**SECTION 22 1123.13**

**DOMESTIC WATER PACKAGED BOOSTER PUMPS**

**PART 1 GENERAL**

1. DESCRIPTION
   1. All work specified in this Section is governed by the Common Work Results for Plumbing Section 22 0500.
   2. This Section 22 1123.13 and the accompanying drawings cover the provisions of all labor, equipment, appliances, and materials and performing all operations in connection with the construction and installation of the packaged booster pumping system as specified herein and as shown. The system shall include, but is not limited to, the following; all factory-assembled as one complete assembly:
      1. Quadplex vertical end suction pumps
      2. Control panel
      3. Bladder surge tank
      4. Piping, valves, wiring, etc.
      5. Frame
   3. System shall be NSF/ANSI 61/372 certified, suitable for potable water service, and shall be “lead-free”.
2. BASIS OF DESIGN
   1. The basis of design is as scheduled. Any proposed substitutions shall be proven equal in all respects to the equipment specified as the basis of design. Any modifications to piping, electrical work, controls, building structure, etc., that result from any substitution shall be coordinated with all trades. This coordination shall occur before delivery of equipment and any modifications shall be performed without incurring additions to the Contract.
3. ACCEPTABLE MANUFACTURERS
   1. Acceptable substitute manufactures shall be listed according to Landmark’s Construction Appendix A – Product Selection.

**PART 2 PRODUCTS**

1. PUMPS
   1. Provide quadplex pumps with capacities as shown. Pumps shall be centrifugal type, flexible-coupled, for installation in vertical position, and capable of being serviced without disturbing piping connections. Pumps shall be appropriate for variable speed and include shaft grounding rings.
   2. Pump casing shall be of cast iron or stainless steel. The impeller shall be of cast bronze, enclosed type, dynamically balanced and keyed to the shaft.
   3. The liquid cavity shall be sealed off at the motor shaft by an internally-flushed mechanical seal. A bronze shaft sleeve shall completely cover the wetted area under the seal.
   4. Pumps shall be rated for a minimum of 300 psi working pressure, or the working pressure where they are to be installed, whichever is greater. Each pump case shall have gauge tappings at the suction and discharge nozzles and shall include vent ports.
   5. Motor shall have heavy-duty grease lubricated ball bearings, selected for the maximum load for which the pump is designed. The motor shall be NEMA standard design and must not use special bearings as a thrust handling method. The motor shall have a 1.15 service factor.
2. CONTROL PANEL
   1. Control panel shall be a NEMA I enclosure complete with HOA switches, run lights, control transformer, magnetic starters with overload protection, single main disconnect switch, system pressure switch, low suction pressure shut off, minimum run timers for each pump, manual and automatic lead-lag alternator and lag pump start timer.
      1. Main Control Panel: A door-operated non fused main disconnect shall be provided which shall remove power from the entire pressure booster when switched off. Each Variable Speed Drive (VFD)/Motor shall be protected by a molded case circuit breaker or MSP enclosed in the main control panel.
      2. Motor Controller: NEMA ICS 7.1 variable-frequency, variable torque, solid-state pulse-width modulating type. VFD protective features shall include:
         1. Ground fault
         2. Short Circuit
         3. Motor overload
      3. Suction and discharge pressure transducers.
         1. Pressure transducers shall be utilized for providing all pressure signals for the pump control logic. Pressure switches are not acceptable.
         2. Pressure transducer shall be a solid-state bonded strain gage type with an accuracy of plus/minus 1 %. Transducer shall be constructed of non-ferrous metal suitable for used with domestic water. Pressure transducers constructed of plastic are not acceptable.
         3. Transducer shall be rated for package discharge and suction pressures as shown on submittal.
         4. Pressure transducer shall be constructed to prevent moisture intrusion.
      4. Controller: Touchscreen variable speed pump logic controller in a NEMA 1 enclosure with door operated disconnect to include, power distribution and overload protection for each AFD and the following control features:
         1. Unit shall utilize user-friendly front panel programming that displays parameters in clear text.
         2. Display shall show all system variables in plain English.
         3. Program settings shall be changeable and stored in non-volatile memory. Program settings shall be retained in memory in the event of loss of power to the controller, without the use of a backup battery.
         4. System operating pressure shall be clearly displayed in PSI or feet of head for ease of use and to provide an operator friendly interface.
         5. Additional parameters, where applicable, shall be displayed in units consistent with pumping systems.
         6. The settings and program in whole or part may be locked out with the use of an operator selectable password. Standard system settings shall include at a minimum the following functions:
            1. Low suction pressure shutdown with auto restart
            2. High discharge pressure shutdown with lockout
            3. High discharge temperature shutdown
            4. Pump failure alarm
            5. Constant pressure setting with variable flow capability
            6. Multiple pump operation with alternation
            7. Pump starting point with allowable, adjustable pressure drop
            8. Mini­mum speed
            9. No flow standby
   2. Provide and install BAS interlock. Coordinate with Controls SubContractor and controls specifications.
3. TANK
   1. Furnish ASME stamped hydro-pneumatic bladder type tank for field installation. Tank shall be rated for the system pressure at the installation location. System shall have ASME relief valve, air charging valve, drain valve, and pressure gauge. Tank shall have a minimum capacity as indicated and be vertical type. Tank shall be installed the location as indicated on the plans or, where not indicated, recommended by the Manufacturer.
4. PIPING AND VALVES
   1. Pressure gauges shall be mounted at the suction header and discharge header.
   2. Piping shall be Type 304 stainless steel complete with two-piece, bronze body, full port ball shut-off valves at each pump suction and discharge.
   3. Non-slam, spring loaded, silent check valves shall be provided at each pump discharge.
   4. Self-contained thermal relief valves factory set to discharge at 125°F shall be mounted on each pump.
5. FRAME
   1. Package Base: The pressure booster base shall be designed and fabricated to provide proper structural support for all attached equipment, and provide for anchorage to the structure. The base shall include a rigid structural member for pump and motor support. Main members shall be constructed from heavy weight structural steel members with reinforcing channels for larger boosters. Steel base shall be painted with machinery enamel and shall be suitable for grouting to a concrete housekeeping pad.
6. TESTING AND PACKAGING
   1. Each system shall be factory tested by the Manufacturer in accordance with Hydraulic Institute Standards at a minimum of 350 psi, thoroughly cleaned, and painted with at least one coat of high-grade machinery enamel prior to shipment.
   2. The entire system shall be factory assembled and shipped with all interconnecting piping and wiring complete and tested for proper operation. The only field connections required shall be:
      1. Suction piping connection
      2. Discharge piping connection
      3. Drain pipe
      4. One power connection at control panel
   3. The booster system shall ship with four (4) certified copies of the shop test documenting the operation and capacity of the system as tested at the factory.

**PART 3 EXECUTION**

1. INSTALLATION AND START-UP
   1. The booster system shall be installed in strict accordance with ANSI/HI 1.4-2000, the manufacturer's recommendations, and the Contract Documents.
   2. The frame shall be grouted level and secured to the housekeeping pad with anchor bolts.
   3. Examine areas, equipment foundations, and conditions, for compliance with requirements for installation tolerances and other conditions affecting performance of pumps.
   4. Examine rough in for piping systems to verify actual locations of piping connections prior to installation.
   5. Examine equipment foundations and/or inertia bases for suitable conditions where pumps are to be installed.
   6. Correct unsatisfactory conditions prior to installation of pumps. Install booster package in specified location.
   7. Provide access for periodic maintenance, including removal of motors, impellers, and accessories.
   8. Verify proper pump rotation at start-up.
   9. Perform start-up procedures per manufacturer’s instructions.
2. SEQUENCE OF OPERATION
   1. The pump controller shall receive a 4-20mA signal from each pressure transducer.
   2. The pressure transducer shall monitor system pressure and provide an analog signal to the pump control software, and allow the VFD motor controller to provide a variable Volts/Hz output to the motor.
   3. Whenever the pressure drops below the set system pressure, the lead pump shall start and run at speed required to maintain system pressure setpoint (as set by the Operator). If the pressure setpoint cannot be maintained by one pump, the lag pump shall start to provide the extra flow and pressure automatically.
   4. When demand decreases to a level which can be met by one pump and an adjustable minimum run-timer has elapsed, the lag pump will be stopped.
   5. The lead pump shall alternate based on elapsed run time.
   6. When the system experiences low demand the controller shall test for a no flow condition without the use of external switches or controls. The controller will stop the lead pump after verifying a zero demand condition exists and a minimum run-timer has elapsed. The hydro-pneumatic tank shall supply water to the system until the pressure falls below the restart pressure, at which point the lead pump shall restart.
   7. All program settings shall be based on centrifugal pump language.
   8. Program settings shall be password protected. With proper password entry, settings shall be field adjustable to allow changes by the User.

**END OF SECTION**