

<Suggested Specification for CONQUEST condensing gas water heater with AquaPLEX storage tank 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. ANSI Z21.10.3 /CSA 4.3 “Gas Water Heaters”
- C. ASHRAE/IES 90.1
- D. CSD-1 “Controls and Safety Devices for Automatically Fired Boilers”
- E. NFPA 70- National Electric Code
- F. NFPA 54- National Fuel Gas Code
- G. NSF/ANSI Standard 61- Drinking Water System Components
- H. NSF/ANSI Standard 372 – Drinking Water System Components – Lead Content
- I. 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. 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/CSA 4.3 “Gas Water Heaters”
- B. ASME Compliance: Water heater shall bear the ASME HLW stamp and be National Board listed
- C. Water heaters with full rated input between 199,000 and 300,000 BTU will operate at a minimum 95.3% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).

<OPTIONAL> Water heaters with full rated input between 399,000 and 600,000 BTU will operate at a minimum 96% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).

<OPTIONAL> Water heaters with full rated input of 700,000 BTU will operate at a minimum 95% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).

<OPTIONAL> Water heaters with full rated input of 800,000 BTU will operate at a minimum 94% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).

<OPTIONAL> Water heaters with full rated input between 900,000 and 1,000,000 BTU will operate at a minimum 95% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).

- D. The water heater will comply with current ASHRAE 90.1 requirements.

1.7 COORDINATION

Coordinate size and location of concrete bases

1.8 WARRANTY

- A. Storage tank, heating surfaces, and combustion chamber will have a manufacturer’s **15-year** warranty (8 years non-prorated, 7 years prorated) covering manufacturing or material defects, waterside or fire side corrosion, leaks, and/or the production of rusty water. Warranties must be directly provided from the water heater manufacturer. Warranties provided by distributors, contractors, sales representatives or third party insurers will not be accepted.

- B. 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.
- 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.
- C. Manufacturers: PVI is the basis of design. Acceptable manufacturers shall be subject to compliance with the requirements.

2.2 CONSTRUCTION

- A. Water heaters will be of the BTU input(s) and storage capacity indicated on the equipment schedule.
- B. 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.
- C. Water heater will be a single-pass, down-fired, fire tube design contained within an integral storage tank.
- D. Tank, combustion chamber and fire tubes will be unlined. Lined or plated water heaters will not be acceptable.
- E. Tank, combustion chamber 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."
- F. Tank will be welded 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.
- G. 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.
- H. 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.

- I. All water contacting tank surfaces will be non-porous and exhibit 0% water absorption.
- J. All tank connections/fittings will be non-ferrous or stainless steel.
- K. To preserve thermal efficiency, the water heater will not use or require a circulator piped from the hot water outlet to the cold water inlet of the heater for the purpose of temperature control during normal operation. Connection for a building return circulation line will be made to a dedicated hot return fitting at the center of the storage vessel and not the cold inlet piping. Connection to a sidearm tank, if used, will be made to a dedicated hot return fitting at the center of the storage vessel and not the cold inlet piping.
- L. Finished vessel will not require sacrificial or impressed current anodes and none will be used. Water heaters or sidearm storage tanks that employ anode rods of any type will not be acceptable.
- M. Combustion will be provided by a premix, fan-assisted surface burner with a gas train meeting UL, ANSI and FM standards for the input specified.
 - <OPTIONAL> Combustion will be provided by a fan-assisted burner with a gas train meeting MASS code requirements for the input specified.
- N. Burner will be stainless steel.
- O. Gas train components will be capable of self-proportionating gas and air to maintain optimum combustion in response to varying vent pressures.
- P. The burner will employ pulse-width modulation.
- Q. Burner NOx emissions will be less than 20 ppm when corrected to 3% oxygen.
- R. Water heater will be a category IV, condensing appliance and vent through PVC, CPVC, Polypropylene, or stainless steel. Water heater will satisfy requirements for sealed combustion. Vents for inlet air and exhaust can terminate in different pressure zones.
- S. <OPTIONAL> Complete heater will be ETL certified for outdoor installation on models with suffix "GCMLW."

2.3 **PERFORMANCE**

- A. Water heaters with full rated input between 199,000 and 300,000 BTU will operate at a minimum 95.3% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).
 - <OPTIONAL> Water heaters with full rated input between 399,000 and 600,000 BTU will operate at a minimum 96% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).
 - <OPTIONAL> Water heaters with full rated input of 700,000 BTU will operate at a minimum 95% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).
 - <OPTIONAL> Water heaters with full rated input of 800,000 BTU will operate at a minimum 94% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).

<OPTIONAL> Water heaters with full rated input between 900,000 and 1,000,000 BTU will operate at a minimum 95% thermal efficiency at full firing rate when tested to the ANSI Z21.10.3 thermal efficiency test protocol (DOE 10 CFR 431).

- B. Water heater will meet the thermal efficiency and standby heat loss requirements of the latest version of the ASHRAE 90.1 standard.
- C. Water heater will be certified by the DOE/EPA Energy Star program for commercial water heaters, whereby standby loss and thermal efficiency are independently tested and certified.
- D. Water heaters will be third party tested and certified to NSF/ANSI 372 standard for lead content.

2.4 WATER HEATER TRIM

- A. As a minimum, the heater will be equipped with the following:
 - a. electronic flame monitoring
 - b. electronic low water cutoff
 - c. an *immersion* operating control
 - d. an *immersion* UL listed temperature limiting device
 - e. an ASME- rated temperature and pressure relief valve
 - f. and options as selected on form PV 8293

- B. 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/GEGAP 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. Control will be embedded with Modbus RTU and BACnet MSTP.

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 meet current ASHRAE 90.1 standby loss requirements and jacketed with a polyethylene liner consisting of 100% recycled material. 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

<OPTIONAL> 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.