

**BLACKMAX
SUBMERSIBLE PUMPS IN HDPE PUMP SLED**

GENERAL SPECIFICATIONS

Project Name: Riverwood High School
Project Location: Georgia
Pumping System Model #: BMXV-1-15-460-3-100-115
Total Design Criteria: Quantity of Lungs: 1
Station Design Capacity: 100 @ 115 PSI Discharge

SCOPE OF WORK

- A. It is the intention of this specification to describe a self-enclosed, automatic SUBMERSIBLE 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.
- B. The pumping station shall be model number WaterMax BMXV-1-15-460-3-100-115 as manufactured by WATERTRONICS, INC. 525 Industrial Drive, P.O. Box 530, Hartland, Wisconsin 53029-0530, www.watertronics.com.

MANUFACTURER

- A. The pump station shall be manufactured by Watertronics, Inc., Hartland, Wisconsin.
- B. The following information must be furnished by the contractor or manufacturer's representative within 10 days before bid data, to the Consultant/Engineer for consideration as an equal brand:
 - 1. A complete specification and submittal of all major components for the proposed pump station with individual pump performance verification.
 - 2. A detailed pumping station proposal drawing complete with component location, size and dimensions specific to the installation and matching the specifications herein.
 - 3. A complete electrical schematic for all high and low voltage circuits showing breaker fuse sizing, wire numbering and color.
 - 4. Pump station manufacturers U.L. file number for the electrical controls and pump station.
 - 5. A copy of the manufacturer's certificate of insurance in excess of \$1,000,000.
 - 6. Product support technicians shall be capable of accessing all information pertaining to the pumping equipment, e.g. electrical schematics, pump curves, program data, bill of materials, etc. The manufacturer shall have no less than two technicians on call seven days a week. Verify with Names, Addresses, and Phone Numbers.
 - 7. The pump station manufacturer shall provide factory authorized or factory direct service personnel for the set, start-up, preventative maintenance and general service of the pump system. A factory authorized or factory direct service technician must be located within one hundred (100) mile radius of the project site. The pump systems technician must have a minimum of 5 years' experience. The pump station manufacturer shall provide technical phone support twenty-four hours a day seven days a week. Verify with Names, Addresses, and Phone Numbers.

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 retimed when system flow drops below the minimum adjustable set point and the pressure set point has been met for an adjustable time delay.

SECTION 2: PUMP AND MOTOR

2.1 PUMP

Pump shall be submersible type, constructed of stainless steel. The pump shall perform as specified by the Technical Specifications.

2.2 MOTOR

Motor shall be submersible type and meet applicable NEMA standards. The motor shall be of corrosion resistant construction, 316 Stainless Steel shell, splined stainless steel shaft, cast iron end bells, hermetically sealed windings, Kingsbury-type thrust bearings, pressure equalizing diaphragm, removable "water-bloc" lead connector and U.L. 778 recognized

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

3.1 FABRICATED PIPING

All steel 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.

3.2 CHECK VALVE

Pump check valve shall be of the silent operating type that begins to close as forward velocity diminishes and be fully closed at zero velocity preventing flow reversal. Valve bodies shall be cast from ASTM-128C 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 manifold and are to consist of 1/4" brass petcocks.

3.5 PRESSURE GAUGES

A compound pressure gauge shall be located on the discharge manifold for easy reading of 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 VARIABLE FREQUENCY DRIVE PRESSURE REGULATION

- A. 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.
- B. 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.
- C. 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 50 degrees C. Humidity of 95% non-condensing

3.7 PRESSURE TRANSDUCER

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 4X control panels along with the pump station manufacturers' U.L. panel shop file number.

4.2 COMBINATION MOTOR STARTER/BREAKER

Motor shall be protected by MSP combination starter and breaker. Device will be UL 508 Type F. Motor starter protector and conductor are assembled and mechanically linked by means of a link module and adapter plate. All starters are suitable for use in group installation applications according to NEC-430-53(c).

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 LEDs 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

- A. Operator interface shall be a full color TFT active matrix LCD display unit mounted in the enclosure door. Operator interface shall be used for logical display of all pump station functions. The operator interface shall be NEMA 4X rated. The operator interface shall be touch sensitive with intuitive on-screen user instruction for ease of operation. The use of buttons or keys or off-screen touch instructions shall be prohibited. Operator interface shall be LCD color display type with no less than 240 x 320 pixel resolution, with viewing area measuring not less than 9" diagonal. User memory for critical operation data shall not be less than required for up to 1 year of data.
- B. The operator interface shall allow the user to view and modify pertinent operation parameters. The operator interface shall incorporate password protection for modification of critical pump station parameters. The operator interface shall include but are not limited to the following:
 - 1. Overview picture showing the system configuration. Screen shall show if each individual pump is enable or disabled, the number of hours on each pump, station full flow and pressure design data.
 - 2. System screen with regulation pressure, setpoint, regulation pressure, System status, restarts remaining, VFD reference speed, pressure regulation method (VFD or EBV modes), adjust settings button. Adjust settings button will allow changing parameters etc after entering password.
 - 3. Settings menu to allow access to pressure regulation settings, pipe saver mode, analog calibration, flow calibration, program or register settings.
 - 4. Flow screen will display pressure in PSI, flow in GPM and total gallons pumped in thousands of gallons. Separate display for total gallons pumped since last reset.
 - 5. Alarm screen with time remaining, display of pump station conditions at shutdown and restart. Alarms will be displayed in red when activated and a separate listing will be displayed in green when they are reset. Alarms will be logged to a compact flash disk allowing the service technician to upload data to a spreadsheet type program.Full control of the capability of monitoring, adjusting and viewing any options present such as water level, inlet strainer, wye strainer, filtration, chemical injection, or liquid tank levels. Adjustment of automatic/manual pressure regulation set points. Graphing capability for up to 1 full year detailing flow rate and pressure. Graphing function shall give option to graph and plot a point every minute. The graph function will be adjustable by day, month and year as well as the time of desired graph. All data will be logged to a compact flash disk allowing the service technician to upload data to a spreadsheet type program.

4.6 SECONDARY CONTROL CIRCUIT BREAKERS

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

4.7 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.

4.8 NATIONAL ELECTRICAL CODE STANDARDS

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

4.9 LIGHTNING ARRESTOR

The main power supply to the pump station shall be equipped with a secondary lightning 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.

4.10 CORROSION INHIBITING MODULES

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

4.11 CONTROL ALARMS:

- A. **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.
- B. **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.
- C. **VFD FAULT ALARM**
The operator interface shall illuminate to indicate a VFD shut off fault. Manual reset required.

SECTION 5: MOUNTING BASE, ENCLOSURE, PUMP SLED, HDPE DISCHARGE PIPE

5.1 STAINLESS STEEL MOUNTING BASE

Construction shall include a fabricated stainless steel base assembly to support all components during shipping and to serve as the installed mounting base. Pump station base shall be fabricated 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.

5.2 MARINE GRADE ALUMINUM ENCLOSURE

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

5.3 EXHAUST FAN FOR CONTROL STATION

For the purpose of cooling 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.

5.4 HDPE FABRICATED SUBMERSIBLE FLOATING PUMP SLED

A. The pump station manufacturer will fabricate a submersible floating pump sled from HDPE piping and HDPE components. The sled shall be designed for ease of application with the proper size and quantity of pump tubes, check valves and discharge fitting. The sled shall include a pressure alarm device as described in the Technical Specifications. The submersible motor shall be coked via a screened inlet as described in the Technical Specifications. The sled will include a standard 1/2" of Stainless Steel cable to assist in removal from the water source.

B. HDPE DISCHARGE PIPING

The discharge piping from the submersible pump sled to the on-shore control station shall be fabricated from high Density polyethylene pipe and equipped with flanged connections to simplify removal or adjustment. Length and diameter will be as shown on plans of technical specifications.

SECTION 6: ADDITIONAL EQUIPMENT

6.1 DROP PIPES

The intake and discharge piping system will be installed at a minimum 90 degree drop to provide below grade connection to a suction pipe or city water supply pipe or below grade connection to a discharge main line. Drop pipe sizes, connection fittings and depth density shall be shown on the project drawings. Intake and discharge drop pipes shall be located through station base.

6.2 SELF-FLUSHING INTAKE SCREEN

A self-flushing intake screen shall be provided. Screen model number and size shall be called out in the technical specification.

6.3 LAKE LEVEL CONTROLS

The intake reservoir shall be constantly monitored by an electronic pressure transducer, which will send a 4-20ma signal to the PLC. The reservoir level will be read on the Touchscreen operator interface and displayed. The operator shall be able to control the remote signal activation level by making the desired adjustments on the screen. When low (set point) level has been maintained, a pre-set 20 VAC signal shall be sent to a dry contact relay in the pump station panel to activate the start signal for a fill pump or valve. Upon a rise in the reservoir level, the signal will stop and the signal will drop out to stop the filling operation. Lake level wire terminal connections will be located in a J-box on the control panel exterior.

6.4 SERVICE DISCONNECT

The incoming high voltage disconnect shall be supplied as a Dead Front style.

6.5 AUTO-FLUSHING FILTER

The pump station discharge piping system will include an automatic flushing filter. The filter brand and style will be dependent on station's maximum gallons per minute design point. The filter model number and micron level of filtration will be call out in the Technical Specifications.

SECTION 7: PAINTING (PIPING SYSTEM)

All piping of the piping system 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 185 degrees for not less than 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 8: 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 9: OWNER'S 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 startup instructions shall be provided by the manufacturer in the Owner's Manual.

SECTION 10: WARRANTY

The manufacturer shall warrant the pump station to be free of defects for two years from date of startup or twenty-seven months after shipment, whichever occurs first. Failures caused by, power surges, vandalism, operator abuse, or acts of God are excluded from warranty coverage.

TECHNICAL SPECIFICATIONS

| | |
|------------------------------|--------------------------------------|
| Design criteria: | 100 GPM @ 115 PSI Discharge Pressure |
| Pump station model #: | BMXV-1-15-460-3-100-115 |
| Quantity of pumps: | 1 |
| Pump station capacity: | 100 GPM @ 115 PSI Discharge Pressure |
| Power supply: | 480 Volt, 3 Phase, 60 Hertz |
| Disconnection Style: | Dead-Front |
| Pump station enclosure type: | Marine Grade Aluminum |
| Station pressure regulation: | Variable Frequency Drive |

Pump Station Requirements

| Parameter | Pump |
|---|---------------------------|
| Pump type | Submersible |
| Pump flow at design point | 100 GPM |
| Pump pressure (115psi) at design point | 115 |
| Pump efficiency at design point | 72% |
| Motor RPM (nominal) | 3600 |
| Motor horsepower | 15 HP |
| Motor full load amperage (FLA) | 27.0 Amperes |
| Motor efficiency @ FL | 81% |
| Motor service factor | 1.15 |
| Pressure regulation type | VFD |
| Low PSI cutoff set point | 20 PSI (below legislate) |
| High PSI cutoff set point | 115 PSI (above legislate) |
| High PSI cutoff time delay | 120 seconds |
| High vibrate temperature cutoff set point | 120 Degrees F |

ADDITIONAL EQUIPMENT

| | |
|-----------------------------|-------------------|
| Intake Drop Pipe | 3" FLG Connection |
| Discharge Drop Pipe | 3" FLG Connection |
| Self-Flushing Intake Screen | Yardley |
| Automatic Filter | VAF V200ST |
| Exhaustion Heater | 200W |



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DATE NO. DESCRIPTION
03/28/18 002 PRELIMINARY SUBMITTAL
06/18/18 003 DESIGN DEVELOPMENT
08/17/18 004 CONSTRUCTION DOCUMENTS
10/10/18 005 PERMIT SET
11/01/18 FINAL COST SUBMITTAL ISSUED FOR PROPOSALS

DOE FACILITY CODE 660-3086

RIVERWOOD HIGH SCHOOL - PHASE 3-B
AUDITORIUM/GYMNASIUM ADDITION

5900 RAIDER DRIVE NW SANDY SPRINGS, GA 30028
FULTON COUNTY SCHOOLS REF NO. 411-19

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IRRIGATION DETAILS

PROJECT NO. 18015.02
DATE 10.31.18
DRAWN BY: ICS
CHECKED BY: HOB
DATE: 10/31/18

1-300

