WATERTRONICS®
ELECTRONICALLY CONTROLLED PUMPING SYSTEMS

WaterMax

LANDSCAPE SPORTS TURF PUMP STATION
SUCTION LIFT
GENERAL SPECIFICATIONS

Project Name: ?
Project Location: ?
Pumping System Model #: LSTL**-HP-Voltage-Phase-Flow-PSI**
Total Design Criteria: Quantity of Pumps: 1
Station Design Capacity: ? GPM @ ? PSI Discharge

08/22/06
SCOPE OF WORK

It is the intention of this specification to describe a self-enclosed, automatic SUCTION LIFT pump station for a commercial turf irrigation system. This is to be accomplished by using a completely prefabricated pump station conforming to the following specifications.

The pumping station shall be model number WaterMax LSTL as manufactured by WATERTRONICS, INC. 525 Industrial Drive, P.O. Box 530, Hartland, Wisconsin 53029-0530, www.watertronics.com.

SECTION 1: GENERAL

1.1 The pump station performance at enclosure limits shall be as noted in the technical specifications. The capacity, discharge pressure, and discharge pipe dimensions shall be per the technical specifications. The pump shall operate at no more than 3600 RPM. The power supply to the station shall be as noted in the technical specifications.

1.2 The station shall be completely wired, piped, dynamically flow and pressure tested prior to shipment.

1.3 Operational sequence: The pump shall activate automatically upon a drop in manifold pressure to an adjustable set point. Operation shall be maintained at an adjustable minimum flow. The pump shall be automatically retired when system flow drops below the minimum adjustable set point and the pressure set point has been met for an adjustable time delay.

1.4 Construction shall be of modular form utilizing a steel base structurally adequate to support pumps, piping, and electrical equipment as a single integral assembly. All nuts, bolts washers, and fasteners shall be stainless steel, zinc or cadmium plated for corrosion resistance.

SECTION 2: PUMP AND MOTOR

2.1 PUMP

Pump shall be electric motor driven, horizontal centrifugal with mechanical shaft seal, volute case and impeller. The shaft seal shall be a self-adjusting mechanical type to prevent leakage and eliminate the need for drain piping. The volute case shall be precision machined from gray cast iron and engineered to modern hydraulic standards. It shall be possible to rotate the discharge connection to any of four positions. A heavy cast iron bracket shall maintain alignment between the motor and volute case. The impeller shall be an enclosed type and balanced to provide smooth operation. The impeller shall be keyed to the shaft and locked with a special cap screw and washer. The motor shaft is to be manufactured from high grade steel and of reduced length to increase shaft rigidity, extend bearing life, and reduce the overall length of the pump and motor assembly. The motor shaft shall be protected with a replaceable stainless steel sleeve. The pump motor and impeller shall be removable from the back of volute case for service without disturbing the plumbing.

2.2 MOTOR

Pump motor shall be a squirrel cage induction horizontal solid shaft type. The pump impeller shall be direct mounted and keyed to the motor shaft with a stainless steel protective sleeve. The temperature rise of the motor shall be to NEMA Standard MG-1-12.42 for class B or Class F insulation. Radial and thrust bearings of ample capacity to accommodate the hydraulic thrust of the pump shall be incorporated into the motor. The motor shall be of proper size to drive the pump at any point on it's operation curve without exceeding the motor service factor.

SECTION 3: PIPING MANIFOLD, VALVES, GAUGES AND OTHER MECHANICAL EQUIPMENT

3.1 FABRICATED PIPING

All fabricated piping shall conform to ASTM specifications A53 for Grade B welded or seamless schedule 40 pipe. All welded flanges shall be forged steel, slip-on or weld neck type. All welded fittings shall be seamless, ASTM Specification A234, with pressure rating not less than 150 PSI.

3.1a SUCTION INTAKE PIPE AND FOOTVALVE

The Technical Specification will describe the type, size and configuration for the suction pipe and foot valve and if it is to be supplied by the pump station manufacturer or installer.

3.2 CHECK VALVE

Pump check valve shall be of the silent operating type that begin to close as forward velocity diminishes and be fully closed at zero velocity preventing flow reversal. Valve bodies shall be cast from ASTM-126C cast-iron or better and shall be free from blow holes, sand holes, and other impurities. The valve design shall incorporate a center guided, spring loaded poppet, guided at opposite ends and having a short linear stroke that generates a flow area equal to the pipe diameter. Internals shall be machined bronze disc, seat, and stem guide. Valves shall be sized to permit full pump capacity to discharge through them without exceeding a pressure drop of 2.5 PSI. Valves 4” and smaller to be pressure rated for 250 PSI.

3.3 STATION DISCHARGE ISOLATION VALVE

Isolation valves shall be butterfly type with ten position lever for sizes 4" and smaller and gear operators for sizes above 4". All shall be rated at 200 psi WOG working pressure. Trim shall include stainless steel stem, bronze or nickel coated iron, streamlined disc, and full faced resilient seat designed to eliminate need for flange gaskets.

3.4 DRAIN VALVES

Drains are to be provided from any possible low point in the system and are to consist of 1/4" brass petcocks.

3.5 PRESSURE GAUGES

A compound pressure gauge shall be located on the pump suction and on the discharge manifold for easy reading of the suction vacuum and discharge pressure. Pressure gauges shall be 304 stainless steel case and bezel construction. Gauges shall be 2-1/2" diameter, liquid filled. Pressure sensing connection shall be 1/4" NPT lower gauge connection.

3.6 HYDRAULIC PRESSURE REDUCING VALVE (Must be call for in Technical Specification)

A hydraulic pressure-reducing valve shall provide constant discharge pressure to the irrigation system under varying flow requirements. The valve shall be hydraulically operated, diaphragm actuated, angle pattern. The valve shall be equipped with a strainer for protecting the pilot valve, valve chamber and tubing from debris. The valve shall be equipped with an opening speed adjustment.

3.7 VARIABLE FREQUENCY DRIVE PRESSURE REGULATION (Replaces Pressure Reducing Valve) (Option must be called out in the Technical Specifications)

The variable frequency drive shall be IGBT based with selectable carrier frequency up to 15 KHZ. The VFD shall include terminals for incoming power, motor output power and control terminals.

The VFD shall generate a sine-coded, variable voltage/ frequency, three phase output for optimum speed control. The VFD shall incorporate power loss ride-through for a minimum of 2 seconds. VFD protective features shall include current limit, auto restart, short circuit protection, electronic motor overload protection and ground fault protection. The VFD shall have a push button programming display for easy access to operation parameters. The VFD shall be protected on the primary side by fuses of the appropriate amperage. Overload capacity: 120% rated output current for one minute. Voltage Fluctuation: +10%, -15%. Sine wave PWM with full range, automatic torque boost. Frequency Control Range: 0.1 to 400Hz. Frequency Accuracy: Digital, 0.01Hz, Analog. .1%. Motor overload protection, Instantaneous Over current of 180% of rated output current. Over voltage at 820VDC if 460V input. Under voltage: user adjustable. Momentary Power Loss: up to 2 second ride through. Electronic Ground Fault. LED capacitor charge indicator. Input Phase loss alarm. Ambient temperature range of + 14 to 104 degrees F. Humidity of 95% non-condensing.

3.8 PRESSURE TRANSDUCER (Required when the VFD option is selected)

A solid state pressure transducer shall provide a noise free, linear output proportional to discharge pressure. Transducer shall be solid-state, strain gauge type with integral voltage regulation and output accuracy not less than 0.25%. Transducer shall be constructed of stainless steel and rated for the pump station discharge pressure called out in the technical specifications.

SECTION 4: ELECTRICAL CONTROLS

4.1 GENERAL PANEL UL FILE NO: **E142155**

The complete control panel assembly shall be built in accordance with the provisions of the National Electrical Code and shall bear the U.L. listing mark for NEMA 1 industrial control panels along with the pump station manufacturers' U.L. panel shop file number.

4.2 PUMP MOTOR STARTER AND OVERLOAD

Motor starter shall be IEC type with 120 Volt coil and shall be contained within a single enclosure. The motor starter shall include an overload relay that is electronic type, ambient compensating and differential tripping type. Bi-metallic or melting alloy type overloads shall not be permitted. The overload shall protect each power leg and shall be set to the motor full-load current rating. Further protection afforded by the overload shall include sensitivity to current imbalance and single phase conditions.

4.3 MAIN STATION DISCONNECT AND FUSING

A three-pole, service rated main station disconnect shall be mounted in a separate NEMA 4 enclosure outside the pump station enclosure to completely isolate the pump station electrical system from incoming power. The service disconnect shall not be located inside the pump enclosure.

4.4 PROGRAMMABLE LOGIC CONTROLLER

The pump sequence controller shall be an industrial grade PLC with diagnostic LED for monitoring of discrete inputs and outputs. Not less than two additional analog inputs and outputs shall be standard for monitoring and control purposes. The PLC shall contain two communication ports for monitoring and programming purposes. The PLC shall contain an EEPROM, battery backed RAM and non volatile memory for storage of critical configuration data.

4.5 OPERATOR INTERFACE

The operator interface shall display pump system running status including timer status and alarm status on a two-line display. For security, the operator interface shall have password protection to prohibit unauthorized access to certain parameters. The interface shall also have a built-in diagnostics function for the status of the programmable controller. The operator interface will be able to show current GPM and PSI if flow and pressure sensor options are called out for in the Technical Specification.

4.6 SECONDARY CONTROL CIRCUIT FUSES

Single-pole secondary distribution fuses with appropriate ratings shall supply power to the pump starter coil circuit, the control system and to other circuits as specified.

4.7 PUMP THERMAL SWITCH

The water temperature entering the pump shall be sensed by a thermal switch. The thermal switch shall be located at the entrance to the pump and shall be screwed into a pipe fitting either in the pump case or a dedicated pipolet. Externally mounted snap disc type thermal switches will not be accepted. The thermal switch shall activate upon a temperature rise above 120 degrees Fahrenheit.

4.8 FLOW SENSOR

The pump station discharge manifold shall incorporate an insertion type, pulse frequency output flow sensor for continuous output to the pump station controls. The flow sensor output pulse shall be conditioned and fed directly to the PLC interrupt input for conversion and display in Gallons Per Minute and totalize. For accuracy and security considerations, conversion to an analog signal prior to PLC input shall not be accepted. Flow sensor accuracy shall be no less than 2% for flow velocities ranging from 1-30 feet per second.

4.9 NATIONAL ELECTRICAL CODE STANDARDS

Electrical controls shall conform to National Electrical Code Standards and be U.L. listed

4.10 LIGHTNING ARRESTOR

The main power supply to the pump station shall be equipped with a secondary lighting arrestor having a breakdown current rating of not less than 60,000 Amps at 14,000 Volts discharge. Power supplies 300 Volts and less shall use a 300 Volt arrestor with an 800 Volt spark-over Voltage. Power supplies up to 600 Volts shall use a 600 Volt rated arrestor with a 1,000 Volt spark-over Voltage.

4.11 CORROSION INHIBITING MODULES

Corrosion inhibiting modules shall be installed in the main electrical control enclosure in accordance with the manufacture's recommendations.

CONTROL ALARMS:

4.12 LOW DISCHARGE PRESSURE SAFETY SHUTDOWN

Low discharge pressure is to be sensed by the pump starting set point. When the station discharge pressure decreases to this point and maintains a start signal for the time called out in the Technical Specifications, the pumps will be de-energized and remain so until the circuit is manually reset. The operator interface shall illuminate to indicate a low discharge pressure shutdown has occurred.

4.12(a) HIGH DISCHARGE PRESSURE SAFETY SHUTDOWN

High discharge pressure is to be sensed by the pump starting set point. When the station discharge pressure increases to this point and maintains a start signal for the time called out in the Technical Specifications, the pumps will be de-energized and remain so until the circuit is manually reset. The operator interface shall illuminate to indicate a high discharge pressure shutdown has occurred.

4.13 HIGH PUMP VOLUTE TEMPERATURE SHUTDOWN

If the pump volute case temperature rises above 120 degrees F. for the time called out in the Technical Specifications, the pump will be de-energized and remain so until the circuit is manually reset. The operator interface shall illuminate to indicate a High Temperature Cutout has occurred.

4.14 VFD FAULT ALARM (Option required with VFD control system)

The operator interface shall illuminate to indicate a VFD shut off fault. Manual reset required.

SECTION 5: MOUNTING BASE, ENCLOSURE & SUCTION PIPE

5.1 MOUNTING BASE

Construction shall include a fabricated steel base assembly to support all components during shipping and to serve as the installed mounting base. Pump station base shall be formed from a single sheet of 1/4" plate resulting in a seamless, one-piece base with rounded edges and corners. The base shall be strategically reinforced beneath as required to provide additional support and strength. Standard base dimensions are 50" long, 34" wide, 3 1/2" high. The base shall be drilled and tapped allowing the pump and manifold to be secured to the base. The exterior of the base will be drilled to accept anchoring bolts. The base shall be shot blasted to bare metal prior to the painting process.

5.2 ENCLOSURE

Construction shall include a weather resistant, 14 gauge, all metal enclosure with welded lockable lid guides on top and bottom. The front side of the enclosure shall have oversized cooling vents. The enclosure is to be supplied with two internally mounted heavy duty gas struts that shall keep the access door open. All components are to be accessible from top and front sides with the door completely open. Enclosure is to be suitable for mounting to the pump station base and shall include openings for suction and discharge piping.

Stainless steel or marine grade aluminum enclosure is available but must be called for in the technical specifications.

5.3 EXHAUST FAN

For the purpose of cooling the pump motor, switchgear and control logic, an exhaust fan shall be located inside the pump enclosure, mounted to the enclosure. The exhaust fan shall be activated upon pump start and shall run until the pump stops. The fan shall be black die-cast aluminum construction with UL94V-0 rated polycarbonate propeller and rated for not less than 240 CFM. Fan motor shall be permanent split capacitor type with stainless steel ball bearings, class B insulation and automatic thermal protection.

5.4 HDPE SUCTION LINE AND FOOT VALVE (This option must be called for in the Technical Specification)

The suction line shall be fabricated from High Density Polyethylene pipe and equipped with a grooved quick disconnect to simplify removal or adjustment. A vertical prime port and cap shall be provided on the suction line, outside the pump enclosure. One suction line shall be required.

A positive shut off foot valve shall be located at the bottom of the pump suction line, constructed of corrosion resistant aluminum with 1/4 or 1/8 inch perforated screens and stainless steel hardware.

SECTION 6: PAINTING (steel enclosure)

Painting of the entire pump station shall consist of a multi-step coating system which includes metal preparation, rust inhibitive baked epoxy prime coat, and a two part ultraviolet light insensitive baked polyurethane finish having total dry film thickness of not less than 5 mils. Prime coat and finish coat shall be baked at 165 degrees for not less that 30 minutes to achieve a high gloss, corrosion resistant finish. Exterior pump station piping components shall be painted the same color as the station.

SECTION 7: TESTING

The pump station and all its component parts shall undergo a complete hydraulic and electrical test prior to shipment from the factory. Testing shall be dynamic and include operation over the entire flow range of the pump station under specified suction and net discharge pressure conditions. A plot containing actual flow, pressure, KW consumption and motor RPM shall be furnished if requested.

SECTION 8: OWNERS MANUAL

The Owner's Manual will contain an as-built drawing of the pump station, model number and part number of all normally replaceable components, and a troubleshooting guide. Complete start up instructions shall be provided by the manufacturer in the Owner's Manual.

SECTION 9: WARRANTY

The manufacturer shall warrant the pump station to be free of defects for one year from date of start up or fifteen months after shipment, whichever occurs first. Failures caused by lightning strikes, power surges, vandalism, operator abuse, or acts of God are excluded from warranty coverage.

END OF SPECIFICATION: LSTL Written Spec-08-22-06