

<Suggested specification for a packaged water heater with a double-wall, copper, steam heat exchanger connected to 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 storage water heaters for potable water utilizing steam as the energy source.

#### **1.3 REFERENCES**

- A. ASME Boiler and Pressure vessel code
- B. ISO 9001 Quality Management System
- C. NFPA 70- National Electric Code
- D. NSF/ANSI Standard 61- Drinking Water System Components

#### **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. Conform to ASME Section VIII for heat exchanger construction.

## **1.6 QUALITY ASSURANCE**

- A. ASME Compliance: Water heater shall bear the ASME stamp and be National Board listed.
- B. Water heater manufacturer shall be certified with ISO 9001 Quality Management System.

## **1.7 COORDINATION**

Coordinate size and location of concrete bases.

## **1.8 WARRANTY**

- A. Heat exchanger: Three year coverage for manufacturing or material defects, leaks, and/or the production of rusty water.
- B. Storage tank: Twenty-five year coverage (15 years full, 10 years prorated) for manufacturing or material defects, corrosion, leakage and/or the production of rusty water.
- C. All other 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 for a period of 5 years from date of startup.

## **PART 2 – PRODUCTS**

### **2.1 MANUFACTURERS**

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

### **2.2 HEAT EXCHANGER CONSTRUCTION**

- A. Water heating system will employ a heat exchanger utilizing steam to heat potable water and potable water will be circulated between this heat exchanger and a tandem storage tank. Building system cold and hot water connections will be made to the storage tank.
- B. The heat exchanger will be a vertical, double-wall, copper tube design utilizing counter flow paths for the potable water and the steam. The exchanger will be ASME stamped, section VIII and rated

for 150 psi operating pressure at 250°F.

- C. At steam pressure up to 15 psi, a steam control valve will not be required at the heat exchanger inlet. At the end of a call for heat, a solenoid valve at the condensate outlet of the heat exchanger will close terminating the flow of steam.

< OPTIONAL> With steam pressure greater than 15 psi, a steam pressure reducing valve will be included to decrease steam pressure to 15 psi at the inlet of the heat exchanger. At the end of a call for heat, a solenoid valve at the condensate outlet of the heat exchanger will close terminating the flow of steam.

- D. The heat exchanger will be mounted on a separate skid for field connection to the sidearm storage tank. Heat exchanger to tank piping will factory pre-assembled and shipped separately for field installation. All piping to and from the potable water side of the exchangers will be non-ferrous.
- E. Heat exchanger will include a steam trap and a condensate y-strainer.
- F. Potable water piping to the heat exchanger will include a bronze y-strainer with a blow down valve.
- G. Potable water piping will include isolation valves to allow clean in place. Dedicated clean-in-place ball valves will be provided.
- H. Potable water piping to the heat exchanger will include a bronze circulator properly sized for the heat transfer requirements and pressure drop through the factory pre-assembled piping.

### 2.3 STORAGE TANK CONSTRUCTION

- A. The storage tank shall be ASME Section IV stamped and National Board Registered for a maximum allowable working pressure of 150 psi and pressure tested at 1-1/2 times working pressure.
- B. All tank fittings shall be non-ferrous. Tank shall be equipped with a ball-type drain valve on the bottom head tank. Tank design will include a man way sized access to the tank interior. Tank will include a combination temperature and pressure relief valve.
- C. 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."
- D. 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.

- E. 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.
- 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.
- G. Water contacting tank surfaces will be non-porous and exhibit 0% water absorption.
- H. Lined or plated storage tanks will not be acceptable.
- I. The water heater will not require anode rods and none will be used. Tanks that employ either sacrificial or impressed current anodes will not be acceptable.

## **2.4 TEMPERATURE CONTROL**

- A. The storage will include an electronic operating thermostat with digital temperature readouts. If equipped with the optional serial cable, the operator will be connectable to BAS utilizing Modbus RTU protocol. BAS will be able to read sensed temperatures and temperature alarm status and over-write the operating set point to engage nighttime setback of stored water temperature if desired.
- B. A call for heat will be initiated when the main operating probe located in the storage tank senses stored water temperature below the set point temperature programmed into the electronic operator. The operating control will then energize the circulating pump to flow water from the tank and into the heat exchanger. The operating control will concurrently open a solenoid valve on the condensate outlet of the heat exchanger allowing steam flow. When the storage tank regains set point temperature, the circulating pump will be de-energized and the condensate solenoid valve will close. Pump circuit will include a short time delay to remove residual heat from the heat exchanger.
- C. **< 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 heating section and the storage tank shall be completely factory packaged on individual skids and will be plumbed together at the job site. The tank- to-exchanger plumbing will be factory pre-

built but shipped separately for field assembly. The entire heating package 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.