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# MiniBoost Extreme

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

1. Steel base
2. Pumps and motors
3. Piping, valves and fittings
4. Control panel

### 1.2 REFERENCES

- A. Hydraulic Institute
- B. ANSI - American National Standards Institute
- C. NEMA - National Electrical Manufacturers Association
- D. UL - Underwriters Laboratories. Inc.
- E. ETL - Electrical Testing Laboratories
- F. CSA - Canadian Standards Association
- G. NEC - National Electrical Code
- H. ISO - International Standards Organization
- I. IEC - International Electrotechnical Commission
- J. NSF - NSF International

### 1.3 SUBMITTALS

#### A. SUBMITTALS SHALL INCLUDE THE FOLLOWING:

1. System summary sheet
2. Sequence of operation
3. Shop drawing indicating dimensions, required clearances and location and size of each field connection
4. Power and control wiring diagrams
5. System profile analysis including pump curves and system curve
6. Pump data sheets

### 1.4 QUALITY ASSURANCE

- A. Manufacturer shall assume "Unit Responsibility" to ensure that all components effectively interface to properly execute the sequence of operation specified herein. An assembler of pumping packages not engaged in the design and manufacture of centrifugal pumps shall not qualify as a manufacturer of pumping systems.
- B. The manufacturer shall have a minimum of 30 years experience in the design and construction of domestic water pressure booster systems.

- C. The package pressure booster shall be hydraulically tested to 125.0 psig.
- D. Manufacturer shall be listed by UL as a manufacturer of packaged pumping systems under UL/cUL category QCZJ.
- E. The pump control panel shall be listed by and bear the label of Underwriter's Laboratory, Inc. (UL/cUL). The controller shall be specifically designed for pressure booster applications.
- F. Manufacturer shall be listed by UL as a manufacturer of packaged pumping systems under UL/cUL category QCZJ and pump package shall bear labeling note this.
- G. The pumping package shall be certified by an approved independent testing and certification organization as being compliant with the requirements of NSF/ANSI 61 for potable drinking water and NSF-61 Annex G for low lead content.
- H. The manufacturer's production facility shall be certified by an approved independent testing and certification organization as being compliant with the requirements of NSF/ANSI 61 and NSF-61 Annex G. The manufacturing facility shall be subjected to periodic inspections and audits.
- I. A copy of manufacturer's certificate of insurance showing as a minimum, a general liability coverage of \$1,000,000, and an excess liability coverage of \$10,000,000.

## PART 2 PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

Subject to compliance with these specifications, the following manufacturers shall be acceptable:

1. Goulds Water Technology
2. Bell & Gossett

### 2.2 CONDITIONS OF SERVICE

The pump package shall provide flow of \_\_\_\_ gpm at \_\_\_\_ psig to the pump package discharge with a minimum suction pressure of \_\_\_\_ psig.

The pump station shall provide \_\_\_\_ gpm at \_\_\_\_ psig with a suction pressure of \_\_\_\_ psig min and \_\_\_\_ psig max.

The Variable Speed Pumping package model shall be MiniBoost Extreme and have the following duty points:

\_\_\_\_ gpm @ \_\_\_\_ ft TDH, \_\_\_\_ hp @ 3600 rpm.

Total pumping package system friction loss shall not exceed 5.0 psig.

Incoming electrical power shall be acceptable within limited performance parameters:

- 208V 1-Phase & 208V 3-Phase
- 230V 1-Phase & 230V 3-Phase
- 460V 3-Phase
- 575V 3-Phase

### 2.3 MANUFACTURED UNIT

- A. Furnish and install as shown on the plans an MiniBoost Extreme Pressure Booster System as manufactured by Bell and Gossett.
- B. The pump package shall utilize 1 (simplex) || 2 (duplex) stainless steel Bell and Gossett NPE and e-HM pumps, in conjunction with variable speed pump controllers as manufactured by Bell and Gossett. Appropriate check and shutoff valves, pressure sensors, suction/discharge piping, pump and electrical protection shall be integrated into the pump package. Xylem and Bell & Gossett are registered trademarks of Xylem Inc. or one of its subsidiaries. All other trademarks or registered trademarks are property of their respective owners.
- C. The entire package assembly shall be listed and bear the label of a nationally recognized test lab.

- D. System shall require a single point power connection.
- E. The MiniBoost Extreme shall provide constant pressure boost of 20.0 psig - 100 psig with flow capacities up to 220.0 gpm (Duplex).
- F. Pumps shall be the manufactured product of a US manufacturer, producing and selling pumps for a minimum of 125 years.
- G. Motors shall meet standard NEMA specifications and shall be of the size, voltage and enclosure called for on the plans. Motors used on MiniBoost Extreme packages will be TEFC rated minimum Class-F insulation.

## 2.4 COMPONENTS

- A. GENERAL: The packaged pumping system shall be constructed with stainless steel headers for duplex units and Class 150 components for simplex. Unit shall be rated for 125.0 psig working pressure and maximum temperature of 125°F with standard seal or 250°F with optional high temperature seal. Headers shall be easily removable to allow for service access and moving the package through doorways. The system shall start upon a drop in system pressure, and will regulate the speed of the pumps to maintain constant pressure under variable flow. The system will stop upon detection of no-flow.
- B. PUMPS: Pumps shall be constructed of 304 or 316L stainless steel and rated for a minimum 125.0 psig working pressure. Casings shall have gauge ports and vent and drain ports at the top and bottom of casing. Pumps shall be centrifugal, close-coupled and end suction NPE pumps or centrifugal, multi-stage, close-coupled end suction e-HM pumps. Pump case, impellers, diffusers, seal spring, inner bowls, seal spring, shaft sleeve and retainer clip shall all be manufactured from stainless steel. Shaft bushing (if needed) shall be from ceramic. Mechanical seal assembly shall be constructed of Carbon/Silicon Carbide/ Viton as standard. Seat elastomers and casing o-rings shall be from Viton. Shaft sleeve shall be from stainless steel. Pump curve shall rise continuously to shut off head. Best efficiency point of pump shall lie between 70% and 80% of maximum flow capacity of the pump. Pump connections shall be NPT or ANSI flanged.
- C. MOTORS: Motor(s) shall be of C-face or JM frame type TEFC enclosures, 3600 RPM, 1.15 service factor, Min class F insulation. Premium Efficiency motors shall be provided in accordance with the DoE energy Efficiency standards. Motors shall be wound for the starting configuration as called out in the technical data sheet. Design pump brake horsepower shall not exceed 100% of motor horsepower exclusive of service factor. The motor shaft shall be high-strength steel. Motors shall be wound with ISR (Inverter Spike Resistant) wire for use with VFD's. Motor manufacturer must provide letter of compatibility of motor with another type of variable frequency or variable speed drive.
- D. VARIABLE SPEED DRIVES: The variable speed drives shall be Bell and Gossett Aquavar IPC variable speed controller rated NEMA/UL Type 1. A station disconnect switch shall be mounted in a NEMA/UL Type 1 panel.

The Aquavar IPC shall provide an adjustable carrier frequency with IGBT power switching, and utilize PWM technology. The drive shall provide noiseless operation of the driving motor, short circuit and ground protection, and work with controlled sinusoidal current synthesis and dynamic over current limitations. Additional control panels, PLC's or other external devices, shall NOT be necessary to accomplish complete pump programming and variable speed control of pump and motor. Standard variable frequency drives that do not incorporate pump control logic as the primary control software; programming and features directly applicable to centrifugal pump applications shall not be considered equal. Standard system hydraulic settings shall include at a minimum the following functions: loss of suction, lack of NPSHa, pump run-out protection, "dead-head" protection, constant pressure setting with variable flow capability, pressure sensor error, overpressure shutdown, and low flow shutdown.
- E. SEQUENCE OF OPERATION: The system shall start upon a drop in system pressure, and will regulate the speed of the pumps to maintain constant pressure under variable flow. The system will stop upon detection of no-flow.

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- F. PUMP PACKAGE BASE: The pump package base shall be designed and fabricated to provide proper structural support for all attached equipment, and provide anchor bolt support. The base shall supply sufficient rigidity to withstand the stresses of reasonable and competent transportation to site, off loading, installation, and operation. Base shall be constructed from 0.3 in formed steel. Provisions shall be made in the station base for off-loading and handling the station at the site of installation. Formed base shall include steel plate mounted under pump and motor and shall be of compact design for most standard doorways.
- G. PIPING: Stainless steel headers for duplex units and Class 150 components for simplex. Suction and Discharge manifolds shall be designed and constructed for minimal friction loss and compact design for most standard doorways.
- H. VALVES: Isolation valves shall be provided for each pump for duplex units only. Each pump shall be equipped with a spring-loaded non-slam silent check valve, appropriately sized to allow no greater than 5.0 psig of head loss at full station rated capacity. Check valves 2.0 in and below shall have a brass body and PTFE Teflon seat. Check valves 2.0 in and below shall be pressure rated to 400.0 psi g WOG. The operation of the valve shall not be affected by the position of installation. When pump is retired, valve shall function to close tightly before flow is reversed, and reducing the possibility of water hammer or shock.
- I. PAINT: The finish coat shall be acrylic enamel to a thickness of no less than 3 mils.
- J. OPTIONAL SHIP-LOOSE ITEMS
1. Low Suction Pressure Cut-out Switch; range: 10-100 psig.

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**PART 3 EXECUTION****3.1 INSTALLATION**

- A. Install equipment in accordance with manufacturer's instructions.
- B. Power wiring, as required, shall be the responsibility of the electrical contractor. All wiring shall be performed per manufacturer's instructions and applicable state, federal and local codes.
- C. Control wiring for remote mounted switches and sensor / transmitters shall be the responsibility of the controls contractor. All wiring shall be performed per manufacturer's instructions and applicable state, federal and local codes.

*Aluminum wiring SHALL NOT be used in any part of the booster system.*

**3.2 DEMONSTRATION/TRAINING**

- A. The system manufacturer's factory qualified representative shall be capable of providing optional start-up of the packaged pumping system. This start-up shall include verification of proper installation, system initiation, adjustment and fine tuning. Start-up shall not be considered complete until the sequence of operation, including all alarms, has been sufficiently demonstrated to the owner or owner's designated representative. This job site visit shall occur only after all hook-ups, tie-ins, and terminations have been completed and signed-off on the manufacturer's start-up request form.
- B. The system manufacturer's factory qualified representative shall be capable of providing on-site training for owner's personnel. This training shall fully cover maintenance and operation of all system components.
- C. The system manufacturer must have an optional complete pressure booster training program available for owner's personnel. The training sessions shall take place at the manufacturer's facility and cover all aspects of pressure booster system design, service and operation.

**3.3 WARRANTY**

- A. The manufacturer shall warrant the water pumping system to be free of defects in material and workmanship for one year (12 months) from date of authorized start-up, not to exceed eighteen (18) months from date of manufacturer's invoice. Complete terms and conditions will be provided upon request.
- B. The complete VFD shall be warranted by the manufacturer for a period of 30 months from date of shipment. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service. The warranty shall be provided by the VFD manufacturer and not a third party. A written warranty statement shall be provided with the submittals.

**3.4 START-UP SERVICE**

- A. Owner start up assistance will be provided by a manufacturer qualified representative and will be limited to one 8-hour day, unless previously negotiated by the factory representative. When discharge piping, electrical connections, and electrical inspection have been completed, the pump station representative shall be contacted for start up. A minimum two-week notice shall be given to the manufacturer qualified representative prior to scheduled start up date. During start up, the complete pumping system shall be given a running test of normal start and stop, and fully loaded operating conditions. During this test, each pump shall demonstrate its ability to operate without undue vibration, or overheating, and shall demonstrate its general fitness for service. All defects shall be corrected and adjustments shall be made to the pumping station for satisfactory operation. System problems or concerns will be corrected by the general contractor or site station staff, in conjunction with the appropriate factory qualified representative. Testing shall be repeated until satisfactory results are obtained, as determined by the engineer.

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- 1) The tissue in plants that brings water upward from the roots;
- 2) a leading global water technology company.

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