<Suggested specification for TURBOPOWER® oil-fired and combination gas/oil-fired water heaters with AquaPLEX® storage tank and fire tubes 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 oil-fired storage water heaters for potable water.

1.3 REFERENCES

A. UL 732 "Oil-fired Storage Tank Water Heaters"

B. UL 795 "Commercial – Industrial Gas Heating Equipment"

C. ASME Boiler and Pressure vessel code, section IV, Part HLW

D. ANSI Z21.10.3/CSA 4.3 "Gas Water Heaters"

E. ASHRAE/IES 90.1

F. ASME CSD-1 "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, and furnished specialties and accessories for each model indicated.

B. Shop Drawings: These contain detailed equipment assemblies and indicate the dimensions, required clearances, components, and size of each field connection.

C. Wiring Diagrams: Contains details for wiring power signal, and differentiates 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: Included in the maintenance manuals specified in Division 1. Include a 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 and oil-fired water heater assembly.

C. Fuel train shall comply with UL Standard 732 and UL Standard 795.

D. Conform to ASME Section IV. Part HLW for Water Heater construction.

1.6 QUALITY ASSURANCE

A. Listing: The water heater will be ETL listed to UL 732 “Oil-fired Storage Type Water Heaters” and UL 795 “Commercial—Industrial Gas Heating Equipment.”

B. ASME Compliance: The water heater shall bear the ASME HLW stamp and be listed with the National Board.

C. The water heater shall operate at least to 83% thermal efficiency when tested to the ANSI Z21.10.3 efficiency standard. It shall also comply with ASHRAE 90.1-2010 requirements for thermal efficiency and standby heat loss.

1.7 COORDINATION

Coordinate the size and location of concrete bases.

1.8 WARRANTY

A. Storage Tank: 25-year coverage (15 years full, 10 years prorated) for manufacturing or material defects, leaks, rusty or discolored water production, and/or chloride stress corrosion cracking.

B. Heat exchanger: 10-year coverage for manufacturing or material defects, leaks, and/or production of rusty or discolored 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, covering labor and freight costs under certain conditions for warranty-covered services.

<OPTIONAL> The heater shall have a long-life service policy (available at additional cost), covering labor and freight costs under certain conditions for warranty-covered services for 5 years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: The manufacturer shall be a company specializing in manufacturing the products specified in this section with a minimum of 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 thermal efficiency and stand-by heat losses as established for gas-fired water heaters incorporating storage tanks.

C. Service Access: The water heater shall have access covers for quickly accessing all serviceable components. All gas train components must be accessible and adjustable without removing 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 fire tube with a storage-type design that fires #2 fuel oil or can be switched between natural gas and #2 fuel oil.

B. The storage section of the water heater shall be ASME HLW stamped and National Board Registered for a maximum allowable working pressure of 150 psi and pressure tested at 1-1/2 times working pressure.

C. All tank connections/ fittings shall be nonferrous. The tank shall be equipped with a ball-type

drain valve. The tank design will include manway-sized access to the interior.

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 923Methods 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 3651-2and 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 the 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 the critical temperature, duration, and chemical concentration controls required to complete the 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. Lined or plated storage tanks will not be acceptable.

J. The water heater will not require anode rods, and none will be used. Tanks that employ anodes will not be acceptable.

K. The heat exchanger shall be a two-pass, fire tube design with the combustion chamber and completely water-backed heating surfaces.

L. The fireside of the combustion chamber shall be of boiler-grade steel. The waterside of the combustion chamber shall be a non-ferrous composite of copper arc spray sealed with PTFE. The fire tubes shall be solid copper. The heat exchanger shall be field removable from the pressure vessel, allowing 100% access to waterside surfaces.

<OPTIONAL> The combustion chamber shall be fabricated from pickle-passivated duplex stainless steel after complete fabrication. The fire tubes shall be solid copper. The heat exchanger shall be field removable from the pressure vessel, allowing 100% access to waterside surfaces.

M. A fan-assisted burner will provide combustion with an oil fuel train meeting UL and FM requirements for the input specified.

<OPTIONAL> Combustion will be provided by a fan-assisted combination GAS/OIL burner with an oil fuel train and gas train meeting UL and FM requirements for the input selected.

2.3 PERFORMANCE

A. When tested to the ANSI Z21.10.3 thermal efficiency standard, the result shall be no less than 83%.

B. The water heater will meet the thermal efficiency and standby 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 thermostat

   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 8166 and PV 8050

B. Operating and safety controls shall meet the requirements of UL and FM

   < OPTIONAL> Operating and safety controls shall meet the requirements of CSD-1/GEGAP and MASS code.

C. < OPTIONAL> The water heater shall employ an electronic operating control with a digital temperature readout. The operator shall be able to connect to a building automation system through a serial connection using Modbus RTU protocol.

D. < OPTIONAL > A BACnet MSTP/IP protocol gateway will be provided.

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

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

PART 3 – EXECUTION

3.1 INSTALLATION

Install the water heater level and plumb per the manufacturer's written instructions and referenced standards.

3.2 FINISHING

The storage and heating sections shall be 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. 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.