SPECIFICATION
CAPSULAR® UNDERGROUND PUMP STATION
WITH _____ PUMPS

GENERAL

The contractor shall furnish and install one factory-built, automatic **CAPSULAR®** pumping station as manufactured by Smith & Loveless, Inc., Lenexa, Kansas. The station shall be complete with all needed equipment factory-installed in a welded steel chamber with welded steel entrance tube and with ladder to provide access.

The principal items of equipment shall include ____ vertical, close-coupled, motor driven, non-clog pumps; valves; internal piping; central control panel with circuit breakers, motor starters and automatic pumping level controls; lighting; sump pump; ventilating blower; dehumidifier and all internal wiring.

OPERATING CONDITIONS

Each pump shall be capable of delivering _____ GPM of raw water or wastewater against a total dynamic head of _____ feet. 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 _____.

_____ pumps operating in parallel shall be capable of delivering _____ GPM at _____ feet TDH. The minimum pump efficiency at this operating point shall be _____%.

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 _____ feet minimum to _____ feet maximum.

PUMP CHAMBER

The station shall be built by the Manufacturer in two major sections, consisting of the pump chamber and the required section(s) of entrance tube, for ease in shipment and handling. These sections shall be joined at the job site by welding.

The pump chamber shall contain all pumps and other equipment and shall be sized as shown on the drawings. The top and bottom of the station shall be 3/8" thick. Steel plate shall meet or exceed ASTM A-36 specifications.

The exterior of the station shall be designed so all welds exposed to ground water after installation are continuous or sealed throughout their length so that water cannot seep between uncoated steel surfaces. In addition, the structure shall be designed so that sharp corners and similar difficult-to-coat conditions are held to an absolute minimum. The thickness of the steel walls and their reinforcements shall be determined by the structural requirements for the depth of bury involved and shall be a minimum of 3/8". It shall be the responsibility of the Manufacturer to determine the structural requirements of the shell based on the external loads specified on the plans.

Lifting eyes adequate to support the entire weight of the pump station shall be provided and welded to the station head. Tie-down holes shall be provided for anchoring the discharge line at the point it leaves the station. A monorail hoist with _____ ton capacity shall be located on the ceiling of the pump station over the pumps at an adequate height to permit pump disassembly. Minimum maintenance clearances shall be as shown on the drawings or specified herein.

A sump with walls of 1/4" structural-grade steel plate shall be provided. Where the ductile iron suction and discharge lines pass through the station walls, they shall be reinforced with 1/4" thick steel sleeves, welded inside and out to the station wall. The space between the ductile iron pipes and the steel sleeves shall be packed tight with Portland cement grout containing Embeco aggregate to prevent leakage.

[NOTE TO DESIGNER: CHOOSE FROM THE FOLLOWING ENTRYWAY OPTIONS. DELETE THE ONE NOT SELECTED]

A. ENTRANCE TUBE

The entrance tube shall be provided in one or more sections as required and the diameter shall be as shown on the drawings. The entrance tube shall be constructed of structural grade steel plate that meets or exceeds ASTM A-36 specifications. The length shall be adequate to place the cover above the surrounding ground as shown on the drawings. The entrance tube shall be adequately stiffened and the field joints arranged so that the joint may be welded from the outside of the tube with all welding being performed in a down-hand position. The bottom of the tube shall be attached to an angle, shop welded to the head of the pump station. This field joint shall also be weldable in the down-hand position. Two lifting loops shall be provided on each section of entrance tube for handling and installation.

A steel ventilation duct with inlet vent shall extend from the top of the station to 24" above grade. The inlet vent shall be covered with a screen to exclude rodents and foreign objects. The station ventilating blower shall be connected directly to the inlet duct.

The entrance tube cover shall be of fiberglass reinforced plastic and shall have a reflective color to reduce heat absorption. The cover shall have a suitable drip lip around the edge and shall be provided with a weatherproof lock of the pin tumbler type that can be opened from the inside without a key. The lock shall be self-locking upon closing the lid.

The fiberglass cover shall have a rung which forms an extension of the access ladder when the cover is latched in the open position. A latch mechanism shall be provided to keep the cover open under any normal load.

The access ladder shall be of heavy aluminum construction and have grooved non-slip rungs of 1-1/4" nominal outside diameter spaced on 12" centers. Neoprene rubber sleeves shall be provided to cover the joint between the adjoining ladder sections.

B. STAIRCASE ENTRY MODULE

The staircase entry module shall be provided in one section with dimensions as shown on the drawings. The entry module shall be constructed of structural grade steel plate that meets or exceeds ASTM A-36 specifications with structural steel support members for the specified depth of bury. The length shall be adequate to place the top above the surrounding grade as shown on the drawings. The entry module shall be adequately stiffened and the field joints arranged so that the joint may be welded from the outside of the module with all welding being performed in a down-hand position. The bottom of the entry module shall be attached to a structural member, shop welded to the head of the pump station. This field joint shall also be weldable in the down-hand position. Lifting loops shall be provided on the entry module structure for handling and installation.

The entry module shall house a 50-degree staircase with aluminum non-slip stair treads. The stair treads shall be bolted to stair stringers fabricated of structural steel channels. The stairway sections shall be bolted in place to steel landings welded to the entry module. The landings shall be located approximately every 4'-0". An anodized aluminum handrail shall be furnished. Aluminum handrail will be furnished to enclose the perimeter around the top above grade opening (except for the entry module entry location). Minimum lighting shall consist of twin 40-watt fluorescent lamp fixtures provided for the convenience and safety of the operator. The lighting shall provide illumination for all areas in the entry module.

The entrance tube shall be extended above grade 8'-0", and shall be provided with an industrial-type door and frame. The door shall provide a minimum opening of 3'-6" x 6'-7", with the doorsill 10" above grade.

[NOTE TO DESIGNER: CHOOSE THE FOLLOWING EQUIPMENT TUBE OPTION, IF REQUIRED. DELETE IF NOT REQUIRED]

EQUIPMENT HANDLING TUBE

The equipment handling tube shall be provided in one or more sections as required and the diameter shall be as shown on the drawings. The tube shall be constructed of structural grade steel plate that meets or exceeds ASTM A-36 specifications. The length shall be adequate to place the cover above the surrounding ground as shown on the drawings. The tube shall be adequately stiffened and the field joints arranged so that the joint may be welded from the outside of the tube with all welding being performed in a down-hand position. The bottom of the tube shall be attached to an angle, shop welded to the head of the pump station. This field joint shall also be weldable in the down-hand position. Two lifting loops shall be provided on each section of entrance tube for handling and installation.

The equipment handling tube shall have a flat steel cover that may be unbolted to allow equipment removal.

WELDING

All steel in the station structure shall be joined by electric arc welding with fillets of adequate section for the joint involved. Where required to exclude ground water, all welded joints on the exterior of the station shall be continuous throughout their length.

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 dehumidifier 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 installation. This kit shall contain detailed instructions for use and shall be the same material as the original coating.

A heavy synthetic rubber mat shall be cemented to the station floor by the Manufacturer to protect the coating on the steel floor.

An adequate number of 17-pound magnesium anode packs shall be provided by the station Manufacturer for cathodic protection. The anode packs shall be provided with 15' long insulated copper leads. Copper lugs shall be provided by the Manufacturer on opposite sides of the station for anode connections.

CAUTION: *Purchasing Contractor shall thoroughly review specifications and Installation Instructions for special anode lead connections, prior to backfilling the station.*

MAIN PUMPS

The pumps shall be _____" vertical, non-clog type of heavy cast iron construction, especially designed for the use of mechanical seals. 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 linearly 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 impeller shall be of the enclosed type made of close-grained cast iron and shall be balanced. 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 shroud. The shroud shall remain full diameter so that close minimum clearance from shroud 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.

In order to reduce the number of registered fits required and minimize the possibility of unbalancing the motor rotor in relation to the impeller and mechanical seal, the motor shall be attached to the pump volute by a one-piece cast iron adapter and backhead. Pump construction incorporating sandwiched parts, such as the backhead, will not be allowed.

The pump shall be arranged so that the rotating element can easily be removed from the volute without disconnecting seal system or the electrical wiring or disassembling the motor, impeller, backhead or seal, so that any foreign object may be removed from the pump or suction elbow. Volute and/or suction elbow clean-outs are not acceptable substitutes.

The pump shaft shall be sealed against leakage by a double mechanical seal installed in a bronze seal housing constructed in two sections with registered fit. The housing shall be recessed into the pump backhead and securely fastened thereto with stainless steel capscrews. The inside of the seal housing shall be tapered to facilitate the replacement of the seal parts. The seals shall be of carbon and ceramic materials with the mating surfaces lapped to a flatness tolerance of one light band. The rotating ceramics shall be held in mating position with the stationary carbons by a stainless steel spring. The seal housing with assembled parts shall be so constructed as to be readily removable from the shaft as a unit and shall be provided with tapped jackscrew openings to assist in removing it from the backhead.

The seal shall be pressurized and lubricated by liquid taken directly from the pump backhead through a filter to the seal housing and introduced between the upper and lower sealing surfaces. The filter shall be of corrosion-resistant materials and shall screen out all solids larger than 50 microns. The seal system shall contain a brass valve connected near the top of the seal housing to permit the relief of any air trapped in the seal unit. A manually operated brass valve shall also be provided to vent the pump volute.

The pump volute shall be free from projections that might cause clogging or interfere with flow through the pump.

The pump shall be supported by a heavy cast iron base with four legs. The height of the base shall be sufficient to permit the use of an increasing suction elbow which shall be provided when the nominal pump size is smaller than the suction line. The suction and discharge openings shall be flanged, faced and drilled 125-pound American Standard.

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, suitable for temperatures up to 105°C. Insulation temperature shall, however, be maintained below 80°C. 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 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 condition, nor 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.

Minimum Requirements: (Partial Listing)

Shaft thru seal:	_____" Dia. Solid Stainless Steel
Seal Housing:	Bronze
Lower Bearing to Impeller	6" Maximum
Shaft Run-Out:	0.003" Maximum
Shaft End Play:	Limited to Bearing Shake
Shaft to Motor Base:	0.005" Maximum
Impeller to Shaft Fit:	Tapered

Impeller Shroud:	Untrimmed-Full Diameter
Upper Bearing:	Axially Free
Lower Bearing:	Locked in Place
Efficiency at Design:	_____% Minimum
Efficiency at B.E.P.:	_____% Minimum
Backhead & Motor Adapter:	One Piece
Motor Insulation:	Class F
Motor Temperature Rise:	Class B
Motor Service Factor:	1.15, Reserved for Owner

Pumps will only be considered if all items of the specifications are met. The stainless steel shaft with tapered impeller attachment is to be provided to minimize corrosion, extend seal life, and provide the ease of impeller removal and seal replacement. The impeller shall be removable in the field without the use of a "wheel puller". All items are specified for long life and ease of operator maintenance. Deviation from the pump specification will be cause for rejection.

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 ensure that the proper pumping system is provided to the Owner.

CONTROL

The control equipment shall be mounted within a NEMA Type 1 enclosure, fabricated of steel and reinforced as required. The circuit breaker, motor-starter section shall be provided with a hinged cover, complete with suitable latching devices. All circuit breakers and pump control switches shall be mounted so that they are operable without opening the high voltage cabinet. The pressure switches shall be mounted on the side of the cabinet. It shall not be necessary to open the front of the cabinet to make minor adjustments to the pressure switches, etc.

A grounding-type convenience duplex 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 over-current protection of all motor, control 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.

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

A. BUBBLER LEVEL CONTROLS

To control the operation of the pumps with variations of liquid level in the wet well, an air bubbler system shall be provided, complete with two air compressors, flow indicator, bubbler line, and a sensitive pressure switch for each pump.

The two air compressors shall be of the close-coupled, oil-less type. Each compressor shall have a minimum capacity of 0.2 cubic feet of free air per minute at 10 PSI. It shall incorporate a single-phase, 60 cycle, 115-volt, drip-proof, brushless type, electric motor. A motor driven timer shall be provided to automatically alternate the compressors every five minutes. Wiring and piping of the air compressors shall be so arranged that one compressor may be removed without removing the other

compressor from service.

The pressure switches shall be of the snap action type, with sensitive pressure elements and independent high and low adjustments for each pump capable of a minimum differential of 18" of water.

An automatic alternator with manual "On-Off" switch shall be provided to change the sequence of operation of the pumps on the completion of each pumping cycle. 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 the entrance tube wall and down to the station control panel. The pressure transducer unit shall be rated for wastewater or potable water service, and for operation in explosion hazardous areas.

[Three (3), Four (4)] 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 backup system shall be entirely independent of the digital system. A 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.

PUMP OPERATION

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.

HIGH WET WELL LEVEL ALARM
❒ (OPTIONAL ITEM - CHECK IF REQUIRED)

An adjustable pressure switch shall be provided to sense a high water level condition in the wet well. The switch shall be connected to the bubbler line and shall activate a contact to indicate the high water condition.

DEHUMIDIFIER AND VENTILATING BLOWER

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 keep the electrical equipment dry and 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 and 68% relative humidity shall be 15.5 pints per day. The maximum capacity of 80° F and 90% relative humidity shall be 25 pints per day. The dehumidifier shall be controlled automatically by an adjustable humidistat. The dehumidifier shall be located above the floor on a shelf and the condensate drained to the sump.

Fresh air shall be drawn into the station through the air duct from above grade. The ventilating blower shall have a minimum capacity of 30 air changes per hour, and shall be controlled by a 15-minute cycle timer with a range of 0-100% so as to provide essentially continuous ventilation without exceeding the capabilities of the dehumidifier.

Ventilation systems so arranged that intake air is not pulled into the station through an inlet duct will not be acceptable.

The ventilating blower shall have a high velocity discharge directed across the station such that vortexing and vigorous mixing will ensure adequate dehumidification and purging of the station air. It shall be positioned on the head of the station to prevent inadvertent damage by service personnel.

A switch shall be provided at the top of the entrance tube for operation of the lights and ventilating blower when entering the station.

AIR CONDITIONING [OPTIONAL – DEPENDING ON MOTOR HP]

A minimum capacity of _____ tons of air conditioning shall be installed in the pump station to remove heat generated by the station equipment. The blower-evaporator unit(s) shall be suspended from the station ceiling. The condensing unit(s) shall be installed on a concrete pad outside the station by the purchasing contractor. The contractor shall run refrigerant piping and electrical service between the evaporator and condensing units per the station manufacturer's instructions. The refrigerant, refrigerant piping and materials required for the installation of this equipment shall be provided by the purchasing contractor. The air conditioning unit(s), thermostatic controls and a humidistat shall be provided by the pump station manufacturer. The humidistat, furnished as an adjunct to the air conditioning unit(s), shall serve only when necessary to backup the dehumidifier, in order to ensure keeping the dew point of the station air at a maximum of 55 degrees Fahrenheit.

LIGHTING

Minimum lighting shall consist of twin 40-watt fluorescent lamp fixture provided for the convenience and safety of the operator. The lighting shall provide illumination for all areas in the station.

SUMP PUMP

A submersible sump pump with close-coupled, vertical motor shall be installed in the sump. It shall have a minimum capacity of 1000 GPH at design head. The design head this pump will operate against is the static head from the sump to 3' below grade. 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. It shall discharge through double check valves and a gate valve.

MAIN PIPING

Pump suction lines shall be Class 53, plain-end, ductile iron pipe terminating outside the pump chamber. Plug valves shall be provided inside the chamber on the suction and discharge sides of the pumps. The discharge line from each pump shall be fitted with a spring loaded, clapper-type check valve. The diameter of all pipe and valves shall be as shown on the drawings.

The common discharge header shall be fabricated of steel for manifolding the discharge risers and the discharge outlet shall be Class 53, plain-end, ductile iron pipe terminating outside the pump chamber.

The air bubbler line furnished by the station Manufacturer in the station shall be 1/2" nominal tubing, terminating in a 1/2" NPT fitting in the entrance tube to accept the 1/2" flexible bubbler line extending to the wet well.

A loop in the bubbler line shall be provided to protect the station from flooding.

WIRING

The pump station shall be completely wired at the factory, except for the power feeder lines and entrance light switch. All wiring in the pump station shall meet the requirements of the National Electrical Code and shall be coded as indicated on the wiring diagram. All wiring outside the panel shall be in conduit, except for 115-volt accessory items, which are provided with connecting insulated service cord. The Manufacturer shall provide conduit from the control panel across the ceiling, and up the entrance tube to receive the feeder lines. The conduit shall terminate in a threaded conduit connection through the wall of the entrance tube above ground level.

Accessory items such as the sump pump, dehumidifier and air compressors shall be plugged into selectively polarized, grounded convenience outlets, located close to their installed position so that such items can be readily removed and serviced if necessary.

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 system and all auxiliary equipment. The pump suction and discharge lines shall be coupled to a reservoir and the pumps shall re-circulate water under simulated service conditions. The automatic controls shall be adjusted to start and stop the pumps at approximately the levels required by the job 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 container shall include complete installation instructions. A spare filter element for the seal filter shall also be provided, in the same container as the pump shaft seal. Spare volute gaskets for the main pumps shall also be furnished.

INSTALLATION AND OPERATING INSTRUCTIONS

Installation of the pump chamber, entrance tube and related appurtenances shall be done in accordance with written instructions provided by the Manufacturer.

CAUTION: *The purchasing contractor shall inspect the interior of the station chamber, prior to backfilling, for possible special Installation Instructions.*

The Manufacturer shall further provide a complete and detailed Installation, Operation and Maintenance Manual. This manual shall cover, in addition to installation and general operating procedures, the operation, maintenance, and servicing procedures of the major individual components provided with the pump station.

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 warranty 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 it 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 Manufacture shall repair or replace, at its discretion, such defective part. It 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 ventilating blower, dehumidifier, sump pump, 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

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, facilitate 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 treatment equipment. Equipment substitutions, since incompatible with the district's standardizations program, will not be considered.

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.

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 manufacturer's 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 repairs services.
F. A list of five (5) installations in the states 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 specified 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

A submittal will be required to be submitted to the owner by manufacturers proposing alternate, unnamed pump stations with their bid. Included in the submittal shall be full-size drawings and detailed specifications on the proposed pump station. Copies of the Engineer's plans and specifications will not be acceptable. Included in the bid submittal shall be the following filled-out checklist. It shall be 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		
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 _____ %		
_____% pump efficiency at best efficiency point for proposed impeller		
Class F motor insulation with Class B max motor temperature rise and 1.15 service factor		
Motor shaft run-out 0.003" max		
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 pumping from a wet well		
Double mechanical seal with rotating ceramic elements and stationary carbon elements		
50 micron seal water filters		
Seal water taken from low pressure area of pump backhead		
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 an officer of the Company signing this affidavit, he has stated 100% compliance with the pump station 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. Generally, the amount of money shall be related to, but not limited to, a 20-year station design life.

_____
Signature of Company Officer

Corporate Seal
(Notarized)

_____
Title