


**Section 22 33 30**  
**Residential, Electric**  
**Domestic Water**  
**Heaters**



# KAUST Standards

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This standard will serve as specific engineering requirements in the design and construction of all KAUST facilities within KAUST vicinity to address electrical, civil/structural, integrated automation, plumbing, HVAC, fire suppression, electronic safety and security aspects.

The standard is a “live” and on-going document that is to be updated as the need arises. It is governed by KAUST procedure SAP-P-007-2015 and related forms for initiating updates and approving any waiver requests developed by E&PM.

## SECTION 22 33 30 – RESIDENTIAL 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.
- B. All related referenced codes and standards in this section corresponds to IBC 2009 edition

#### 1.2. SUMMARY

- A. This Section includes the following:
  - 1. Household, collector-to-tank, heat-exchanger-coil, solar-electric water heaters.
  - 2. Thermostat-control, instantaneous electric water heaters.
  - 3. General commercial electric water heaters.
  - 4. Heavy Commercial, storage electric water heaters.
  - 5. Heat Exchangers for Plumbing Service

#### 1.3. SUBMITTALS

- A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. LEED Submittal:
  - 1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with ASHRAE/IESNA 90.1-2004, Section 7 - "Service Water Heating."
- C. Shop Drawings: Diagram power, signal, and control wiring.
- D. Product Certificates: For each type of commercial and instantaneous electric water heater, signed by product manufacturer.
- E. Source quality-control test reports.
  - 1. Include details of tank lining and tank lining integrity testing.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.
- H. Warranty: Special warranty specified in this Section.

#### 1.4. QUALITY ASSURANCE

- A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.
- B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70- National Electrical Code – 2014 Edition, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.

- E. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- F. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.
- G. Maintain required quantity of water in cement lined tanks per manufacturer requirements.

#### **1.5. COORDINATION**

- A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

#### **1.6. WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric 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 Period(s): From date of Substantial Completion:
    - a. Household Electric Water Heaters:
      - (1) Storage Tank: Five years.
      - (2) Controls and Other Components: Two years.
    - a. Instantaneous Electric Water Heaters: One year(s).
    - b. General Commercial Electric Water Heaters:
      - (1) Storage Tank: Three years.
      - (2) Controls and Other Components: Two years.
    - c. Heavy Commercial Electric Water Heaters:
      - (1) Storage Tank: Ten years.
      - (2) Controls and Other Components: Five years.

## **PART 2 - PRODUCTS**

### **2.1. GENERAL**

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Provide equipment that complies with the requirements listed in each section below.

### **2.2. RESIDENTIAL ELECTRIC WATER HEATERS**

- A. Residential, Heavy Duty Collector-to-Tank, Heat-Exchanger-Coil, Solar-Electric Water Heaters: Comply with UL 174 with integral coil-type heat exchanger.
  - 1. Storage-Tank Construction: Steel.
    - a. Tappings: DN pipe tappings, size not less than as indicated on drawings.
    - b. Pressure Rating: 1035 kPa.

- c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.
          - (1) Approved linings for this application are 13mm or greater cement lining or 3 oz/sf copper plate.
        - d. ASME Code Construction
  - 2. Factory-Installed Storage-Tank Appurtenances:
    - a. Anode Rod: Replaceable magnesium.
    - b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
    - c. Drain Valve: ASSE 1005.
    - d. Insulation: Comply with ASHRAE/IESNA 90.1-2004.
    - e. Jacket: Steel with enameled finish.
    - f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
    - g. Heat Exchanger: Removable, copper-nickel tube construction, U-tube bundle, non-ferrous Teflon (PTFE) baffles, copper-nickel tube sheet, 1034kPA, Class 150 inlet/outlet connections, fouling resistance not less than 0.0005, capacity as indicated on drawings. ASME code constructed, double wall.
    - h. Heating Element: Electric, screw-in immersion type with power and quantity as specified. .
    - i. Temperature Control: Adjustable thermostat for each element, close differential immersion type.
    - j. Safety Control: High-temperature-limit cutoff device or system.
    - k. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input, and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
    - l. Tank Inlet/ Outlet Tappings: Size not less than indicated on drawings.
  - 3. Capacity and Characteristics: See Drawings.
  - 4. Basis of Design: Hubbell series SLN, factory modified as indicated.
- A. Thermostat-Control, Instantaneous Electric Water Heaters: Comply with UL 499 for tankless electric (water heater) heating appliance.
  - 1. Construction: Copper piping or tubing complying with NSF 61 barrier materials for potable water, without storage capacity.
    - a. Connections: DN pipe tappings as indicated on drawings.
    - b. Pressure Rating: 1035 kPa.
    - c. Heating Element: Resistance heating system.
    - d. Temperature Control: Thermostat, field adjustable with microprocessor.
    - e. Safety Control: High-temperature-limit cutoff device or system.
    - f. Jacket: Aluminum or steel with enameled finish or plastic.
  - 2. Support: Bracket for wall mounting.
  - 3. Capacity and Characteristics: See Drawings.
  - 4. Basis of Design: Chromomite Instant-Temp.

## **PART 3 - EXECUTION**

### **3.1. WATER HEATER INSTALLATION**

- A. Install commercial water heaters on concrete bases.
  - 1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
  - 2. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Install 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.
- C. 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.
- D. 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 water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.
- E. Install thermometer on outlet piping of water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.
- F. Install thermometers on inlet and outlet piping of household, collector-to-tank, solar-electric water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.
- G. Install pressure gage(s) on inlet and outlet of commercial electric water-heater piping. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.
- H. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
- I. Fill water heaters with water.
- J. Charge compression tanks with air.

### **3.2. CONNECTIONS**

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

### **3.3. FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
  2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
  3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

### **3.4. DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 01 Section "Demonstration and Training."

## **PART 4 - MANUFACTURERS**

### **4.1 ACCEPTABLE MANUFACTURERS**

- A. Subject to compliance with the requirements of this specification, provide products by one of the following:
1. Household Electric Water Heaters
    - a. AO Smith
    - b. Bradford White
    - c. Hubbell Water Heaters
    - d. Vaughn Manufacturing Corporation.
  2. Thermostat Control, Instantaneous Electric Water Heaters
    - a. Chronomite Laboratories, Inc.
    - b. IMI Waterheating, Ltd.
    - c. Keltech, Inc.
    - d. Niagara Industries, Inc.
  3. General Duty Commercial Electric Water Heaters
    - a. Bradford White Corporation.
    - b. Hubbell Heaters Division.
    - c. GSW Water Heating Company/ John Wood Water Heaters.
    - d. Hubbell Water Heaters
    - e. Lochinvar Corporation.
    - f. PVI Industries
    - g. Rheem Water Heater Div.; Rheem Manufacturing Company.
    - h. Ruud Water Heater Div.; Rheem Manufacturing Company.
    - i. Smith, A. O. Water Products Company.
    - j. State Industries, Inc.
    - k. Vaughn Manufacturing Corporation.
  4. Heavy Commercial Electric Water Heaters
    - a. AO Smith Water Heaters
    - b. Bradford White Corporation.
    - c. Hubbell Water Heaters
    - d. Lochinvar Corporation.
    - e. PVI Industries, LLC.
    - f. Rheem Manufacturing

5. Heavy Commercial Electric Water Heaters with Submerged Heat Exchanger
  - a. AO Smith Water Heaters
  - b. Bradford White Corporation.
  - c. Hubbell Water Heaters
  - d. Lochinvar Corporation.
  - e. PVI Industries, LLC.
  - f. Rheem Manufacturing
6. Shell and Tube Heat Exchanger
  - a. Ace Boiler
  - b. Armstrong
  - c. Bell and Gossett
  - d. Patterson Kelley
  - e. Taco

**END OF SECTION 22 33 30**