristics shall be certified.
3. Impeller, motor rating and electrical connections shall first be checked for compliance to the specifications.
4. A motor and cable insulation test for moisture content or insulation defects shall be made.
5. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
6. The pump shall be run for 30 minutes submerged, a minimum of 6 feet under water.
7. After the operational test described in line No. 6, the insulation test described in line No. 4 shall be performed again.
8. After testing, the pump shall be inspected to insure that the pump maintains full watertight integrity.

A written report stating the tests have successfully been completed and providing the results of the test shall be provided for each pump. The pump manufacturer shall also certify that similar test have been conducted on pumps of a similar size for a period of not less than 5 years.

## PART 2 PRODUCTS

### 2.01 PUMP REQUIREMENTS

Pumps shall be the submersible type specifically designed for pumping raw sewage containing solids and stringy materials. The pumps shall be capable of handling raw, unscreened sewage while running in a continuous submerged condition to a depth of 65 feet. The pump shall operate without clogging or fouling caused by materials in the pumped fluid at any operating condition within the range of service specified. The pump shall be designed to operate without cavitation over the full range of operating conditions. The pump head-capacity curve shall slope in one continuous curve with no point of reverse slope inflection. Pumps shall be designed for continuous operation under submerged, partially submerged or totally dry conditions without damage to the pump or motor.

The complete pumping unit shall be designed to operate without overload on any component at any point along the pump's entire operating curve. Without derating the motor, the pumps shall be able to pump continuously with the minimum water level at the bottom of the motor housing, under full load, without the need of spray systems or air moving equipment. The motor horsepowers shall be adequate so that each pump is non-overloading throughout its entire pump performance curve from shut-off through run-out.

Pumps to be installed at the locations described on the ENGINEER's plans shall be submersible centrifugal pumps, modified to provide the specified features and to meet the specified operating conditions.

## 2.02 MATERIALS OF CONSTRUCTION

As a minimum, materials employed for the construction of equipment provided under this specification shall be as follows:

<u>Component</u>	<u>Material</u>
Pump and motor casing	Cast iron, ASTM A48, Class 35
Discharge elbow	Cast iron, ASTM A48, Class 35
Impeller	Cast iron, ASTM A48, Class 35
Motor and pump shaft	Stainless steel ASTM A276, Series 416
Wearing ring	Nitrile or stainless steel, ASTM A276 Series 400
Externals bolts and nuts	Stainless steel, ASTM A276 Type 304
Guide bar brackets	Stainless steel, ASTM A276 Type 304
Guide bars, lifting chain and hook assemblies	Stainless steel, type 316L and/or ASTM A276 Type 304

All surfaces, excluding stainless steel or brass, shall be coated in accordance with the manufacturer's recommendations.

## 2.03 EQUIPMENT FEATURES

### A. GENERAL

Motor and rotating parts shall be removable from the motor end of pumps. All mating surfaces where watertight sealing is required shall be machined and fitted with Buna-N rubber O-rings. Pumps shall be fitted with dynamically balanced nonclog impellers designed to pass coarse solids and stringy materials. Major pump components shall have smooth surfaces devoid of blow holes or other irregularities. All external surfaces coming into contact with the pumpage, other than stainless steel or other corrosive resistant materials, shall be painted per Section 3.04.

The pump discharge connection shall be permanently installed in the pump sump along with the discharge piping. Pumps shall be automatically and firmly connected to the discharge piping when lowered into place to the discharge connections. Pumps shall be easily removable for inspection or service, requiring no bolts, nuts, or other fastening to be removed for this purpose, and no need for personnel to enter pump well. Pumps shall be fitted with stainless steel chain of adequate strength and length to permit raising pumps for inspection and removal by the hoist. Sealing of the pumping unit to the discharge connections shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided to and pressing tightly against the discharge connections. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact or a profile seal. The connection between the pump and discharge connection shall allow zero leakage. No

portion of the pump shall bear directly on the floor of the sump and no rotary motion of the pump shall be required for sealing. There is not more than one 90 degree bend allowed between the volute discharge flange and discharge piping. Guide bars, which shall steer the pump into proper contact with the discharge elbow shall be nonadjustable and shall not bear the weight of the pump.

#### B. PUMP SHAFT

Pump and motor shaft shall be of the same unit. A surface finish with minimum roughness value of 12 micro-inches shall be required.

The shaft shall not extend or overhand more than 2 1/2 times its maximum diameter below the bottom support bearing. The pump shaft shall be completely isolated from the pumped media.

#### C. BEARINGS

The pump shaft shall rotate three permanently lubricated bearings. The upper bearing, provided for radial forces, shall be a single roller or ball bearing. The two lower bearings shall consist of one roller or ball bearing for radial forces and one angular contact for axial thrust. Bearings shall be heavy-duty, oil lubricated or permanently greased lubricated type double shielded and factory sealed. Bearings shall be designed for an L-10 bearing life of a minimum 40,000 hours.

#### D. IMPELLER

Impellers shall be dynamically balanced, double shrouded, nonclogging design capable of handling solids, fibrous materials, heavy sludge, and other matter found in normal sewage applications. Fit between the impeller and the shaft shall be a sliding fit with a tamper-lock bushing pressed by a screw which is threaded into the end of the shaft, or a slip fit onto the shaft and drive key and fastened to the shaft by an impeller nut having cover for protection from pumped fluid. A wearing ring system designed for abrasion resistance shall provide efficient sealing between the volute and impeller. All impellers and interior surfaces of pump shall be coated with a factory applied acrylic compound or high solids content epoxy, resistant to wastewater.

#### E. MECHANICAL SEALS AND WEARING RINGS

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an oil reservoir that hydrodynamically lubricates the solid block seal faces at a constant rate. The lower, primary seal unit, between the pump and oil chamber, shall consist of one stationary and one positively driven, rotating silicon-carbide or tungsten-carbide ring, with each pair of rings held in contact by a separate springs. The upper, secondary seal unit, between the oil sump and the motor housing, shall consist of one stationary silicon-carbide or tungsten-carbide seal ring AND one positively driven rotating silicon or tungsten-carbide seal ring. Ceramic seals will not be acceptable. The seals shall require neither maintenance nor adjustment and shall be easily replaceable and commercially available. Conventional double mechanical seals with a single or a double spring between the mating faces, or that require constant differential pressure to effect sealing or are subject to opening and penetration by pumping forces, will not be acceptable. The submersible pumps shall be capable of continuous submergence without loss of watertight integrity to a depth of 65 feet.

A replaceable wear ring system shall be installed to provide efficient sealing between the volute and impeller. The wear ring shall consist of a brass ring insert and is press-fitted to the volute inlet. A

rotating wear ring, 420 or 431 stainless steel which is fitted to the impeller suction inlet shall be provided.

Each pump shall be provided with an oil chamber for the shaft sealing system, and have moisture detecting early warning probes installed. The oil chamber shall be designed to prevent overfilling and to provide oil 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.

#### F. CABLE SEAL

The flexible power cables for submersible pumps shall include an equipment grounding conductor to the submersible pump frame and shall be sized according to NEC and ICEA Standards. The power cable shall be of sufficient length to reach the junction box without any need of splices. The outer jacket of the cover shall be ethylene-propylene rubber. The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall be comprised of a single cylindrical elastomer grommet having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry 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 terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top. The cable entry design shall be of the non-wicking type so moisture does not enter the cap if the cable is damaged in any way.

#### G. MOTOR

The pumps shall be driven by a completely sealed submersible type, explosion-proof, air cooled, watertight, electric motor designed for operation up to 104 degrees F. ambient. The pump motors shall be a squirrel-cage induction, shell type design, housed in an air-filled watertight chamber, NEMA B type. The stator winding and stator leads shall be insulated with moisture resistant Class H insulation. The motors shall be designed for continuous duty handling pumped media and capable of sustaining a minimum of 15 starts per hour. The temperature rise of the motors shall not be in excess of that specified in NEMA MG-1 or equal for class B insulating materials when operating continuously under load. The stator shall be insulated by the triple impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The junction chamber, containing the terminal board, shall be hermetically sealed from the motor. Connection between the cable conductors and stator leads shall be made with threaded compressed type binding post permanently affixed to a terminal board. Wire nuts or crimping type connection devices are not acceptable. The submersible electrical cable shall be of sufficient length to reach the control panel. The motors and cables shall be capable of continuous submergence underwater without losses of watertight integrity to a depth of 65 feet. The motor and pump shall be designed by the same manufacturer.

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%. The motor shall be designed for operation up to 104° F (40° C) ambient and with a temperature rise not to exceed 176 ° F (80° C), and shall be rated in strict accordance with NEMA and SWPA standards.

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.

An electronic moisture detection system shall be provided in each pump. The leakage sensor shall be located in the motor housing and wired through the junction box to the control panel. Any indication of moisture present shall activate a visual warning that leakage has occurred.

#### H. COOLING SYSTEM AND MOTOR PROTECTION

Each pump shall be provided with a cooling system for continuous pump operation in liquid temperature of up to 104° F. The cooling systems for each pump shall consist of a water jacket encircling the stator housing. Impeller back vanes shall provide the necessary circulation of the cooling liquid through the water jacket. The cooling media channels and ports shall be non-clogging by virtue of their dimensions.

The motor protection systems shall consist of thermal and leakage sensors. The stator in each pump shall be equipped with three thermal switches to monitor stator temperature and protect the pump from overheating. The thermal switches shall be embedded in the end coils of the stator winding (one switch in each stator phase) and shall be used in conjunction with external motor overload protection and wired to the control panel. Should high temperature occur, the thermal switches shall open and activate an alarm.

The lower bearing housing in each pump shall include an independent thermal sensor to monitor the bearing temperature. If a high temperature occurs, the sensor shall activate an alarm.

A leakage sensor shall be available to detect water in the stator chambers. The monitoring system shall consist of the float switch which when activated; the sensor shall activate an alarm.

Submersible electrical cables of sufficient length to reach control panel shall be provided from thermal and leakage sensors.

#### I. GUIDE SYSTEM

The pumps shall be provided with a guide system to allow easy removal of the pumps without entering the wet well. Two guide bars shall be provided extending from the top slab of the lift station to the discharge connection of each pump and shall assist in raising and lowering the pump unit. The discharge connection shall be bolted to the floor and shall serve as a lower attachment for the guide bars. The working load of the lifting system shall be 50% greater than the pump unit weight.

The pump unit shall be guided on the bars by a guide bracket which shall be an integral part of the pump. Each pump shall be fitted with sufficient length of stainless steel wire rope capable of lifting the pump and motor. The guide system shall also include the "grip eye" lift and slings. The necessary fittings and eye bolts shall be provided. The guide system shall be fully warranted for 1 year.

## 2.04 PUMP CONTROL PANEL

- A. A NEMA-4X watertight stainless steel control panel shall be provided. The control panel shall be fabricated in a UL508 recognized facility.
- B. The pump control panel shall be constructed to be compliant with the applicable sections of Article 430 of the latest version of the National Electrical Code (NEC). The panel shall be installed per the requirements of the relevant sections of the NEC.
- C. The wet well is considered a Class I Division I environment. As such, all conduits emanating from the wet well should be installed per the NEC code which deals with Class I Division I environments. This includes, but is not limited to, sealing the conduit before it enters the motor control panel.
- D. The pump control panel shall be equipped with an integral service disconnect which removes primary power from the panel. The control panel shall contain a sub-panel which separates the operator from the high voltage / current circuitry. The panel shall be constructed to provide an interlocking mechanism between the panel disconnect and the sub-panel which prevents the sub-panel from opening unless the disconnect is in the off position. The service disconnect may also provide the motor branch circuit overload protection (ie, it may be a circuit breaker which doubles as a disconnect switch).
- E. The incoming service to the control panel shall be based on the power requirements of the pump motors. Three phase induction motors are typically specified for the pump motors so three phase power should be specified for the site. In cases where single phase power is all that is available, a single phase to 3 phase inverter or variable speed motor control unit shall be used. The contractor shall be responsible for contacting the local power company to specify and coordinate the installation of the required power feed.
- F. Pump motors rated at 30HP or greater shall be equipped with soft start circuitry.
- G. Provide three 120VAC, 20A, 1 pole circuit breakers in the pump control panel for town's use as shown on the electrical single line diagram drawing.
- H. Phase monitor shall be provided to sense low voltage and loss of power. Upon sensing any of these conditions, the pumps shall be stopped.
- I. Provide a weatherproof, shatterproof alarm light with 40-watt lamp and a horn mounted on the exterior of the control panel. The alarm will be sounded upon detection of a high level alarm in the wet well or in the event that all pumps are reporting a failed condition. (In general, the alarm shall be sounded based on any detectable condition which could result in a wet well overflow condition.) The alarm light shall flash until the alarm condition ceases to exist. A silence pushbutton shall be provided to silence the horn.

J. The panel shall contain pump control logic which meets the specifications described in this section.

1. The logic shall be scalable to accommodate the number of pumps specified for the installation.
2. The logic shall interface to the specified level detection devices located in the wet well and activate the pump(s) based on a user selectable set point (water level).
3. The logic shall interface to the motor fault detection sensors (ie, over temperature and moisture).
4. In multiple pump installations, the logic shall contain provisions to set a lead pump and to alternate between (or through) the available pumps in order to evenly distribute pump wear.
5. The control system shall have a self-contained switchboard device used to control the pump systems and alarms. Status information for pumps, pump fault, mode of operation, next pump to start, and level alarms shall be clearly indicated on the front display.
6. It is recommended that a Multitrode MT2PC or equivalent pump controller be used to implement these control functions.

K. The pump control panel shall contain the following controls and indicators:

1. A “Hand – Off- Auto” switch for each pump.
  - The “Hand” position will force the pump to turn on unless operation is precluded due to a fault condition.
  - The “Off” position disables the pump. Power cannot be applied to the pump with the switch in this position.
  - The “Auto” position causes the pump to operate based on the wet well water level in conjunction with the pump control logic.
2. High visibility panel lamps to indicate alarm and status information. The following table contains the indicator and its color.

<b>Indicator Function</b>	<b>Color</b>
Panel Power Indicator	Green
Pump “n” Active	Green
Pump “n” Fault	Red

3. A pump run-time meter for each pump.

L. The pump control panel shall make the following status information available to the SCADA system by way of relay contacts:

<b>Parameter</b>	<b>Relay Contacts</b>	
	<b>Open</b>	<b>Closed</b>
Pump Run Status (for each pump)	Not Running	Running
Pump Failure (for each pump)	Normal	Failure
Wet well level high	Normal	High

		Level
Phase loss	Normal	Failure

Note that this table also contains the contact state associated with the associated status information.

The relay contacts shall be rated for 120VAC operation with a minimum current capacity of 0.1A (100mA).

- M. The Panel Vendor shall provide training and documentation on the operation, troubleshooting, and maintenance of the control panel. Documentation shall include:
- Operator’s manual(s) which contains the following information:
    - The function of each control and indicator.
    - A troubleshooting guide geared for the operator.
    - Description of fuses and circuit breakers and their locations within the panel.
    - Recommended sparing list for field replaceable parts (if any).
  - A copy of the signed-off factory acceptance test procedure.
  - A set of electrical schematics which accurately reflect the actual construction of the control panel. All components and wiring in the control panel shall be uniquely labeled and referenced on the schematics by the appropriate labels. The schematic shall contain a legend table which explicitly describes any acronyms, abbreviations, or non-standard symbols used to describe the circuitry or its components. The schematics shall be laminated and attached to the inside doorway of the panel.
- N. The panel vendor shall provide an acceptance test procedure and sign-off sheet for use during field acceptance testing. The vendor or an authorized representative shall be required to demonstrate that each function listed in the acceptance test procedure operates properly before the equipment will be accepted.

## 2.05 CAST AND DUCTILE IRON PIPE AND FITTINGS

Cast and ductile iron pipe and fittings shall be of the size and type as shown on the drawings, and as specified in the Town’s Standards.

## 2.06 LEVEL SENSOR/CONTROLLERS

A conductance actuated MultiTrode with back-up conventional tilt switch control system shall be provided. The system shall utilize an indicating controller with necessary intrinsic barriers to both operate both sets of pumps at designated levels and actuate alarms as required.

Probe shall be installed at the locations and elevations shown on the plans. Provide probe cable of adequate length to reach the pump control panel without splicing.

One extra probe shall be with specified cable length as a spare.

## 2.07 PUMP PORTABLE HOIST

Each station shall be provided and installed with a hoist system of stainless steel construction specifically sized and designed for the pumps. The portable hoist shall be guaranteed against defects in material and or workmanship for a period of 3 years.

## PART 3 EXECUTION

### 3.01 INSTALLATION

The DEVELOPER-CONTRACTOR shall furnish and install the pumps at the locations shown on the Contract Drawings and in accordance with the pump manufacturer's specification and recommendations. All discharge elbows shall be mounted on concrete pedestals prepared for them and over anchor bolts set in the concrete. Pump pedestals shall be carefully set at proper elevation, location and alignment, and leveled after which they shall be properly grouted in with grout filling the entire underside of the base. Grouting shall be as recommended by the manufacturer.. All piping shall be brought to the pump connection in such manner as to prevent the possibility of applying any loads or stresses to pump connections.

### 3.02 ANCHOR BOLTS AND FASTENERS

Anchor bolts, nuts, washers, and fasteners shall be furnished with the equipment herein specified and set in conformance with templates or drawings also supplied by the manufacturer. All anchor bolts, studs, fasteners, washers, and nut shall be Type 316 stainless steel. The DEVELOPER-CONTRACTOR shall install all anchor bolts, studs, washers, nuts and fasteners required to complete the work of this Contract.

### 3.03 SAFETY GUARDS

All exposed shafts, couplings, belts, etc., shall be provided with removable, rigidly constructed and mounted protective safety guards, meeting in full the requirements of the OSHA standards, State safety standards and all local codes or ordinances that may apply. Guards shall be designed to facilitate access for lubrication, maintenance, and/or belt replacement.

### 3.04 PAINTING

See Section 02601 for wetwell coatings. Unless otherwise specified, all mild steel parts not buried in concrete, cadmium plated, galvanized or plastic covered, shall be shop primed with one coat of paint recommended as compatible with finish coats by the manufacturer whose paint is to be used for field painting. Stainless steel, aluminum, brass, bronze, galvanized or cadmium plated steel, and plastic covered parts will not be painted. Machined and finished surfaces shall be protected with a suitable lubricant to prevent rusting.

The DEVELOPER-CONTRACTOR shall, under this Section, remedy all damage to shop coatings after installation of equipment, and to the satisfaction of the ENGINEER.

### 3.05 TOOLS AND LUBRICANTS

The CONTRACTOR shall furnish a complete set of any special tools required for the maintenance and operation of this equipment, as designated by the equipment manufacturer.

### 3.06 FIELD TEST

The pumps installed shall be tested at start-up by the Pump Manufacturer or his Authorized Representative. All hydraulic, mechanical and electrical tests shall be run to insure the proper installation, operation, and maintenance of the pumps. As a minimum, the site tests shall include checks for:

- A. Compliance with operating requirements.
- B. Correct rotation before mounting to the discharge connection.
- C. Balanced voltage and current.
- D. Proper seating of the pump to the discharge connection.
- E. Insurance that the connection between the pump and discharge connection does not leak. If the connection leaks, the discharge elbow shall be replaced by the DEVELOPER-CONTRACTOR OR pump manufacturer.

### 3.07 ADJUSTING, TESTING, TRAINING AND ADDITIONAL SERVICES

In addition to the tests listed under this Section, each pump together with actual motors shall be fully tested in water at the pump manufacturers' works to establish that all rating conditions have been met. The DEVELOPER-CONTRACTOR shall make all remedial work necessary on any or all pumps should they fail to meet the conditions specified at no extra compensation. Pumps shall then be retested and failure to meet the specified conditions after remedial work has been performed may be cause for rejection of the pumps. Three (3) certified copies of these tests on all pumps shall be submitted to the TOWN.

On completion of the work, the entire pumping equipment shall be lined up, operated and adjusted by qualified representatives of the several pump and control manufacturers, and under the intended operating conditions, and shall be left in first class, satisfactory, operating conditions, ready for continuous and satisfactory operation. The DEVELOPER-CONTRACTOR shall furnish all power, oil, fuses and other supplies for the field testing of the pumps, equipment, controls, and appurtenances, together with the services of the manufacturer's representatives.

In addition, the DEVELOPER-CONTRACTOR shall make available experienced factory trained representatives to provide the required operation and maintenance instruction to plant personnel for a period of not less than three (3) days.

### 3.08 LIFT STATION WARRANTY

The DEVELOPER-CONTRACTOR AND lift station supplier/manufacturer shall submit the proper documentation demonstrating that the supplier/manufacturer warrants all components, controls, equipment and the pumps being supplied to the OWNER against defects in materials and workmanship for a period of five (5) years or 10,000 hours under a Municipal Wastewater Permanent Installation Warranty.

END OF SECTION