INVITATION FOR BIDS

NOTICE IS HEREBY GIVEN, pursuant to Article 5A of the General Municipal Law of the State of New York that sealed bids are sought by

THE VILLAGE OF MILLBROOK, NEW YORK

For: REQUEST FOR PROPOSAL FOR SMITH AND LOVELESS PUMP STATION PURCHASE

Sealed bids will be received by the **Village of Millbrook Village Hall**, Attention: Sarah Witt, 35 Merritt Avenue, PO Box 349, Millbrook, NY 12545 until 1:30 pm local time of March 1, 2023, and then at said office publicly opened and read.

The Request for Quotations, consists of, but is not limited to the purchase of a new Smith and Loveless pump station to replace the existing pump station in kind. Smith and Loveless Serial Number 16-3233-G with two pump, model 4B2D.

All equipment, material, training, and work shall be completed within 200 days from date of the Notice to Proceed.

Digital copies of the Contract Documents may be obtained from Delaware Engineering. Email Jake Fogarty at jfogarty@delawareengineering.com.

Any Addenda will be emailed from Delaware Engineering.

The bidder(s), and /or significant subcontractor(s), shall have the requisite experience to perform the project work. Bidder(s) and subcontractor(s) shall provide a list of similar projects on-going and/or completed over the last ten (10) years with their bid. Those bidders lacking adequate experience will be deemed non-responsive and are encouraged to not submit a bid.

Bidders are responsible for the timely delivery of their Bid proposal to the proper department as indicated in this "Invitation to Bid". Bid proposals received after the date and time specified in the Invitation shall be considered unresponsive and will be returned to the Bidder unopened.

The Owner reserves the right to reject any and all Bids or waive any informality in the Bidding. Bids may be held by the Owner for a period not to exceed forty-five (45) days from the date of the openings of Bids for the purpose of reviewing the Bids and investigate the qualifications of the Bidders, prior to awarding the Contract.

Questions regarding this project should be directed to Jake Fogarty, P.E., Delaware Engineering, DPC., at (518) 452-1290.

DELAWARE ENGINEERING, D.P.C.
28 Madison Avenue Extension
Albany, New York 12203
Tel: 518.452.1290
Fax: 518.452.1335

Village of Millbrook, NY
Smith and Loveless Pump Station

Scope of Work

This document serves as a request from the Village of Millbrook to provide a proposal to furnish all labor, equipment, materials, services, insurance, etc. associated with the purchase of a new Smith and Loveless pump station and appurtenances.

Supplier:

The Proposing Supplier Shall:

- Provide all labor, materials, equipment, shipping, warranty, equipment certifications, insurance, etc. to provide and deliver to the Village of Millbrook a new Smith and Loveless to replace in kind.
- Once delivered, and after all, start-up testing and training have been finalized and approved the Pump Station shall be the property of the Village of Millbrook.
- Provide and adhere to the attached specifications and provide a one year warranty coverage.
- Supplier shall provide a startup test and training for a minimum of 6 hours by a local representative.

Village:

The Village will:

- Schedule delivery of the new generator and schedule the local representative to witness and attend the startup testing and training.
- Confirm final connection requirements with the suppliers.

Schedule

Provide a written schedule with your quote.

Quote Response

Provide sealed bid as follows:

- Fill out and submit Base Bid Sheets
- Any desired exceptions or changes to the scope of work can be added if desired, for Village to consider.
- Schedule for work (purchase, start up, load test and training dates after receiving approval to purchase).

Note that the Village intends to award the bid for the purchase to the responsible bidder with the requisite experience and the lowest cost.

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The Village reserves the right to reject any or all bids.

Please provide your sealed proposal to Village of Millbrook at the following addresses via mail by March 1, 2023 at 1:30 pm.

Attention: Sarah Witt
Village Hall
35 Merritt Avenue
PO Box 349
Millbrook, NY 12545

Technical Questions:
Prospective bidders can contact Jake Fogarty, Delaware Engineering, DPC, at (518) 452-1290 or via email jfogarty@delawareengineering.com with technical questions.

Questions regarding the bidding process can be directed to Jake Fogarty, P.E., Delaware Engineering (see above for information).

BID SHEET FOR SMITH AND LOVELESS PS

Bid Item No.	Work Item No.	Item Description	Quantity	Unit of Measure	Unit Price	Total Price
1	1.01	**SMITH AND LOVELESS PS - COMPLETE AS SPECIFIED**	1	Lump Sum	$_____	$_____

BASE BID TOTAL (In Figures) $

BASE BID TOTAL (In Words)

BID SUBMITTED BY: _____
(Name of Company)

Date Submitted _____

DELAWARE ENGINEERING, D.P.C.
CIVIL AND ENVIRONMENTAL ENGINEERING · ALBANY – ONEONTA, NEW YORK

Note: Contract Bid Award is based on the sum of the ONE Base Bid Item (i.e.,sum of the product of unit price multiplied by the quantity for each bid item and sub-items) , not the Bid Alternate Costs.
Bid alternate pricing, IF INCLUDED ON SUBSEQUENT BID SHEETS, is to be provided for use in the contract should alternate or additional work be desired or required.

SECTION 11140
VACUUM PRIMED PUMP STATION

PART 1 GENERAL

1.01 DESCRIPTION

A. The CONTRACTOR shall furnish and provide transportation for a factory built duplex wet well mounted vacuum priming pump station, and controls as specified herein and shown on the Drawings.

B. This project is replacing in-kind S&L Serial No 16-3233-G with two pump model number 4B2D for 5’ diameter wetwell.

1.02 REFERENCES

A. Publications listed below form part of this specification to extent referenced in the text by basic designation only. Consult latest edition of publication unless otherwise noted.

1. American Iron & Steel Institute (AISI)
2. American Society for Testing and Materials (ASTM)
3. Factory Mutual (FM)
4. Hydraulic Institute Standards for Centrifugal, Rotary, and Reciprocating Pumps (HI)
5. National Fire Protection Agency (NFPA)
6. National Electric Code (NEC)
7. National Electrical Manufacturers Association (NEMA)
8. Anti-Friction Bearing Manufacturers Association (AFBMA)
9. International Standards Organization (ISO) - ISO9001

1.03 SYSTEM DESCRIPTION

A. Contractor shall furnish and install one factory built base mounted, automatic pump station. The station shall be complete with all equipment specified herein, factory assembled on welded stainless steel base with a hinged fiberglass enclosure.

B. The principal items of equipment shall include three vertical, close-coupled, motor driven, vacuum primed, non-clog pumps; valves; internal piping; central three-phase power and control panel with circuit breakers, motor circuit protectors, motor starters, PLC automatic digital pumping level controls, color touch screen HMI and auxiliaries; submersible level transducer; 120V and 24V control power transformers; heater; ventilating blower; priming pumps with pump prime detection system and appurtenances; and all internal wiring.

1.04 PERFORMANCE CRITERIA

A. Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Pumps shall have 4" suction connection, and 4" discharge connection. Each pump shall be selected to perform under following operating conditions:

Bennett Pump Station

1.	Capacity	175 GPM @ 85 FT
2.	Impeller	9-1/4”
3.	Design Static Suction Lift	11.70 FT
4.	Pump Efficiency	61%

5.	Horsepower	15 HP
6.	Speed	1750 RPM
7.	Power Requirements	230, 3∅, 60 Hz

1.04 SUBMITTALS

A. Product Data

1. Prior to fabrication, pump station manufacturer shall submit 3 copies of submittal data for review and approval.

2. Submittal shall include shop drawings, electrical ladder logic drawings, and support data as follows: pump characteristic curves showing the design duty point capacity (GPM), head (FT), net positive suction head required (NPSHr), and hydraulic brake horsepower (BHP). Electrical components used in the motor branch and liquid level control shall be fully described.

B. Shop drawings shall provide layout of mechanical equipment and connection locations for station. Contractor piping connections and station access clearances shall be dimensioned relative to the station centerline. The electrical ladder logic drawings shall illustrate motor branch and liquid level control circuits to extent necessary to validate function and integration of circuits to form a complete working system.

1.05 MANUFACTURER'S WARRANTY

A. A written one year standard warranty from the date of the successful equipment start-up shall be provided by the equipment supplier to guarantee that there shall be no defects in material or workmanship in any item supplied.

PART 2 PRODUCTS

2.01 UNITARY RESPONSIBILITY

A. In order to unify responsibility for proper operation of the complete pumping station, it is the intent of these Specifications that all system components be furnished by a single supplier (unitary source). The pumping station must be of standard catalog design, totally warranted by the manufacturer. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.

2.02 MANUFACTURER

The physical layout of the system as shown on the contract drawings and the equipment specified herein are based upon the pump model replacement as manufactured by Smith and Loveless. The use of this system does not remove any responsibility of the CONTRACTOR to verify dimensions and elevations to ensure the equipment will fit within the building and equipment configuration. The use of an “or equal” pump system will require the manufacturer to provide a modified layout subject to the approval of the ENGINEER. The equipment supplied shall be in compliance with these specifications and plans and shall be supplied by one of the following manufacturers:

1. Smith & Loveless, Inc.
2. or Equal

B. If the CONTRACTOR proposes an "or equal" system, it shall be understood that the proposed system meets or exceeds the specified performance and construction and offers a cost savings to the OWNER. The CONTRACTOR shall be responsible for engineering time to review proposed substitutions and if approved, shall provide a credit to the OWNER for cost difference of the specified and approved equipment.

2.03 CONSTRUCTION

A. The station shall be constructed in one complete, factory-built assembly. It shall be sized to rest on the top of the wet well as detailed in the construction drawings.

B. The pump casings and discharge piping shall be mounted in relation to the station floor as detailed in the construction drawings. All installed valves, piping and fittings shall be capable of passing a 3" (76 mm) diameter spherical solid. All pump components and station piping, including the suction pipe connections, shall be removable without having to enter the wet well. 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.

C. Enclosures utilized to house the valve train and/or controls, which are defined under OSHA Article 29CFR, Parts 1910 as a Confined Space shall not be acceptable.

2.04 UNIT BASE

A. The baseplate of the pump station structure shall be fabricated of ½" (13 mm) 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% H2SO4 at 120 degrees F. Due to the corrosion resistance requirements, Grade 304-304L is not acceptable.

B. The stainless steel surfaces shall be glass bead blast cleaned to remove surface contamination and provide a uniform finish, after which the baseplate shall undergo an electrochemical passivation process to remove any free iron contamination from the stainless steel surface. This process shall also add a transparent oxide film to protect the surface from future contamination.

C. 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.

D. 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.

2.05 FIBERGLASS ENCLOSURE

A. The pump station shall be enclosed by a hinged fiberglass cover made of molded reinforced orthophthalic polyester resins with a minimum of 30% glass fibers with a minimum average length of 1-1/4" (32 mm). The outside of the enclosure shall be coated with a polyester

protective in-mold coating for superior resistance to weathering, ultraviolet radiation, yellowing and chalking. The completed fiberglass enclosure shall be resistant to mold, mildew, fungus and corrosive liquids and gasses normally found in pump station environments. The dimensions of the enclosure shown on the drawings shall be considered a minimum, for internal component clearances and accessibility, and nothing smaller will be acceptable. 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.

B. The cover shall be attached with a multi segment stainless steel hinge, constructed of 7 gauge (406 mm) (minimum) type 304 stainless steel with a 3/8" (9.5 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 3/8" (9.5 mm) thick anodized aluminum backing plate shall anchor the hinge to the fiberglass cover.

C. 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 20 pounds (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.

D. 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 operation.

E. Enclosures utilized to house the valve train and/or controls, which are defined under OSHA Article 29CFR, Parts 1910 as a Confined Space shall not be acceptable.

2.06 MANWAY

A. A two-piece manway cover of 1/4" aluminum treadplate, with stainless steel piano hinges and hardware, located exterior to the fiberglass pump chamber shall be provided, complete with padlocking provisions. A two-piece manway shall be required to facilitate visual checking of the float switch settings. The manway shall be an integral part of the station and provide access to the wet well. The minimum open area of the manway access into the wet well shall be at least 4.2 square feet.

B. The manway cover shall have a three-color corrosion-resistant sign permanently affixed to it, reading "DANGER - Before Entering, Test For Explosive Atmosphere. Test For Oxygen Deficiency. Supply Fresh Air To Work Area" The aluminum manway cover sections shall be secured with tamperproof fasteners to prevent unauthorized removal.

2.07 PUMP STATION DESIGN

A. PUMPS

1. The pumps shall be 4" vertical, centrifugal non-clog type of heavy cast-iron construction, especially designed for the use of mechanical seals and vacuum priming. In order to minimize seal wear caused by linear movement of the shaft, the shaft bearing nearest the pump impeller shall be locked in place so that end play is limited to the clearance within the bearing. 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 1-7/8" (48 mm) for motor frame sizes 213 through 286; 2-1/8" (54 mm) for motor frame sizes 324 and 326; and 3" (76 mm) for frame 364 and larger. The dimension from the lowest bearing to the top of the impeller shall not exceed 6". The motor shaft shall be directly connected to the impeller without the use of drive belts or couplings, which require alignment and maintenance, and which increase power consumption due to their inherent energy losses.

2. The oversized shaft incorporating oversized bearings and heavier bearing frame construction provides for extended mechanical seal, bearing and overall pump/motor life. Since the larger shaft with the specified minimum overhang is the key to heavier, more rigid construction throughout, no deviation from the specified shaft diameter or tolerances will be allowed.

3. 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. 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.

4. 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. Self-priming pumps are specifically unacceptable due to the need for suction check valves, air vent piping and the possibility of overheating and damaging the pump or producing steam or high temperatures in the pump, which may be a hazard to the operator, when the pump is run dry. The 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.

5. The pump shall be constructed so as to permit priming from the lower pressure area behind the impeller. Priming from high-pressure connections, which tends to cause solids to enter and clog the priming system, will not be acceptable. As an additional measure to prevent plugging, all passages in the priming system which contain liquid shall be at least equivalent to a 2-1/2" (64 mm) opening. The priming bowl shall be transparent, enabling the operator to monitor the priming level.

6. 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, so that any foreign object may be removed from the pump or suction line. Enclosed impellers must be used to avoid the necessity of wear plates and the associated costs of replacement and maintenance of wear plate clearances with semi-open impellers.

7. 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 that lubricates the mechanical seal 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, thereby preventing freezing and breakage of the seal during power outages in

sub-freezing temperatures.

8. 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 buildup. Use of cast-iron or other ferrous material for the seal housing, which will rust and damage the seal, shortening its life, will not be acceptable.

9. The pump volute shall be furnished with fronthead mounting adapters, bolted to the station floor for rigidity, and gasketed for a gas-tight seal.

B. IMPELLER

1. The pump impeller shall be of the enclosed mono-port type made of close-grained cast-iron and shall be in dynamic balance when pumping wastewater. Two (2) port impellers are specifically disallowed. The dynamic balance shall be obtained without the use of balance weights or liquid filled chambers. The impeller shall be designed to allow for the trimming of the impeller to meet design condition changes without altering the balance. The eye of the impeller as well as the port shall be large enough to permit the passage of a sphere 3" (76 mm) in diameter in accordance with nationally recognized codes. To further prevent clogging, the impeller port shall have a minimum area of 10.6 in^2 (6840 mm^2). 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. To prevent the buildup of stringy materials, grit and other foreign particles around the pump shaft, all impellers less than full diameter shall be trimmed inside the impeller shrouds. The shrouds shall remain full diameter so that close minimum clearance from shrouds to volute is maintained. Both the end of the shaft and the bore of the impeller shall be tapered to permit easy removal of the impeller from the shaft.

C. MOTORS

1. The pump motors shall be vertical, solid shaft, NEMA P-base, squirrel-cage induction-type, suitable for 3 phase, 60 Hz, 240 volt electric current and VFD rated. They shall have Class F insulation. Insulation temperature shall, however, be limited to Class B. The motors shall have normal starting torque and low-starting current, as specified by NEMA Design B characteristics. They shall be open drip-proof design with forced air circulation by integral fan. Openings for ventilation shall be uniformly spaced around the motor frame. Leads shall be terminated in a cast connection box and shall be clearly identified.

2. The motors shall have 1.15 service factor. The service factor shall be reserved for the owner's protection. 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 .005" (0.127 mm). The shaft runout shall not exceed .003" (0.076 mm).

4. The motor shaft shall equal or exceed the diameter specified under Pumps at all points from the drive end bearing to the top of the impeller hub.

5. 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.

6. The motor shall be fitted with heavy lifting eyes or lugs, capable of supporting the entire weight of the pump and motor.

7. The pump motors shall be Premium Efficiency type, VFD rated, 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

D. MAIN PIPING

1. The pump suction connections shall be drilled and tapped for a 125-pound American Standard flange for easy attachment of the suction risers. The discharge line from each pump shall be fitted with a clapper-type check valve and eccentric plug valve. Size, location and quantity of check valves and plug valves shall be as shown on the construction drawing. The check valve shall be of the spring-loaded type with external lever arm and an easily replaced resilient seat for added assurance against vacuum leaks. Check valves shall have stainless steel shaft with replaceable bronze shaft bushings. Ball-type check valves are specifically unacceptable for this application. An operating wrench shall be provided for the plug valves. All station piping and fittings shall be capable of passing a 3” (76 mm) spherical solid.

2. Protrusions through the station floor shall be sealed where necessary to effect sealing between the equipment chamber and the wet well. The suction and discharge connections, where they pass through the floor, shall be sealed by gaskets in order to prevent corrosive, noxious fumes from entering the station. Welded joints that do not allow adjustment or replacement will not be considered for this application. The pump station manufacturer shall extend the suction and discharge connections below the floor at the factory so that field connections can be made without disturbing the gas-tight seals. Once the station is installed, however, it shall be possible to remove the entire 4” or 6” suction pipes through the station floor without having to enter the wet well to unbolt them.

3. The manufacturer of the pump station shall provide a compression-type sleeve coupling for installation on the common discharge pipe. A minimum of two anchoring points shall be provided on the bottom of the station baseplate for attachment of coupling joint restraints, which shall be provided by the installing contractor.

E. VACUUM-PRIMING SYSTEM

1. A vacuum priming system shall be furnished to prime the main pumps. The system shall be as shown on the vacuum priming schematic and shall include two vacuum pumps, providing 100 percent standby. Vacuum pumps shall have corrosion-resistant internal components. The vacuum priming system shall be complete with large port vacuum

control solenoid valves, prime level sensor, float-operated check valves to protect the vacuum pumps, and all necessary shut-off valves as shown on the piping schematic. The float-operated check valves shall have a transparent body for visual inspection. All hoses and tubing used in the priming system shall be at least 3/8" nominal diameter. The air discharged from the vacuum pumps shall be piped into the wet well.

2. The vacuum pumps shall be mounted on adjustable extruded aluminum slotted rail supports and shall be operated through finger safe relays with a "push-to-operate" manual override feature.

3. The solenoid valves used in the vacuum priming system shall be of the high flow, direct acting brass body type, with threaded ports, NBR seals and 300 Series stainless steel plunger, rod, plate and springs. The minimum orifice diameter shall be 5/16" (8 mm). The solenoid valves shall be UL Listed, with Class F coil rating and of suitable voltage and thermal capacity for the application. The solenoid valve shall be capable of being disassembled without the use of special tools.

4. Liquid level in the pump priming chamber shall be monitored by a resonant frequency liquid level probe. At each measurement point the sensor shall take readings. Using a multi-variable sensing technology, collected over a spectrum sweep, the sensor shall create an outline of the medium, its residue and absence of medium. From these reference points the sensor shall be able to accurately determine the presence or absence of liquid, unaffected by foam, residue or deposits. The liquid level sensor algorithm shall provide prime status in less than 100 milliseconds.

5. The probe shall be provided with red and green light emitting diodes as a diagnostic tool to indicate connectivity, prime status or a fault condition. In addition, a magnetic key shall be provided to allow external operation of the unit for troubleshooting or for manual override. Systems utilizing an electrode, mechanical means such as a float, or that require any type of electrical or moving parts inside the priming chamber, which may accumulate debris, short-out, bind or fail will not be acceptable.

6. The priming system shall automatically provide positive lubrication of the mechanical seal each time a main pump is primed. To prevent excessive stoppage due to grease accumulation, no passageway in the priming system through which the pumped liquid must pass shall be smaller than the equivalent of a 2-1/2" opening.

7. The vacuum priming system shall have two field selectable modes of operation. In the "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. In the "Constant Prime" mode, both pumps are kept primed continuously, and ready to start immediately when called for.

F. COLD CLIMATE PACKAGE

1. The station shall be provided with a 1300/1500 watt, dual range auxiliary heater with automatic circulating fan, thermostat control and an On/Off switch. The auxiliary heater shall be plugged into the station's duplex receptacle. In addition, the fiberglass cover shall have a minimum of 1" thick urethane insulation, protected by fiberglass, with an "R" value of 7 or more. Also, the priming system shall be interlocked with the station temperature sensor so that, should the station ambient temperature fall below a pre-set

minimum, solenoid valves shall open the priming system to atmospheric pressure, when the pumps are not running, allowing the liquid in the pumps and piping to drain back into the wet well, preventing freezing.

G. ENVIRONMENTAL EQUIPMENT

1. A ventilating blower capable of delivering 245 CFM at 0.1" static water pressure shall be provided in order to remove the heat generated by continuous motor operation. The ventilating blower shall be turned On and Off automatically by the station controller. The temperature settings to operate the fan shall be adjustable using the interface display. 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. A 500-watt electric heater controlled by the station controller, shall be furnished. The temperature settings to operate the heater shall be adjustable using the interface display. The heater shall be rigidly mounted in the station to prevent removal.

2. A 3 KVA insulating-type transformer shall be provided to supply power for lights, controls and auxiliary devices. The transformer shall have 240 volt primary, 120 volt secondary, Class F insulation, with temperature rise not to exceed 115^{o}C above 40^{o}C ambient. The core and coil assembly shall be given a double dip and bake. The coil shall be protected by a metal housing to prevent damage. The transformer shall be protected by a separate circuit breaker on the supply side.

H. SUCTION SUPPORT KIT

I. To restrain and support the two 4" diameter suction pipes in the 5'-0" inside diameter wet well, a 6" 304L stainless steel horizontal support channel with 304L stainless steel adjustable end brackets and 316 stainless steel "U" bolts and mounting hardware, shall be provided for field installation by the Installing Contractor. It shall be anchored to the wet well wall by the Contractor, using the provided 316 stainless steel 5/8" wedge anchors, and adjusted to hold the suction pipes securely in a vertical position and minimize strain on the piping. The support shall be located 4' to 10' above the bottom of the vertical piping, as shown on the drawings

J. PROTECTED LIQUID FILLED COMPOUND PRESSURE GAUGES

1. A 4" Bourdon tube-type compound vacuum/pressure gauge with 3-1/2" (89 mm) dial, fitted with a brass stop valve and a manual air relief valve shall be provided for each pump. The gauges shall be mounted apart from the pumps, on a bracket attached to the control panel support structure, and connected to the pump discharge taps by flexible tubing to minimize vibration. 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 (1 bar) of vacuum. The dial shall be white with black markings and the gauge itself shall have an accuracy of 1% of scale. The gauge shall be American made, with a Zytel Nylon case with 1/2 blow-out plug, stainless steel bezel, acrylic lens and phosphorus bronze tube with brass socket. Each compound gauge shall be filled with a viscous fluid to dampen vibration and pulsation effects on the needle reading. Temperature compensation shall be provided by an internal compensating diaphragm. Gauges shall be protected from the service fluid by a Buna-N elastomer "boot" diaphragm within the stem, and the Bourdon tube and the space

between the Bourdon tube and the internal isolating diaphragm shall be filled with low temperature instrument oil, completely isolating the gauge components from the fluid being measured.

K. 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.

L. NON-MERCURY FLOAT SWITCHES

1. The level control float switches shall be of the mercury free design, Opti-Float optical float switch all mounted in a sealed plastic float housing, supported by a watertight cord. An external weight shall cause inversion on submergence. Optical floats are intrinsically safe as only a light is passing through the float.

2.08 CONTROLS

A. CONTROL PANEL

1. The control equipment shall be mounted in a NEMA Type 4X steel enclosure with two hinged, lockable doors and a steel barrier partition down the middle. One side of the divider shall house the three-phase circuits (motor starters and circuit protectors, etc.), and the other shall house the single-phase control circuits and low voltage components. The microprocessor and low voltage controls shall be accessible without exposing the three-phase high voltage supply, and the pump station controller shall be operable without opening the enclosure door.

2. The control panel shall be supported on adjustable, extruded aluminum mounting legs, secured to the station baseplate. The slotted legs shall also serve as mounting points for auxiliary items, such as the vacuum priming subassembly.

3. All components within the control panel shall be UL listed or recognized, and the complete station control panel itself shall be labeled as a UL 508A General Use Industrial Control Panel. The electrical equipment in the panel shall be protected by a surge protective device.

4. To facilitate wire tracing and servicing, the control wiring shall be run in enclosed wireways, with removable covers, rather than tied up in bundles.

5. Control relays up to 6-amp capacity shall be the modular, plug-in type, with integral LED indicating lights to show activation. Larger control relays and vacuum pump contactors shall be enclosed to be “finger safe”.

6. A duplex GFI protected convenience outlet shall be provided in the station for operation of 120-volt AC devices.

7. Thermal magnetic air circuit breakers shall be provided for branch disconnect service and short-circuit protection of all auxiliary circuits, and motor circuit protectors with lockout capability shall be provided for each pump motor. Only instantaneous trip magnetic type motor circuit protectors, matched to the motor inrush current, shall be used for the motor circuits, for added protection from low-level faults. Thermal magnetic circuit breakers

will not be allowed for pump motor service.

8. Magnetic across-the-line starters with 24-volt coils and solid-state overload protection for each phase shall be provided for each pump motor to give positive protection against phase unbalance, thermal overload, phase loss and ground fault. To provide the fastest trip speed and for ground fault protection, only solid-state overload protection will be used, and motor starters using heater coils will not be acceptable. Each single-phase auxiliary motor shall be equipped with an over-current protection device in addition to the branch circuit breaker, or shall be impedance protected. All wiring shall be labeled with thermal transfer self-laminating labels and a coded wiring diagram shall be provided.

9. Individual NEMA 4 oil-tight Hand-Off-Automatic selector switches shall be provided for each pump. The switches shall be 3-position rotary-type with spring return on the Hand position, and mounted on the top of the station control panel for easy access from either side.

B. CONTROL SYSTEM

1. To control the operation of the pumps with variations of liquid level in the wet well, and monitor the station control, environmental and alarm functions, a specially preprogrammed, dedicated PLC-based control system shall be provided. The controller shall interface with the wet well level transducer, panel display unit, motor starters, environmental system, accessories and alarm functions through isolated digital and analog input and output ports as required. The digital controls shall operate on 24 volts or less, to eliminate shock hazard. The 24-volt power supply shall be overload protected to be “crowbar safe” and will return to operation when a short is removed. Program integrity shall be maintained by battery-backed RAM.

2. A NEMA 4 rated display unit shall be mounted through the front of the panel to provide operator input to and visual output from the PLC controller. This interface shall be a 7” (178 mm) wide screen graphic interface with DSTN 65K-color Liquid Crystal Display with backlighting and resistive-type touch screen, for data input and programming.

3. The display shall have a “sleep” feature to prolong screen life. A minimum of 11 (eleven) menu screens shall be available for display and management of pump and station control functions including, but not limited to:

   a. General alarm indication
   b. Individual alarm indicators for each alarm function (with time and date)
   c. Lead pump indication
   d. Alarm silencing
   e. Digital indication of air temperature
   f. Digital and graphical indication of wet well level
   g. Digital indication of elapsed run time for each pump
   h. Digital indication of elapsed run time for parallel pump operation
   i. Digital indication of level control and alarm settings
   j. Date & time indication with set time functionality
   k. Heater/blower running indication
   l. Alarm logging, coded for “time active” or “return time“ time cleared for the last 500 events by date and time

m. Wet well simulation
n. Prime mode selection

4. The control system shall be designed to allow alternation of the pumps by either a time clock or alternation at the end of each pumping cycle. Selection of the alternation method and setting of the interval for timed alternation shall be easily done without opening the panel. The panel display shall indicate which pump is currently the lead pump.

5. A resistance temperature device (RTD) shall be provided to monitor the ambient temperature in the pump station, and to control the operation of the ventilation blower and the 500-watt station heater.

6. The liquid level in the wet well shall be monitored by a submersible hydrostatic pressure transducer with stainless steel sensor diaphragm, providing a 4-20 mA signal to the pump control unit. The body of the transducer shall be made of 316 stainless steel. The transducer shall have dual arrestor technology for lightning and surge protection. The pressure transducer shall have a permanent hermetically sealed connection to a polyurethane cable, which shall support the transducer 12" (300 mm) from the bottom of the wet well, and shall pass through a cord grip seal in the station base. The pressure transducer unit shall be rated for wastewater or potable water service.

7. The digital pump controller shall take the signal from the level transducer and provide a continuous readout of the wet well level in feet and tenths of a foot, through the panel display unit. It shall also be the means of setting the pump on and off points and alarm levels. As a minimum, the controller shall be capable of digitally setting "On" levels for lead and lag pumps, an "Off" level, and alarm levels. Provisions shall be made for the pumps to operate in parallel should the level in the wet well continue to rise above the starting level for the low-level pump.

8. Two (2) displacement switches shall be provided to automatically operate the pump in back-up mode, in case of failure of the digital control system or the submersible level transducer. The back-up system shall be entirely independent of the digital system. A 30' (9 m) color-coded 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. The displacement switch cords and the cable for the submersible pressure transducer shall enter the wet well through cord grip seals mounted to a removable, gasketed floor plate. The floor plate shall allow the displacement switches and transducer to be adjusted or removed and replaced without having to enter or reach into the wet well.

PART 3 EXECUTION

3.01 EXAMINATION

A. Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage. Station manufacturer shall provide written instruction for proper handling. Immediately after off-loading, contractor shall inspect complete pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in written claim with shipper prior to accepting delivery. Validate all station serial numbers and parts lists with shipping documentation. Notify the manufacturer's

representative of any unacceptable conditions noted with shipper.

3.02 INSTALLATION

A. Install, level, align, and lubricate pump station as indicated on project drawings. Installation must be in accordance with written instructions supplied by the manufacturer at time of delivery.

B. Suction pipe connections are vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump station piping. Install and secure all service lines level control as required in wet well.

C. Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

D. Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

3.03 FIELD QUALITY CONTROL

A. Operational Test

1. Prior to acceptance by owner, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition; and conforms to the specified operating characteristics.

2. After construction debris and foreign material has been removed from the wet well, contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

B. Manufacturer’s Start-up Services

1. Coordinate station start-up with manufacturer’s technical representative. The representative or factory service technician will inspect the completed installation. He will calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.04 CLEANING

A. Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

3.05 PROTECTION

A. The pump station should be placed into service immediately. If operation is delayed, drain water from pumps and piping. Open motor circuit breakers and protect station controls and interior equipment from cold and moisture. Station is to be stored and maintained per manufacturer's written instructions.

3.06 CERTIFIED CURVES

A. Factory certified performance test curves shall be provided for the pumps, tested after installation in the station, to stimulate actual operating conditions. Copies of these curves, showing head, flow, BHP, efficiency, and the back-up data, shall be provided with the station. 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.

3.07 SPARE PARTS

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

B. A spare 24v DC control power supply unit shall be provided to be available as an emergency replacement.

C. 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: purpose and location of the mechanical seal, signs of a defective mechanical seal, how to remove the mechanical seal, troubleshooting seal failure causes, seal components, required tools, how to reinstall the seal, and how to place the pump back into service. The video shall include footage of an actual seal replacement

END OF SECTION