PRE-FABRICATED FIBREGLASS REINFORCED PLASTIC PUMPING STATIONS (R1)

1. GENERAL

1.1 Scope

.1 This Specification is intended for the design, fabrication, pre-assembly and supply of a pre-fabricated fibreglass reinforced plastic (FRP) sewage pump station or water lift station for burial in the vertical position.

.2 The station shall consist of an all FRP tank, including top and bottom, all internal piping, including valves, electric submersible pumps, electrical controls and other components and accessories necessary for reliable operation.

.3 All materials in the station shall be of a non-corrosive nature as much as possible in order to minimize long term corrosion

.4 The station is to be pre-assembled with all equipment installed except for the pumps and electrical hook-ups, allowing economical shipment to site and reducing installation time and start-up costs.

.5 All components shall be of the best industrial quality, designed for extended, reliable and maintenance-free operation under extremely cold and warm weather conditions. Electro-mechanical components are limited to a strict minimum.

1.2 Design Standards

.1 The following standards are used for the FRP fabrication where applicable

.1 Amec 4S-10.01 Manufacture and Installation for FRP Structures

.2 Amec 4S-10.02 FRP Pressure Pipe, Fittings and Flanges

.3 Canadian Government Standard 41-GP-22 (safety factor of 4 only)

.2 A safety factor of four on the minimum ultimate tensile strength of the laminate shall be used in designing the wall, bottom and roof thickness of the station, taking into account all normally imposed loads arising from floatation, soil pressures, normal backfill, handling loads, operating loads and static loads imposed by equipment used in hoisting the pumps in and out of station

1.3 Documentation

.1 The Contractor shall submit for approval the following

.1 Complete As-constructed Drawings

.2 Complete instruction manuals

.3 Control sequences and detailed programming (“Listing of the program”)

.4 Bill of materials

1.4 Drawings

.1 Within three weeks of receipt of the order the supplier will furnish three (6) complete sets of Drawings for approval. Refer to Section 01300.

1.5 Maintenance and Operations Manuals

.1 Two (2) copies of the maintenance and operations manual shall be provided with the pumping station. These manuals shall contain the following information:

.1 A copy of the general assembly drawing(s) of the station confirming locations, sizes, elevations and equipment to be supplied

.2 An outline drawing of the CP series pumps and discharge connections

.3 A performance curve for the pumps

.4 Information of the level regulation system and components

.5 A schematic diagram of the control system

.6 Start-up, operating and safety instructions for the system

1.6 Shipment

.1 The station will be shipped assembled to the greatest extent possible to reduce installation and start-up costs. Shipped separately from the tank will be the pumps, the controls including the regulators, and a container of miscellaneous connecting hardware, etc.

2. PRODUCTS

2.1 Main Chamber Pumping Station Tank

.1 The main chamber shall be a vertical cylinder made integrally with a reinforced bottom capable of withstanding a full hydrostatic head from the exterior of the tank while the station is completely empty.

.2 The station bottom shall include 150 mm at minimum, knuckle-radius smooth-molded corners to minimize build up of solids. The bottom shall be cored for stiffness with solid sections where pump anchor bolts are located. These bolts are to be permanently laminated into this solid section and sealed.

.3 The shell section shall be made of FRP using the filament winding process. This process provides maximum strength to weight ratio. Materials for construction are detailed in Clause 3.1.1. This chamber shall also be constructed to handle the external ground loads for the specific application and also withstand both corrosive environments of the liquids inside and outside the wetwell. Filament wound external reinforcing ribs shall be provided for additional strength against buckling and also provide a method of securing the support lugs. Quantity and size of these ribs shall be calculated for each application. Main chamber is to

have adequate hydraulic storage capacity for each application and is designed for mounting and removal of the submersible pumps specified.

.4 The interior finish is to be a smooth, bright white mold finish for ease of cleaning.

2.2 Service Platform

.1 An intermediate platform capable of withstanding a concentrated load of 200 kg plus the dead weight of one of the pumps will form a service area with sufficient servicing space in the upper section of the main chamber. This platform is to be made of non-corrosive materials such as FRP, marine grade aluminum or stainless steel. All bolting hardware shall be 304 SS minimum. Hinged access hatches shall be sized for the removal of the pumps furnished and capable of handling the weight of one. The valves are to be located above the platform to facilitate operation and maintenance. Any bolting through the tank wall is to be sealed and laminated over on the exterior to prevent internal or external seepage.

2.3 Entrance Covers

.1 The hinged and lockable entrance covers are to be made of either FRP or checker plate aluminum. Each access cover will be suitable to support the weight of two men (200 kg). The hinges are to be fabricated out of stainless steel. The cover stays and lock boxes are to be made of stainless steel or marine grade aluminum.

.2 Doors are to be designed to lay flat on their backs when open or maintained in the vertical position by cover stays or pneumatic cylinders.

2.4 Access Ladder

.1 An access ladder shall provide a safe access to the station bottom and or the optional intermediate platform. Materials for this ladder can be aluminum, stainless steel or FRP, depending on the corrosive properties of the liquids and its gases. Ladder construction and its supports are to be capable of holding two people at one time or 200 kg. Its design shall meet all safety requirements of the Workers Compensation Board and safety codes of the local area.

2.5 Influent and Discharge Connections

.1 All nozzle connections to the tank wall shall be fabricated from FRP and laminated to the tank wall with inside and outside lay-ups using laminating resins equivalent to the resin used in the shell construction. Two connection types are acceptable, one being a full face flange the other a machined spigot. The full face FRP flange shall be of a 350 kPa (50 psi) design for the inlet and 1380 kPa (200 psi) design for the discharge, as per standards described in Clause 1.2. The machined spigot shall be 13 mm thick minimum. A 150 mm long portion of the machined end is required for proper fit to field connections. Machined spigots, flanges, and their attachment layups are to be made using alternate layers of chopped strand mats and woven roving with an overall glass content between 30 percent to 40 percent.

2.6 Lifting Lugs

.1 A minimum of two (2) lifting lugs are required on stations 1905 mm diameter or under and a minimum of four (4) on larger ones, each capable of handling the entire weight of the

station. These lugs will shall be capable of handling a lift from the horizontal position to the vertical position.

.2 Material shall be mild steel epoxy coated, galvanized or stainless steel. It is critical that the shape of the lugs is such that they cannot pull out of the fibreglass overlay. The overlay can be hand lay-up or filament wound in conjunction with the top external reinforcing rib. This eliminates the need for bolting through the station shell. In larger station, 3050 mm to 3660 mm in diameter larger custom designed lugs shall be required.

2.7 Anchoring Lugs

.1 A sufficient amount of lugs shall be provided to secure the pre-fabricated station to the concrete base. Materials and design shall be similar to those of the lifting lugs, with the exception that a bolt through lug is not allowed near the station bottom. Lugs are to be designed in such a manner to fit over 22 mm diameter "J" type anchors imbedded in the concrete slab. The bottom external reinforcing rib shall be placed as near to the bottom as possible in order to encapsulate this rib in the second concrete pour. Concrete shall be poured to 150 mm above the bottom rib. This second pour provides additional ballast and anchoring. It is critical that the second pour of concrete be sufficiently anchored to the main concrete base. The combination of the hold down lugs, encapsulation of the bottom rib in concrete and the loading of the backfill material over the concrete base will provide adequate ballast against buoyancy in a full hydrostatic head scenario.

2.8 Piping and Ducts

.1 Piping

.1 The discharge piping shall run from each pump discharge connection and terminate in a common discharge inside the station. This includes an inside header onto which the vertical risers and valves connect to.

.2 All piping, with the exception of the guide bars (see 2.10.3), is made of non-corrosive FRP rated for 1380 kPa (200 psi). This piping shall also be painted with a bright white gelcoat. All flanges shall be full and flat face type and have ANSI B16.1, Class 125 drilling

2.9 Valves

.1 Check Valves

.1 The check valves shall be non-clog ball type design. The ball shall be hollow steel covered with nitrile rubber resistant to grease, animal and vegetable fats, diluted concentrations of acids and alkaline (pH 4 to 10), tearing, and abrasion. The ball shall be guided to and from the seat by guide vanes cast in the housing. The ball shall clear the water by providing "full flow" equal to nominal size. There shall be only one moving part (the ball) and no outside levers, weights, springs, dash pots or other accessories are required.

.2 The body shall be of grey cast iron, class 35. Exterior shall be painted with a black coal tar epoxy.

.3 Flange drilling shall be according to ANSI- B16.1, Class 125.

.2 Plug Valves

.1 The valves shall be of the round port eccentric plug type, with bodies made of ASTM - A126 Class B Cast Iron, lever operated. The plug shall have a resilient nitrile rubber coating, wear and corrosion resistant.

.2 Flange drilling shall be according to ANSI B 16.1, Class 125

2.10 Pumps and Equipment

.1 Pumps

.1 The pumps shall be Flygt model CP Series, totally submersible pumps, all as described in the applicable Flygt Sewage Pump Specifications.

.2 Discharge Connections

.1 A Flygt patented automatic discharge connection shall be provided for each pump to connect the pump to the discharge piping. The discharge connection shall be made of cast iron per ASTM A-40 Class 30B and shall be bolted to the bottom of the pump chamber, sealed from internal or external seepage.

.2 Its discharge flange shall be drilled as per ANSI B16.1, Class 125

.3 Guide Bars

.1 Two vertical bars shall be provided for each pump for the purpose of assuring correct alignment of the pump with the Flygt automatic discharge connection.

.2 For each pump the guide bars shall consist of galvanized, Schedule 80 pipe, securely fixed at the lower end to the discharge connection by means of special bosses provided. The guide bars shall extend from the discharge connection upward, to ground level, or to the intermediate floor, and shall be securely fixed at this point by means of a bracket, (upper guide bar holder). The upper guide bar holder shall be provided with special rubber inserts.

.3 When intermediate guide bar holders are required, they shall be supported at the intermediate platform or by the discharge piping.

.4 Level Regulation

.1 Flygt liquid level regulators ENH-10 shall be provided to control the operation of the pumps in accordance with variations of the liquid level in the pump chamber. Each regulator shall consist of a mercury switch enclosed in a watertight PVC casing and a three-conductor cable.

.2 The regulators shall be suspended from the top of the pump chamber via a galvanized steel level regulator hanger, at pre-determined elevations.

.5 Forced Ventilation

.1 A ventilation fan shall draw air from outside of the station and discharge it within. The fan shall have adequate capacity to change the air in the station a minimum of once every ten minutes. The fan motor shall be thermally protected. Manually operated, it shall be controlled by a switch in the control panel, where a pilot light will indicate its operation.

.6 Station Light

.1 A vapour-tight light with a heavy duty 100 Watt light bulb shall be provided. The light shall be operated by a switch in the control panel.

2.11 Electric Wiring and Control

.1 General:

.1 The control panel shall be complete with all the components listed under this section and all necessary hardware and software to provide a trouble-free pumping station in accordance with the CSA norms. The control panel shall be specifically designed and manufactured for use with Flygt pumps and shall include the programmable logic control LOGIMAC 280 of ITT Flygt for the control and the surveillance of the pumping station.

.2 All parts shall be of the best industrial quality. The control panel shall be supplied by the pump manufacturer and installed as indicated on the Drawings.

.2 Standards and requirements

.1 The control panel shall be in accordance with all the CSA standards and requirements. Grounding shall also meet all the requirements of the electrical code.

.2 Supply a fully assembled control panel for the duplex operation of two submersible pumps. The control panel shall be supplied with two (2) full voltage, direct-on-line starters as well as necessary components to operate the pumps.

.3 The heavy industrial quality enclosure shall be in accordance with EEMAC 3 to provide reliable outdoor operation. The panel is fitted with a heavy steel inner door, which is hinge-mounted and an exterior door with a 135 degree angle opening to allow easy access to the components. The panel shall be in steel painted with a grey coating ASA61 and a minimum thickness of 1.6 mm (16 gauge), all assembled and factory tested.

.3 Identification:

.1 Any component of the control panel shall be identified with a label bearing the same code or name described on the drawing. All wiring shall be numbered and identified at both ends to facilitate service and troubleshooting.

.2 The control shall be equipped with a terminal board relaying alarms, power supply, pump wiring, and probe signal, digital inputs. The terminal board shall be located at the bottom of the panel.

.4 Cabling

.1 The control panel shall be wired according to the National Electrical Code. The level regulator shall also be supplied with necessary cable to provide direct connection to the panel without splicing. Control cable shall be rated #14 AWG with exemption for 24 VDC PLC inputs and outputs which can be # 18 AWG or bigger. Power cable shall be separated from signal cable. All cabling shall be routed in conduit.

2.1 Programmable Logic Controller

.1 The control panel is equipped with the programmable logic controller LOGIMAC 280 of ITT Flygt or approved equivalent. The LOGIMAC 280 shall have necessary protection and be sturdy to remain operational in a hostile environment. Its power supply shall be protected against the network fluctuations and its inputs-outputs

.2 I/O shall also be protected against noise and interference to allow steady operation and maintain reliability of the pump station.

.3 The LOGIMAC 280 programming shall be the pump manufacturer responsibility and be made in “LADDER” Logic. The LOGIMAC 280 receives discrete and analog inputs, and controls discrete outputs in a manner dictated by the user specified logic called Relay Ladder Logic. The LOGIMAC 280 shall also perform data handling operations and communicate with external devices. The programming software shall also be commercially available. The pump manufacturer shall supply a copy of the LOGIMAC 280 program, with the control.

.4 The programmable logic control LOGIMAC 280, from ITT Flygt, shall feature:

.1 Modular

.2 16 Kwords programming memory

.3 9999 words storage memory

.4 16 digital inputs and 16 digital outputs

.5 Built-in real time clock

.6 4 analog inputs (4-20 mA)

.7 User’s program on flash memory (no volatile)

.8 Battery back-up RAM memory

.9 Boolean function execution rate of 0.6 microseconds per instructions

.10 LED indication

.11 Programming software readily and commercially available

.12 Protected power supply against network surge

.13 Power supply at 120 VAC

.14 Plug-in cards

.5 All products shall be designed, manufactured, and tested in accordance with recognized UL, CSA, IEC, and JIS industrial standards. The system shall be operational during and after testing.

.1 Vibration: the method of testing is to be based upon the IEC 68-2-6 and JIS C 0911 standard specifications for vibration.

.2 Shock: the method of testing is to be based upon the IEC 68-2-27 and JIS C 0912 standard specifications for shock.

.3 Noise: the method of testing is to be based upon the following:

.1 Showering Arc per NEMA ICS 2-230

.2 Ring Wave per ANSI C37.90A

.3 Fast Transient per IEC 801.4.

.6 Complete product documentation describing installation and simple field maintenance shall be provided.

.7 The manufacturer or its authorized representative shall provide complete technical support for all of the products. This shall include headquarters or local training, regional application centers, and local or headquarters technical assistance.

.8 The system shall consist of rugged components designed specifically for industrial environments. A complete system shall consist of one or more racks containing I/O modules, interconnected by signal cables.

.9 The LOGIMAC 280 CPU shall be modular. The CPU shall be fully enclosed within a durable plastic shroud.

.10 All signal cables furnished by the manufacturer shall be constructed so as to withstand, without damage, all normal use and handling.

.11 The I/O system shall be modular. Each module shall be fully enclosed within a durable plastic shroud. When mounted on the system base, each I/O module shall not occupy more than one available slot.

.12 I/O modules shall be installed in any available slot in the CPU or expansion baseplate, and shall require no tools for insertion and extraction. I/O modules shall connect electrically to the baseplate via a pin and socket connector.

.13 Wherever possible, all assemblies and sub-assemblies performing similar functions shall be interchangeable

.14 The system design shall accommodate the replacement of assemblies without having to disconnect field wiring. Wherever possible, removable connectors shall be used to connect field wiring to the individual circuit board assemblies.

.15 All components within the controller family shall be manufactured with a high degree of durability.

.16 All major assemblies and sub-assemblies, circuit boards, and devices shall be identified using permanent labels or markings each of which indicates the manufacturer's catalog number, product manufacturing date code, UL and CSA certifications.

.17 All components of the LOGIMAC 280, except CRT terminals and programming workstations, shall meet the following environmental specifications:

.1 Storage conditions: Temperature -40 to 85°C

.2 Operating conditions: Temperature 0 to 60°C

.3 Humidity: 5 to 95 percent relative humidity, non-condensing

.18 The LOGIMAC 280 shall have a 120 VAC power supply with built-in 24 VDC power supply for input/output connection.

.19 The power supply shall be modular in design, separate from the CPU and baseplate for easy replacement in the unlikely event of failure. The power supply shall provide +5 VDC to the bus.

.20 The power supply shall not use a slot available for an I/O card.

.21 The central processing unit (CPU) of the LOGIMAC 280 shall be modular. It shall possess the capability to solve application logic, store the application program, and store numerical values related to the application processes and logic, and interface to the I/O systems.

.22 The modular type CPU shall contain a dedicated VLSI Instruction Sequencer

.23 Coprocessor (ISCP Boolean Coprocessor) for performing Boolean operations, and interfaces to a serial port and the system bus.

.24 The modular and embedded CPUs shall contain an alarm processor that is special PLC feature designed to receive and process faults. The diagnostics shall provide information on the configuration and CPU, memory, communications and I/O status.

.25 The alarm processor function shall log I/O and system faults in two fault tables that shall be accessible for display on the IBM compatible programming software screen or uploaded to a host computer or other coprocessor.

.26 The alarm processor shall maintain the state system diagnostic bits to be read by a host or incorporated as contacts into the ladder program for customized diagnostic routines.

.27 The CPU shall be programmed by an external peripheral IBM compatible via a serial port. The software shall execute on Windows operating system and shall provide on-screen help information throughout its execution paths.

.28 The programming interface shall be capable of being remotely or locally connected to the CPU while the CPU is running. The Hand-Held Programmer shall be able to access the application program, the system configuration, the registers and the diagnosis system.

.29 The programming devices shall have access to the application program, the CPU and I/O system configurations, all registers, CPU and I/O status, system diagnostic relays, and I/O override capabilities.

.30 It shall have the capability of programming the relay ladder program, store the program to the PLC, monitor program and reference address status while the PLC is in Run or Stop mode.

.31 All application memory shall be available to the user program. Executive level operations performed by the CPU shall not consume application memory.

.32 The register values and the application program shall be stored in battery backed, CMOS static RAM memory.

.33 The LOGIMAC 280 shall have a long-life Lithium battery used to maintain the contents of the CMOS RAM memory in the CPU. There shall be an easily accessible battery compartment in the power supply with dual battery connectors. The battery shall be replaceable with power applied to the PLC and without removing the CPU.

.34 The battery shall allow resident user program to be maintained in the CPU without power applied. Additionally, a low battery condition shall be alarmed with a system diagnostic bit.

.35 The CPU shall calculate the application program checksum at the end of every sweep. A fixed number of program memory checksum shall be calculated each sweep. If the calculated checksum does not equal the reference checksum, a fault shall be recorded, and the CPU mode will change to STOP.

.36 The CPU shall be capable of solving an application program whose source format shall be relay ladder diagram. The language shall support relay, timers and counters, arithmetic, relational, bit operation, data move, conversion, and control functions.

.37 The arithmetic function block shall used simple data types, under a 16 or 32 bits integer configuration. The arithmetic operations shall support two data types, Signed Integer (INT), and Double Precision Integer (DINT).

.38 The battery shall maintain the application program for six months without power supply.

.39 The LOGIMAC 280 CPU shall have a real-time clock battery protected, accessible by both the application program and the fault processor.

.40 The LOGIMAC 280 CPU shall support high level diagnostic functions together with the distributed intelligent I/O system.

.41 The LOGIMAC 280 shall record the system and I/O malfunctions with the date and the time of occurrences.

.42 The LOGIMAC 280 shall record the faults in registers assigned respectively for the CPU and the I/O. These registers shall be accessible via the programming interface or a PC.

.43 I/O reference addressing for each I/O module shall be assigned through the use of the IBM compatible configuration and programming software or the hand held programmer. There shall be no jumpers or DIP switch settings required addressing modules

.44 The circuit status of each I/O point shall be indicated by LED mounted at the top of the module. Also each I/O status shall be available through the programming interface

.45 The LOGIMAC 280 shall support an operator interface, based on high level performing characters. This intelligent module shall communicate with the central processing unit via a cable connected to a serial port.

2.2 Main Disconnect

.1 The control panel is equipped with a main disconnect switch mechanically interlocked with the inner door to electrically isolate the components of the control panel when the inner door is opened.

.2 For ratings up to 100 A, the main disconnect switch is of the fusible type with fuses rated at 100,000 A short circuit capacity. For capacities above 100 A, the main disconnect switch is a thermal-magnetic circuit breaker having a fast response, high interrupting capacity and sealed contact chambers with clear covers for inspection.

2.3 Pump Protection

.1 Each pump circuit is fitted with a three-pole thermal-magnetic circuit breaker or current limiting motor protector with instantaneous magnetic trip and overload relay. The response time under short circuit conditions is less than one-quarter of a cycle; the action opens all poles thus avoiding single-phase operation of three-phase pumps.

.2 Isolated rotary handles for each motor protector are mounted on the inner door.

.3 The circuit breaker and overload relay exhibit stable operation under changing temperature conditions from 25°C below zero up to 40°C above zero. The circuit breaker has a high interrupting capacity independent of the thermal setting.

2.4 Pump Selector Switch

.1 The control panel shall be fitted with a COMPUTER/OFF/HAND switch for each pump to allow manual pump operation.

2.5 Pump Contactor

.1 Each pump circuit shall be fitted with a three-pole fast-acting magnetic contactor, designed for a minimum of 20 years of service under normal operating conditions. Under overload

conditions, the circuit shall be designed to clear the fault by opening the motor protector or circuit breaker and then the contactor.

2.6 Control Relay

.1 The necessary electromechanical relays for control and alarm function shall be protected against malfunctioning. They shall be rated for a service factor up to 600 VAC and 300 VDC.

2.7 Heating Element

.1 The control panel shall be equipped with a heating element with a thermostat, of not less than 100 W. A protective shield around the heating element shall be supplied to prevent accidental injuries.

2.8 Control Circuit Protection

.1 The pump control circuit shall be protected by circuit breakers and fuses on the primary shall protect auxiliary circuits.

2.9 Annunciator Panel

.1 The control panel shall include the annunciator panel. The annunciator panel shall indicate the following alarms and status:

.1 High level

.2 Low level

.3 Power failure

.4 Power supply

.5 Leakage P1

.6 Leakage P2

.7 High temperature P1

.8 High temperature P2

.9 Overload P1

.10 Overload P2

.11 Run P1

.12 Run P2

.2 The annunciator panels shall have one reset button and a lamp test button.

2.10 Control panel functions

.1 The control panel shall be equipped with a programmable logic control LOGIMAC 280 specifically chosen and programmed to provide a safe and reliable operation of the pumping station. The LOGIMAC 280 shall provide, but is not limited to the following functions:

.1 Controls the starting, stopping and, if necessary, alternation of up to two pumps. The number of pumps to control and the number of pumps allowed to parallel operation shall be user configurable.

.2 An adjustable software time delay from 0 to 60 seconds, before the starting of a pump is available to prevent the high inrush current, which would result if both pumps were started at the same time.

.3 Registers the running time and the number of starts of each pump.

.4 The LOGIMAC 280 constantly monitors the pumps to verify that there is no leakage or excessive temperature in the motor windings. The signal for motor over temperature or leakage is coming from the supervision relay (mini CAS II as per ITT Flygt). If a pump overheats, the LOGIMAC 280 stops it before overheating. The LOGIMAC 280 provides the same protection for leakage. For either one of these abnormal situations, the LOGIMAC 280 stops the faulty pump and activates an alarm.

.5 The following alarms shall be latched by the LOGIMAC 280 until manually resetted. The LOGIMAC 280 shall activate the following alarms without any delay:

.1 For each pump:

.1 Motor overload

.2 High temperature stator

.3 Leakage

.2 Low level

.3 High level

.4 Power failure

.2 The LOGIMAC 280 shall have an analogue input to accommodate the 4-20 mA signal from the sump level detector. From this signal the LOGIMAC 280, shall control the starting and stopping of the pumps.

.3 The LOGIMAC 280 is fitted with a real time clock. A battery back up is provided to maintain correct alarm registration

.4 The LOGIMAC 280 is protected against signal interference that could occur in the pumping stations. In order to reduce the sensibility to interference, all inputs and outputs are galvanically isolated from ground.

.5 The LOGIMAC 280 is equipped with LED type lights indicating the operational functions and the alarm status.

.6 The LOGIMAC 280 shall have an interface operator allowing:

.1 Easy access to set points and operating parameters, password protected.

.2 Normal text displayed

.3 Key-in station data (read-only)

.4 Alarm display

.7 In the automatic mode, the LOGIMAC 280 and the control panel operate the pumps according to the following level signals:

.1 Low level float: low level alarm and stopping of the pump(s)

.2 4-20 mA signal: start/stop/alternate the pump(s)

.3 High level float: high level alarm and starting of all pumps available in parallel operation.

.4 The level floats shall be mercury and lead free, compatible with the latest environmental laws and approved by CSA Floats shall be model ENM-10 as fabricated by ITT Flygt.

.5 The float shall be mounted on a galvanised steel guide rail and each float shall be supplied with an adjustable vertical support. If the 4-20 mA signal is faulty the low level float shall stop the pumps and the high level float shall start a pump.

.6 The pumps shall alternate after each pumping cycle if ALTERNATE mode is chosen.

2.11 Accessories

.1 The panel shall be equipped with a monitoring relay for leakage detection and stator high temperature model MiniCas II as fabricated by ITT Flygt. In case of a malfunction, the monitoring relay should stop the pump. On high temperature detection a pump shall not be made available until a manual reset has been performed.

.2 The floats shall be equipped with intrinsically safe, CSA approved relays to render the float installation conform for operation in Class I, Division 2, Group C and D hazardous environments.

.3 The LOGIMAC 280 panel shall be equipped with a UPS (Uninterrupted Power Supply) for three hour back up.

.4 The control panel will be supplied with the following equipment mounted on the inner door:

.1 An ammeter per pump with phase selector

.2 A voltmeter with phase selector

.5 The control panel shall be supplied with a protective relay against phase failure and phase reversal.

.6 An alarm circuit with circuit breaker protection shall be provided with the panel. This circuit will energise an alarm light mounted on top of the panel for outdoor installation.

.7 A 120 V outlet shall be provided for connection of convenience equipment with a maximum load of 100W. The maximum rating shall be clearly identified in the panel with a label. A control transformer, dry type single phase with 120 volts secondary shall be added if the supply ifs different than 120 VAC. The transformer rating shall be calculated according to the control load.

.8 An alarm silencing push button shall be present to stop the alarm from unnecessary operation once the station operator has taken notice of the fault.

.9 The control panel shall be in accordance to the Specifications and the wiring diagram provided under the electrical section.

3. EXECUTION

3.1 Construction

.1 Materials

.1 The white interior finish shall a premium isopthalic NPG gelcoat.

.2 Resin for the corrosion liner and structural layers shall be a premium grade isopthalic polyester at minimum. Vinyl esters resins shall be used on the corrosion liner for leachate or more severe corrosive environments.

.3 Glass fibre reinforcing materials other than the surfacing veil is to be commercial Grade “E” type glass

.2 Laminate Construction

.1 All FRP laminates shall have a corrosion liner on surfaces that are exposed to the corrosive environment and a structural laminate. The tank shell and its external reinforcing ribs shall use the filament winding process for the structure. The structural laminate shall be by the hand lay-up method for all sections or parts other than the tank shell.

.3 Corrosion Liner

.1 The surface of the liner exposed to the corrosive medium shall be resin rich reinforced with a “C” grade surfacing veil. The veil shall be saturated with white pigmented resin or an ISO-NPG white gelcoat. This layer is to be 0.254 mm minimum thickness.

.2 The liner behind the surface shall have a minimum thickness of 2.54 mm and shall be reinforced with not less than 20 percent and not more than 30 percent by weight of non continuous chopped strand mat. The inside surface is to be a smooth molded surface with a bright white finish. Corrosion liner shall be free of air and voids for optimum corrosion resistance.

.4 Structural Laminates

.1 Once the liner is completed and cured, the remainder of the wall thickness of FRP laminates shall be built up to provide sufficient strength to meet the mechanical requirements. The tank shell shall be filament wound in a helical pattern, while the top and base are to be fabricated using the hand lay-up method

.1 Hand Layup Construction

.1 In hand lay-up laminates, alternate layers of chopped stand mat and woven roving, saturated in catalyzed resin, shall be added until the required of layers have been applied or the required wall thickness has been obtained. The exterior of the laminate shall consist of a chopped strand mat. Glass content shall be between 30 percent and 50 percent by weight. Laminate should be properly wetted out and rolled out, free of air voids as per design Specifications.

.2 Filament Winding Construction

.1 Filament wound structural laminates provide superior strength to weight ratio by a higher glass content than hand lay-up or chop-hoop winding methods.

.1 Filament wound laminates shall be constructed by saturating continuous strand glass roving in a controlled pattern over the corrosion liner on a suitable mold.

.2 The rovings shall be applied at an angle to the axis of the mold. This winding angle shall be selected by the fabricator to obtain the desired hoop and longitudinal properties required for each application. It shall be uniform throughout the entire length and thickness of the product. Each cover or bi-directional layer, is to consist of two (2) complete layers of continuous rovings. As many of these covers will be applied as is required to provide adequate thickness for the mechanical loads of each application. The winding pattern shall be regular and shall produce a dense laminate without unreinforced resin pockets or air bridging between the rovings. Glass content shall be between 60 percent to 70 percent by weight.

.5 Surface Finish

.1 Inside

.1 All inside surfaces should be smooth and free of cracks and crazing. The inside surface will be pigmented or gelcoated to a bright white finish. All surfaces other

than those made in contact with the mold surface shall be coated with air-inhibited resin or gelcoat, this includes any cut edges of laminates.

.2 Outside

.1 All external surfaces shall be resin coated with an air inhibited resin coat, including any drilled holes, ground areas or cut edges.

.2 The portion of the station to be above ground level shall be painted with forest green colour gelcoat with UV inhibitors and air inhibitor additives. Above ground portions may also be painted with a polyurethane base type paints.

3.2 Start-up

.1 The contractor shall insure proper start-up of the pump station and provide total reliability of the control panel. The Contractor shall include in his price one (1) day for the control start-up to perform:

.1 Simulate and verify each control loop

.2 Calibrate the instrumentation and sensors

.3 Adjust each alarm contact or level

.4 Verify the cabling and wiring

.5 Verify the component identification

.6 Coordinate start-up

.7 Render operational the control panel in accordance with the Specifications and Drawings.

3.3 Inspection

.1 Prior to installation in the station the pumps shall be thoroughly tested and operated for a minimum of 30 minutes. The level regulators have also been checked for correct operation. A Factory Inspection Certificate shall be furnished indicating that all equipment has been submitted to detailed inspections and was found to be satisfactory. The certificate shall be signed by a responsible official of the supplier.

.1 The supplier grants the right of inspection of the pumping station to any authorized representative of the purchaser before shipment from factory. If inspection is requested Flygt will give 48 hours notice in advance of the time when the equipment will be ready for inspection at the factory.

.2 Any equipment in the pumping station that may have been provided by another supplier shall have been tested by the original supplier

3.4 Installation Supervision

.1 A trained representative of the supplier shall be made available to:

.1 Supervise the connection of electrical power to station,

.2 Supervise the installation of the pumps,

.3 Install and adjust the level regulators,

.4 Test the controls, and

.5 Start, test and adjust the equipment for complete and satisfactory operation after installation.

END OF SECTION