SECTION 22 3000
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Water heaters.
B. Packaged water heating systems.
C. Domestic water heat exchangers.
D. Water storage tanks.
E. Water softeners.
F. Reverse osmosis equipment.
G. Pumps,
   1. Circulators.
H. Water pressure booster system.

1.02 RELATED REQUIREMENTS
A. Section 26 2717 - Equipment Wiring: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS
A. ANSI Z21.10.1 - Gas Water Heaters - Volume I - Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less; 2011.
B. ANSI Z21.10.3 - Gas-Fired Water Heaters - Volume III - Storage Water Heaters with Input Ratings Above 75,000 Btu per Hour, Circulating and Instantaneous; 2014.
C. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.
D. ICC (IPC) - International Plumbing Code; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
B. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.
C. Shop Drawings:
   1. Indicate heat exchanger dimensions, size of tappings, and performance data.
   2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
D. Project Record Documents: Record actual locations of components.
E. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner’s name and registered with manufacturer.
G. Project Record Documents: Record actual locations of components.
1.06 QUALITY ASSURANCE
   A. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
   B. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.08 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATER MANUFACTURERS
   D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 CERTIFICATIONS
   A. Water Heaters: NSF approved.
   B. Gas Water Heaters: Certified by CSA International to ANSI Z21.10.1 or ANSI Z21.10.3, as applicable, in addition to requirements specified elsewhere.
   D. Water Tanks: ASME labeled, to ASME BPVC-VIII-1.

2.03 COMMERCIAL GAS FIRED WATER HEATERS
   A. Type: Automatic, natural gas-fired, vertical storage.
   B. Tank: Glass lined welded steel ASME labeled; multiple flue passages, 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
   C. Accessories: Provide:
      2. Dip tube: Brass.
      3. Drain Valve.
      4. Anode: Magnesium.
      5. Temperature and Pressure Relief Valve: ASME labelled.
   D. Controls: Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F, automatic reset high temperature limiting thermostat factory set at 195 degrees F, gas pressure regulator, multi-ribbon or tubular burner, 100 percent safety shut-off pilot and thermocouple, flue baffle and draft hood.

2.04 PACKAGED WATER HEATING SYSTEMS
   A. Manufacturers:
      1. ITT Bell & Gossett; ______: www.bellgossett.com.
      3. Substitutions: See Section 01 6000 - Product Requirements.
   B. System: Gas-fired direct heating boiler, circulating pump, controls, piping and valving as indicated, storage tank, all mounted on structural steel skid.
   C. Boiler:
1. **Type:** Gas-fired water tube boiler, with copper finned tube heat exchanger, steel jacket with glass fiber insulation.

2. **Boiler Trim:** Gas burner, thermometer and pressure gage, immersion thermostats for operating and high limit protection, 100 percent safety shut-off electric gas valve with transformer, electronic safety pilot and pilot burner, gas pressure regulator, manual gas shut-off, low water cut off, ASME rated temperature and pressure relief valve, coil relief valve, automatic boiler fill and expansion tank, draft inverter.

3. **Performance:**
   
   **D. Vertical storage tank:**
   1. **Working Pressure:** 150 psi ASME labelled.
   2. **Lining:** 15 mils thick epoxy lining extended through flanges and couplings.
   3. **Support:** Two welded tank saddles not less than 4 inches wide by 1/4 inch thick, mounted on 2 inch pipe stand with minimum four cross braced legs; sheet teflon isolation strip between tank and saddle; dielectric unions between tank and piping system.
   4. **Insulation:** 3 inch glass fiber insulation with steel jacket.

   **E. Pump:**
   1. **Type:** All bronze, in-line circulation pump mounted on boiler, controlled by tank mounted immersion thermostat.

   **F. Thermostatic Valve:** Three-way, self-contained, full line size, bronze body 1/2 to 2 inches size, iron body 2-1/2 inches and over, set at 140 degrees F.

**2.05 DOMESTIC WATER HEAT EXCHANGERS**

A. **Tubes:** U-tube type with 3/4 inch diameter seamless copper tubes suitable for 125 psi working pressure.

B. **Heads:** Cast iron or steel, with steel tube sheets, threaded or flanged for piping connections.

C. **Water Chamber and Tube Bundle:** Removable for inspection and cleaning.

D. **Coating:** Prime coat exterior.

E. **Code:** ASME BPVC-VIII-1 for service pressures, ASME "U" symbol stamped on heat exchanger.

F. **Accessories:**
   1. Wells for temperature regulator sensor and high limit sensor at water outlet.
   2. ASME rated pressure and temperature relief valve on water outlet.
   3. ASME rated pressure relief valves from tapping on heated water side, set at 120 psig.
   4. ASME rated pressure relief valve on steam inlet on downstream side of control valve.
   5. Thermometers and pressure gage tappings in water inlet and outlet.
   6. Vacuum breaker and pressure gage tapping with pigtail siphon in shell.

**2.06 WATER SOFTENERS**

A. **Manufacturers:**

B. **Softener Tank:**
   1. Glassfiber reinforced plastic tank.

C. **Brine Tank:**
   1. Glassfiber reinforced plastic tank.

D. **Microprocessor Based Control:** Brass control valve cycled to regenerate from one to twelve day period.

**2.07 IN-LINE CIRCULATOR PUMPS**

A. **Manufacturers:**
2. ITT Bell & Gossett; ______: www.bellgossett.com.

B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
C. Impeller: Bronze.
D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
E. Seal: Carbon rotating against a stationary ceramic seat.
F. Drive: Flexible coupling.

2.08 PRESSURE BOOSTER SYSTEMS

A. Manufacturers:
   2. ITT Bell & Gossett; ______: www.bellgossett.com.

B. System: Packaged with two pumps, factory assembled, tested, and adjusted; shipped to site as integral unit; consisting of pumps, valves, and galvanized piping, with control panel assembled on fabricated steel base with structural steel framework.

C. Controls and Instruments: Locate in NEMA 250 Type 1 general purpose enclosure with main disconnect interlocked with door, fused circuit for each motor, magnetic starters with three overloads, control circuit transformer with fuse protection, selector switch for each pump, low limit pressure switch, low pressure alarm light, running lights, current sensing devices, minimum run timers, manual alternation, and suction and discharge pressure gages.

D. Lead Pump: Operate continuously with lag pump operating on system demand. Should lead pump fail to operate, next pump in sequence shall start automatically.

E. Time Delay Relay: Prevent lag pump short cycling on fluctuating demands.

F. Thermal Bleed Circuit with Solenoid Valve: Prevent overheating during low demand.

G. Low Pressure Control: Stop pump operation if incoming water pressure drops to atmospheric.

H. Pump Switch: Permit manual or automatic operation.

I. Valving: Each pump outlet combination pressure reducing and check valve to maintain constant system pressure. Provide gate or butterfly valves on suction and discharge of each pump. Provide check valve on each pump discharge.

J. Time Clock for Automatic Day-Night Changeover:
   1. Day cycle: System shall operate continuously with pressure to fixtures maintained by pressure reducing valves.
   2. Night Cycle: Pump shall operate intermittently on pressure switch located near pressure tank operating pump for pre-determined adjustable time period.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Domestic Water Heat Exchangers:
   1. Install domestic water heat exchangers with clearance for tube bundle removal without disturbing other installed equipment or piping.
   2. Pipe relief valves and drains to nearest floor drain.

D. Pumps:
   1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 22 3000