

<Suggested specification for TURBOPOWER® 99 water heaters with AquaPLEX® storage tanks as manufactured by PVI Industries, LLC of Fort Worth, Texas.>

SECTION 15514 - DOMESTIC WATER HEATERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 1 Specification Sections, apply to this section.

1.2 SUMMARY

This section includes gas-fired storage water heaters for potable water.

1.3 REFERENCES

- A. UL 795 “Commercial – Industrial Gas Heating Equipment”
- B. ASME Boiler and Pressure vessel code, section IV, Part HLW
- C. ANSI Z21.10.3 -2004/CSA 4.3-2004 “Gas Water Heaters”
- D. ASHRAE/IES 90.1-2010
- E. ISO 9001 Quality Management System
- F. NSF/ANSI Standard 61- Drinking Water System Components
- G. ASTM G123 - 00(2005) “Standard Test Method for Evaluating Stress-Corrosion Cracking of Stainless Alloys with Different Nickel Content in Boiling Acidified Sodium Chloride Solution.”
- H. CSD-1-2009 “Controls and Safety Devices for Automatically Fired Boilers”
- I. NFPA 70- National Electric Code
- J. NFPA 54- National Fuel Gas Code

1.4 SUBMITTALS

- A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties and accessories for each model indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, required clearances, components, and size of each field connection
- C. Wiring Diagrams: Detail for wiring power signal, differentiate between manufacture- installed and field-installed wiring
- D. Field Test Reports: Indicate and interpret test reports for compliance with performance requirements. A copy will be furnished to the owner.

- E. Maintenance Data: Include in the maintenance manuals specified in Division 1. Include maintenance guide and wiring diagrams

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable code for internal wiring of factory wired equipment
- B. Units: ETL, UL or CSA Certified as a Complete Gas Fired Water Heater Assemblies.
- C. Gas Train shall comply with UL Standard 795 & ASME CSD-1.
- D. Conform to ASME Section IV. Part HLW for Water Heater construction.

1.6 QUALITY ASSURANCE

- A. Listing: The water heater assembly; including both steam and gas heat exchangers, burners and controls, will be listed ETL listed as a completely packaged unit to UL 795 "Commercial – Industrial Gas Heating Equipment."
- B. ASME Compliance: Water heater shall bear the ASME HLW stamp and be National Board listed
- C. The gas-fired water heater shall operate at 99% thermal efficiency at full firing rate when heating water from 40°F to 140°F. When tested to the ANSI Z21.10.3 efficiency standard, result shall be no less than 97% thermal efficiency at full firing rate. Heater shall comply with ASHRAE 90.1-2007.
- D. The storage capacity indicated on the schedule shall be actual gallons of water available at set-point temperature and not the total gallon capacity of a storage tank with a factor of total gallons available at set-point temperature.
- E. Water heater certified with ISO 9001 International Quality System.
- F. Materials shall meet ASME Section II material requirements and be accepted by NSF 61 for municipal potable water systems. Storage tank materials shall contain more than 80% post-consumer recycled materials and be 100% recyclable.

1.7 COORDINATION

Coordinate size and location of concrete bases

1.8 WARRANTY

- A. Storage Tank: 25-year coverage (15 full, 10 prorated) for manufacturing or material defects, leaks, the production of rusty water and/or chloride stress corrosion cracking. Tank coverage shall include failure due to scale buildup with no provision or condition for maintenance or inspections and no limitations on water chemistry. Tank warranty does not require inspection and maintenance of anode rods.
- B. TURBOPOWER Heat exchanger: 10 year coverage for manufacturing or material defects, leaks, and/or the production of rusty water (5-years full and 5-years pro-rated). Full portion of the warranty includes the replacement exchanger, labor and freight.
- C. Burner and all heater parts: 1 year

- D. The heater shall have a first year service policy, which shall cover labor and freight costs under certain conditions for warranty covered services.

<OPTIONAL> The heater shall have a long-life service policy, which shall cover labor and freight costs under certain conditions for warranty covered services.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Manufacturer shall be a company specializing in manufacturing the products specified in this section with minimum five years' experience. The water heaters shall be manufactured by a company that has achieved certification to the ISO 9001 Quality Management System.
- B. The water heaters shall be ETL listed as a complete unit. The heater shall satisfy current Federal Energy Policy Act standards for both thermal efficiency and stand-by heat losses as established for gas fired water heaters incorporating storage tanks.
- C. Service Access: The water heater shall be provided with access covers for easily accessing all serviceable components. All gas train components must be accessible and able to adjust without the removal of cabinet components.
- D. Manufacturers: PVI is the basis of design. Acceptable manufacturers shall be subject to compliance with the requirements. The storage capacity of the specified product represents the quantity of water available at usable temperature. The storage tanks from alternate suppliers will be upsized as necessary to equal the amount of water available at usable temperature in the specified product.

2.2 CONSTRUCTION and DESIGN

- A. Water heater will be a 4-pass, fire tube, storage-type design firing natural gas.
- B. The storage section of the water heater shall be ASME stamped and National Board Registered for a maximum allowable working pressure of 150 psi and pressure tested to 1-1/2 times working pressure.
- C. All tank connections/ fittings shall be nonferrous and non 300 series stainless steel.
- D. The storage tank shall be an unlined pressure vessel constructed from phase-balanced austenitic and ferritic duplex steel with a chemical structure containing a minimum of 21% chromium to prevent corrosion and mill certified per ASTM A 923 Methods A to ensure that the product is free of detrimental chemical precipitation that affects corrosion resistance. The material selected shall be tested and certified to pass stress chloride cracking test protocols as defined in ISO 3651-2 and ASTM G123 - 00(2005) "Standard Test Method for Evaluating Stress-Corrosion Cracking of Stainless Alloys with Different Nickel Content in Boiling Acidified Sodium Chloride Solution."
- E. Waterside surfaces shall be welded internally utilizing joint designs to minimize volume of weld deposit and heat input. All heat affected zones (HAZ) shall be processed after welding to ensure the HAZ corrosion resistance is consistent with the mill condition base metal chemical composition. Weld procedures (amperage, volts, welding speed, filler metals and shielding gases) utilized shall result in a narrow range of austenite-ferrite microstructure content consistent with phase balanced objectives for welds, HAZ and the base metal.

- F. To attain the highest level of corrosion resistance to potable water and condensation, all internal and external surfaces shall undergo full immersion passivation and pickling processing to meet critical temperature, duration and chemical concentration controls required to complete corrosion resistance restoration of pressure vessel surfaces. Other passivation and pickling methods are not accepted. Immersion passivation and pickling certification documents are required and shall be provided with each product.
- G. Materials shall meet ASME Section II material requirements and be accepted by NSF 61 for municipal potable water systems. Storage tank materials shall contain more than 80% post-consumer recycled materials and be 100% recyclable.
- H. The water heater design will incorporate two separate heat exchangers; a primary, non-condensing heat exchanger and a secondary condensing heat exchanger. Both the primary and secondary heat exchangers shall be ASME-stamped and National Board Registered for a working pressure of 150 psi.
- I. The pre-condensing heat exchanger shall be a fire tube design with the combustion chamber and all heating surfaces completely water-backed. The fireside of the combustion chamber shall be of boiler-grade steel. The waterside of the combustion chamber shall be non-ferrous. The fire tubes shall be solid copper. The heat exchanger shall be field removable from the pressure vessel, allowing 100% access to waterside surfaces.
- J. The condensing heat exchanger shall consist of a series of u-bend fire tubes that are completely submerged in the lower section of the storage tank.
- K. Condensing water heater designs that reintroduce recirculated building hot potable water into the bottom of the vessel or the cold water inlet will not be accepted.
- L. Condensing water heaters that recirculate water from the hot water outlet to the cold water inlet in order to provide temperature or burner modulation control will not be accepted.

2.3 **PERFORMANCE**

- A. When heating water from 40°F to 140°F, the gas-fired water heater shall operate at a minimum 99% thermal efficiency at maximum burner firing rate.
- B. Water heaters that must reduce firing rate to achieve thermal efficiency of 99% when heating water to 140°F will not be acceptable.
- C. When tested to the ANSI Z21.10.3 efficiency standard, result shall be no less than 97% thermal efficiency at maximum burner firing rate.
- D. Water heater will vent through PVC and can connect to PVC immediately at the appliance's vent connection.

2.4 WATER HEATER TRIM

- A. Heater shall employ an electronic operating control with digital temperature readout. Operator shall be capable of connecting to a building automation system through serial connection using Modbus RTU protocol. Combustion shall be controlled by an electronic flame safeguard with pre-purge and post-purge.
 - B. Standard safety controls shall include a secondary operating limit, an automatic-reset high temperature limit and an ASME-rated temperature and pressure relief valve. Optional controls include those selected on the standard and optional equipment list.
 - C. Operating and safety controls shall meet the requirements of UL 795 and FM
- <OPTIONAL> Operating and safety controls shall meet the requirements of CSD-1 or MASS code

PART 3 – EXECUTION

3.1 INSTALLATION

Install water heaters level and plumb in accordance with manufacturers written instructions and referenced standards.

3.2 FINISHING

The storage and heating sections shall be completely factory packaged on a single skid, requiring only job site hookup to utilities, venting, and plumbing. The heater shall be insulated to ASHRAE 90.1-2010 requirements, jacketed with enameled steel panels, and mounted on heavy-duty channel skids. Pressure vessel shall include welded lifting lugs and a ball-type drain valve. The heater shall fit properly in the space provided and installation shall conform to all local, state, and national codes.

3.3 START-UP

Start up on the unit, including flue gas analysis, will be performed by factory trained and authorized personnel. A copy of the startup report will be provided to the owner.