CRUZ - HOGAN
ENGINEERS I PLANNERS
TBPE Firm Reg No. F-4860

Offices
Weslaco
McAllen
Harlingen

CITY OF SAN JUAN
WASTEWATER TREATMENT PLANT IMPROVEMENTS
PHASE TWO
TWDB CWSRF Project No. 73796
RFB No. 25-003-12-18

ADDENDUM NO. 1: December 2, 2024

TO ALL DOCUMENT HOLDERS OF RECORD:

This Addendum forms a part of the Contract Documents and modifies the original Specifications and Drawings as noted below. Acknowledge receipt of the Addendum in the space provided in the Bid Form and on the outer envelope of Bid Proposal. Failure to acknowledge receipt of this Addendum may subject Bidder to disqualification.

PROJECT SPECIFICATIONS

Item No. 1 **Specification Section 11171 -Hydropneumatic Pressure Control System**

Add this Specification Section to the Project ***(attached)***

Item No. 2 **Specification Section 11300- Vertical Turbine Pumps and Motors**

Add this Specification Section to the Project ***(attached)***

Item No. 3 **Specification Section 11500 - Vortex Grit Removal Equipment**

Envirodyne Systems, Inc. is an acceptable manufacturer and supplier for the Vortex Grit Removal Equipment

Item No. 4 **Specification Section 11600 – Circular Sludge Thickener**

Envirodyne Systems, Inc. is an acceptable manufacturer and supplier for the Circular Sludge Thickener Equipment

Item No. 5 **Specification Section 13050 - Clarifier Launder Covers**

Envirodyne Systems, Inc. is an acceptable manufacturer and supplier for the Clarifier Launder Covers Equipment

STATE OF TEXAS
ORLANDO CRUZ
55740
REGISTERED PROFESSIONAL ENGINEER

12/2/24

END OF ADDENDUM NO. 1

SECTION 11171

HYDROPNEUMATIC PRESSURE CONTROL SYSTEM

1.0 SCOPE.

This specification describes the requirements for a Hydropneumatic Pressure Control System. The purpose of the system is to minimize cycling of the pressurization pump(s) and to automatically maintain pressure within upper and lower limits during operation. The System shall be designed for non potable return water service. It is the intent of this specification to replace the existing hydropneumatic tank and pressure control system to existing operational like conditions. Equipment shall include all control, valves, fitting, piping and accessories for a complete operable system.

2.0 GENERAL REQUIREMENTS.

2.1 Accepted Manufacturer. The Hydropneumatic Pressure Control System shall be as designed and manufactured or prior approved equal.

2.2 The Hydropneumatic Pressure Control System shall include a hydropneumatic tank and automatic pressure control system. The supplier must have a minimum of five years' experience, designing, supplying and startup of Hydropneumatic Pressure Control Systems.

2.3 Manufacturer shall have a quality management system certification per ISO 9001:2008 for engineered designs, solutions and manufacturing for fluid pulsation, and hydraulic surge control.

2.4 Personnel representing the pressure control system supplier are required to check the installation and instruct the owner's personnel in the operation of the pressure control system. A field test of the equipment will be performed in conjunction with this site visit.

3.0 REFERENCE SPECIFICATIONS, CODES AND STANDARDS.

3.1 Pressure vessels shall be in accordance with the latest revision of the American Society of Mechanical Engineers (ASME) Code for Unfired Pressure Vessels, Section VIII, Division 1.

3.2 All local Plumbing Codes shall be met.

3.3 The system and anchorage of the hydropneumatic tank shall conform to the International Building Code (IBC).

3.4 The National Electric Code (NEC) shall be used for all wiring.

4.0 SUBMITTALS.

4.1 Submittals shall be in accordance with project specifications.

4.2 For review and approval.

4.2.1 Shop Drawings: Detailed hydropneumatic tank fabrication drawings, system assembly and installation drawings.

4.2.2 Product Data: Specifications for system components, accessories and protective coatings.

4.2.3 Electrical: Complete electrical diagrams

4.2.4 ASME code calculations.

4.3 Included in Operation and Maintenance Manual.

4.3.1 Instructions on installation, operation and maintenance of supplied components.

4.3.2 Copy of ASME Pressures Vessel Code Form U-1A.

5.0 WARRANTY.

The supplied components shall carry a warranty of one year from initial operation or eighteen months from delivery, whichever comes first.

6.0 DESIGN AND PERFORMANCE REQUIREMENTS.

6.1 The system shall be designed to maintain water pressure between 70 psig and 80 psig and shall have a useable (drawdown) volume of 2000 gallons. There shall be no less than fifteen percent reserve water in the hydropneumatic tank at the maximum air volume (water seal volume). The tank shall have a minimum of 125 psi working pressure rating.

6.2 System Supplier to develop recommended set points to match these requirements.

6.3 System shall be tailored to the following environmental conditions.

(installation of equipment is outdoors and all equipment shall be provided for the existing ambient temperature at the plant, and any other environmental factors which may affect operations and warranty).

7.0 COMPONENTS.

7.1 HYDROPNEUMATIC TANK.

7.1.1 The volume of the hydropneumatic tank shall be a minimum of 2000 gallons and an outside diameter of 60 inches. The hydropneumatic tank must have no moving parts, vanes or elastomers and shall contain a vortex breaker.

7.1.2 The hydropneumatic tank shall be constructed of carbon steel for a Maximum Allowable Working Pressure (MAWP) of 125 psig in accordance with the ASME Pressure Vessel Code, Section VIII, Division 1. The minimum wall thickness shall be ¼ inch. The hydropneumatic tank shall be provided with a flanged line connection *(state diameter)*, adequate supports (two saddles for horizontal or four legs for vertical), lifting lugs and couplings for drain, safety relief valve and control system. The hydropneumatic tank shall be provided with an elliptical manway, minimum 14" x 18".

7.1.3 Hydrostatic test the hydropneumatic tank in accordance with ASME Code for Unfired Pressure Vessels. Form U-1A "Manufacturers' Data Report for Unfired Pressure Vessels" shall be provided by the hydropneumatic tank manufacturer to certify that the hydropneumatic tank was built in accordance with ASME Code Rules for the Construction of Unfired Pressure Vessels and inspected by a certified inspector. Copies of this form shall be supplied with the hydropneumatic tank and included in the Operation and Maintenance Manual.

7.1.4 The internal surface of the pressure tank shall be sandblasted to SSPC-SP-10 and apply NSF Standard 61 approved epoxy coating. Coating shall be applied in accordance with coating manufacturer's instructions.

7.1.5 The external surface of the pressure tank shall be sandblasted to SSPC-SP-6 and coated with a poly-urethane coating system with a zinc-rich primer. Final top coat color shall be white. Coating shall be applied in accordance with coating manufacturer's instructions.

7.2 CONTROL COMPONENTS.

7.2.1 The Automatic Pressure Control System includes Pressure Controller, Level Transmitter, Solenoid Valves and Air Compressor.

a) The PLC based pressure controller shall be a PULSCO Skypark Series or approved equal.

i) All electronics shall be housed in a 304 SS NEMA 4X enclosure.

ii) Controller shall be equipped with a door mounted 12" HMI touch screen display with a built in proximity sensor that will put the display to sleep if no movement is detected for several minutes.

iii) HMI shall contain screens that have continuous indication of water level and corresponding tank water volume in real time that displays current water level in relation to solenoid and alarm level set points.

iv) HMI shall contain screens that display and allow changes to current solenoid and alarm level set points and timers.

v) A button on the HMI shall be provided that resets all values to pre-programmed O&M values.

vi) Vent and Add air solenoid control shall be selectable from hand, off, and auto from the controller display.

vii) HMI shall contain an alarm screen that lists the alarms that have occurred and the number of occurrences that each alarm has had.

viii) Controller shall log and save locally all alarms and input signals for a minimum 3 months.

ix) All field wiring to the controller shall be done through heavy duty connectors. There shall be no field wiring to components inside of the controller.

x) Multiple heavy duty connectors shall be provided to separate AC and DC voltages.

xi) Electrical surge suppression devices shall be installed on all analog input signals.

xii) Dry contacts shall be available for all alarm, solenoid relays, and pump starts.

xiii) controller shall contain a managed Ethernet switch to allow Ethernet communication with site PLC or SCADA system.

b) Level Transmitter. Level transmitter provides a 4-20 mA signal and can be a Differential Pressure Transmitter, Magnetic Level Transmitter, or R.F Capacitance probe.

c) Pressure Transmitter. Pressure transmitter provides a 4-20 mA signal. The range shall span the operating pressure range plus margins at each end. The pressure connection for the pressure transmitter shall be at the instrument well or on the top of the hydropneumatic tank. The pressure signal shall control the pump turn on point, add/vent air solenoid valves and provide high and low pressure alarm signals

d) Solenoid Valves. ASCO Redhat model or equal. One solenoid valve for adding air (raising tank pressure) and one solenoid valve for venting air (lowering tank pressure).

e) (Optional) Pneumatic Assembly. Solenoid valves and associated ball valves and piping shall be pre-assembled by the supplier and installed in a NEMA 4 enclosure with the Pressure Control controller.

f) Air Compressor. The air compressor package shall be a Simplex *(one air-cooled, two-stage, oil lubricated reciprocating type air compressor mounted on one air receiver)*or a Duplex *(two air-cooled, two-stage, oil lubricated reciprocating type air compressors mounted on one air receiver).* Air Compressor(s) shall include all necessary piping (tubing) for connection to the air receiver and all components wired to the air compressor motor starter box. The air compressor package shall be the standard product of a manufacturer who is regularly engaged in the design and construction of fully automatic air compressor systems. The air compressor system shall include the following items.

   i) A Totally Enclosed Fan Cooled (TEFC) motor shall drive the compressor and shall be adequate to drive the compressor continuously at full-rated output. Power supply shall be 230/460 volts, 3 phase and 60 hertz.

   ii) The Hydropneumatic Pressure Control System supplier shall select the compressor volumetric capacity and discharge pressure. The capacity and discharge pressure selected shall be sufficient for the application to adjust the pressure from the add air setpoint to the add air reset in no more than 20 minutes.

   iii) Compressor unit shall include a totally enclosed crankcase of cast iron, separate detachable deep finned cylinders, matched balanced pistons, separately removable valve housing, low oil switch and a direct reading pressure gauge. The low oil switch shall shut down the compressor if the oil level is too low. The switch shall not reset without adding oil.

   iv) The air compressor controller shall be provided with a power on light, Hand-Off-Automatic (HOA) switch, run light, motor overload alarm light and low oil level alarm light. The controller shall contain a magnetic motor starter and 120V power supply.

   v) The air compressor shall start and stop based on pressure in the air receiver. Dry contacts shall be provided in the controller for remote indication of running conditions for the compressor. The compressor shall be shutdown by motor overload, or low oil level. An alarm condition shall energize a local alarm light.

   vi) The compressor shall start automatically, provided its HOA switch is in the AUTO position. The compressor shall run continuously if its HOA switch is in the HAND position and shall shut down if its HOA switch is in the OFF position.

vii) The air receiver shall be a minimum of 80-gallon capacity.

viii) The air compressor package shall be coated with the standard factory coating.

7.3 MISCELLANEOUS COMPONENTS.

7.3.1 ¾" Safety Relief Valve. The pressure tank shall have a safety valve sized in accordance with the ASME code to prevent over pressurizing the pressure tank above its design pressure. Safety Relief Valve setpoint shall be set to the maximum allowable working pressure of the pressure tank.

7.3.2 Check valve for air line.

7.3.3 A valve shall be installed on the top of the tank to prevent fluid from ever being able to enter the air piping.

7.3.4 Ball valves for isolation and bypass of solenoid valves, isolation and drain of the probe well and drain and isolation of the air piping.

7.3.5 Instrument Well. Stainless steel chamber with couplings for connection to pressure tank and installation of level transmitter, level indicator and drain valve to allow for easy troubleshooting of the system.

7.3.6 Level Gauge Assembly - A level indicator shall be mounted on the instrument well for visually checking pressure tank water level. The indicator's connections shall have isolation valves. Indicator shall extend from approximately 6" below and 6" above the designed operating range.

7.3.7 Air Muffler for reducing the noise generated from the venting of air from the pressuretank.

7.3.8 Pressure Gauge for indicating pressure in pressure tank, 4 ½" diameter dial, ¼" bottom connection.

7.4 PUMPS:The owner shall furnish the supply/booster pump(s). The shutoff head of the supply pumps must exceed the maximum system operating pressure.

8.0 SYSTEM CONTROL.

8.1 The system shall be designed to the requirement of paragraph 6.0. The pump(s) shall maintain pressure in the hydropneumatic tank via the level and pressure controls. Pressure set points energize pump(s) and level set points de-energize pump(s).

8.2 The control system shall include adjustable water level set points and adjustable pressure set points. The levels shall be adjusted to four different set points within the hydropneumatic tank. Pressure set point shall be set to six pressures over the entire range of control.

8.3 The six pressure set points are specified as being open when the pressure is less than the pressure setting and closed when the pressure is equal to or greater than the pressure setting.

8.3.1	PS-1	High pressure alarm	___ psig
8.3.2	PS-2	Energize vent air solenoid valve	___ psig
8.3.3	PS-3	Start lead pump	___ psig

8.3.4	PS-4	Start lag pump	___ psig
8.3.5	PS-5	Energize add air solenoid valve	___ psig
8.3.6	PS-6	Low pressure alarm	___ psig

8.4 The four level set points are specified as being open when the level is greater than the level setting and closed when the level is equal to or less than the level setting. Percentages are of the water volume in the hydropneumatic tank.

8.4.1	LHH	Level High High (alarm) ___ %
8.4.2	LH	Level High (lead pump off) ___ %
8.4.3	LL	Level Low (lag pump off) ___ %
8.4.4	LLL	Level Low Low (alarm) ___ %

8.5 As the water level falls (drops in pressure), the lead pump is energized at a pre-set pressure (PS-3). If the pressure continues to drop, as demand continues to increase, the lag pump is started at PS-4. If the demand falls, pressure rises and the hydropneumatic tank water level rises to the LL set point, the lag pump shall be shut down. If the demand continues to fall, pressure rises and the hydropneumatic tank water level rises to the LH set point, the lead pump shall be shut down.

8.6 Whenever the alternator senses that no pumps are running then the alternator shall automatically alternate the lead and lag pumps.

8.7 Low-pressure alarm (PS-6) and high-pressure alarm (PS-1) are provided to activate indicating lights and close dry contacts for remote signals at the Controller.

8.8 Whenever the water level reaches the LH switch, all pumps are off. If the pressure is below PS-5, then the add air solenoid valve will open until the pressure is increased to PS-5 reset point. If the water level is at LH switch and the pressure is above PS-2 then the vent air solenoid valve will open until the pressure is decreased to PS-2 reset point.

8.9 The controller shall start and stop the compressor indirectly via the add air solenoid valve and start/stop the pumps via dry contact closure. In addition, one dry contact shall be provided for remote indication of any of the following conditions: high or low hydropneumatic tank water level, high or low hydropneumatic tank pressure.

9.0 INSTALLATION AND TESTING.

9.1 The supplier shall provide all components and assembly instructions to the Contractor for installation.

9.2 Testing shall be performed by the Contractor in the presence of the Engineer and a representative of the supplier. Testing shall consist of a functional test of the level and pressure control system.

9.3 System supplier shall provide start up support (one trip, two days) to test and instruct project personnel on the supplied components.

10.0 PERFORMANCE GUARANTEE.

10.1 The manufacturer shall provide a guarantee of performance and workmanship certifying that the system will meet all provisions of these specifications.

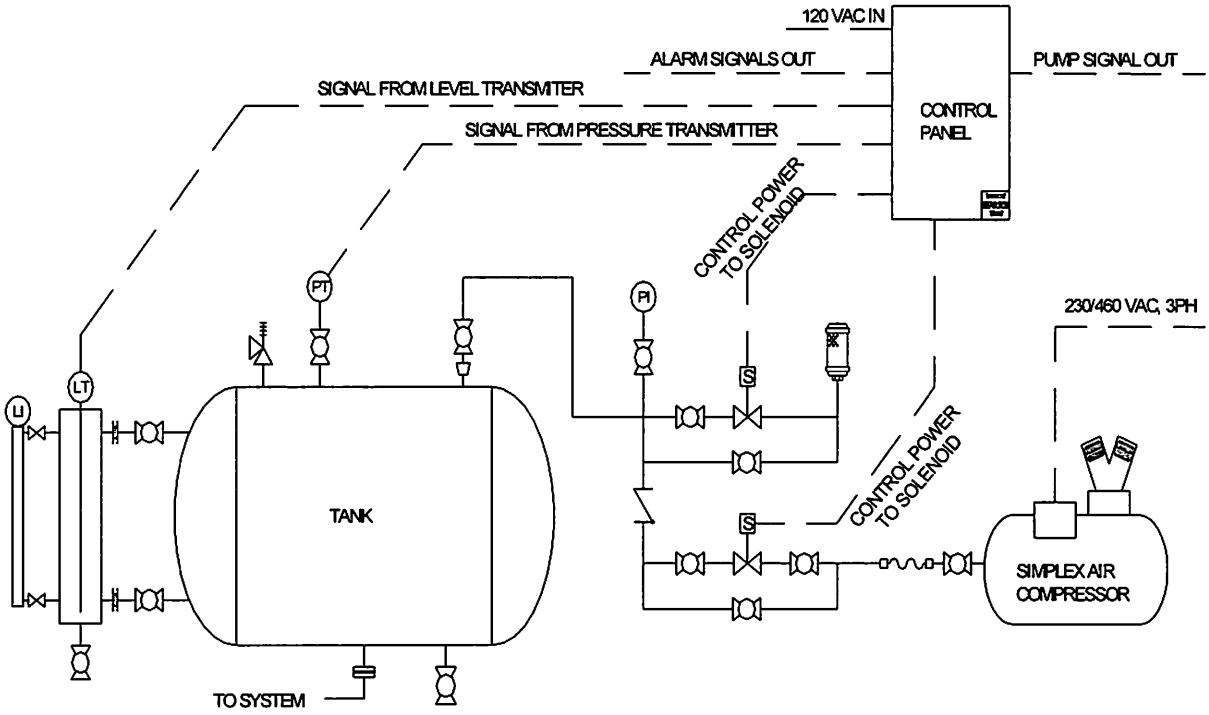
10.2 Such performance shall be verified by operational field tests.

11.0 UNIT RESPONSIBILITY.

11.1 The Hydropneumatic Pressure Control System shall be designed and supplied by a single manufacturer.

11.2 Installation shall be the responsibility of the General Contractor.

Typical Hydropneumatic Pressure Control System Schematic



PRESSURE CONTROL SYSTEM SCHEMATIC

END OF SPECIFICATION

SECTION 11300

VERTICAL TURBINE PUMPS AND MOTORS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope

The equipment to be furnished under this section of the specifications shall consist of vertical turbine pumps complete with electrical motors and motor replacements as specified herein to be installed as part of wastewater treatment plant process water system. New pumps are to be installed in existing pump cans and match existing bolt patterns and match dimensions of existing piping headers.

1.02 QUALITY ASSURANCE

A. All pumps furnished shall be the product of a single American pump manufacturer regularly engaged in the manufacture of pumps for public water systems for a minimum period of twenty-five years. The following manufacturers are acceptable. d

1. Fairbanks-Morse
2. Byron Jackson
3. Peerless
4. WILO/American Marsh

B. The motors shall be the product of a single American motor manufacturer regularly engaged in the manufacture of motors having similar service and size for a minimum period of ten (10) years. The following manufacturers are acceptable:

1. Nidec (U.S. Motors)
2. General Electric
3. TECO-Westinghouse
4. Engineer's Approved Equal

C. Manufacturer's listing above does not imply that a standard product is acceptable. The successful manufacturer will be required to conform to all requirements of the specifications. It shall be the responsibility of the pump manufacturer to supply proper materials of construction, throughout the pump, that will be capable of withstanding all potential pressures and mechanical loads that can be imposed by the pump.

D. The pumps furnished under this section shall be suitable for application in treated water pumping applications in public uewater supply systems. All Materials used in the construction and coating of the pumps shall be suitable for contact with potable water and shall comply with all applicable USPHS, EPA, FDA and AWWA standards.

E. The pump column inside and out, plus inside dot discharge head shall be coated with Scotchcote 134 . Color to be forest green..

1.03 SUBMITTALS

A. The Contractor shall furnish the following submittal information prior to manufacture:

1. Performance curves showing head/capacity curve, field efficiency, field horsepower, and NPSHR.
2. Full and complete specifications covering each component of the proposed pumping assemblies.
3. Accurate dimensional drawings or, certified prints, in 8.5x11 format, that may be used for layout and construction purposes.
4. Drawings showing complete dimensions, anchor bolt locations, anchor bolt Recommendations, flange details, motor details and conduit requirements.
5. Bulletins and supporting information.

B. Submittals required after manufacturing and prior to shipment consist of six (6) bound copies of operation and maintenance manuals. Each copy to include:

1. As built drawings.
2. Parts list and recommended spare parts list.
3. Operational instructions.
4. Maintenance instructions.
5. Job site storage and maintenance requirements.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. NEW PROCESS WATER SYSTEM PUMPS NO. 1 AND NO. 2

The pumping units shall be designed to operate satisfactorily throughout the total range of head as indicated, and shall deliver the quantity shown for the rated head and capacity conditions; all as given in the following tabulation:

	Process Water Pump-Design Point	Secondary Pump Conditions
Primary Rating:		
G.P.M.	150	100
T.D.H.	175'	200'
Min. Shutoff Head	210	
'Max. Speed, R.P.M.	1770	
Min. Pump Efficiency at design point	75%	
@ Primary & Secondary Rating		
Min. Motor H.P.	10 HP	
MAX NPSH-R AT 100'TDH	12FT	
Existing Bowl Dia. (Min.) and Length	Field Verify	
Discharge Dia.	4 inch (match existing)	
Discharge Location	Surface	
Nominal Electrical Service	-460 VAC 3 phases 60 Hz	

NOTES:

(1) Pump No. 1 and No. 2 will utilize existing pump cans. It is up to the pump supplier to verify dimensions and make adjustment as required.

(2) New pump bases and pump outlets must match existing pump can head configuration.

(3)

(4) New pump and bases shall match existing pipe inlet and outlet elevations and conditions.

2.02 CONSTRUCTION

A. GENERAL

Pumps shall be of the vertical turbine, open line shaft type, with shaft direct- connected to a vertical hollow shaft induction motor. The weight of the revolving parts of the pump including the unbalanced hydraulic thrust of the pump impellers shall be carried by a thrust bearing in the motor. Pump shall be supported from a heavy steel discharge head by means of a vertical column.

BOWL ASSEMBLY

The pump bowl and suction bell shall be Ductile Iron. The bowl shall have a bearing below and above each impeller. They shall be C954 bronze. The impeller shall be A.I.S.I. 316 SS or 304SS of the enclosed type or semi-open, dynamically balanced. Pumps with enclosed impellers will have wear rings. The impeller shaft shall be A.I.S.I. 416 SS with 316SS collets to hold the impellers to the shaft.

B. COLUMN AND SHAFT ASSEMBLY

The column size shall be selected to produce a fluid velocity of less than 6 feet per second, having a minimum wall thickness of .250 inch. Maximum length of any column section shall be 5 feet. The upper end of the column pipe will be threaded to pump head. The column section shall be threaded and faced on both ends to insure proper alignment when butted against the spiders in the sleeve-type couplings. The bottom column section shall be properly adapted to connect to the bowl assembly. A.I.S.I. 304 SS spiders shall be furnished between the column sections for supporting the line shaft bearings. The line shaft bearings shall be fluted rubber. The line shaft shall be 4 16SSI with stainless steel shaft journals at each line shaft bearing or solid 416 stainless steel without sleeve. The shaft will be connected with steel threaded type couplings with minimum diameter of 1.00 inch.

C. DISCHARGE HEAD

The pump head shall be Fabricated Steel, with 125# ANSI discharge flange. The top of the head shall have a machined register to fit the motor. It shall be of sufficient strength to carry the complete weight of the pump and motor and withstand the hydraulic loads normally imposed on by the system. The stuffing box shall be Class 30 cast iron and have the proper type and amount of packing to prevent excessive leakage in the head. The head shall include a tapped opening for draining away the normal leakage from the packing. There shall be a thread 416SS coupling between the discharge head and electric motor.

D. ELECTRIC MOTORS

(1) The motor shall be vertical, hollow shaft, squirrel-cage, induction, TEFC high-thrust type. It shall be rated for continuous duty at the speed and electrical service specified. The base shall have a machined register to fit on the head. The motor shall be NEMA Design B, with maximum temperature rise for 80 degree C over 40 degree ambient, measured by resistance. Motor shall have a 1.15 Service Factor.

(2) Each motor shall be electrically and mechanically suited for the pump to which it will be applied. The manufacturer of the motor shall coordinate closely with the manufacturer of the pump, so that the motor shall operate efficiently, without overloading, overheating, or abnormal vibration, throughout the entire range of speed and load. Each motor shall be readily capable of starting the pump under all conditions to which it could be subjected. There shall be no point on the pump curve at which the motor name plate rating is overloaded, even momentarily.

(3) Motors shall be TEFC enclosures with minimum efficiency of 91%. All openings shall be screened to prevent entrance of insects and rodents. Each motor shall be equipped with two oversize conduit boxes, one for power and one for control and heater circuits. The power box shall include a ground stud. Space heaters shall operate at 120 volts. They shall maintain internal temperature above dew point when the motor is not operating.

(4) Bearings shall have an AFBMA rated life of 10 years minimum when the motor is operated continuously at rated speed bearing life rating shall consider the weight of rotor plus all combined dead and live loads.

(5) Insulation

a. The maximum temperature rise above 40 degrees C ambient shall be 90 degrees C for a service factor of 1.15.

b. Moisture proof premium insulation shall be used in all windings.

c. Insulation shall be class F.

(6) Lubrication

a. Each oil lubricated bearing shall have a visual level indicator and accessible filler and drain plugs.

b. Each grease lubricated bearing shall be regreasable, with a grease reservoir above the bearing.

(7) Non-reverse Ratchet

a. Each motor shall be furnished with non-reverse ratchet.

b. The ratchet shall employ steel balls to absolutely prevent the reverse rotation of the pump and motor assembly.

PART 3 - EXECUTION

3.01 DELIVERY AND STORAGE

A. The Contractor shall off-load the pumping units when received. Any damage which occurred during transit shall be noted and the pump manufacturer advised in writing. Copies of the receiving report shall be transmitted to the Engineer.

B. The Contractor shall use quality lifting equipment. Lifting of the pumping units shall be done from the lifting locations and by methods recommended by the pump manufacturer.

C. The Contractor shall provide adequate dry and protected storage for the pumping units. Follow the pump and motor manufacturer's recommendations for bearing maintenance and storage procedures.

D. The Manufacturer shall properly protect the pumps and motors so that no damage or deterioration will occur from the time of shipment until installation is completed and the units are ready for operation. Flanges shall be protected by bolt on wooden blank flanges. Finished iron and steel surfaces not painted shall be properly protected to prevent rust and corrosion.

3.02 INSTALLATION AND FIELD TESTING

A. The contractor shall install the pumping units on the foundations in the location and in the manner indicated on the drawings and in accordance with the manufacturer's recommendations. The pump manufacturers' representative shall inspect the pumping assemblies and certify in writing to the contractor and Engineer that the pumps are installed in accordance with the Manufacturer's recommendations.

B. Contractor shall install the necessary pipe and valve supports so that the discharge head of the pump does not carry any weight of adjoining pipe.

C. Pump bases shall be grouted using non-shrinking material in accordance with the pump manufacturers recommendations.

D. After installation and prior to acceptance, the Contractor shall perform field tests under the supervision of the pump manufacturer, to confirm of the pump and motor assembly, and to ascertain if noise and vibration are within acceptable standards. The pump manufacturer shall provide the services of a rained field representative.

E. All initial lubricants, testing instruments and all other items as needed that may be required for the successful start-up, shall be provided by the contractor. All costs involved in the start-up, shall be provided by the Contractor, and shall be included in the contractor's bid.

3.03 WARRANTY

The pump manufacturer shall guarantee the complete assemblies for a period of 12 months after final acceptance. The warranty shall cover all defective parts, material and workmanship. The pump manufacturer shall replace or repair all defects without cost to the Owner.

END OF SECTION