

<Suggested Specification for POWER VT PLUS condensing gas water heater (inputs 399 to 900 MBH) 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

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 condensing gas-fired storage water heaters for potable water.

1.3 REFERENCES

- A. ASME Boiler and Pressure vessel code, section IV, Part HLW
- B. UL 795 “Industrial Gas Heating Equipment”
- 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. CSD-1-2009 “Controls and Safety Devices for Automatically Fired Boilers”
- G. NFPA 70- National Electric Code
- H. NFPA 54- National Fuel Gas Code
- I. NSF/ANSI Standard 61- Drinking Water System Components
- J. 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.”

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 Assembly.
- C. Gas Train shall comply with ANSI Z.21.10.3 or UL 795
- D. Conform to ASME Section IV, Part HLW for Water Heater construction.

1.6 QUALITY ASSURANCE

- A. Listing: The water heater will be listed ETL listed to UL 795 or ANSI Z21.10.3 -2004/CSA 4.3-2004 "Gas Water Heaters"
- B. ASME Compliance: Water heater shall bear the ASME HLW stamp and be National Board listed
- C. The water heater will operate at a minimum 96% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol.
- D. The water heater will comply with current ASHRAE 90.1 requirements.
- E. Water heater manufacturer certified to the ISO 9001 International Quality System.

1.7 COORDINATION

Coordinate size and location of concrete bases

1.8 WARRANTY

- A. Storage tank, heating surfaces, and combustion chamber will have a **15-year** warranty (8 full, 7 prorated) covering manufacturing or material defects, leaks, the production of rusty water, chloride stress corrosion cracking and/or fireside condensate corrosion of heating surfaces.
- B. 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.
- C. Burner and all heater parts: 1 year

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 twenty 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: 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.

2.2 CONSTRUCTION

- A. The water heater will be a vertical fire tube design that is constructed and stamped in accordance with Section IV, Part HLW of the ASME code. Water heater will be National Board Registered for a working pressure of 150 psi and will be pressure tested at 1-1/2 times working pressure.
- B. Water heater will be a three-pass configuration
- C. Tank and fire tubes will be unlined. Lined or plated water heaters will not be acceptable
- D. Tank and fire tubes will be 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. All internal and external tank 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. Water contacting tank surfaces will be non-porous and exhibit 0% water absorption.
- I. All tank connections/fittings will be non-ferrous.
- J. Finished vessel will not require sacrificial anode rods and none will be used. Water heaters or sidearm storage tanks that employ anode rods of any type will not be acceptable.
- K. Combustion will be provided by a premix, fan-assisted surface burner with a gas train meeting ANSI and FM requirements for the input specified.

<OPTIONAL> Combustion will be provided by a fan-assisted burner with a gas train meeting CSD-1/GE-GAP/MASS requirements for the input specified.
- L. Burner will be stainless steel
- M. Burner will employ non-linkage modulation utilizing only a VFD drive to vary gas and air.
- N. Burner NOx emissions will be less than 20 ppm when corrected to 3% oxygen.
- O. Water heater will be a category IV, condensing appliance and vent through CPVC

2.3 **PERFORMANCE**

- A. When tested to the ANSI Z21.10.3 standard, the water heater shall operate at 96% thermal efficiency at full firing rate.
- B. When modulated to low fire, water heater will be capable of 99% thermal efficiency.
- C. Water heater will meet the thermal efficiency and standby heat loss requirements of ASHRAE 90.1 – 2010.

2.4 **WATER HEATER TRIM**

- A. As a minimum, the heater will be equipped with the following:
 - a. electronic flame monitoring
 - b. an *immersion* operating control
 - c. an *immersion* temperature limiting device
 - d. an ASME- or AGA-rated temperature and pressure relief valve
 - e. and options as selected on form PV 8002
- B. Operating and safety controls shall meet the requirements of UL 795 and FM, or ANSI Z21.10.3.

<OPTIONAL> Operating and safety controls shall meet the requirements of CSD-1/GE-GAP and MASS code
- C. The water 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.
- D. <OPTIONAL> A protocol gateway for BacNet MSTP/IP will be provided

< OPTIONAL> A protocol gateway for Lonworks will be provided.

< OPTIONAL> A protocol gateway for Modbus TCP/IP will be provided.

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 coated steel panels, and mounted on heavy-duty channel skids. Pressure vessel shall include 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 will be performed by factory trained and authorized personnel. A copy of the startup report will be provided to the owner.