PART 1 - GENERAL REQUIREMENTS

1.01 SUMMARY

A. This Section includes commercial gas fired water heaters.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Section "Concrete Work" for specifications on concrete and reinforcing materials and concrete placing requirements for equipment pads.
2. Division 22 Section “Common Work Results for Plumbing” for concrete equipment pads.
3. Division 22 Section "Basic Piping Materials and Methods" for flexible metal braid connectors, pipe joining materials, specialties, unions, dielectric unions, dielectric flanges, dielectric flange kits and basic installation requirements.
4. Division 22 Section "Meters and Gauges for Plumbing Piping." for thermometers and their installation requirements.
5. Division 22 Section “Natural Gas Piping” for natural gas equipment connections.
6. Division 23 Section "Breechings, Chimneys, and Stacks" for gas-fired water heater vents.
7. Division 26 Section “Common Work Results for Electrical” required electrical devices.
8. Division 26 Sections "Enclosed Switches and Circuit Breakers" for field-installed disconnects.

1.02 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories, and indicating dimensions, required clearances, and methods of assembly of components, and piping and wiring connections.
2. Wiring diagrams from manufacturers detailing electrical requirements for electrical power supply wiring to water heaters. Include ladder-type wiring diagrams for interlock and control wiring required for final installation of water heaters and controls. Differentiate between portions of wiring that are factory installed and portions that are to be field installed.
3. Certificates of shop inspection and data report as required by provisions of the ASME Boiler and Pressure Vessel Code.

4. Maintenance data for inclusion in Operating and Maintenance Manual specified in Division 1 and Division 22 Section "General Plumbing Requirements."

1.03 QUALITY ASSURANCE

A. UL Standards: Provide water heaters complying with the following:

1. UL 778, "Motor Operated Water Pumps."

B. NSF Standards: Provide water heaters complying with NSF No. 5, "Standard for Hot Water Generating Equipment for Food Service Establishments using Spray Type Dishwashing Machines," and bearing NSF label.

C. Electrical Component Standard: Provide components complying with NFPA 70 "National Electrical Code."

D. Listing and Labeling: Provide water heaters that are listed and labeled.

1. The terms "listed" and "labeled" shall be as defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

E. AGA Standards: Provide water heaters that bear the label of the American Gas Association.

F. ASME Code Compliance: Provide water heaters and safety relief valves that comply with ASME Boiler and Pressure Vessel Code and that bear the appropriate code symbols.

G. State Boiler Code Compliance: Provide rated water heaters, safety relief valve, gas train and accessories that comply with the state boiler code in effect.

H. ASHRAE Standards: Provide water heaters with performance efficiencies not less than prescribed in ASHRAE 90.1b, "Energy Conservation in New Building Design."

I. Design Concept: The drawings indicate types and capacities of water heaters and are based on specific descriptions and manufacturers indicated. Water heaters having equal performance characteristics by other manufacturers may be considered provided that deviations in capacities, dimensions, operation, or other characteristics are minor and do not change the design concept or intended performance as judged by the Architect. Burden of proof for equality of water heaters is on the proposer.

1.04 WARRANTY

A. Special Project Warranty: Submit a written warranty, executed by manufacturer, agreeing to repair or replace water heater units that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, controls, tanks, coils, heat exchangers, and burners. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

1. Commercial, Finned-Tube, Gas Fired Water Heaters:

a) Heat Exchanger: Five years.
b) Controls and Other Components: One year.
c) Separate Hot-Water Storage Tanks: Five years.

PART 2 - PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Commercial Gas-Fired Copper Finned-Tube Water Heaters:

a) A.O. Smith Water Products Co. Div.; A.O. Smith Corp.
b) Laars.
c) Lochinvar Water Heater Corp.
d) Raypak, Inc.
e) RBI.

2. Thermal Expansion Tanks

a) Armstrong Pumps, Inc.
b) Amtrol, Inc.
c) Bell & Gosset, ITT
d) Elbi
e) TACO, Inc.

3. Pressure Relief Valves

a) Apollo #16LF-202
b) Cash ACME #FW
c) Watts #LF53
d) Wilkins #P1520XL

4. Vacuum Relief Valves

a) Apollo #37
b) Cash ACME #VR-801
c) Watts #N36
d) Wilkins #VR-10

B. Temperature and Pressure Relief Valve: Lead free brass body meeting ANSI Z21.22.

2.02 GAS-FIRED COPPER FINNED-TUBE WATER HEATERS

A. Description: Automatic, commercial, gas-fired, ASME labeled, copper finned-tube heat exchanger; with integral controls, draft diverter, gas burner, gas train including gas regulator, ASME labeled storage tank, and circulating pump.

1. Heat Exchanger Headers: ASME Boiler Pressure Vessel Code Section 4 160-psig rated bronze or glass-lined, cast iron.

B. Water Heater Insulation: Manufacturer's standard insulation.

C. Storage Tank: ASME Boiler Pressure Vessel Code Section 8 150-rated, glass-lined steel, with anode rods and temperature and pressure relief valve.

D. Storage Tank Insulation: Fiberglass surrounding tank.

E. Water Heater and Storage Tank Jackets: Steel, with baked-on enamel finish.

F. Circulating Pump: All bronze, inline, centrifugal, single-stage, radially split case design, with mechanical seals, and rated for 125 psig working pressure and 225 deg F continuous water temperature.

G. Controls: Adjustable storage tank temperature control fitting with immersion thermostat and Intermittent electronic ignition.

H. Safety Controls: Automatic gas shutoff device to shut off entire gas supply in event of excessive temperature, low water cutout, low gas pressure, low air pressure and flow switch to verify circulating pump operation.

I. Temperature and Pressure Relief Valve: Lead free brass body meeting ANSI Z21.22.

2.03 THERMAL EXPANSION TANKS

A. ASME Thermal Expansion Tanks: Provide size and number as indicated; construct of welded carbon steel ASME labeled for 150 psig working pressure, 200 deg F maximum operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a FDA approved butyl rubber diaphragm securely sealed into tank. Provide taps for pressure gauge and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base. Tank, with taps and supports, shall be constructed, tested, and labeled in accordance with ASME Pressure Vessel Code, Section VIII, Division 1.

B. Thermal Expansion Tanks: Provide size and number as indicated; construct of welded carbon steel listed for 150 psig working pressure, 200 deg F maximum

operating temperature. Separate air charge from system water to maintain design expansion capacity, by means of a FDA approved butyl rubber diaphragm securely sealed into tank. Provide taps for pressure gauge and air charging fitting, and drain fitting. Support vertical tanks with steel legs or base.

2.04 VACUUM RELIEF VALVES

A. Lead free brass body meeting ANSI Z21.22 with silicon disc. Valve shall open at 0.5 inches HG vacuum and be rated for 200 psig working pressure and 250 F operating temperature.

2.05 PRESSURE RELIEF VALVES

A. Pressure Relief Valve: ½" lead free brass body meeting ANSI Z21.22 with screwed ends, stainless steel spring and factory set to relieve at 100 psig

PART 3 - EXECUTION

3.01 WATER HEATER INSTALLATION

A. Install in accordance with manufacturer's installation instructions.

B. General: Install water heaters on concrete equipment bases. Set and connect units in accordance with manufacturer's installation-instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances. Orient so controls and devices needing servicing are accessible.

C. Install thermometers on water heater outlet piping. Thermometers are specified in Division 22 Section "Meters and Gauges for Plumbing Piping."

D. NFPA Compliance: Install gas-fired water heaters in compliance with NFPA 54, "National Fuel Gas Code."

E. NFPA Compliance: Install oil-fired water heaters in compliance with NFPA 31, "Installation of Oil Burning Equipment."

F. Install temperature and pressure relief valve furnished with water heater. The temperature shall be normally set to relieve at 210F and the pressure relief shall be equal to the tank pressure rating. Install line size relief valve discharge line to discharge to an approved receptor with air gap.

G. Vacuum Relief Valve: Install in cold water supply to each water heater downstream of the shutoff and check valves.

H. Water Heater Drain Pan: Install under water heater on wall or ceiling supports or resting on elevated floor slabs. Install drain pan drain line to discharge to an approved receptor with air gap.

I. Install pressure relief valve on cold water supply to water heater downstream of shutoff and check valves. The pressure relief shall be factory set to 100 psig. Install line size relief valve discharge line to discharge to an approved receptor with air gap.

J. Install condensate neutralization kit furnished with water heater condensate drain downstream of trap at condensate connection. Fill kit with water heater manufacturer recommended neutralization media.

3.02 CONCRETE EQUIPMENT BASES

A. Construct concrete equipment bases in accordance with Section "Basic Mechanical Materials and Methods" for setting of equipment.

3.03 EXPANSION TANK INSTALLATION

A. Install in-line expansion tanks in the vertical or horizontal position (where allowed by manufacturer). Where tanks are installed in horizontal position, provide supports per manufacturer requirements.

B. Install stand mounted expansion tanks on concrete equipment bases.

C. Charge expansion tank bladder with air to a pressure equal to the domestic water static pressure.

3.04 CONNECTIONS

A. Piping installation requirements are specified in other Sections of Division 22. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping adjacent to equipment arranged to allow servicing and maintenance.
2. Connect hot and cold water piping to units with shutoff valves and unions. Connect hot water circulating piping to unit with shutoff valve, check valve, and union. Extend relief valve discharge to closest floor drain.
    a) Where water heater piping connections are dissimilar metals, install dielectric waterway fittings or dielectric unions for joints 2" and smaller and dielectric flanges for joints 2-1/2" and larger. Dielectric waterway fittings, unions and flanges are specified in Division 22 Section "Basic Piping Materials and Methods."
    b) Install vacuum relief valve in cold water inlet piping.
3. Connect gas supply piping to burner with drip leg, tee, gas cock, and union; minimum size same as inlet connection. Arrange piping to allow unit servicing. Gas piping is specified in Division 22 Section "Natural Gas Piping".

a) Install vent piping from gas train pressure regulators and valves to outside the building. Terminate vent piping with brass screened vent cap fitting. Do not combine vents except with approval of local authority.

b) Install gas pressure regulators where indicated.

4. Install drain as indirect waste to spill into open drain or over floor drain.

a) Install drain valve at low point in water piping, for water heaters not having tank drain.

5. Install heat traps at inlet and outlet of each water heater storage tank. Heat trap shall be made of elbows and piping. Heat trap shall turn down to 12" below the outlet or inlet, run 12" horizontal and turn up to the cold water to the heater or hot water from the heater. Where multiple tanks are connected with a manifold, a single heat trap may be provided at the connection of the cold water supply to the cold water manifold together.

B. Electrical Connections:

1. Power wiring is specified in Division 26 Section "Common Work Results for Electrical"
2. Field-installed disconnects are specified in Division 26 Sections "Enclosed Switches and Circuit Breakers".
3. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

C. Vent Connections: Connect gas-fired water heater draft hood to the vent system. Unless otherwise indicated provide vent same size as outlet on heater. Comply with gas utility requirements.

1. Vents are specified in Division 23 Section "Breechings, Chimneys, and Stacks."

3.05 FIELD QUALITY CONTROL

A. General: Provide the services of a factory-authorized service representative to test and inspect unit installation, provide start-up service, and demonstrate operation of equipment as specified below.

1. Test and adjust operating and safety controls. Replace damaged and malfunctioning controls and equipment.

3.06 STARTUP

A. Perform the following before start-up final checks:

1. Fill water heaters with water.
2. Piping systems test complete.
3. Check for piping connections leaks.
4. Check for adequate combustion air.

5. Check for clear vent.
6. Test operation of safety controls and devices.

B. Perform the following start-up procedures:

1. Energize circuits.
2. Adjust operating controls.
3. Adjust hot water outlet temperature setting.

3.07 TRAINING

A. General: At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel for a minimum of two hours on the operation and maintenance of the equipment provided under this section.

B. Content: Training shall include but not be limited to:

1. Overview of the system and/or equipment as it relates to the facility as a whole.
2. Operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention.
3. Review data included in the operation and maintenance manuals. Refer to Division 1 Section "Operating and Maintenance Data."

C. Certification: Contractor shall submit to the Engineer a certification letter stating that the Owner’s designated representative has been trained as specified herein. Letter shall include date, time, attendees and subject of training. The certification letter shall be signed by the Contractor and the Owner’s representative indicating agreement that the training has been provided.

D. Schedule: Schedule training with Owner with at least 7 days' advance notice.

END OF SECTION