SPECIFICATION
FACTORY-BUILT CAPSULAR®
WET WELL MOUNTED VACUUM-PRIMED PUMP STATION

GENERAL

The contractor shall furnish and install one factory-built, automatic **CAPSULAR®** Wet Well Mounted Vacuum-Primed Pumping Station as manufactured by Smith & Loveless, Inc., Lenexa, Kansas. The station shall be complete with all equipment factory-installed in a recessed, welded steel structure with fiberglass housing. Dimensions shall be as shown on the drawings.

The principal items of equipment shall include ___ vertical, motor driven, vacuum-primed, non-clog pumps; valves; internal piping; central control panel with circuit breakers; motor starters and automatic pumping level controls; heater; ventilating blower; priming pumps with **SONIC START®** pump prime detection system and appurtenances; and all internal wiring.

OPERATING CONDITIONS

OPTION A – PUMPS CONNECTED IN PARALLEL [DELETE THIS LINE FROM FINAL SPEC]

Each pump shall be capable of delivering ___ GPM of raw water or wastewater against a total dynamic head of __'. The minimum acceptable pump efficiency at this condition shall be ___%. Due to the energy conservation requirements, the minimum efficiency will be enforced. The maximum allowable speed shall be ___ RPM. The minimum rated horsepower of each pump motor shall be ___. The maximum static suction lift shall be ___'.

___ pumps operating in parallel shall deliver a combined capacity of ___ GPM at __' TDH.

___ pumps operating in parallel shall meet the design conditions of the station with the ____ unit acting as standby.

All openings and passages shall be large enough to permit the passage of a sphere 3" in diameter. The anticipated operating head range is from ___' minimum to ___' maximum. The pump motors shall not be overloaded beyond their nameplate rating, at the design conditions, or at any head in the operating range.

OPTION B – PUMPS CONNECTED IN SERIES [DELETE THIS LINE FROM FINAL SPEC]

Each pump shall be capable of delivering ___ GPM of raw water or wastewater against a total dynamic head of __'. The minimum acceptable pump efficiency at this condition shall be ___%. Due to the energy conservation requirements, the minimum efficiency will be enforced. The maximum allowable speed shall be ___ RPM. The minimum rated horsepower of each pump motor shall be ___. The maximum static suction lift shall be ___'.

Two (2) pumps operating in series shall deliver ___ GPM at __' TDH.

All openings and passages shall be large enough to permit the passage of a sphere 3” in diameter. The anticipated operating head range is from ___' minimum to ___' maximum. The pump motors shall not be overloaded beyond their nameplate rating, at the design conditions, or at any head in the operating range.

PUMP CHAMBER

The pump chamber shall contain all pumps and other equipment and shall be shaped as shown on the drawings. The clear height inside the chamber from floor to ceiling, available maintenance area and all dimensions shall be as shown on the drawings.

The base of the station shall be adequately reinforced to prevent deflection. The thickness of the steel plate shall be a minimum of 3/8" and shall meet or exceed ASTM A-36 specifications.

A 2'-0" x 6'-7" door way shall be provided for personnel access and a 3'-0" x 3'-0" removable cover shall be installed in the top of the fiberglass housing, near the doorway to provide for removal of the main pumping units. Lifting stanchions shall be provided to facilitate removal of the pump rotating assemblies.

A sump with walls of 1/4" structural-grade steel plate shall be provided where shown on the drawings.

❑ DURO-LAST® Corrosion-Resistant Stainless Steel Baseplate [Optional Item. Designer Check If Required]

The baseplate of the pump station structure shall be fabricated of corrosion-resistant lean duplex series 2100 stainless steel alloy, 316L stainless steel or equal. The stainless steel shall have a Pitting Resistance Equivalent Number (PRE_N) of 24.0 or greater and general corrosion resistance shall be less than or equal to 0.1 mm per year in 15% H_2SO_4 at 120 degrees F. Due to the corrosion resistance requirements, Grade 304-304L is not acceptable.

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

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.

STRUCTURAL DESIGN

The manufacturer shall assume full responsibility for the adequacy of the pump station structure. He shall determine the size of all members, their placement and attachment to the structure. He shall determine the thickness of fiberglass housing, structural steel base and shell and the reinforcement required.

All steel structural members shall be joined by electric arc welding with fillets of adequate section for the joint involved. Where required, to exclude groundwater or for structural reasons, such welds shall be continuous and watertight. All other external gaps in welding shall be filled with structural adhesive to exclude groundwater.

INTERIOR CLEARANCES

The station floor plan dimensions must equal or exceed those shown on the drawings to provide adequate access for inspection and maintenance. All main pumps must be accessible without climbing over piping or accessory items. Adequate room between components shall be provided for pump disassembly and other maintenance.

The clear dimensions shown on the drawings must be equaled or exceeded. All floor area must be on one level. Access platforms or walkways are not acceptable.

PROTECTION AGAINST CORROSION

All structural steel surfaces shall be factory blasted with steel grit to remove rust, mill scale, weld slag, etc. All weld spatter and surface roughness shall be removed by grinding. Surface preparation shall comply with SSPC-SP6 specifications. Immediately following cleaning, a single 6-mil dry film thickness of **VERSAPOX®** epoxy resin shall be factory applied. This finish coating shall be as formulated by Smith & Loveless for abrasion and corrosion resistance.

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

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

MAIN PUMPS

The pumps shall be (4") (6") (8") 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" for motor frame sizes 213 through 286; 2-1/8" for motor frame sizes 324 and 326; and 3" for frame 364 and larger. The dimension from the lowest bearing to the top of the impeller shall not exceed 6".

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.
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.

The pump shall have an 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.

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

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.

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 which 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.

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

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

[NOTE TO DESIGNER: SELECT ONE OF THE FOLLOWING PUMP TYPE PARAGRAPHS, A OR B, AND DELETE THE OTHER. CHECK PUMP CURVES FOR PROPER APPLICATION]

A. NON-CLOG TWO-PORT IMPELLER (4", 6", 8" PUMP OPTION)

The pump impeller shall be of the enclosed two-port type made of close-grained cast iron and shall be balanced. The eye of the impeller as well as the ports shall be large enough to permit the passage of a sphere 3" in diameter in accordance with nationally recognized codes. The impeller shall be keyed with a stainless steel key and secured to the motor shaft by a stainless steel capscrew equipped with a Nylock or other suitable self-locking device. The impeller shall not be screwed or pinned to the

motor pump shaft and shall be readily removable without the use of special tools. 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.

B. X-PELLER® SUPER CLOG-RESISTANT MONO-PORT IMPELLER (4" & 6" PUMP OPTION)

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 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" 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. 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.

MOTORS

The pump motors shall be vertical, solid shaft, NEMA P-base squirrel-cage induction type, suitable for _ phase, __ cycle, ___ volt electric current. 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.

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, or at any head in the operating range as specified under Operating Conditions.

The motor-pump shaft shall be centered, in relation to the motor base, within .005". The shaft run-out shall be limited to .003".

The motor shaft shall equal or exceed the diameter specified under "main pumps", at all points from immediately below the top bearing to the top of the impeller hub.

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.

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

[NOTE TO DESIGNER: CHOOSE FROM THE FOLLOWING MOTOR OPTIONS, IF REQUIRED. DELETE IF NOT REQUIRED]

A. SUPER DUTY MOTORS

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

B. IMMERSIBLE PUMP MOTORS

The pump motors shall be of special construction and fitted with special seals to enable the motor to be immersed in up to 30' of water for a period of up to three weeks, without water entering the motor cavity. As part of the immersible motor package, a float switch shall be provided in the station to provide indication of water approaching the level of the motors and another float switch shall shut down the motors when the water level reaches them. Each of these floats shall signal alarms and activate alarm lights on the control panel. The alarms shall remain activated until manually reset by switches on the panel. In addition, moisture detectors and high temperature thermostats shall be provided in each motor, as a backup, to shut down the associated pump and to signal alarm conditions and activate alarm lights on the control panel. All of these alarm contacts shall be wired to a terminal strip in the control panel for connection to the Owner's alarm system.

PUMP OPERATION

OPTION A – PUMPS CONNECTED IN PARALLEL [DELETE THIS LINE FROM FINAL SPEC]

Starting from a low wet well with all pumps in the "off" position, the general scheme for pump sequencing is as follows:

When the wet well rises to the low level on position, the lead pump shall start. If the flow into the wet well exceeds the capacity of the lead pump, the wet well will rise to a higher elevation, and the lag pump shall then come on and operate in parallel with the lead pump. If more than two pumps are required, and the flow into the wet well exceeds the capacity of the lead pump and lag pump operating together, the wet well will continue to rise to an even higher elevation, and the next pump shall then come on operating in parallel with the lead pump and lag pump. As the rate of flow to the wet well decreases and the wet well level drops, the reverse sequence to the above shall occur.

This general scheme for sequencing of the pumps shall apply regardless of the number of pumps specified on the drawings.

OPTION B – PUMPS CONNECTED IN SERIES [DELETE THIS LINE FROM FINAL SPEC]

Starting from a low wet well with all pumps in the "off" position, the pump operation sequence is as follows:

When the wet well rises to the low level on position, the lead pump-set shall start. If the flow into the wet well exceeds the capacity of the lead pump-set, the wet well will rise to a higher elevation, and the lag pump-set shall then come on and operate in parallel with the lead pump-set.

As the rate of flow to the wet well decreases and the wet well level drops to the low level off position, all pumps will stop.

CONTROLS

The control equipment shall be mounted within a NEMA Type 1 steel enclosure with a hinged access cover. The circuit breakers and control switches shall be operable without opening the access cover.

A grounding type convenience outlet shall be provided on the side of the cabinet for operation of 115-volt AC devices.

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

Magnetic across-the-line starters with under-voltage release and overload coils for each phase shall be provided for each pump motor to give positive protection. Each single-phase auxiliary motor shall be equipped with an over-current protection device, in addition to its branch circuit breaker, or shall be impedance protected. All switches shall be labeled, and a coded wiring diagram shall be provided.

❑ (OPTIONAL ITEM – CHECK IF REQUIRED)
SINGLE-PHASE 120-VOLT POWER TRANSFORMER [DESIGNER: A STATION-MOUNTED CONTROL POWER TRANSFORMER IS REQUIRED FOR ALL STATIONS UNLESS A SEPARATE 1/60/120 SUPPLY FROM A SEPARATE TRANSFORMER (NOT A PHASE-TO-NEUTRAL TAP FROM THE 3-PHASE SUPPLY) IS AVAILABLE. SELECT FROM FOLLOWING CHART:]

Suction Pipe Size	Aux. Heater	Min. Transformer Size
4”	No	3 KVA 208v
4”	No	3 KVA 230/460v
4”	Yes	5 KVA 208/230/460v
6” or 8”	No	5 KVA 208/230/460v
6” or 8”	Yes	7.5 KVA 208/230/460v

A (3) (5) (7.5) KVA insulating-type transformer shall be provided to supply power for lights, controls and auxiliary devices. The transformer shall have 240/480 volt primary, 120/240 volt secondary, Class F insulation, with temperature rise not to exceed 115°C above 40°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.

[NOTE TO DESIGNER: SELECT ONE OF THE FOLLOWING LEVEL CONTROL SYSTEM PARAGRAPHS, A or B, AND DELETE THE OTHER.]

A. FLOAT SWITCH LEVEL CONTROLS

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

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

Provisions shall also 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.

B. PUMPLOGIX™ MICROPROCESSOR LEVEL CONTROL SYSTEM

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 pressure transducer shall have a permanent hermetically sealed connection to a polyethylene insulated cable, which shall support the transducer 6” 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, and for operation in explosion hazardous areas.

Three (3) 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’ 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.

To control the operation of the pumps with variations of liquid level in the wet well, and the high and low water alarm functions, a specially preprogrammed, dedicated microprocessor-based control system shall be provided. The controller shall interface with the wet well level transducer, integral panel display unit, motor starters, and alarm functions 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.

To reduce exposure to corrosive environments and ensure the control system's reliable, long-term operation, the controller shall have a sealed, user-friendly, graphical interface. The interface shall be comprised of a rotary knob, switches and five (5) columns of ultra-bright, daylight-viewable red LED's. Four (4) 40-segment, 4" columns of LED's shall show the wet well level, the pump on and off control bands, and the high and low alarm setpoint bands. All LED's within a control band shall be illuminated when operating under normal power. A fifth LED column shall indicate the controller's configuration, status, and active alarms. Alarms shall consist of high alarm, low alarm and input signal out of range. Monitor functions shall include control power and normal system operation. Discrete LED's shall show the activation of the differential pump control stages.

The controller shall provide easy, convenient indication and adjustment of the operating setpoints and controller configuration without the need for tools. For ease of operation and configuration, multiple indicating columns are required. Controllers that provide fewer columns; thus, limiting the viewing of relevant and necessary station information, are specifically precluded by this specification.

The pump control circuits shall be forced OFF by power loss. Upon power restoration, the controller shall enable the pumps in an adjustable time-step sequence as required to meet the demand.

The controller shall continuously indicate the status of the selected alternation sequence and control modes. The controller shall provide 1st On/1st Off, Fixed and Auto Rotate alternation sequences.

Integral span, offset and damping adjustments shall be easily adjustable. The controller shall have a configurable security lockout feature.

The controller shall contain a level simulation function that allows manual manipulation of the displayed process variable. While simulating, the controller shall display both the actual wet well level and the simulated level.

The controller shall contain an RS-232 communication port and have capabilities for connection to a SCADA (Supervisory Control and Data Acquisition) system using Modbus® protocol. The complete assembly shall be designed for use in UL508 Industrial Control Panels.

It is the specific intention of this functional requirement that a controller shall be provided with features as described herein. Additionally, this controller shall be a fully integrated assembly. That is, the furnishing of similar functions using multiple setpoint modules, a custom-configured programmable logic controller (PLC) or extensive relay/timer logic to accomplish control sequences, etc., is specifically precluded by this specification and is not acceptable.

Provisions shall also 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.

HIGH WET WELL LEVEL ALARM

An adjustable displacement switch shall be provided to sense a high water level condition. The switch shall hang into the wet well, and shall activate a contact to indicate the high water condition.

RUNNING TIME METER

A running time meter shall be supplied for each pump to show the number of hours of operation. The meter shall be enclosed in a dust and moisture-proof molded plastic case. The flush-mounted dial shall register in hours and tenths of hours up to 99,999.9 hours before repeating. The meter shall be suitable for operation from a 115-volt, 60-cycle supply.

PUMP FAILURE TO PRIME OR FAILURE TO PUMP ALARM (CHECK VALVE SWITCH TYPE)

To sense failure to deliver normal flow for any reason, including failure to prime, each pump shall be provided with a sealed sensor switch mounted in a protective ABS enclosure. The enclosure shall be mounted with an adjustable universal mounting bracket to the external arm of each discharge check valve. The mounting bracket shall allow the adjustment of the sensor switch with a single locking pivot adjustment. A red LED indicating light shall be provided on each switch unit to facilitate accurate setting of the switch for proper operation. The sensor switch shall monitor the movement of the check valve arm and thereby detect failure of the pump to deliver normal operating flow when called on to run. An auxiliary time delay relay shall be provided to prevent an alarm signal during the pump priming and startup period.

❒ [OPTIONAL ITEM. CHECK IF REQUIRED] TEST UNIT WITH BATTERY FOR MULTI-SENSOR CHECK VALVE SWITCH [FOR USE WITH RELAY LOGIC CONTROLS. NOT REQUIRED WITH PROTRONIX® II OR PUMPLOGIX™ CONTROLLERS]

To test or set the multi-sensor check valve switches using the built-in LED light with Relay Logic control systems, a separate hand held battery pack with connecting cord and plug shall be provided. This is to enable the operator to accurately set the trip point of the switch manually, by means of the built-in test light on the multi-sensor.

VACUUM-PRIMING SYSTEM

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 one vacuum pump for each main pump, 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, **SONIC START®** 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 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”. The solenoid valves shall be UL Listed, with Class F coil rating and of suitable voltage and thermal capacity for the application.

Liquid level in the pump priming chamber shall be monitored by a **SONIC START®** resonant frequency liquid level probe. The probe shall be equipped with a piezoelectric drive and sensitive circuits to detect frequency shifts when the probe is covered by liquid. The probe shall be completely sealed and have a 316L stainless steel housing for corrosion resistance. It shall be provided with a wiring connector molded of PolyPhenylSulfone, an amorphous high performance thermoplastic for impact and chemical resistance. The probe shall have a plug-in connector to facilitate easy removal.

The **SONIC START®** probe shall be provided with light emitting diodes. This diagnostic tool shall indicate connectivity, prime status or a fault condition. Systems utilizing an electrode, mechanical means such as a float, or that require any type of electrical or moving parts inside the priming chamber, which may accumulate debris, short out, bind or fail will not be acceptable.

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.

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.

ENVIRONMENTAL EQUIPMENT

A ventilating blower shall be provided, capable of delivering 250 CFM at 0.1" static water pressure, in order to remove the heat generated by continuous motor operation. The ventilating blower shall be turned on and off automatically by a pre-set thermostat.

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

Minimum lighting, consisting of twin 40-watt fluorescent lamp fixtures as shown on the plans shall be provided for the convenience and safety of the operator. The lighting shall provide illumination for all areas in the station.

DEHUMIDIFIER

A dehumidifier assembly with hermetically sealed Freon refrigeration-type compressor, expansion coil, fan and condenser coil shall be furnished to maintain the relative humidity of the air in the pump chamber low enough to prevent condensation on the walls.

The moisture removing capability of the dehumidifier will vary with the temperature and relative humidity within the station.

The minimum capacity rating at 80°F shall be 15.5 pints per day at 68% relative humidity. The maximum capacity at 80°F shall be 25 pints per day at 90% humidity. The dehumidifier shall be controlled automatically by an adjustable humidistat.
The dehumidifier shall be located above the floor level, and the condensate shall be drained to the sump.

SUMP PUMP

A submersible sump pump with close-coupled, vertical motor shall be installed in the sump, as shown on the drawings. The sump pump shall have a minimum capacity of 1000 GPH at design head. A mechanical seal on the shaft shall exclude liquid from the motor housing.

The sump pump shall be controlled automatically by a built-in float switch, capable of operation on a 5" differential. The sump pump shall provide with double check valves, and a gate valve within the pump chamber.

WET WELL VENTILATION BLOWER

A ventilating blower sized to deliver _____ CFM shall be mounted on the baseplate of the station to provide ventilation for the wet well. The blower shall be controlled by an adjustable timer with manual override to blow air into the wet well. An exhaust opening shall also be provided to vent the wet well.

MAIN PIPING

The pump suction shall be drilled and tapped for a 125-pound American Standard flange for ready connection of the suction riser. The discharge line from each pump shall be fitted with a clapper-type check valve. 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 a stainless steel shaft with replaceable bronze shaft bushings, and shall be sealed with an adjustable Teflon seal.

Plug valves shall be provided, as shown on the drawings. They shall be capable of isolating any of the main pumps from the force main. A valve-operating handle shall be included.

All protrusions through the floor plate shall be gas-tight where necessary to effect sealing between the equipment chamber and the wet well; in order to prevent corrosion, noxious fumes from entering the station. The pump station manufacturer shall extend the suction connections below the floor plate at the factory, so that field connections can be made without disturbing the gas-tight seals.

The manufacturer of the pump station shall provide a compression-type sleeve coupling for installation in the common discharge pipe. Provisions shall also be made for tying the coupling to the station floor plate.

The attached pump specification and checklist must be met in total. There are many reasons for incorporating a good pump specification. For example, the stainless steel shaft with tapered impeller attachment is provided to minimize corrosion, extend seal life, and provide ease of impeller removal and seal replacement without the use of a wheel puller. All items specified are for long life, durability and maintainability of the pumping equipment. Deviations from the pump specifications will not be allowed.

A checklist is also provided to insure that the proper pumping system is provided to the owner.

FACTORY TESTS

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

Factory test instrumentation must include flow measuring with indicator; compound suction gauge; bourdon tube type discharge pressure gauge; electrical meters to measure amperes, volts, kilowatts and power factor; speed indicator and a vibrometer capable of measuring both amplitude and frequency.

SPARE PARTS

A complete replacement pump shaft seal assembly shall be furnished within the 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.

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.

INSTALLATION AND OPERATING INSTRUCTIONS

Installation of the pump chamber shall be done in accordance with written instructions provided by the Manufacturer.

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

STARTUP

The manufacturer shall provide the services of a factory-trained representative for a maximum period of one day on site to perform initial startup of the pump station, and to instruct the owner's operating personnel in the operation and maintenance of the equipment.

WARRANTY

The manufacturer of the station shall warrant for one (1) year from date of start-up, not to exceed eighteen (18) months from date of shipment, that the structure and all equipment he provides will be free from defects in material and workmanship.

Warranties of the suppliers of various components in lieu of a single source responsibility by the Manufacturer will not be accepted. The Manufacturer shall assume prime responsibility for the warranty of the station and all components.

In the event a component fails to perform as specified or is proven defective in service during the warranty period, the Manufacturer shall repair or replace, at his discretion, such defective part. He shall further provide, without cost, such labor as may be required to replace, repair or modify major components such as the steel structure, main pumps, main pump motors and main piping manifold. After start-up service has been performed, the labor to replace accessory items such as the blower, priming pumps, alternator, etc., shall be the responsibility of others.

The repair or replacement of those items normally consumed in service, such as seals, grease, light bulbs, etc., shall be considered as part of routine maintenance and upkeep.

It is not intended that the Manufacturer assume responsibility for contingent liabilities or consequential damages of any nature resulting from defects in design, material, workmanship or delays in delivery, replacement or otherwise.

MANUFACTURER'S INSURANCE

All equipment manufacturers, either direct or subcontractors to the general or mechanical contractors, SHALL HAVE in effect at TIME OF BID, CONTRACT AWARD, CONTRACT PERFORMANCE, and WARRANTY TERM, PRODUCT AND COMPREHENSIVE LIABILITY INSURANCE, INCLUDING SUDDEN AND ACCIDENTAL POLLUTION COVERAGE in the amount of FIVE MILLION DOLLARS, $5,000,000 through an insurance company with a minimum rating of A+ (SUPERIOR) XV according to the BEST'S INSURANCE REPORTS. All policies must be written on an OCCURRENCE BASIS. Policies written on a CLAIMS MADE BASIS are not acceptable. A typical CERTIFICATE OF INSURANCE attesting to the specified coverage issued by the responsible carrier naming the ENGINEER OF RECORD and the OWNER as ADDITIONAL INSURED, must be presented to the named additional insured prior to contract award. A FAILURE TO COMPLY with this requirement BY THE BIDDER will require DISQUALIFICATION of the BID and CONTRACT AWARD.

MANUFACTURED EQUIPMENT
OPTION 1 (STANDARDIZATION) [DELETE THIS LINE FROM FINAL SPEC TEXT]

The specifications and drawings detail Smith & Loveless equipment and represent the minimum standard of quality for both equipment and materials of construction. The contractor shall prepare his bid on the basis of the particular equipment and materials specified for the purpose of determining the low bid.

The owner has standardized on the named equipment in order to optimize their operation, maintenance, and safety programs, provide for interchangeability of costly equipment items, reduce stocking levels required for necessary spare parts and provide increased flexibility in the utilization of their pumping stations. Equipment substitutions, since incompatible with the districts standardization program, will not be considered.

OPTION 2
(BASE BID WITH BID SUBMITTAL) [DELETE THIS LINE FROM FINAL SPEC]

The specifications and drawings detail Smith & Loveless equipment and represent the minimum standard of quality for both equipment and materials of construction. The contractor shall prepare his bid on the basis of this equipment for the purpose of determining the low bid without consideration of a possible substitute.

Substitution of other makes may be considered if the equipment proposed for substitution is superior or equal in quality and efficiency to the standards of quality named in the specifications, and this is demonstrated to the satisfaction of the engineer.

Contractors wishing to offer a deduct for substitute equipment shall include the following submittal information with their proposal.

BID SUBMITTAL (APPLICABLE TO OPTION 2)

This submittal shall include all necessary information for the proper determination of the acceptability of the proposed substitution and shall not necessarily be limited to the following.

A. Complete description of the equipment, system, process, or function, including a list of system components and features, drawings, catalog information and cuts, manufacturer's specifications, including materials description.
B. Performance data and curves, and horsepower requirements.
C. Outside utility requirements, such as water, power, air, etc.
D. Functional description of any internal instrumentation and control supplied including list of parameters monitored, controlled, or alarmed.
E. Addresses and phone numbers of nearest service centers and a listing of the manufacturers or manufacturer's representatives services available at these locations, including addresses and phone numbers of the nearest parts warehouses capable of providing full parts replacement and/or repair services.
F. A list of five installations in the state where similar equipment by the manufacturer is currently in similar service; include contact name, telephone number, mailing address of the municipality or installation, engineer, owner, and installation contractor; if five installations do not exist, the list shall include all that do exist, if any.
G. Detailed information on site, architectural, structural, mechanical, plumbing, electrical, and control, and all other changes or modifications to the design and construction work necessary to adapt the equipment or systems to the arrangement shown and/or functions described on the drawings and in the technical specifications. This shall include plan view and section sketches illustrating any additional space requirements necessary to provide the minimum adequate clear space within and around the equipment for operation and maintenance, as shown on the Drawings and specified.
H. All differences between the specifications and the proposed substitute equipment shall be clearly stated in writing under a heading of "differences"'.
I. Other specific submittal requirements listed in the detailed equipment and material specifications.
J. A completed and signed copy of the "Pump Station Certification Affidavit" which follows.

EVALUATION

Approval of the substitution to bid as an alternate shall in no way relieve the contractor from submitting the specified shop drawings for approval or complying fully with all provisions of the specifications and drawings.

If substituted equipment is accepted, the contractor shall, at his own expense, make any changes in the structures, piping, electrical, etc. necessary to accommodate the equipment. If engineering is required due to substitution of alternate equipment, the contractor shall pay for all engineering charges.

To receive final consideration, copies of the manufacturers' quotations for the equipment may be required to document the savings to the satisfaction of the engineer. It is the intent that the owner shall receive the full benefit of the savings in cost of equipment and the contractor's bid price shall be reduced by an amount equal to the savings. In all technical and other evaluations, the decision of the engineer is final.

TYPICAL BID FORM
[ADD TO BID FORM AS APPLICABLE TO ABOVE SELECTED OPTION]

OPTION 1

For reasons of standardization, bids shall be based on the named equipment. Alternate bids will not be allowed.

OPTION 2

The bid shall be based on the named equipment. Alternate/substitute equipment may be offered as a deduct, provided all conditions of the "manufactured equipment" section are met.

Alternate/substitute manufacturer _____

Deduct $ _____.

PUMP STATION CERTIFICATION AFFIDAVIT

(Two-Port Impeller)

A submittal to the owner by manufacturers proposing alternate, unnamed pump stations will be required with their bid. Included in the submittal shall be detailed drawings and specifications on the proposed pump station. The bid submittal shall include the following completed checklist signed by an officer of the company.

	YES	NO
Close-coupled pump design - no motor to pump shaft coupling		
Pump shaft diameter of _____ minimum through seal		
Full diameter impeller shrouds		
Stainless steel pump shaft with tapered shaft to impeller fit		
Maximum pump shaft overhang of 6"- lower bearing to impeller		
Bronze seal housing		
Minimum pump efficiency at design point of _____ GPM of _____ %		
Impeller eye and ports pass a 3" sphere		
Class F motor insulation with Class B max motor temperature rise and 1.15 service factor		
Motor shaft run-out 0.003" max at end of shaft		
Motor shaft centered to motor base with 0.005"		
Locked lower bearing and floating upper bearing		
One-piece motor adapter/backhead		
Motor HP of _____ at _____ RPM		
Complete pump station factory tested on a wet well		
Priming from low pressure area behind the impeller		
Resonant frequency pump prime detection system		
Transparent priming bowl for operator monitoring		
Hollow priming adapter for positive seal lubrication		
Completely separate priming system for each pump		
Minimum 2-1/2" equivalent opening in priming passageways		
All other items for the station, as specified with minimum sizes, capacities and materials indicated		
Product liability insurance, $5 million per specification		
Structure blasted with steel grit in environmentally controlled booth prior to coating with epoxy resin		

The consulting engineer shall be the sole judge of whether the proposed equipment is acceptable. The manufacturer shall have the responsibility of submitting sufficient information in one submission. Incomplete or inaccurate submittal data shall be cause for rejection of the proposed equipment.

By signing this affidavit, the officer of the company has stated 100% compliance with the plans and specifications and further states he will supply or pay for all deficiencies found in the job submittals or after the unit is installed. The consulting engineer shall be the sole judge regarding compliance with the plans and specifications and shall be sole judge on the amount of moneys required if any deficiencies are found, related to, but not limited to, a 20-year station design life.

_____
Signature of Company Officer

Corporate Seal
(Notarized)

_____
Title

PUMP STATION CERTIFICATION AFFIDAVIT

(**X-PELLER®** Mono-Port Impeller)

A submittal to the owner by manufacturers proposing alternate, unnamed pump stations will be required with their bid. Included in the submittal shall be detailed drawings and specifications on the proposed pump station. The bid submittal shall include the following completed checklist signed by an officer of the Company.

	YES	NO
Close-coupled pump design - no motor to pump shaft coupling		
Pump shaft diameter of _____ minimum through seal		
Full diameter impeller shrouds		
Stainless steel pump shaft with tapered shaft to impeller fit		
Maximum pump shaft overhang of 6"- lower bearing to impeller		
Bronze seal housing		
Minimum pump efficiency at design point of _____ GPM of _____ %		
Impeller eye and port pass a 3" sphere		
Impeller of mono-port design with a minimum area of 10.6 square inches		
Trimming of impeller vane does not alter dynamic balance		
Impeller dynamically balanced without use of weights or liquid filled chambers		
Class F motor insulation with Class B max motor temperature rise and 1.15 service factor		
Motor shaft run-out 0.003" max at end of shaft		
Motor shaft centered to motor base with 0.005"		
Locked lower bearing and floating upper bearing		
One-piece motor adapter/backhead		
Motor HP of _____ at _____ RPM		
Complete pump station factory tested on a wet well		
Priming from low pressure area behind the impeller		
Resonant frequency pump prime detection system		
Transparent priming bowl for operator monitoring		
Hollow priming adapter for positive seal lubrication		
Completely separate priming system for each pump		
Minimum 2-1/2" equivalent opening in priming passageways		
All other items for the station, as specified with minimum sizes, capacities and materials indicated		
Product liability insurance, $5 million per specification		
Structure blasted with steel grit in environmentally controlled booth prior to coating with epoxy resin		

The consulting engineer shall be the sole judge of whether the proposed equipment is acceptable. The manufacturer shall have the responsibility of submitting sufficient information in one submission. Incomplete or inaccurate submittal data shall be cause for rejection of the proposed equipment.

By signing this affidavit, the officer of the Company has stated 100% compliance with the plans and specifications and further states he will supply or pay for all deficiencies found in the job submittals or after the unit is installed. The consulting engineer shall be the sole judge regarding compliance with the plans and specifications and shall be sole judge on the amount of moneys required if any deficiencies are found, related to, but not limited to, a 20-year station design life.

_____
Signature of Company Officer

Corporate Seal
(Notarized)

_____
Title