SECTION 223300 - ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Commercial, electric, storage, water heaters.
   2. Commercial, light-duty, storage, electric, water heaters.
   3. Electric, tankless, water heaters.

1.2 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 and the unit will be fully operational after the seismic event."

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated.

B. LEED Submittals:
   1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1, Section 7, "Service Water Heating."

C. Shop Drawings:
   1. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For commercial domestic-water heaters, accessories, and components, from manufacturer.

B. Water Heater Labeling: Certified and visibly labeled by testing agency acceptable to authorities having jurisdiction.

C. Source quality-control reports.

D. Field quality-control reports.
1.5 CLOSEOUT SUBMITTALS
   A. Installation, operation, and maintenance data.

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, "Drinking Water System Components - Health Effects."

1.7 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. Warranty Periods: From date of Substantial Completion.
         a. Storage Tank: No less than three years.
         b. Controls and Other Components: Two years

PART 2 - PRODUCTS

2.1 COMMERCIAL, ELECTRIC, domestic-WATER HEATERS
   A. Commercial, Electric, Storage, Water Heaters:
      1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         a. American Water Heaters – Heavy Duty Series
         b. Ruud – Heavy Duty Series
         c. A. O. Smith, Water Products Co. – Gold Series
         d. State Water Heaters – Heavy Duty Series
         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.
            2) NPS 2-1/2 and Larger: Flanged ends.
         b. Pressure Rating: 150 psig.

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c. Interior Finish: Comply with NSF 61 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.

5. Special Requirements:
   a. NSF 5 construction with legs for off-floor installation.
   b. Remove all factory provided steel/galvanized nipples and replace with brass nipples.

B. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      b. A. O. Smith Water Products Co. – DuraPower Series
      c. Ruud – Light Duty Series
      d. State Water Heaters – Light Duty Series
      b. Pressure Rating: 150 psig.
      c. Interior Finish: Comply with NSF 61 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. Dip Tube: Required unless cold-water inlet is near bottom of tank.
      c. Drain Valve: ASSE 1005.
      d. Insulation: Comply with ASHRAE/IESNA 90.
      e. Jacket: Steel with enameled finish.
      f. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation unless otherwise indicated. Limited to 12 kW total.
      g. Temperature Control: Adjustable thermostat.
      h. Safety Control: High-temperature-limit cutoff device or system.
      i. Relief Valve: ASME rated and stamped for combination temperature-and-pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Retain subparagraph below if domestic-water heater is required for foodservice equipment. Verify that NSF compliance is available for selected domestic-water heater.

5. Special Requirements:
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a. NSF 5 construction with legs for off-floor installation.
b. Remove all factory provided steel/galvanized nipples and replace with brass nipples.

C. The water heaters shall possess the Capacity and Characteristics at Design Conditions as specified on the drawings and in the submittals for the following parameters:
1. Tank Capacity (Gallons).
2. Recovery Rate (GPH °F).
3. Temperature Rise (°F).
4. Power Demand (KW).
5. Heating Elements:
   a. Number of Elements.
   b. Kilowatts Each Element.
   c. Number of Stages.
6. Electrical Characteristics:
   a. Voltage.
   b. Phases.
   c. Frequency (Hertz).
   d. Full-Load Amperes (Amps).
   e. Minimum Circuit Ampacity (Amps).
   f. Maximum Overcurrent Protection (Amps).

2.2 ELECTRIC, TANKLESS, domestic-WATER HEATERS

A. Electric, Tankless, Domestic-Water Heaters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   a. Eemax.
   b. Instant-Flow.
   c. Powerstream-Pro.
   d. Hot Aqua
2. Standard: UL 499 for electric heating appliances.
3. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.
   b. Pressure Rating: 150 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.

5. The water heaters shall possess the Capacity and Characteristics as specified on the drawings and in the submittals for the following parameters:
   a. Flow Rate (GPM).
   b. Supply Temperature (°F)
   c. Power Demand (KW).
   d. Electrical Characteristics:
      1) Volts
      2) Phases.

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3) Frequency (Hertz).
4) Full-Load Amperes (Amps).
5) Minimum Circuit Ampacity (Amps).
6) Maximum Overcurrent Protection (Amps).

2.3 SOURCE QUALITY CONTROL

A. Hydrostatically test domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

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.

C. 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. Comply with requirements for concrete bases specified in Division 3 Concrete.
   1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated on drawings.
   2. Maintain manufacturer’s recommended clearances for maintenance, service, and replacement.
   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 structure.

B. Electric, Tankless, Water Heater Mounting: Install at least 18 inches above floor on wall bracket.
   1. Maintain manufacturer’s recommended clearances for maintenance, service, and replacement.
   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 structure.

C. Install electric, 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 "General-Duty Valves for Plumbing Piping."

D. Install commercial, electric, domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

E. 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.

F. 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.

G. 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."

H. 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."

I. In non-recirculating systems, install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

J. Fill electric, domestic-water heaters with potable water.

K. Provide an expansion tank in accordance with Section 232113 and the manufacturer's sizing recommendations. The expansion tank shall be located in the cold water supply line between the check valve and the water heater. Charge domestic-water compression tanks with air to match the cold water supply pressure.

L. Provide an antisiphon device (e.g., check valve) in the cold water supply line between the shut off valve and the expansion tank to prevent backflow of tank water into the cold water supply line per IPC.
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 and valves for easy removal of domestic-water heaters while maintaining cold water service elsewhere in the building.

C. Replace existing nipples and install brass nipples to prevent any possible galvanic action

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 safety. 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.

C. Provide test and inspection reports.

END OF SECTION