



**DIVISION 22 34 36.23**

**STAINLESS STEEL DOMESTIC WATER HEATERS**

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Section includes condensing gas-fired, stainless steel hot water supply Heaters

*Specifier Note: Use as needed*

B. Related Sections

- 1. Building Services Piping – Division 23 21 00
- 2. Breeching, Chimneys, and Stacks (Venting) – Division 23 51 00
- 3. HVAC Instrumentation and Controls – Division 23 09 00
- 4. Electrical – Division 23 09 33

1.2 REFERENCES

- A. ANSI Z21.10.3/CSA 4.3
- B. ASME, Section IV
- C. 2006 UMC, Section 1107.6
- D. ANSI/ASHRAE 15-1994, Section 8.13.6
- E. National Fuel Gas Code, ANSI Z223.1/NFPA 54
- F. NEC

1.3 SUBMITTALS

- A. Product data sheet (including dimensions, rated capacities, shipping weights, accessories)
- B. Wiring diagram
- C. Warranty information
- D. Installation and operating instructions

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements
  - 1. ANSI Z21.10.3/CSA 4.3
  - 2. Local and national air quality regulations for low NOx
- B. Certifications
  - 1. CSA
  - 2. ASME, Section IV, H Stamp and National Board Listed
  - 3. S.C.A.Q.M.D. rule 1146.2 (<20 PPM NOx emissions @ 3% O<sub>2</sub>)
  - 4. CSA Certified – AB 1953 & VLA 193 Low Lead Compliant

1.5 HEAT EXCHANGER WARRANTY

- A. Limited five-year heat exchanger warranty
- B. Limited twenty-five-year thermal shock warranty

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

#### A. Raypak, Inc.

1. Contact: 2151 Eastman Ave., Oxnard, CA 93030; Telephone: (805) 278-5300; Fax: (800) 872-9725; Web site: www.raypak.com
2. Product: XFyre™ condensing stainless steel hot water supply Heater(s)

### 2.2 HEATERS

#### A. General

1. Heater(s) shall be fired with \_\_\_\_\_ gas at a rated input of \_\_\_\_\_ BTU/hr.
2. Heater(s) shall be CSA tested and certified with a minimum thermal efficiency of 95 percent at full fire.
3. Heater(s) shall be ASME inspected and stamped and National Board registered for 160 PSIG maximum allowable working pressure and 210°F maximum allowable temperature, complete with a Manufacturer's Data Report.
4. Heater(s) shall have a floor loading of 95 lbs. /square foot or less.

#### B. Primary Heat Exchanger

1. The primary heat exchanger shall be of a helically wound, multi-pass design and shall completely encircle the combustion chamber for maximum efficiency.
2. There shall be no banding material, gaskets or "O" rings in the header configuration. The heat exchanger is removable from the cabinet for replacement without removing the entire heater assembly from the site. The stainless steel combustion chamber shall be designed to have a trough located on the bottom front and back section leading to the middle to ensure that condensation does not collect in the Heater.
3. The low water volume primary heat exchanger shall be explosion-proof on the water side and shall carry a twenty-five-year warranty against thermal shock.
4. The flue connection, combustion air opening, gas connection, electrical connections and condensate drain shall be located on the rear. Water connections shall be located on the left rear top of the unit.

#### C. Condensate Drain

1. Heater(s) will feature a condensate float switch which will shut down the Heater(s) if the condensate drain is blocked.

#### D. Burners

1. The combustion chamber shall be of the sealed combustion type employing the Raypak high temperature metal fiber burner, mounted in a horizontal orientation.
2. The burner shall be a premix design and constructed of high grade Inconel and must be capable of firing at both a complete blue flame with maximum gas and air input as well as firing infrared when gas and air are reduced. The burner must be capable of firing at 100% of rated input when supplied with 4.0" WC of inlet gas pressure, so as to maintain service under heavy demand conditions; no exceptions.
3. The burner shall use a combustion air blower to precisely control the fuel/air mixture for maximum efficiency throughout the entire range of modulation. The combustion air blower shall operate for a pre-purge period before burner ignition and a post-purge period after burner operation to clear the combustion chamber.
4. The blower shall infinitely vary its output in response to a PWM signal supplied directly from the Versa IC modulating control, thereby electronically and precisely adjusting the volume of air and gas supplied for combustion. Minimum fire shall be 20 percent of rated input.

#### E. Ignition Control System

1. Heater(s) shall be equipped with a 100 percent safety shutdown.
2. The ignition shall be spark ignition type with full flame rectification by the ignition source, with a three try-for-ignition sequence, to ensure consistent operation.
3. The igniter will be located above the burner to ensure easy ignition.

4. The Versa IC ignition control module shall include an LCD display that indicates individual diagnostic faults.
  5. A viewing port shall be provided, permitting visual observation of burner operation.
- F. Gas Train
1. The heater(s) shall have a firing/leak test valve and pressure test valve as required by CSD-1.
  2. The heater(s) shall have dual-seated main gas valve.
  3. Gas control trains shall have a redundant safety shut-off feature, main gas regulation, and plugged pressure tapping to meet the requirements of ANSI Z21.10.3/CSA 4.3.
- G. Heater Control
1. The following safety controls shall be provided:
    - a. 180°F High limit control with manual reset (maximum tank setpoint 150°F)
    - b. Flow switch, mounted and wired
    - c. \_\_\_\_\_ PSIG ASME pressure relief valve, piped by the installer to an approved drain
    - d. Temperature and pressure gauge (shipped loose)
  2. The heater(s) shall be equipped with an integrated PID modulating temperature controller with LCD display that incorporates an adjustable energy-saving pump control relay and freeze protection and is factory mounted and wired to improve system efficiency; three water sensors are included (tank sensor is loose).
  3. The heater(s) shall allow for 0-10 VDC input connection for remote building DDC system control of tank temperature or firing rate and have a built-in "Cascade" function to sequence and rotate while maintaining modulation of up to four heaters without utilizing an external sequencer.
- H. Firing Mode: Provide electronic modulating control of the gas input to the Heater.
- I. Heater Diagnostics
1. Provide monitoring of all safeties, internal/external interlocks with fault display by a 3-1/2" LCD display:
    - a. System status
    - b. Ignition failure
    - c. Condensate blockage
    - d. Blower speed error
    - e. Low 24VAC
    - f. Manual reset high limit
    - g. Auto reset high limit
    - h. Low Water Cut Off (LWCO) (optional)
    - i. Blocked vent
    - j. Low gas pressure switch (optional)
    - k. High gas pressure switch (optional)
    - l. Flow switch fault
    - m. Sensor failure
      1. Inlet sensor (open or short)
      2. Outlet sensor (open or short)
      3. System sensor (open or short)
      4. Air sensor (optional) (open or short)
      5. DHW sensor (optional) (open or short)
    - n. High vent temperature
    - o. Internal control fault
    - p. ID Card fault
    - q. Cascade communication error
- J. Cabinet
1. The corrosion-resistant galvanized-steel jackets shall be finished with a baked-on PolyTuf powder coat, which is suitable for outdoor installation, applied prior to assembly for complete coverage.
  2. The heater(s), if located on a combustible floor, shall not require a separate combustible floor base.
  3. The heater(s) shall connect both the combustion air and flue products through the back of the unit.

4. The heater shall have as standard an internal, combustion air filter rated to MERV 8 (>95% arrestance).

K. Heater Pump – The heater(s) shall be equipped with an optional factory-packaged pump system.

### 2.3 HEATER OPERATING CONTROLS

- A. Each heater shall have the ability to receive a 0 to 10 VDC signal from the Central Energy Management and Direct Digital Control System (EMCS) to vary the setpoint control or firing rate. Each heater shall have an alarm contact for connection to the central EMCS system.
- B. Each heater shall be equipped with Modbus communications compatibility with up to 146 points of data available.
- C. Heater(s) shall feature an integrated Versa IC modulating digital controller, mounted and wired.
- D. System sensor shall be shipped loose for field installation by installing contractor. Inlet/Outlet sensors are factory-installed.

### 2.4 DIRECT VENT

- A. Heater(s) shall meet safety standards for direct vent equipment as noted by the 2006 Uniform Mechanical Code, section 1107.6, and ASHRAE 15-1994, section 8.13.6.
- B. Heater shall be capable of combined combustion air duct and vent lengths not to exceed 200 equivalent feet.

### 2.5 SOURCE QUALITY CONTROL

- A. Heater(s) shall be completely assembled, wired, and fire-tested prior to shipment from the factory.
- B. Heater(s) shall be furnished with the sales order, ASME Manufacturer's Data Report(s), inspection sheet, wiring diagram, rating plate and Installation and Operating Manual.

## **PART 3 - EXECUTION**

### 3.1 INSTALLATION

- A. Must comply with:
  - 1. Local, state, provincial, and national codes, laws, regulations and ordinances
  - 2. National Fuel Gas Code, ANSI Z223.1/NFPA 54 – latest edition
  - 3. National Electrical Code, ANSI/NFPA 70 – latest edition
  - 4. Canada only: CAN/CGA B149 Installation Code and CSA C22.1 CEC Part I
  - 5. Manufacturer's installation instructions, including required service clearances and venting guidelines
- B. Manufacturer's representative to verify proper and complete installation.

### 3.2 START-UP

- A. Shall be performed by Raypak factory-trained personnel.
- B. Test during operation and adjust if necessary:
  - 1. Safeties
  - 2. Operating Controls
  - 3. Static and full load gas supply pressure
  - 4. Gas manifold and blower suction pressure
  - 5. Combustion analysis
- C. Submit copy of start-up report to Architect and Engineer.

### 3.3 TRAINING

- A. Provide factory-authorized service representative to train maintenance personnel on procedures and schedules related to start-up, shut-down, troubleshooting, servicing, and preventive maintenance.
- B. Schedule training at least seven days in advance.

**END OF SECTION**