SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

This Section may include provisions for LEED 2009, LEED v4, ASHRAE 189.1, IgCC, and Green Globes. Note that some sustainable design requirements are either mandatory or optional requirements and may be inserted in the Section Text using the hypertext links. Other requirements that are associated with sustainable design, and may be considered "best practice" or retained even if a sustainable design standard is not a project requirement, are discussed in the Evaluations.

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section Includes:

Commercial, atmospheric, gas-fired, storage, domestic-water heaters.

Commercial, power-burner, gas-fired, storage, domestic-water heaters.

Commercial, power-vent, gas-fired, storage, domestic-water heaters.

Commercial, direct-vent, gas-fired, storage, domestic-water heater.

Commercial, gas-fired, high-efficiency, storage, domestic-water heaters.

Commercial, coil-type, finned-tube, gas-fired, domestic-water heaters.

Commercial, grid-type, finned-tube, gas-fired, domestic-water heaters.

Gas-fired, tankless, domestic-water heaters.

Residential, atmospheric, gas-fired, storage, domestic-water heaters.

Residential, direct-vent, gas-fired, storage, domestic-water heaters.

Residential, power-vent, gas-fired, storage, domestic-water heaters.

Commercial, oil-fired, storage, domestic-water heaters.

Commercial, large-volume, oil-fired, domestic-water heaters.

Residential, oil-fired, storage, domestic-water heaters.

Commercial, gas- and oil-fired, domestic-water heaters.

Domestic-water heater accessories.

* + - 1. SUBMITTALS
         1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
         2. Manufacturer’s installation instructions shall be provided along with product data.
         3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
         4. Product Data: For each type of product.[**Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.**]

Retain "Sustainable Design Submittals" paragraph below and "ASHRAE/IES 90.1 Compliance" paragraph in "Quality Assurance" Article if required for fuel-fired, domestic-water heaters.

* + - * 1. Sustainable Design Submittals:

Retain "Shop Drawings" paragraph below for domestic-water heaters that require electrical power.

* + - * 1. Shop Drawings:

Include diagrams for power, signal, and control wiring.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum use for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Equipment room drawing or BIM model, drawn to scale, on which the items described in this Section are shown and coordinated with all building trades.

Retain "Seismic Qualification Data" paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Data: Certificates, for fuel-fired, domestic-water heaters, accessories, and components, from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Retain "Product Certificates" paragraph below to require submittal of product certificates from manufacturers. Certificates may indicate certification that products have passed certain performance testing or compliance with standards, such as ENERGY STAR, GreenGuard, or other product certification programs.

* + - * 1. Product Certificates: For each type of [**commercial, gas-fired,**] [**gas-fired, tankless,**] [**residential, gas-fired,**] [**commercial, oil-fired,**] [**residential, oil-fired,**] [**and**] [**commercial, gas- and oil-fired,**] domestic-water heater.

Retain "Domestic-Water Heater Labeling" paragraph below if plumbing codes for Project area require domestic-water heaters to be independent-testing-agency certified. Verify availability for units retained.

* + - * 1. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
        2. Source quality-control reports.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
        2. Sample Warranty: For special warranty.
      1. CLOSEOUT SUBMITTALS
         1. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.
      2. COORDINATION
         1. Coordinate sizes and locations of concrete bases with actual equipment provided.
      3. WARRANTY

When warranties are required, verify with Owner's counsel that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

Failures include, but are not limited to, the following:

Structural failures including storage tank and supports.

Faulty operation of controls.

Deterioration of metals, metal finishes, and other materials beyond normal use.

Verify available warranties and warranty periods for units and components.

Warranty Periods: From date of Substantial Completion.

Commercial, Gas-Fired, Storage, Domestic-Water Heaters:

Storage Tank: [**Three**] [**Five**] <**Insert number**> years.

Controls and Other Components: [**One**] [**Two**] <**Insert number**> year(s).

Commercial, Finned-Tube, Gas-Fired, Domestic-Water Heaters:

Heat Exchanger: [**Three**] [**Five**] <**Insert number**> years.

Controls and Other Components: [**One**] [**Two**] <**Insert number**> year(s).

Separate Hot-Water Storage Tanks: [**Three**] [**Five**] <**Insert number**> years.

Gas-Fired, Tankless, Domestic-Water Heaters:

Heat Exchanger: [**Five**] <**Insert number**> years.

Controls and Other Components: [**Three**] <**Insert number**> years.

Residential, Gas-Fired, Storage, Domestic-Water Heaters:

Storage Tank: [**Five**] [**Six**] <**Insert number**> years.

Controls and Other Components: [**Two**] [**Three**] <**Insert number**> years.

Commercial, Oil-Fired, Domestic-Water Heaters:

Storage Tank: [**Three**] [**Five**] <**Insert number**> years.

Burner: [**One**] [**Two**] <**Insert number**> year(s).

Controls and Other Components: [**One**] [**Two**] [**Three**] <**Insert number**> year(s).

Residential, Oil-Fired, Storage, Domestic-Water Heaters:

Storage Tank: [**Five**] [**Six**] <**Insert number**> years.

Burner: [**One**] [**Two**] <**Insert number**> year(s).

Controls and Other Components: [**Two**] [**Three**] <**Insert number**> years.

Commercial, Gas- and Oil-Fired, Domestic-Water Heaters:

Storage Tank: [**Three**] [**Five**] <**Insert number**> years.

Burner: [**One**] [**Two**] <**Insert number**> year(s).

Controls and Other Components: [**Two**] [**Three**] <**Insert number**> years.

Expansion Tanks: [**Five**] <**Insert number**> years.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

See discussions on various types of fuel-fired, domestic-water heaters in the Evaluations for minimum and maximum limits on capacity and recovery of domestic-water heaters in this Section.

* + - 1. PERFORMANCE REQUIREMENTS
         1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

Retain "Seismic Performance" paragraph below with "Seismic Qualification Data" paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with structural engineer.

* + - * 1. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined in accordance with [**ASCE/SEI 7**] <**Insert requirement**>.

Retain first subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

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**]."

For life-safety components required to function after an earthquake (such as fire-sprinkler systems, components that contain hazardous content, and storage racks in structures open to the public), the Component Importance Factor is 1.5. For other components, the Component Importance Factor is 1.0 unless the structure is in Seismic Use Group III and component is necessary for continued operation of facility or failure of component could impair continued operation of facility, in which case the Component Importance Factor is 1.5.

Component Importance Factor: [**1.5**] [**1.0**].

See ASCE/SEI 7, Coefficients for Architectural Component Table and Seismic Coefficients for Mechanical and Electrical Components Table, for requirements to be inserted in subparagraph below.

<**Insert requirements for Component Amplification Factor and Component Response Modification Factor**>.

* + - * 1. ASHRAE/IES Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IES 90.1.
        2. 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.

Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

* + - * 1. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.
      1. COMMERCIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS
         1. Commercial, Atmospheric, Gas-Fired, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2395) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143772).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143764).

[Raypak; a Rheem brand](http://www.specagent.com/Lookup?uid=123457196937).

Lochinvar

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.10.3/CSA 4.3.

Storage-Tank Construction: [**Non-**]ASME-code steel with [**150-psig**] <**Insert value**> working-pressure rating.

Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Retain "Interior Finish" or "Lining" subparagraph below. Retain first subparagraph for manufacturer's standard lining or second for a specific lining; verify availability.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Lining: [**Cement**] [**Glass**] [**Nickel plate**] [**Phenolic coating**] [**Sheet copper**] <**Insert material**> complying with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1. Surround entire storage tank except connections and controls.

Jacket: Steel with enameled finish.

Burner: For use with atmospheric, gas-fired, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic ignition in "Ignition" subparagraph below is used in place of a continuously burning (standing) pilot flame for fuel ignition at the burner. Verify availability for model selected.

Ignition: Standing pilot or ANSI Z21.20/CSA C22.2 No. 60730-2-5, electric, automatic, gas-ignition system.

Temperature Control: Adjustable thermostat.

Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

Retain "Special Requirements" subparagraph below if domestic-water heater is required for foodservice equipment. Verify that NSF compliance is available for selected domestic-water heater.

Special Requirements: NSF 5 construction.

Draft Hood: Draft diverter, complying with ANSI Z21.12.

Dampers in "Automatic Damper" subparagraph below are used, but not required, downstream of water heater draft hoods to shut off the venting system when the water heater is in standby or not in operation. Verify availability for model selected.

Automatic Damper: ANSI Z21.66/CSA 6.14, [**electrically operated**] [**mechanically activated**] [**thermally activated**], automatic-vent-damper device with size matching draft hood.

* + - * 1. Commercial, Power-Burner, Gas-Fired, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2396) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143800).

[Bock Water Heaters, Inc](http://www.specagent.com/Lookup?uid=123457143793).

[PVI; A WATTS Brand](http://www.specagent.com/Lookup?uid=123457143796).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.10.3/CSA 4.3.

Storage-Tank Construction: [**Non-**]ASME-code steel with [**150-psig**] <**Insert value**> working-pressure rating.

Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Retain "Interior Finish" or "Lining" subparagraph below. Retain first subparagraph for manufacturer's standard lining or second for a specific lining; verify availability.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Lining: [**Cement**] [**Glass**] [**Nickel plate**] [**Phenolic coating**] [**Sheet copper**] <**Insert material**> complying with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1. Surround entire storage tank except connections and controls.

Jacket: Steel with enameled finish.

Burner: UL 795 for power-burner, gas-fired, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 60730-2-5, electric, automatic, gas-ignition system.

Temperature Control: Adjustable thermostat.

Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

Retain "Special Requirements" subparagraph below if domestic-water heater is required for foodservice equipment. Verify that NSF compliance is available for selected domestic-water heater.

Special Requirements: NSF 5 construction.

Draft Hood: [**Draft diverter, complying with ANSI Z21.12**] <**Insert different hood or other arrangement**>.

* + - * 1. Commercial, Power-Vent, Gas-Fired, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2398) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143808).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143805).

[Raypak; a Rheem brand](http://www.specagent.com/Lookup?uid=123457196941).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.10.3/CSA 4.3.

Storage-Tank Construction: [**Non-**]ASME-code steel with [**150-psig**] <**Insert value**> working-pressure rating.

Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Retain "Interior Finish" or "Lining" subparagraph below. Retain first subparagraph for manufacturer's standard lining or second for a specific lining; verify availability.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Lining: [**Cement**] [**Glass**] [**Nickel plate**] [**Phenolic coating**] [**Sheet copper**] <**Insert material**> complying with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1. Surround entire storage tank except connections and controls.

Jacket: Steel with enameled finish.

Burner: For use with power-vent, gas-fired, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 60730-2-5, electric, automatic, gas-ignition system.

Temperature Control: Adjustable thermostat.

Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

Retain "Special Requirements" subparagraph below if domestic-water heater is required for foodservice equipment. Verify that NSF compliance is available for selected domestic-water heater.

Special Requirements: NSF 5 construction.

Power-Vent System: Exhaust fan, interlocked with burner.

* + - * 1. Commercial, Direct-Vent, Gas-Fired, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2408) Subject to compliance with requirements, provide products by one of the following:

[American Water Heaters](http://www.specagent.com/Lookup?uid=123457143847).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143842).

[Lochinvar, LLC](http://www.specagent.com/Lookup?uid=123457143841).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.10.1/CSA 4.1.

Storage-Tank Construction: Steel.

Tappings: ASME B1.20.1 pipe thread.

Pressure Rating: 150 psig.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.

Factory-Installed Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1.

Jacket: Steel with enameled finish.

Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.

Burner: For use with direct-vent, gas-fired, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic ignition in "Ignition" subparagraph below is used in place of a continuously burning (standing) pilot flame for fuel ignition at the burner. Verify availability for model selected.

Ignition: Standing pilot or ANSI Z21.20/CSA C22.2 No. 60730-2-5, electric, automatic, gas-ignition system.

Temperature Control: Adjustable thermostat.

Combination Temperature-and-Pressure Relief Valve: ANSI Z21.22/CSA 4.4. Include relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valve with sensing element that extends into storage tank.

Direct-Vent System: Through-[**wall**] [**roof**], coaxial- or double-channel vent assembly with domestic-water heater manufacturers' outside intake/exhaust screen.

* + - * 1. Commercial, Gas-Fired, High-Efficiency, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2400) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143820).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143815).

[Raypak; a Rheem brand](http://www.specagent.com/Lookup?uid=123457196942).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.10.3/CSA 4.3.

In "Description" subparagraph below, verify combustion efficiency of model selected.

Description: Manufacturer's proprietary design to provide at least [**84**] [**85**] [**88**] [**95**] <**Insert number**> percent combustion efficiency at optimum operating conditions.

The features and attributes below may be revised or omitted if domestic-water heater otherwise complies with requirements for performance.

Storage-Tank Construction: ASME-code steel with [**150-psig**] <**Insert value**> minimum working-pressure rating.

Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Retain "Interior Finish" or "Lining" subparagraph below. Retain first subparagraph for manufacturer's standard lining or second for a specific lining; verify availability.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Lining: [**Cement**] [**Glass**] [**Nickel plate**] [**Phenolic coating**] [**Sheet copper**] <**Insert material**> complying with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1. Surround entire storage tank except connections and controls.

Jacket: Steel with enameled finish.

Burner or Heat Exchanger: Comply with UL 795 or approved testing agency requirements for gas-fired, high-efficiency, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Temperature Control: Adjustable thermostat.

Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

Draft Hood: [**Draft diverter, complying with ANSI Z21.12**] <**Insert different hood or other arrangement**>.

If more than one commercial, gas-fired, storage, domestic-water heater is required on Project, delete "Capacity and Characteristics" paragraph below and schedule commercial, gas-fired, storage, domestic-water heaters on Drawings.

* + - * 1. Capacity and Characteristics:

Capacity: <**Insert gal.**>.

Recovery: <**Insert gph**> at [**100 deg F**] <**Insert temperature**> temperature rise.

Temperature Setting: [**125 deg F**] [**140 deg F**] <**Insert temperature**>.

Fuel Gas Demand: <**Insert cfh**>.

Fuel Gas Input: <**Insert Btu/h**>.

Gas Pressure Regulator:

Capacity: <**Insert cfh**>.

Inlet Pressure: <**Insert psig or inches**> water column.

Gas Pressure Required at Burner: <**Insert psig or inches**> water column.

Retain "Electrical Characteristics" subparagraph below if model selected requires electrical power.

Electrical Characteristics:

Volts: [**120**] [**240**] [**277**] [**480**] <**Insert value**> V.

Phase: [**Single**] [**Three**].

Hertz: 60 Hz.

Full-Load Amperes: <**Insert value**> A.

Minimum Circuit Ampacity: <**Insert value**> A.

Maximum Overcurrent Protection: <**Insert value**> A.

Minimum Vent Diameter: <**Insert inches**>.

* + - 1. COMMERCIAL, FINNED-TUBE, GAS-FIRED, DOMESTIC-WATER HEATERS
         1. Commercial, Coil-Type, Finned-Tube, Gas-Fired, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2401) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143778).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143779).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.13/CSA 4.9 for hot-water-supply boilers.

Description: Packaged unit with boiler, separate hot-water storage tank, pump, piping, and controls.

Boiler Construction: ASME code with [**160-psig**] <**Insert value**> working-pressure rating for hot-water-supply boiler, domestic-water heater.

Heat Exchanger: Helix or spiral, finned-copper-tube coils with bronze headers.

Connections: Factory fabricated of materials compatible with boiler. Attach to boiler before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Boiler Appurtenances:

Insulation: Comply with ASHRAE/IES 90.1. Surround entire boiler except connections and controls.

Jacket: Steel with enameled finish.

Burner: For use with coil-type, finned-tube, gas-fired, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 60730-2-5, intermittent electronic-ignition system.

Temperature Control: Adjustable, storage-tank temperature-control fitting and flow switch, interlocked with circulator and burner.

Safety Control: Automatic, high-temperature-limit cutoff device or system.

Support: Steel base or skids.

Draft Hood: [**Draft diverter, complying with ANSI Z21.12**] <**Insert different hood or other arrangement**>.

Dampers in "Automatic Damper" subparagraph below are used, but not required, downstream of water heater draft hoods to shut off the venting system when the water heater is in standby or not in operation. Verify availability for model selected.

Automatic Damper: ANSI Z21.66/CSA 6.14, [**electrically operated**] [**mechanically activated**] [**thermally activated**], automatic-vent-damper device with size matching draft hood.

Hot-Water Storage Tank: Connected with piping to circulating pump and domestic-water heater.

Construction: In accordance with ASME Boiler and Pressure Vessel Code: Section VIII, steel with [**150-psig**] [**125-psig**] <**Insert value**> working-pressure rating.

Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rods: Factory installed, magnesium.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1. Surround entire storage tank except connections and controls.

Jacket: Steel with enameled finish.

Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

Circulating Pump: UL 778, all-bronze, centrifugal, overhung-impeller, separately coupled in-line pump as defined in HI 1.1-1.2 and HI 1.3. Include mechanical seals, [**125-psig**] <**Insert value**> minimum working-pressure rating, and 225 deg F continuous-water-temperature rating.

Piping: Copper tubing; copper, solder-joint fittings; and brazed or flanged joints.

Mounting: Domestic-water heater, tank, and accessories factory mounted on skids.

* + - * 1. Commercial, Grid-Type, Finned-Tube, Gas-Fired, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2403) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143830).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143821).

[Lochinvar, LLC](http://www.specagent.com/Lookup?uid=123457143824).

[Raypak; a Rheem brand](http://www.specagent.com/Lookup?uid=123457143828).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.13/CSA 4.9 for hot-water-supply boilers.

Description: Packaged unit with boiler, storage tank, pump, piping, and controls.

Boiler Construction: ASME code with [**160-psig**] <**Insert value**> working-pressure rating for hot-water-boiler-type, domestic-water heater.

Heat Exchanger: Horizontal, straight, finned-copper tubes with bronze headers.

Connections: Factory fabricated of materials compatible with boiler. Attach to boiler before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Boiler Appurtenances:

Insulation: Comply with ASHRAE/IES 90.1. Surround entire boiler except connections and controls.

Jacket: Steel with enameled finish.

Burner: For use with grid-type, finned-tube, gas-fired, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 60730-2-5, intermittent electronic-ignition system.

Temperature Control: Adjustable, storage-tank temperature-control fitting and flow switch, interlocked with circulator and burner.

Safety Control: Automatic, high-temperature-limit cutoff device or system.

Support: Steel base or skids.

Draft Hood: [**Draft diverter, complying with ANSI Z21.12**] <**Insert different hood or other arrangement**>.

Dampers in "Automatic Damper" subparagraph below are used, but not required, downstream of water heater draft hoods to shut off the venting system when the water heater is in standby or not in operation. Verify availability for model selected.

Automatic Damper: ANSI Z21.66/CSA 6.14, [**electrically operated**] [**mechanically activated**] [**thermally activated**], automatic-vent-damper device with size matching draft hood.

Hot-Water Storage Tank: Connected with piping to circulating pump and domestic-water heater.

Construction: In accordance with ASME Boiler and Pressure Vessel Code: Section VIII, steel with [**150-psig**] [**125-psig**] <**Insert value**> working-pressure rating.

Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rods: Factory installed, magnesium.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1. Surround entire storage tank except connections and controls.

Jacket: Steel with enameled finish.

Combination Temperature-and-Pressure Relief Valves: ANSI Z21.22/CSA 4.4. Include one or more relief valves with total relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

Circulating Pump: UL 778, all-bronze, centrifugal, overhung-impeller, separately coupled in-line pump as defined in HI 1.1-1.2 and HI 1.3. Include mechanical seals, [**125-psig**] <**Insert value**> minimum working-pressure rating, and 225 deg F continuous-water-temperature rating.

Piping: Copper tubing; copper, solder-joint fittings; and brazed or flanged joints.

Mounting: Domestic-water heater, tank, and accessories factory mounted on skids.

If more than one commercial, finned-tube, gas-fired, domestic-water heater is required on Project, delete "Capacity and Characteristics" paragraph below and schedule commercial, finned-tube, gas-fired, domestic-water heaters on Drawings.

* + - * 1. Capacity and Characteristics:

Hot-Water Storage-Tank Capacity: <**Insert gal.**>.

Recovery: <**Insert gph**> at [**100 deg F**] <**Insert temperature**> temperature rise.

Temperature Setting: [**125 deg F**] [**140 deg F**] <**Insert temperature**>.

Fuel Gas Demand: <**Insert cfh**>.

Fuel Gas Input: <**Insert Btu/h**>.

Gas Pressure Regulator:

Capacity: <**Insert cfh**>.

Inlet Pressure: <**Insert psig or inches**> water column.

Gas Pressure Required at Burner: <**Insert psig or inches**> water column.

Electrical Characteristics:

Volts: [**120**] [**240**] [**277**] [**480**] <**Insert value**> V.

Phase: [**Single**] [**Three**].

Hertz: 60 Hz.

Full-Load Amperes: <**Insert value**> A.

Minimum Circuit Ampacity: <**Insert value**> A.

Maximum Overcurrent Protection: <**Insert value**> A.

Minimum Vent Diameter: <**Insert inches**>.

* + - 1. GAS-FIRED, TANKLESS, DOMESTIC-WATER HEATERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2405) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143790).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143787).

[Laars Heating Systems Company; a subsidiary of Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143791).

Approved equivalent.

* + - * 1. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
        2. Standard: ANSI Z21.10.3/CSA 4.3 for gas-fired, instantaneous, domestic-water heaters for indoor application.
        3. Construction: Copper piping or tubing complying with NSF 61 and NSF 372 barrier materials for potable water, without storage capacity.

Tappings: ASME B1.20.1 pipe thread.

Pressure Rating: 150 psig.

Some manufacturers provide unit with stainless steel heat exchanger. Coordinate with manufacturer.

Heat Exchanger: [**Copper tubing**] [**Stainless steel**].

Insulation: Comply with [**ASHRAE/IES 90.1**] [**ASHRAE 90.2**].

Jacket: Metal, with enameled finish, or plastic.

Burner: For use with tankless, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic ignition device in "Automatic Ignition" subparagraph below may be batteries, gas pilot, or electrical power.

Automatic Ignition: Manufacturer's proprietary system for automatic, gas ignition.

Temperature Control: Adjustable thermostat.

* + - * 1. Support: Bracket for wall mounting.

If more than one gas-fired, tankless, domestic-water heater is required on Project, delete "Capacity and Characteristics" paragraph below and schedule gas-fired, tankless, domestic-water heaters on Drawings.

* + - * 1. Capacity and Characteristics:

Flow Rate: <**Insert gpm**> at [**100 deg F**] <**Insert temperature**> temperature rise.

Temperature Setting: [**125 deg F**] [**140 deg F**] <**Insert temperature**>.

Fuel Gas Demand: <**Insert cfh**>.

Fuel Gas Input: <**Insert Btu/h**>.

Gas Pressure Regulator:

Capacity: <**Insert cfh**>.

Inlet Pressure: <**Insert psig or inches**> water column.

Gas Pressure Required at Burner: <**Insert psig or inches**> water column.

Retain "Electrical Characteristics" subparagraph below if model selected requires electrical power.

Electrical Characteristics:

Volts: [**120**] <**Insert value**> V.

Phase: Single.

Hertz: 60 Hz.

Full-Load Amperes: <**Insert value**> A.

Minimum Circuit Ampacity: <**Insert value**> A.

Maximum Overcurrent Protection: <**Insert value**> A.

Minimum Vent Diameter: <**Insert inches**>.

* + - 1. RESIDENTIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS
         1. Residential, Atmospheric, Gas-Fired, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2406) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143839).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143833).

[Lochinvar, LLC](http://www.specagent.com/Lookup?uid=123457143835).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.10.1/CSA 4.1.

Storage-Tank Construction: Steel.

Tappings: ASME B1.20.1 pipe thread.

Pressure Rating: 150 psig.

Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with [**ASHRAE/IES 90.1**] [**ASHRAE 90.2**].

Jacket: Steel with enameled finish.

Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.

Burner: For use with atmospheric, gas-fired, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic ignition in "Ignition" subparagraph below is used in place of a continuously burning (standing) pilot flame for fuel ignition at the burner. Verify availability for model selected.

Ignition: Standing pilot or ANSI Z21.20/CSA C22.2 No. 60730-2-5, electric, automatic, gas-ignition system.

Temperature Control: Adjustable thermostat.

Combination Temperature-and-Pressure Relief Valve: ANSI Z21.22/CSA 4.4. Include relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valve with sensing element that extends into storage tank.

Draft Hood: Low-profile-type draft diverter, complying with ANSI Z21.12.

Dampers in "Automatic Damper" subparagraph below are used, but not required, downstream of water heater draft hoods to shut off the venting system when the water heater is in standby or not in operation. Verify availability for model selected.

Automatic Damper: ANSI Z21.66/CSA 6.14, [**electrically operated**] [**mechanically activated**] [**thermally activated**], automatic-vent-damper device with size matching draft hood.

* + - * 1. Residential, Direct-Vent, Gas-Fired, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=10483) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143756).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143758).

[Lochinvar, LLC](http://www.specagent.com/Lookup?uid=123457143759).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.10.1/CSA 4.1.

Storage-Tank Construction: Steel.

Tappings: ASME B1.20.1 pipe thread.

Pressure Rating: 150 psig.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with [**ASHRAE/IES 90.1**] [**ASHRAE 90.2**].

Jacket: Steel with enameled finish.

Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.

Burner: For use with direct-vent, gas-fired, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic ignition in "Ignition" subparagraph below is used in place of a continuously burning (standing) pilot flame for fuel ignition at the burner. Verify availability for model selected.

Ignition: Standing pilot or ANSI Z21.20/CSA C22.2 No. 60730-2-5, electric, automatic, gas-ignition system.

Temperature Control: Adjustable thermostat.

Combination Temperature-and-Pressure Relief Valve: ANSI Z21.22/CSA 4.4. Include relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valve with sensing element that extends into storage tank.

Direct-Vent System: Through-[**wall**] [**roof**], coaxial- or double-channel vent assembly with domestic-water heater manufacturers' outside intake/exhaust screen.

* + - * 1. Residential, Power-Vent, Gas-Fired, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2410) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143856).

[American Water Heaters](http://www.specagent.com/Lookup?uid=123457143850).

[Bradford White Corporation](http://www.specagent.com/Lookup?uid=123457143851).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: ANSI Z21.10.1/CSA 4.1.

Storage-Tank Construction: Steel.

Tappings: ASME B1.20.1 pipe thread.

Pressure Rating: 150 psig.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with [**ASHRAE/IES 90.1**] [**ASHRAE 90.2**].

Jacket: Steel with enameled finish.

Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.

Burner: For use with power-vent, gas-fired, domestic-water heaters and [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Automatic ignition in "Ignition" subparagraph below is used in place of a continuously burning (standing) pilot flame for fuel ignition at the burner. Verify availability for model selected.

Ignition: Standing pilot or ANSI Z21.20/CSA C22.2 No. 60730-2-5, electric, automatic, gas-ignition system.

Temperature Control: Adjustable thermostat.

Combination Temperature-and-Pressure Relief Valve: ANSI Z21.22/CSA 4.4. Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valve with sensing element that extends into storage tank.

Power-Vent System: Exhaust fan, interlocked with burner.

If more than one residential, gas-fired, storage, domestic-water heater is required on Project, delete "Capacity and Characteristics" paragraph below and schedule residential, gas-fired, storage, domestic-water heaters on Drawings.

* + - * 1. Capacity and Characteristics:

Capacity: <**Insert gal.**>.

Recovery: <**Insert gph**> at [**100 deg F**] <**Insert temperature**> temperature rise.

Temperature Setting: [**125 deg F**] <**Insert temperature**>.

Fuel Gas Demand: <**Insert cfh**>.

Fuel Gas Input: <**Insert Btu/h**>.

Gas Pressure Regulator:

Capacity: <**Insert cfh**>.

Inlet Pressure: <**Insert psig or inches**> water column.

Gas Pressure Required at Burner: <**Insert psig or inches**> water column.

Electrical Characteristics:

Volts: [**120**] [**240**] <**Insert value**> V.

Phase: [**Single**] [**Three**].

Hertz: 60 Hz.

Full-Load Amperes: <**Insert value**> A.

Minimum Circuit Ampacity: <**Insert value**> A.

Maximum Overcurrent Protection: <**Insert value**> A.

Minimum Vent Diameter: <**Insert inches**>.

* + - 1. OIL-FIRED, DOMESTIC-WATER HEATERS
         1. Commercial, Oil-Fired, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2411) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143864).

[Aldrich Company, Inc. (The)](http://www.specagent.com/Lookup?uid=123457143863).

[State Industries](http://www.specagent.com/Lookup?uid=123457143862).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: UL 732 for storage, domestic-water heaters.

Storage-Tank Construction: [**Non-**]ASME-code steel with [**150-psig**] <**Insert value**> minimum working-pressure rating.

Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Retain "Interior Finish" or "Lining" subparagraph below. Retain first subparagraph for manufacturer's standard lining or second for a specific lining; verify availability.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Lining: [**Cement**] [**Glass**] [**Nickel plate**] [**Phenolic coating**] [**Sheet copper**] <**Insert material**> complying with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1.

Jacket: Steel with enameled finish.

Temperature Control: Adjustable thermostat.

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 working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

Oil Burners:

Standard: UL 296 for use with No. 2 fuel oil.

Safety Control: Automatic, high-temperature-limit cutoff device or system.

Draft Regulator: Barometric type or adjustable-damper device.

* + - * 1. Commercial, Large-Volume, Oil-Fired, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2413) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143873).

[Precision Boilers](http://www.specagent.com/Lookup?uid=123457143871).

[PVI; A WATTS Brand](http://www.specagent.com/Lookup?uid=123457143866).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: UL 732 for storage, domestic-water heaters except when capacity is greater than 120 gal..

Storage-Tank Construction: ASME-code steel with [**150-psig**] <**Insert value**> minimum working-pressure rating.

Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Retain "Interior Finish" or "Lining" subparagraph below. Retain first subparagraph for manufacturer's standard lining or second for a specific lining; verify availability.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Lining: [**Cement**] [**Glass**] [**Nickel plate**] [**Phenolic coating**] [**Sheet copper**] <**Insert material**> complying with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1.

Jacket: Steel with enameled finish.

Temperature Control: Adjustable thermostat.

Safety Control: Automatic, high-temperature-limit cutoff device or system.

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 working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

Oil Burners:

Standard: UL 296 for use with No. 2 fuel oil.

Safety Controls: Automatic, high-temperature-limit and low-water cutoff devices or systems.

Draft Regulator: Barometric type or adjustable-damper device.

* + - * 1. Residential, Oil-Fired, Storage, Domestic-Water Heaters:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=2415) Subject to compliance with requirements, provide products by one of the following:

[Bock Water Heaters, Inc](http://www.specagent.com/Lookup?uid=123457143879).

[Therma-Flow/Everhot](http://www.specagent.com/Lookup?uid=123457143877).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

Standard: UL 732 for storage, domestic-water heaters.

Storage-Tank Construction: Steel.

Tappings: ASME B1.20.1 pipe thread.

Pressure Rating: 150 psig.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.

Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with [**ASHRAE/IES 90.1**] [**ASHRAE 90.2**].

Jacket: Steel with enameled finish.

Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.

Temperature Control: Adjustable thermostat.

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 working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

Oil Burner: UL 296 for use with No. 2 fuel oil.

Draft Regulator: Barometric type or adjustable-damper device.

If more than one oil-fired, domestic-water heater is required on Project, delete "Capacity and Characteristics" paragraph below and schedule oil-fired, domestic-water heaters on Drawings.

* + - * 1. Capacity and Characteristics:

Capacity: <**Insert gal.**>.

Recovery: <**Insert gph**> at [**100 deg F**] <**Insert temperature**> temperature rise.

Temperature Setting: [**125 deg F**] [**140 deg F**] <**Insert temperature**>.

Fuel-Oil Demand: <**Insert gpm**>.

Fuel-Oil Input: <**Insert Btu/h**>.

Electrical Characteristics:

Burner Horsepower: <**Insert value**>.

Volts: [**120**] [**240**] [**277**] [**480**] <**Insert value**> V.

Phase: [**Single**] [**Three**].

Hertz: 60 Hz.

Full-Load Amperes: <**Insert value**> A.

Minimum Circuit Ampacity: <**Insert value**> A.

Maximum Overcurrent Protection: <**Insert value**> A.

Minimum Vent Diameter: <**Insert inches**>.

* + - 1. COMMERCIAL, GAS- AND OIL-FIRED, DOMESTIC-WATER HEATERS
         1. Description: Comply with ANSI Z21.10.3/CSA 4.3 or UL 732 requirements appropriate for dual-fuel, gas- and oil-fired, domestic-water heaters.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=2416) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143885).

[Bock Water Heaters, Inc](http://www.specagent.com/Lookup?uid=123457143886).

[PVI; A WATTS Brand](http://www.specagent.com/Lookup?uid=123457143883).

Approved equivalent.

* + - * 1. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.
        2. Storage-Tank Construction: ASME-code steel with [**150-psig**] <**Insert value**> minimum working-pressure rating.

Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.

NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges and in accordance with ASME B16.24 for copper and copper-alloy flanges.

Retain "Interior Finish" or "Lining" subparagraph below. Retain first subparagraph for manufacturer's standard lining or second for a specific lining; verify availability.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Lining: [**Cement**] [**Glass**] [**Nickel plate**] [**Phenolic coating**] [**Sheet copper**] <**Insert material**> complying with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

* + - * 1. Factory-Installed, Storage-Tank Appurtenances:

Anode Rod: Replaceable magnesium.

Dip Tube: Required unless cold-water inlet is near bottom of tank.

Drain Valve: Corrosion-resistant metal with hose-end connection.

Insulation: Comply with ASHRAE/IES 90.1.

Jacket: Steel with enameled finish.

Temperature Control: Adjustable thermostat.

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 working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

* + - * 1. Fuel Burner:

Standards: Combination gas-and-oil burner assembly, complying with appropriate requirements of UL 795; or comply with UL 296 for oil burners for No. 2 fuel oil and UL 795 for [**natural-gas**] [**LP-gas**] <**Insert fuel gas**> fuel.

Safety Control: Automatic, high-temperature-limit cutoff device or system.

Vent Connection: In accordance with standards of authorities having jurisdiction for dual-fuel, domestic-water heaters.

If more than one commercial, gas- and oil-fired, domestic-water heater is required on Project, delete "Capacity and Characteristics" paragraph below and schedule commercial, gas- and oil-fired, domestic-water heaters on Drawings.

* + - * 1. Capacity and Characteristics:

Capacity: <**Insert gal.**>.

Recovery: <**Insert gph**> at [**100 deg F**] <**Insert temperature**> temperature rise.

Temperature Setting: [**125 deg F**] [**140 deg F**] <**Insert temperature**>.

Fuel Gas Demand: <**Insert cfh**>.

Fuel Gas Input: <**Insert Btu/h**>.

Gas Pressure Regulator:

Capacity: <**Insert cfh**>.

Inlet Pressure: <**Insert psig or inches**> water column.

Gas Pressure Required at Burner: <**Insert psig or inches**> water column.

Fuel-Oil Demand: <**Insert gpm**>.

Fuel-Oil Input: <**Insert Btu/h**>.

Electrical Characteristics:

Burner Horsepower: <**Insert value**>.

Volts: [**120**] [**240**] <**Insert value**> V.

Phase: [**Single**] [**Three**].

Hertz: 60 Hz.

Full-Load Amperes: <**Insert value**> A.

Minimum Circuit Ampacity: <**Insert value**> A.

Maximum Overcurrent Protection: <**Insert value**> A.

Minimum Vent Diameter: <**Insert inches**>.

* + - 1. DOMESTIC-WATER HEATER ACCESSORIES

Retain "Domestic-Water Expansion Tanks" paragraph below only if small, non-ASME-code, diaphragm tanks with a capacity of 25 gal. (95 L) or less are required. Small tanks are usually available with 150-psig (1035-kPa) working-pressure rating. Large tanks are usually available with 100-psig (690-kPa) working-pressure rating. A multiple small-tank arrangement may be used to match system pressure and volume requirements. Other expansion tanks are specified in Section 221216 "Facility Elevated, Potable-Water Storage Tanks" or Section 221219 "Facility Ground-Mounted, Potable-Water Storage Tanks."

* + - * 1. Domestic-Water Expansion Tanks:

[Manufacturers:](http://www.specagent.com/Lookup?ulid=13515) Subject to compliance with requirements, provide products by one of the following:

[A. O. Smith Corporation](http://www.specagent.com/Lookup?uid=123457143893).

[Honeywell International Inc](http://www.specagent.com/Lookup?uid=123457143889).

[Taco Comfort Solutions](http://www.specagent.com/Lookup?uid=123457143891).

Approved equivalent.

Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

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.

Construction:

Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.

Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.

Air-Charging Valve: Factory installed.

If more than one domestic-water expansion tank is required on Project, delete "Capacity and Characteristics" subparagraph below and schedule domestic-water expansion tanks on Drawings.

Capacity and Characteristics:

Working-Pressure Rating: [**100 psig**] [**150 psig**] <**Insert value**>.

Capacity Acceptable: [**2 gal.**] [**4 gal.**] [**7 gal.**] [**10 gal.**] <**Insert value**> minimum.

Air Precharge Pressure: <**Insert system pressure**>.

* + - * 1. Drain Pans: Corrosion-resistant metal with raised edge. 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.
        2. Piping-Type Heat Traps: Field-fabricated piping arrangement in accordance with ASHRAE/IES 90.1.
        3. Heat-Trap Fittings: ASHRAE 90.2.

Retain "Manifold Kits" paragraph below only if required for multiple domestic-water heater arrangement. Verify availability. Some domestic-water heater manufacturers can provide piping manifold kits for their domestic-water heaters. Larger manifolds can be field fabricated from water piping and valves.

* + - * 1. 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.
        2. 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."

Comply with requirements for balancing valves specified in Section 221119 "Domestic Water Piping Specialties."

* + - * 1. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1, manually operated. Furnish for installation in piping.

Retain "Gas Pressure Regulators" paragraph below, for a gas pressure regulator to reduce gas supply pressure to pressure required at the domestic-water heater, if the specified water heater does not have the correct regulator.

* + - * 1. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include [**1/2-psig**] [**2-psig**] [**5-psig**] pressure rating as required to match gas supply.
        2. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

Relief valves in "Combination Temperature-and-Pressure Relief Valves," "Pressure Relief Valves," and "Vacuum Relief Valves" paragraphs below are for installation in piping or where no relief valve is specified with the domestic-water heater.

* + - * 1. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valves with sensing element that extends into storage tank.

Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4.

Oil-Fired, Domestic-Water Heaters: ASME rated and stamped.

* + - * 1. Pressure Relief Valves: Include pressure setting less than working-pressure rating of domestic-water heater.

Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4.

Oil-Fired, Domestic-Water Heaters: ASME rated and stamped.

* + - * 1. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

Indicate on Drawings where each type of domestic-water heater support in "Domestic-Water Heater Stands" and "Domestic-Water Heater Mounting Brackets" paragraphs below is required. Delete support types not required. Domestic-water heaters can also be installed at or above ceilings on suspended platforms or brackets.

* + - * 1. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Provide dimension that will support bottom of domestic-water heater minimum of [**18 inches**] <**Insert dimension**> above the floor.
        2. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.
      1. SOURCE QUALITY CONTROL

Retain "Factory Tests" paragraph below for factory-assembled domestic-water heaters and storage tanks. Factory tests are an added cost option and may not be available from some manufacturers. Verify requirement with Owner.

* + - * 1. Factory Tests: Test and inspect assembled domestic-water heaters[**and storage tanks**] specified to be ASME-code construction, in accordance with ASME Boiler and Pressure Vessel Code.

Retain options in first paragraph below if testing of only commercial domestic-water heaters and storage tanks is required.

* + - * 1. Hydrostatically test[**commercial**] domestic-water heaters[**and storage tanks**] to minimum of one and one-half times pressure rating before shipment.
        2. Domestic-water heaters will be considered defective if they do not pass tests and inspections.
        3. Prepare test and inspection reports.

1. EXECUTION
   * + 1. DOMESTIC-WATER HEATER INSTALLATION
          1. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.

Maintain manufacturer's recommended clearances.

Arrange units so controls and devices that require servicing are accessible.

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.

For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

Install anchor bolts to elevations required for proper attachment to supported equipment.

Anchor domestic-water heaters to substrate.

Retain second or third option in "Residential, Domestic-Water Heater Mounting" paragraph below if domestic-water heaters (possible source of ignition) will be installed in a location where hazardous fumes can accumulate.

* + - * 1. Residential, Domestic-Water Heater Mounting: Install residential domestic-water heaters on [**floor**] [**water-heater stand on floor**] [**domestic-water heater mounting bracket**].

Maintain manufacturer's recommended clearances.

Arrange units so controls and devices that require servicing are accessible.

Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

Install anchor bolts to elevations required for proper attachment to supported equipment.

Anchor domestic-water heaters to substrate.

Retain option in "Tankless, Domestic-Water Heater Mounting" paragraph below if domestic-water heaters (possible source of ignition) will be installed in a location where hazardous fumes can accumulate.

* + - * 1. Tankless, Domestic-Water Heater Mounting: Install tankless, domestic-water heaters[**at least 18 inches above floor**] on wall bracket.

Maintain manufacturer's recommended clearances.

Arrange units so controls and devices that require servicing are accessible.

Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

Install anchor bolts to elevations required for proper attachment to supported equipment.

Anchor domestic-water heaters to substrate.

* + - * 1. Install domestic-water heaters level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

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."

* + - * 1. Install gas-fired, domestic-water heaters in accordance with NFPA 54.

Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.

Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.

Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.

Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in [**Section 231123 "Facility Natural-Gas Piping."**] [**Section 231126 "Facility Liquefied-Petroleum Gas Piping."**]

* + - * 1. Install oil-fired, domestic-water heaters in accordance with NFPA 31.

Install shutoff valves on fuel-oil supply piping to oil-fired water-heater burners without shutoff valves. Comply with requirements for shutoff valves specified in Section 231113 "Facility Fuel-Oil Piping."

Retain first paragraph below if domestic-water heaters are required to withstand seismic design loads. Insert special requirements for seismic restraints here or detail on Drawings.

* + - * 1. Install commercial 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" and Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."
        2. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend domestic-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.
        3. Install [**combination temperature-and-**]pressure relief valves in water piping for domestic-water heaters without storage. Extend domestic-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.
        4. 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 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."
        5. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
        6. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each 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."
        7. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
        8. Fill domestic-water heaters with water.

Retain first paragraph below only if domestic-water expansion tanks are specified in this Section. Expansion tanks are often installed in the hot-water supply piping downstream from water heaters. Small, non-ASME, domestic-water expansion tanks are included in this Section. Larger steel, precharged, potable-water storage tanks are specified in Section 221216 "Facility Elevated, Potable-Water Storage Tanks" and Section 221219 "Facility Ground-Mounted Potable-Water Storage Tanks."

* + - * 1. Charge domestic-water expansion tanks with air to required system pressure.
        2. Install dielectric fittings in all locations where piping of dissimilar metals is to be joined. The wetted surface of the dielectric fitting contacted by potable water shall contain less than 0.25 percent of lead by weight.
      1. PIPING CONNECTIONS

Coordinate piping installations and specialty arrangements with Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
        2. Comply with requirements for fuel-oil piping specified in Section 231113 "Facility Fuel-Oil Piping."
        3. Comply with requirements for gas piping specified in [**Section 231123 "Facility Natural-Gas Piping."**] [**Section 231126 "Facility Liquefied-Petroleum Gas Piping."**]
        4. Drawings indicate general arrangement of piping, fittings, and specialties.
        5. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.
      1. IDENTIFICATION
         1. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."
      2. FIELD QUALITY CONTROL

Retain one of first four paragraphs below. Retain first "Testing Agency" paragraph below if Owner will hire an independent testing agency.

* + - * 1. Testing Agency: Director’s Representative will engage a qualified testing agency to perform tests and inspections.

Retain "Testing Agency" paragraph below to require Contractor to hire an independent testing agency.

* + - * 1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Retain "Manufacturer's Field Service" paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a Company Service Advisor to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform tests and inspections" paragraph below to require Contractor to perform tests and inspections and retain option to require Contractor to arrange for the assistance of a factory-authorized service agent.

* + - * 1. Perform tests and inspections[**with the assistance of a Company Field Advisor per OGS Spec Section 014216**].

Retain test requirements below with any combination of paragraphs above.

* + - * 1. Tests and Inspections:

Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

* + - * 1. Domestic-water heaters will be considered defective if they do not pass tests and inspections.
        2. Prepare test and inspection reports.
      1. DEMONSTRATION

Retain this article for commercial, gas-fired, storage, domestic-water heaters; gas-fired, tankless domestic-water heaters; commercial, oil-fired, domestic-water heaters; and commercial, gas- and oil-fired, domestic-water heaters.

* + - * 1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to train**] [**Train**] Director’s Representative's Facility’s maintenance personnel to adjust, operate, and maintain [**commercial, gas-fired, storage,**] [**gas-fired, tankless**] [**commercial, oil-fired,**] [**commercial, gas- and oil-fired,**] domestic-water heaters. Training shall be a minimum of [**one**] [**two**] <**Insert duration**> hour(s).

END OF SECTION 223400