

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 RELATION TO OTHER WORK

- A. Refer to the section, "General Plumbing Provisions", for related requirements. Refer to other sections of Division 22 and to all other applicable portions of the Drawings and Specifications.

1.3 SUMMARY

- A. Section Includes:
 - 1. Commercial, electric, storage, domestic-water heaters.
 - 2. Flow-control, electric, tankless, domestic-water heaters.
 - 3. Thermostat-control, electric, tankless, domestic-water heaters.
 - 4. Domestic-water heater accessories.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.5 SUBMITTALS

- A. Submit manufacturer's data for review before any work is commenced

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 - 2. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Five years.
 - b. Electric, Tankless, Domestic-Water Heaters: Five year(s).
 - c. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

- A. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Smith, A. O. Corporation.
 - b. Lochinvar, LLC.
 - c. State Industries
 - 2. Standard: UL 1453.
 - 3. Storage-Tank Construction: ASME-code, steel vertical arrangement.
 - a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
 - 1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
 - 2) NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.
 - b. Pressure Rating: 160 psig

- c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.
- 4. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
 - c. Insulation: Comply with ASHRAE/IESNA 90.1.
 - d. Jacket: Steel with enameled finish.
 - e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
 - f. Temperature Control: Adjustable thermostat.
 - g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
 - h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
- 5. Special Requirements: NSF 5 construction.

2.2 ELECTRIC, TANKLESS, DOMESTIC-WATER HEATERS

A. Flow-Control, Electric, Tankless, Domestic-Water Heaters:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eemax, Inc.
 - b. Chronomite Laboratories, Inc.
 - c. Stiebel Eltron.
- 2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
- 3. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.
 - a. Connections: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 145 psig.
 - c. Heating Element: Resistance heating system.
 - d. Temperature Control: Flow-control fitting.
 - e. Safety Control: High-temperature-limit cutoff device or system.
 - f. Jacket: Aluminum or steel with enameled finish or plastic.
- 4. Support: Bracket for wall mounting.

B. Thermostat-Control, Electric, Tankless, Domestic-Water Heaters:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eemax, Inc..
 - b. Chronomite Laboratories, Inc.
 - c. Stiebel Eltron.

2. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
3. Construction: Copper piping or tubing complying with NSF 61 Annex G barrier materials for potable water, without storage capacity.
 - a. Connections: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 145 psig.
 - c. Heating Element: Resistance heating system.
 - d. Temperature Control: Thermostat.
 - e. Safety Control: High-temperature-limit cutoff device or system.
 - f. Jacket: Aluminum or steel with enameled finish or plastic.
4. Support: Bracket for wall mounting.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AMTROL, Inc.
 - b. Flexcon Industries.
 - c. Honeywell.
 - d. Pentair Pump Group.
 - e. Smith, A. O. Corporation.
 - f. State Industries.
 - g. TACO Comfort Solutions, Inc.
2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
4. Capacity and Characteristics:
 - a. Working-Pressure Rating: 150 psig.
 - b. Capacity Acceptable: 10 gal. minimum.

B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

1. Provide galvanized steel (24 gage min.) or other corrosion resistant material plastic or PVC accepted metal safety pan with a minimum depth of 1-1/2 inches and of sufficient size and shape to receive all drippings and/or condensate from the water storage tank or heater. The pan shall be drained by an indirect waste pipe no less than one (1) inch in diameter or the diameter of the outlet of the required relief valve(s) whichever is larger

2. The pan drain shall extend full-size and terminate over a suitably located indirect waste receptor or floor drain or extend to the exterior of the building and terminate no less than six (6) inches or more than twenty-four (24) inches above grade.
 3. When the discharge from the relief valve(s) is to be discharged into the safety pan, it shall be piped full-size of the valve outlet pipe size to a point not more than two (2) inches or no less than one (1) inch above the pan flood level rim.
 4. The discharge from the relief valve shall be piped full-size separately to the outside of the building or to another approved terminal as provided for safety pan drain terminals but in no case shall the discharge from a relief valve be trapped.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- D. Heat-Trap Fittings: ASHRAE 90.2.
- E. Manifold Kits: Domestic-water heater manufacturer's factory-fabricated inlet and outlet piping for field installation, for multiple domestic-water heater installation. Include ball-, butterfly-, or gate-type shutoff valves to isolate each domestic-water heater and **[calibrated]** **[memory-stop]** balancing valves to provide balanced flow through each domestic-water heater.
1. Comply with requirements for ball-, butterfly-, or gate-type shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
 2. Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."
- F. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig-maximum outlet pressure unless otherwise indicated.
- G. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
- H. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.
- I. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- J. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.
- K. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.
- L. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.4 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

- B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base.
 - 1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
 - 2. Maintain manufacturer's recommended clearances.
 - 3. Arrange units so controls and devices that require servicing are accessible.
 - 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 - 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 - 6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 7. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 8. Anchor domestic-water heaters to substrate.
- B. Electric, Tankless, Domestic-Water Heater Mounting: Install electric, tankless, domestic-water heaters at least 18 inches above floor on wall bracket.
 - 1. Maintain manufacturer's recommended clearances.
 - 2. Arrange units so controls and devices that require servicing are accessible.
 - 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 5. Anchor domestic-water heaters to substrate.
- C. Install electric, domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

- E. Install combination temperature and pressure relief valves in water piping for electric, domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- F. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- G. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- H. Install thermometers on inlet and outlet piping of residential, electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- I. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping," and comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- J. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- C. Prepare test and inspection reports.

END OF SECTION 223300