

**SECTION 22 30 00
PLUMBING EQUIPMENT**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Water heaters
- B. Packaged water heating systems
- C. Water storage tanks
- D. Water softeners
- E. Pumps
- F. Circulators

1.2 REFERENCES

- A. ASHRAE 90-1 - Energy Standard for Building Except Low-Rise Residential Buildings
- B. ASME BPVC-VIII – ASME Boiler & Pressure Vessels Codes
- C. NFPA 30 - Flammable and Combustible Liquids Code
- D. NFPA 54 - National Fuel Gas Code
- E. NFPA 58 - Storage and Handling of Liquefied Petroleum Gases
- F. NFPA 70 - National Electrical Code
- G. UL 174 - Household Electric Storage Tank Water Heaters
- H. UL 1453 - Electric Booster and Commercial Storage Tank Water Heaters
- I. FBC Florida Building Code

1.3 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 – 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, and power requirements.
 - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted.
 - a. Include NPSH curve when applicable.
 - 4. Provide electrical characteristics and connection requirements.
- C. Shop Drawings
 - 1. Indicate heat exchanger dimensions, size of tapings, and performance data.
 - 2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tapings, and drains.

1.4 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 – Submittals Procedures, procedures for submittals.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

- A. Section 01 77 00 - Contract Closeout, procedures for submittals.
- B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- C. Submit manufacturer's warranty in Owner's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

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- C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
 - 1. American Gas Association (AGA)
 - 2. National Sanitation Foundation (NSF)
 - 3. American Society of Mechanical Engineers (ASME)
 - 4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI)
 - 5. National Electrical Manufacturers' Association (NEMA)
 - 6. Underwriters Laboratories (UL)
 - 7. American National Standards Institute (ANSI)
 - a. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation; operate within 25% of midpoint of published maximum efficiency curve.
- 1.7 REGULATORY REQUIREMENTS
- A. Conform to AGA, NFPA 54, NFPA 70, UL 174, UL 1453 requirements for water heaters.
 - B. Conform to ASME BPVC_VIII for manufacture of pressure vessels for heat exchangers.
 - C. Conform to ASME BPVC_VIII for tanks.
 - D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- 1.8 DELIVERY, STORAGE, AND HANDLING
- A. Section 01 60 00 - Material Equipment and approved equals: Transport, handle, store, and protect products.
 - B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.
- 1.9 WARRANTY
- A. Section 01 78 00 - Warranties.
 - B. Provide 5-year manufacturer parts and labor warranty for domestic water heaters, packaged water heating systems.
- 1.10 MAINTENANCE PRODUCTS
- A. Section 01 78 00 - Operation and Maintenance Data.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. All manufacturers shall be a United States based company doing business in the U.S. for at least 10-years.

2.2 RESIDENTIAL GAS FIRED WATER HEATER

- A. Type: Automatic natural gas fired vertical storage.
- B. Performance
 - 1. Input per design documents.
 - 2. Minimum recovery rate per design documents with 100°F temperature rise.
 - 3. Maximum working pressure is 150 psig.
 - 4. Provide certification: CGA P.3.
- C. Tank: Glass lined welded steel single flue passage, flue baffle and draft hood; thermally insulated with glass fiber and encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
- D. Controls: Automatic water thermostat and built-in gas pressure regulator; temperature range adjustable from 120° to 170°F, cast iron or sheet metal burner, safety pilot and thermocouple.
- E. Accessories

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1. Brass water connections, dip tube, drain valve, magnesium anode, thermometer, and ASME temperature, and pressure relief valve.
 2. ANSI rated vacuum relief valve if required, expansion tank if required.
- 2.3 COMMERCIAL GAS FIRED WATER HEATER
- A. Type: Automatic natural gas fired split system (heater and unfired vertical storage tank) with capacity in accordance with design documents.
 - B. Performance
 1. Input maximum of 400,000 BTUH per heater and with the use of multiple heaters for demand exceeding this limit. Maximum water temperature of 210 deg F.
 2. Minimum recovery rate per design documents with 100°F temperature rise.
 3. Maximum working pressure: 150 psig.
 - C. Tank: 120 gallon maximum capacity, glass lined welded steel ASME certified HLW stamped, thermally insulated with minimum 2" glass fiber, encased in corrosion-resistant steel jacket; baked-on enamel finish.
 - D. Accessories
 1. Brass water connections, dip tube, drain valve, high-density magnesium anode, thermometer, and ASME rated temperature and pressure relief valve.
 2. ANSI rated vacuum relief valve if required, expansion tank if required.
- 2.4 Approval shall be per AGA as automatic storage water-heater operating at 180°F.
- A. Automatic water thermostat with temperature range adjustable from 120° to 180°F, automatic reset high temperature limiting thermostat factory set at 195°F, gas pressure regulator, multi-ribbon or tubular burner, 100% safety shut-off pilot and thermocouple, flue baffle and draft hood.
- 2.5 RESIDENTIAL ELECTRIC WATER HEATER
- A. Type: Automatic electric fired vertical storage.
 - B. Performance
 1. Minimum recovery rate per design documents with 100°F temperature rise.
 2. Maximum working pressure is 150 psig.
 - C. Tank: Glass lined welded steel, thermally insulated with 1-inch thick glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
 - D. Controls
 1. An automatic water thermostat with adjustable temperature range from 120° to 170°F, flanged or screw-in nichrome elements, enclosed controls, electrical junction box, and operating light.
 2. Wire double element units so elements do not operate simultaneously.
 - E. Accessories
 1. Brass water connections, dip tube, drain valve, magnesium anode, thermometer, and ASME rated temperature and pressure relief valve.
 2. ANSI rated vacuum relief valve if required, expansion tank if required.
 3. Emergency drain pan.
- 2.6 COMMERCIAL ELECTRIC WATER HEATERS
- A. Type: Factory-assembled and wired electric vertical storage.
 - B. Performance
 1. Minimum recovery rate per design documents with 100°F temperature rise.
 2. Maximum working pressure is 150 psig.

- C. Tank: Glass lined welded steel; 4" diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish, ASME HLW stamped.
 - D. Controls: Provide an automatic immersion water thermostat with externally adjustable temperature controls ranging from 60° to 180°F, a flanged or screw-in nichrome element, and a high temperature limit thermostat.
 - E. Accessories
 - 1. Brass water connections, dip tube, drain valve, magnesium anode, thermometer, and ASME rated temperature and pressure relief valve.
 - 2. ANSI rated vacuum relief valve if required, expansion tank if required.
- 2.7 PACKAGED WATER HEATING SYSTEMS
- A. System: Gas-fired direct heating boiler, circulating pump, controls, piping, and valving as indicated.
 - B. Boiler
 - 1. Type: Gas fired water tube boiler with copper finned tube heat exchanger, steel jacket, and glass fiber insulation.
 - 2. Boiler Trim: Gas burner, thermometer and pressure gauge, immersion thermostats for operating and high limit protection, 100% 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, draft inverter.
 - 3. Performance
 - a. Gross input: BTUH per design documents, at sea level.
 - b. Gross output: BTUH per design documents, at sea level.
 - C. Vertical or Horizontal storage tank:
 - 1. Working pressure: 150 psi ASME labeled.
 - 2. Lining: 15 mils thick epoxy lining extended through flanges and couplings.
 - 3. Support: Two welded tank saddles not less than 4" wide by ¼" thick, mounted on 2" 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: Provide 3" glass fiber insulation with aluminum jacket.
 - D. Pump
 - 1. Type: All bronze, in-line circulation pump controlled by tank mounted immersion thermostat set at 140°F.
 - E. Thermostatic Valve: Three-way, self-contained, full line size, bronze body 2 to 2" size, iron body 2½" inches and over, set at 140°F.
- 2.8 TANKLESS WATER HEATERS
- A. Gas: Natural gas or LP, digital setpoint temperature display and control to 1°F increments, range 80°F to 140°F, energy star qualified, stainless steel heat exchanger, ultra-low NOx emissions <20ppm, internal flow meter with 0.3 gpm activation point.
 - B. Electric: Copper immersion heating element, digital setpoint temperature display and control to 1°F increments, range 80°F to 140°F, internal flow meter with 0.3 gpm activation point.
- 2.9 WATER SOFTENERS
- A. Softener Tank: Glass fiber reinforced plastic tank.
 - B. Brine Tank: Glass fiber reinforced plastic tank.
 - C. Control: Brass control valve cycled to regenerate after adjustable metered quantity of water flow.
- 2.10 IN-LINE CIRCULATOR PUMPS

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- A. Casing: Bronze rated for 125 psig working pressure with stainless steel rotor assembly.
- B. Impeller: Bronze or stainless steel
- C. Shaft: Stainless steel.
- D. Seal: Carbon rotating against a stationary ceramic seat.
- E. Drive: Flexible coupling.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install water heaters and water softeners in accordance with manufacturer's instructions.
 - 1. In addition, install water heaters to applicable AGA, ANSI, NFPA 54, UL requirements.
- B. Coordinate with plumbing piping and related fuel piping, gas venting and electrical work to achieve operating system.
- C. Domestic Water Heater Exchangers:
 - 1. Install domestic water heater exchangers with clearance for tube bundle removal without disturbing other installed equipment or piping.
 - 2. Support unit on pipe stand.
 - 3. Pipe relief valves and drains to nearest floor drain.
 - 4. Connect steam branch line from top of main.
 - a. Pipe in flexible manner pitched with steam flow and with a pipe union connection.
 - b. Provide steam pressure gauge at exchanger inlet.
 - 5. Provide steam traps and valves as indicated.
 - 6. Pitch shell for condensate drain to traps.
- D. Domestic Hot Water Storage Tank:
 - 1. Provide support, independent of building structural framing members.
 - 2. Clean and flush tank, then seal until pipe connection is complete.
 - 3. Provide 4" thick concrete housekeeping pad for floor mounted tanks.
- E. Pump
 - 1. Ensure shaft length allows sump pumps to be located minimum 24" below lowest invert into sump pit and minimum 6" clearance from bottom of sump pit.
 - 2. Provide air cock and drain connection on horizontal pump casings.
 - 3. Provide line sized isolating valve and strainer on suction and line sized soft-seated check valve and balancing valve on discharge.
 - 4. Decrease from line size with long radius reducing elbows or reducers.
 - a. Support piping adjacent to pump such that the pump casings carry no weight.
 - b. Provide supports under elbows on pump suction and discharge line sizes 4" and over.
 - 5. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitations, are non-overloading in parallel or individual operation, and operate within 25% of midpoint of published maximum efficiency curve.
 - 6. Align and verify alignment of base mounted pumps prior to start up.

3.2 DEMONSTRATION AND TRAINING

- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
 - 1. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.

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2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
 3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements.
- B. Demonstration and Training shall be provided for the following equipment:
1. Domestic Hot Water Heaters
 2. Packaged Water Heating Systems
 3. Water Softeners

END OF SECTION