PART 1 GENERAL

1.1 MEASUREMENT PROCEDURES

.1 Measure supply and installation of packaged factory assembled components to form the sewage lift station pumping skid and controls at designed conditions, as indicated in this specification.

.2 Payment is to be on a lump sum basis for supply and installation of the packaged sewage lift station.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Water Works Association (AWWA)

.1 ANSI B16.1, Cast iron pipe flanges and flanged fittings.
.2 ANSI/AWWA C115/A21.51, Cast/ductile iron pipe with threaded flanges.
.3 ANSI 253.1, Safety Color Code for Marking Physical Hazards.
.4 ANSI B40.1, Gauges, Pressure and Vacuum.
.5 AWWA C508, Single Swing Check Valves.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM A48, Grey Iron Castings.
.2 ASTM A126, Valves, Flanges, and Pipe Fittings.
.3 ASTM A307, Carbon Steel Bolts and Studs.
.4 ASTM A36, Structural Steel.

.3 Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE Std 100, Standard Dictionary of Electrical Terms.
.2 ANSI/IEEE Std 112, Test Procedure for Polyphase Induction Motors.
.3 IEEE Std 242, Protection of Industrial and Control Power Systems.

.4 National Electric Code (NEC) / National Electrical Manufacturers Assoc. (NEMA)

.1 NEC, National Electric Code.
.2 NEC 701, National Electric Code article 701.
.3 NEMA Std MG1, Motors and Generators.

.5 Miscellaneous References

.1 Ten-State Standards, Recommended Standards for Sewage Works.
.2 Hydraulic Institute, Std for Centrifugal, Rotary and Reciprocating Pumps.
.3 NMTBA and JIC Std, National Machine Tool Builders Association and Joint Industrial Council Standards
.4 ISO 9001, International Organization for Standardization

.6 Canadian Standards Association (CSA International)

.1 CAN/CSA-A257 Series-M92 (R1998), Standards for Concrete Pipe.

.2 CSA-B70-02, Cast Iron Soil Pipe, Fittings and Means of Joining.

1.3 SYSTEM DESCRIPTION

.1 The contractor shall supply and install one factory-built, automatic pumping, suction lift sewage lift station. The station shall be complete with all required equipment, factory-installed on a welded stainless steel base with fiberglass cover. The complete pumping station shall be labeled with a USL/CNL UL QCZJ certification.

.2 The principal items of equipment shall include:

.1 Four (4) vertical, close-coupled, motor driven, vacuum primed, non-clog pumps.

.2 Valves.

.3 Internal piping.

.4 Central control panel with touchscreen interface and circuit breakers.

.5 Remote monitoring and alarm callout system.

.6 Motor starters and automatic pumping level controls.

.7 Heater.

.8 Ventilating blower.

.9 Priming pumps with a pump prime detection system and appurtenances.

.10 All internal wiring.

.11 Two piece sliding insulated cover.

.3 Equipment and installation to include following:

.1 Excavation for sewage lift station.

.2 Placement of bedding gravel on a native soil base.

.3 Connection of power to control panel as indicated.

.4 Connections to gravity sewers.

.5 Connections to force mains.

.6 Connections to Storage/Holding Tanks.

.7 Supply and installation of packaged sewage lift station tanks in accordance with manufacturer's instructions.

.8 Supply and installation of precast concrete wet well and storage tanks in accordance with manufacturer's instructions.

.9 Backfill around lift station wet well and storage tanks as per design drawings.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit complete shop drawings and construction schedule, including methods of installation.

.3 Submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

.4 Ensure certification is marked on pipe.

.5 Submit manufacturers information data sheets and instructions in accordance with Section 01 33 00 - Submittal Procedures.

.6 Certified Curves

.1 Factory-certified performance test curves shall be provided for the pumps, tested after installation in the station, to stimulate actual operating conditions.

.2 Copies of these curves, showing head, flow, BHP, efficiency and the backup data, shall be provided with the station.

.3 Typical data or curves from a similar pump are not acceptable. Data and curves must be for the actual pumps provided, and while mounted in the station.

1.5 SPARE PARTS

.1 A complete replacement pump shaft seal assembly shall be furnished with the pump station. The spare seal shall be packed in a suitable container and shall include complete installation instructions.

.2 A spare volute gasket and seal gasket shall be provided.

.3 An instructional video presentation on the pump mechanical seal system in DVD format shall be included. The DVD shall contain a presentation on the following subjects:

.1 purpose and location of the mechanical seal
.2 signs of a defective mechanical seal
.3 how to remove the mechanical seal
.4 troubleshooting seal failure causes
.5 seal components
.6 required tools
.7 how to reinstall the seal
.8 how to place the pump back into service.

.4 The video shall include footage of an actual seal replacement.

1.6 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for sewage lift station for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Operation and maintenance manuals shall be furnished which will include parts lists of components and complete service procedures and troubleshooting guide.

.3 Include in this information:

.1 Record drawings, wiring diagrams, electrical schematics of equipment as installed.
.2 Interconnections with numbers and wire sizes.
.3 Certified pump characteristic curves.
.4 Detailed operation and maintenance instructions.

.5 Spare parts list comprising a complete schedule clearly identified to facilitate re-ordering.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

1.8 SCHEDULING

.1 Schedule work to minimize interruptions to existing services.

.2 Maintain existing sewage flows during construction.

PART 2 PRODUCTS

2.1 OPERATING CONDITIONS

.1 Characteristics:

.1 Capacity: 12.2 L/s of raw wastewater at 49.1 m head.

.2 Total dynamic head: 49.1 m.

.3 Maximum static suction lift: 6.0 m.

.4 Maximum speed: 1760 RPM

.5 Minimum acceptable pump efficiency: 36%. Due to the energy conservation requirements, the minimum efficiency will be enforced.

.6 Minimum rated horsepower of each pump motor shall be 10 HP.

.2 All openings and passages shall be large enough to permit the passage of a sphere 75 mm in diameter and the pump shall have a flanged suction and discharge connection no smaller than 100 mm. The pump motors shall not be overloaded beyond their nameplate rating at the design conditions nor at any head in the operating range of 80 to 400 GPM or 5.0 – 25 l/s.

.3 NFPA 820, Table 2.2, Item #11 classifies a residential wastewater pumping station as Class 1 Div 2 for all intents and purpose that means Class 1, Zone 2 in the Canadian Electrical Code (CEC 2002). Thus wiring practices, fixtures, motors et al must meet CEC requirements for Class 1, Zone 2.

2.2 PACKAGED SEWAGE PUMP STATION SYSTEM

.1 Smith & Loveless Series Wet Well Mounted Pump Station with two non-clog series pump sets, Protronix II controller, and StationComm communications system, or approved equal.

.2 If the Contractor wishes to propose an equivalent packaged lift station, such a proposal must be received prior to tender closing. Bids received that include packaged lift stations that have not been approved by the Departmental Representative prior to tender closing will be considered non-compliant and will be rejected.

2.3 PUMPS

.1 The pumps shall be 100 mm vertical, centrifugal non-clog type of heavy cast-iron construction, designed for the use of mechanical seals and vacuum priming.

.2 The shaft bearing nearest the pump impeller shall be locked in place so that end play is limited to the clearance within the bearing.

.3 To minimize seal wear resulting from shaft deflection caused by the radial thrust of the pump, the shaft from the top of the impeller to the lower bearing supporting the impeller shall have a minimum diameter of 54 mm for motor frame sizes 324 and 326. Stainless steel shaft sleeves will not be acceptable.

.4 The dimension from the lowest bearing to the top of the impeller shall not exceed 150 mm.

.5 The motor shaft shall be directly connected to the impeller without the use of drive belts or couplings.

.6 Pumps with less than a standard 100 mm suction discharge connection, or with less than a 75 mm spherical solids handling capacity will be rejected for this application.

.7 No deviation from the specified shaft diameter or tolerances will be allowed.

.8 The bearing nearest the impeller shall be designed for the combined thrust and radial load. The upper bearing shall be free to move in a linear direction with the thermal expansion of the shaft and shall carry only radial loads.

.9 The shaft shall be solid stainless steel through the mechanical seal to eliminate corrosion and abrasive rust particles. Removable shaft sleeves will not be acceptable if the shaft under the sleeve does not meet the specified minimum diameter.

.10 The pump shall have an integral adapter providing a large water reservoir above the impeller to provide for positive exclusion of air from the impeller. The seal shall be inside this area to assure lubrication. Pumps which do not use hollow priming adapters for positive lubrication of the seal will not be acceptable.

.11 Self priming pumps are unacceptable.

.12 Pump controls must be set so that the main pumps cannot be turned on unless they are filled with liquid, and the pump is completely primed.

.13 The pump shall be constructed so as to permit priming from the lower pressure area behind the impeller. Priming from high- pressure connections will not be acceptable.

.14 The priming bowl shall be transparent, enabling the operator to monitor the priming level.

.15 The pump shall be arranged so that the rotating element can easily be removed from the casing without disconnecting the electrical wiring or disassembling the motor, impeller, backhead or seal.

.16 Enclosed impellers must be used to avoid the necessity of wear plates.

.17 The pump shaft shall be sealed against leakage by a single mechanical seal constructed so as to be automatically drained and primed each time the pump is drained and primed. Water shall be automatically drained from around the seal if the pump loses prime in order to allow both the pump and the seal to be drained.

.18 The seal shall be of carbon and ceramic materials with the mating surfaces lapped to a flatness tolerance of one light band. The rotating ceramic shall be held in mating position with the stationary carbon by a stainless steel spring. The entire seal assembly shall be held in place by a bronze seal housing to prevent excessive heat build-up. Use of cast-iron or other ferrous material for the seal housing will not be acceptable.

.19 The pump volute shall be furnished with mounting lugs and bolted to the station floor plate, forming a gas-tight seal.

.20 The pump impeller shall be of the enclosed two-port type made of close-grained cast-iron and shall be balanced. The eye of the impeller as well as the ports shall be large enough to permit the passage of a sphere 3" in diameter in accordance with nationally recognized codes. The impeller shall be keyed with a stainless steel key and secured to the motor shaft by a stainless steel capscrew equipped with a Nylock or other suitable self-locking device. The impeller shall not be screwed or pinned to the motor pump shaft and shall be readily removable without the use of special tools.

.21 Smith & Loveless 10 hp, 1760 rpm, 4B2D pumps or approved equal.

.22 If the Contractor wishes to propose an equivalent pumps, such a proposal must be received prior to tender closing. Bids received that include pumps that have not been approved by the Departmental Representative prior to tender closing will be considered non-compliant and will be rejected.

2.4 PUMP MOTORS

.1 The pump motors shall:

- .1 Be Vertical, solid shaft, NEMA P-base, squirrel-cage induction type, suitable for 3 phase, 60 cycle, 120/208 VAC electric current.
- .2 Have Class F insulation. Insulation temperature shall, however, be limited to Class B.
- .3 Normal starting torque and low-starting current, as specified by NEMA Design B characteristics.
- .4 Have an open drip-proof design with forced air circulation by integral fan. Openings for ventilation shall be uniformly spaced around the motor frame.
- .5 Leads to be terminated in a cast connection box and clearly identified.

.2 The motors shall have 1.15 service factor. The motors shall not be overloaded beyond their nameplate rating, at the design conditions, nor at any head in the operating range as specified under Operating Conditions.

.3 The motor-pump shaft shall be centered, in relation to the motor base, within 0.127 mm. The shaft runout shall not exceed .0762 mm.

.4 A bearing cap shall be provided to hold the bottom motor bearing in a fixed position. Bearing housings shall be provided with fittings for lubrication as well as purging old lubricant.

.5 The pump motors shall be Premium Efficiency type, per NEMA MG-1 table 12-12, Inverter Ready per NEMA Part 31.4.4.2, with cast-iron frames, and be UL Recognized and CSA Approved. The motor windings shall be 200 C Inverter Spike-Resistant magnet wire and the rotors shall have an epoxy coating for corrosion protection.

2.5 PUMP CONTROL SYSTEM

.1 The control equipment shall be mounted in a NEMA Type 1 steel enclosure with a hinged access cover.

.2 The circuit breakers and control switches shall be operable without opening the access cover.

.3 A grounding type convenience outlet shall be provided on the side of the cabinet for operation of 120-volt AC devices.

.4 Thermal magnetic air circuit breakers shall be provided for branch disconnect service and short circuit protection of all motor control and auxiliary circuits.

.5 Solid-State Reduced Voltage Starters

.1 UL listed, solid-state reduced voltage starters shall be supplied.

.2 The starters shall be capable of a soft start and soft stop.

.3 The starters shall have built in overload protection as well as built in bypass contactors. One set of form C auxiliary contacts shall be supplied on the starter.

.4 The starters shall be powered by 24V DC and shall have a built-in Digital Signal Processor utilizing a low impedance run circuit.

.5 The starters shall be programmable by using a standard screwdriver.

.6 Provide the following alarms for the pump control system:

.1 Low Level
.2 High Level
.3 High-High Level
.4 Pump Failure to Prime
.5 Pump Overload
.6 Pump Failure
.7 Power Failure
.8 Station Intrusion Alarm

.7 Running Time Meter

.1 The meter shall be enclosed in a dust and moisture-proof moulded plastic case.

.2 The flush-mounted dial shall register in hours and tenths of hours up to 99,999.9 hours before repeating.

.3 The meter shall be suitable for operation from a 115-volt, 60 Hz supply.

.8 Pump Running Lights

.1 A green panel light to indicate “Pump On” shall be provided for each main pump.

.9 120v Alarm Light with Flasher

.1 A vapour-proof light fixture with 50-watt flashing lamp for outdoor pole mounting shall be provided. The light shall flash during alarm conditions. The fixture shall be complete with a red globe and guard.

.10 Remote Alarm Contacts

.1 In addition to the common, powered local alarm connection, individual unpowered contacts shall be provided and wired to a terminal strip for field connection to a remote alarm monitoring system (not included).

.11 Remote Monitoring/Alarm Callout System

.1 The controller shall be furnished with a remote monitoring and alarm callout system capable of two-way communication between the operator and station via text messaging.

.2 The system shall be capable of sending a text message to up to 10 phone numbers to notify of various alarms.

.3 Operators shall be able to monitor the status of various components of the system via text message.

.12 Base1-Base2-Auto Alternate Selector Switch

.1 A 3-position selector switch shall be mounted on the face of the control panel to allow selection of either pump as the lead pump, or to allow for automatic alternation.

.13 Surge Capacitor

.1 A surge capacitor with an internal automatic discharge circuit and rated for three phase service shall be provided.

.14 Lightning Arrestor

.1 A lightning arrestor shall be provided on the station control panel for the incoming three-phase service

.15 Time Delay

.1 The pump control system shall provide for a time delay to prevent simultaneously starting the pump motors after power failure.

.16 Sequential Alternation

.1 In lieu of the timed alternation system, provisions shall be made to alternate the pumps at the completion of each pumping cycle.

.17 Main Circuit Breaker

.1 A main circuit breaker shall be installed in the control panel to provide over-current protection for the station, and shall be capable of being used to disconnect the three-phase power to the pump station.

.2 The breaker shall be operable without opening the panel, and shall be interlocked with the panel door. It shall be capable of being padlocked in the "Off" position.

.3

.18 Pump Failure Alarm (Check Valve Switch Type)

.1 To sense failure to deliver normal flow, each pump shall be provided with a sealed sensor switch mounted in a protective ABS enclosure.

.2 The enclosure shall be mounted with an adjustable universal mounting bracket to the external arm of each discharge check valve. The mounting bracket shall allow the adjustment of the sensor switch with a single locking pivot adjustment.

.3 A red LED indicating light shall be provided on each switch unit to facilitate accurate setting of the switch for proper operation.

.4 The sensor switch shall monitor the movement of the check valve arm and thereby detect failure of the pump to deliver normal operating flow when called on to run.

.5 An auxiliary time delay relay shall be provided to prevent an alarm signal during pump start-up period.

2.6 FLOAT SWITCH LEVEL CONTROLS

.1 To control the operation of the pumps with variations of liquid level in the wet well, a minimum of three (3) displacement switches shall be provided. A 30' cord shall be provided with each switch. The cord shall have a corrosion-resistant vinyl jacket and be multi-stranded in order to prevent fatigue.

.2 An automatic alternator with manual switch shall be provided to change the sequence of operation of the pumps every eight hours. Alternating the pumps at less than eight-hour intervals will not be acceptable.

.3 The pumps should not operate in parallel under any conditions.

2.7 AUXILIARY STATION HEATER

.1 A 1300/1500 watt, dual range, electric heater with automatic circulating fan, thermostat control and an On/Off switch is to be provided. The heater is to be operated by connection to the station convenience receptacle.

2.8 VACUUM-PRIMING SYSTEM

.1 A vacuum priming system shall be furnished to prime the main pumps. The system shall include two vacuum pumps, providing 100 percent standby.

.2 Vacuum pumps shall have corrosion-resistant internal components.

.3 The vacuum priming system shall be complete with:

.1 large port vacuum control solenoid valves shall be located to for positive vacuum pump shut-off when main sewage pump is primed.

.2 a prime level sensor – resonant frequency type. Other types of prime sensors are not acceptable.

.3 float-operated check valves to protect the vacuum pumps

.4 all necessary shut-off valves as required.

.4 The float-operated check valves shall have a transparent body for visual inspection.

.5 All hoses and tubing used in the priming system shall be at least 10 mm nominal diameter.

.6 The solenoid valves used in the vacuum priming system shall:

.1 be of the high flow, direct acting brass body type, with threaded ports

.2 have NBR seals and 300 Series stainless steel plunger, rod, plate and springs.

.3 Minimum orifice diameter of 8 mm.

.4 Be UL Listed, with Class F coil rating and of suitable voltage and thermal capacity for the application.

.7 Liquid level in the pump priming chamber shall be monitored by a resonant frequency liquid level probe.

.1 The probe shall be equipped with a piezoelectric drive and sensitive circuits to detect frequency shifts when the probe is covered by liquid.

.2 The probe shall be completely sealed and have a 316L stainless steel housing for corrosion resistance.

.3 It shall be provided with a wiring connector moulded of PolyPhenylSulfone.

.4 The probe shall have a plug-in connector to facilitate easy removal.

.5 The probe shall be provided with light emitting diodes to indicate connectivity, prime status or a fault condition. Systems utilizing an electrode, mechanical means such as a float, or that require any type of electrical or moving parts inside the priming chamber will not be acceptable.

.8 The priming system shall automatically provide positive lubrication of the mechanical seal each time a main pump is primed.

.1 No passageway in the priming system through which the pumped liquid must pass shall be smaller than the equivalent of a 64 mm opening.

.9 The vacuum priming system shall have two field selectable modes of operation.

.1 “On-Demand” mode - the priming system will operate only after a pump is called on to run, and if it is not primed. Once primed, the pump will be allowed to run.

.2 “Constant Prime” mode - both pumps are kept primed continuously, and ready to start immediately when called for.

2.9 PIPING AND VALVES

.1 Cast iron pipe, fittings and joints: to CSA-B70, minimum size 100 mm.

.2 Plug valves: Class 125, flanged, to ANSI/AWWA

.3 Check valves: Class 125, wafer check type, spring loaded lever, stainless steel shaft, with replaceable bronze shaft bushings and shall be sealed with an adjustable Teflon seal, to

.4 The pump suction shall be drilled and tapped for a 125 lb. American Standard flange.

.5 Protrusions through the floor plate shall be gas-tight.

.1 Bolted and sealed joints to be provided at the pump casings or suction pipes in order to prevent fumes from entering the station.

.2 Pump station manufacturer shall extend the suction and discharge connections below the floor plate at the factory so that field connections can be made without disturbing the gas-tight seals.

.6 The manufacturer of the pump station shall provide a compression-type sleeve coupling for installation in the common discharge pipe.

.7 Labels: all components on and inside panel to indicate operating routine. Labels to be anodized aluminum with 5 mm minimum letters.

.8 Schematic wiring diagram: mounted inside panel door, varnish protected.

.9 Conductors: copper.

.10 Control wiring: minimum number 14 AWG, stranded type TEW.

.11 Power wire: minimum number 12 AWG, type RW 90.

2.10 ENVIRONMENTAL EQUIPMENT

.1 A ventilating blower capable of delivering 250 CFM at 3 mm static water pressure shall be provided in order to remove the heat generated by continuous motor operation.

.2 The ventilating blower shall be turned on and off automatically by a pre-set thermostat.

.3 A heavy extruded aluminum louvered grille with adjustable openings shall cover the discharge of the blower. A similar grille shall be provided in the other end of the station enclosure for air intake.

.4 A 500-watt electric heater controlled by a pre-set thermostat shall be furnished. The heater shall be rigidly mounted in the station to prevent removal.

2.11 ENCLOSURE

.1 The pump station shall be enclosed by a lockable, sliding fiberglass cover made of molded reinforced orthophthalic polyester resins with a minimum of 30% glass fibers with a minimum average length of 32 mm.

.2 The outside of the enclosure shall be coated with a polyester protective in-mould coating.

.3 The fiberglass enclosure shall be resistant to mould, mildew, fungus and corrosive liquids and gasses normally found in pump station environments.

.4 The cover shall have a suitable drip-lip around the edge and shall be provided with a hasp and staple connection to the floor plate to allow the pump chamber to be locked with a padlock.

.5 The cover shall be attached with a multi segment stainless steel hinge, constructed of 7 gauge (minimum) type 304 stainless steel with a 10 mm diameter stainless steel pin and supporting at least 75% of the width of one end. Stainless steel bolts with tamperproof heads and a full width 10 mm thick anodized aluminum backing plate shall anchor the hinge to the fiberglass cover.

.6 Dual high-pressure gas struts shall be provided to counteract the dead weight of the cover assembly and limit the maximum lifting force required for opening to less than 9 kg. The cover shall be self-latching upon opening, with a manually operated release for closing. Duplex heavy gauge safety chains shall be provided to prevent over-extension. All hardware and components of the cover assembly that are exposed to the weather shall be constructed of corrosion-resistant materials.

.7 Heavy extruded aluminum, adjustable ventilating louvers shall be provided on each end of the fiberglass cover, which are capable of being closed during cold weather.

.8 The fiberglass cover shall have a minimum of 1” thick urethane insulation, protected by fiberglass, with an “R” value of 7 or more.

.9 The fibreglass cover shall be “Forest Green” in colour.

2.12 MANWAY

.1 An aluminum manway cover fabricated of 6 mm treadplate, located exterior to the fiberglass pump chamber shall be provided, complete with padlocking provisions. The manway shall be an integral part of the station floor plate and provide access to the wet well. The minimum open area of the manway access into the wet well shall be at least 0.39 square metres.

.2 To allow on-site maintenance of the pumps, a stanchion with lifting arm shall be provided to lift each pump. The lifting arm shall have a hook over the center of the motor to support a hoist (provided by others) for removal of the motors, impellers and pumps from the station.

.3 The pump casings and discharge piping shall be mounted in relation to the floor plate as detailed in the construction drawings. The suction and discharge connections, where they pass through the floor shall be sealed by gaskets, rather than being welded, to allow adjustment and replacement.

2.13 STAINLESS STEEL BASEPLATE

.1 The baseplate of the pump station structure shall be fabricated of corrosion-resistant lean duplex series 2100 stainless steel alloy, 316L stainless steel or equal. The stainless steel shall have a Pitting Resistance Equivalent Number (PREN) of 24.0 or greater and general corrosion resistance shall be less than or equal to 0.1 mm per year in 15% H_2SO_4 at 49 degrees C. Due to the corrosion resistance requirements, Grade 304-304L is not acceptable.

.2 The stainless steel surfaces shall be glass bead blast cleaned to remove surface contamination and provide a uniform finish.

.3 The manufacturer of the station shall warrant the stainless steel baseplate for twenty-five (25) years from date of shipment against structural failure and perforation due to corrosion.

2.14 WELDING

.1 All steel structural members shall be joined by electric arc welding with welds of adequate section for the joint involved. Structural welding shall be pre-formed in accordance with AWS standards and procedures.

2.15 PROTECTION AGAINST CORROSION

.1 All structural steel surfaces shall be factory blasted with steel grit, to remove rust, mill scale, weld slag, etc. Sandblasting is specifically prohibited. All weld spatter and surface roughness shall be removed by grinding. Surface preparation shall comply with SSPC-SP6 specifications. Immediately following cleaning, a single 6-mil dry film thickness of a self-priming Cycloaliphatic Amine Epoxy, shall be factory applied.

.2 Stainless steel, aluminum and other corrosion-resistant surfaces shall not be coated. Carbon steel surfaces not otherwise protected shall be coated with a suitable non-hardening rust preventative compound. Auxiliary components such as the electrical enclosure, ventilating blower and vacuum pumps shall be furnished with the original manufacturer's coating.

.3 Finish coating shall be accomplished prior to shipment of the station from the factory and shall comply fully with the intent of these specifications. A touch-up kit shall be provided by the pump station manufacturer for repair of any mars or scratches occurring during shipping and installation. This kit shall contain detailed instructions for use and shall be the same material as the original coating.

2.16 EMERGENCY PUMPING CONNECTION

.1 The common discharge pipe of the pump station shall be fitted with a branch with a plug valve and male quick-connect fitting with cap, to facilitate connection of a portable emergency pump to the force main, to bypass the pump station.

.2 The emergency pumping connection shall be housed within the fiberglass cover.

2.17 FACTORY TESTING

.1 All components of the pump station shall be given an operational test at the pump station manufacturer's facility to check for excessive vibration or leaks in the piping or seals, and to correct operation of the automatic control and vacuum priming systems and all auxiliary equipment. Installed pumps shall take suction from a deep wet well, simulating actual service conditions.

.2 The control panel shall undergo both a dry logic test and a full operational test with all systems operating.

.3 Instrumentation Factory testing must include:

.1 flow measuring with indicator.

.2 compound suction gauge.

.3 Bourdon tube type discharge pressure gauge.

.4 electrical meters to measure amperes, volts, kilowatts and power factor.

.5 speed indicator.

.6 Vibrometer capable of measuring both amplitude and frequency

.4 Provide certification that pumps and controls have been factory tested and all deficiencies rectified prior to delivery to site.

2.18 COMPOUND PRESSURE GAUGES

.1 A four-inch (4") Bourdon tube type compound vacuum/pressure gauge with 3-1/2" dial, fitted with a brass stop valve and a manual air relief valve shall be provided for each pump set. The gauges shall be mounted apart from the pumps, on a bracket attached to the control panel support structure, and connected to the second stage pump discharge taps by flexible tubing, to minimize vibration.

.2 The range of each gauge shall be selected to place the normal operating discharge pressure reading in the middle one-third of the scale and the gauge shall also be capable of measuring up to 30" HG of vacuum. The dial shall be white with black markings and the gauge itself shall have an accuracy of 1% of scale.

PART 3 EXECUTION

3.1 EXCAVATION BACKFILLING AND COMPACTION

.1 Excavate, backfill and compact in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling and as indicated.

3.2 CONCRETE

.1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete and Section 03 41 00 – Pre-Cast Concrete Tanks.

3.3 EQUIPMENT INSTALLATION

.1 Install equipment, piping and controls in accordance with manufacturers' recommendations.

3.4 FIELD QUALITY CONTROL

.1 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of Departmental Representative.

.2 Test in presence of Departmental Representative and representative from equipment supplier.

.3 The Manufacturer shall provide the services of a factory-trained representative on-site to perform initial start-up of the pump station and to instruct the Departmental Representative's operating personnel in the operation and maintenance of the equipment.

.4 Provide labour and ancillary equipment necessary to fulfill tests.

.5 Test to demonstrate that:

.1 Pumps and equipment run free from heating, or vibration.

.2 Operation meets requirements of these specifications.

.3 Pumps and pumping are free and clear of debris and obstructions.

.6 Replace equipment found defective. Repeat test until equipment is accepted by Departmental Representative.

3.5 DEMONSTRATION

.1 Operating Personnel Training

.1 Provide on site training by qualified personnel for designated operating personnel prior to final commissioning. Training to be in accordance with training plan approved by Departmental Representative.

.2 Provide training for designated personnel on all routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.

.3 Provide safety precaution procedures for all systems.

END OF SECTION