

DIVISION 23 52 33.13

DOMESTIC FINNED-TUBE WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes copper or cupronickel finned-tube gas-fired water heaters

Specifier Note: Use as needed

B. Related Sections

1. Building Services Piping – Division 22 10 00
2. Breeching, Chimneys, and Stacks (Venting) – Division 23 51 00
3. Electrical – Division 23 09 33

1.2 REFERENCES

- A. ANSI Z21.10.3/CSA 4.3
- B. ASME, Section IV
- C. 2015 UMC, Section 1107.6
- D. ANSI/ASHRAE 15-2010, Section 8.13.6
- E. National Fuel Gas Code, NFPA 54/ANSI Z223.1
- F. NEC, ANSI/NFPA 70
- G. ASME CSD-1, 2018 (if required)
- H. ASHRAE 90.1 (if installed as a part of an applicable system)

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 (less than 20 PPM NOx emissions) water heaters
- B. Certifications
 1. CSA
 2. CEC
 3. ASME, HLW Stamped and National Board Listed
 4. Ultra Low NOx (BAAQMD Reg. 9, Rule 7 Approved)
 5. CSA Certified – AB1953 & VLA 193 Low Lead Compliant
 6. ISO 9001:2015

1.5 WARRANTY

- A. Limited one-year parts warranty
- B. Limited five-year copper heat exchanger warranty
- C. Limited ten-year cupronickel heat exchanger warranty
- D. Limited twenty-five-year thermal shock warranty

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PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Raypak, Inc.

1. Contact: 2151 Eastman Ave., Oxnard, CA 93030; Telephone: (805) 278-5300; Fax: (805) 278-5468; Web site: www.raypak.com
2. Product: MVB copper or cupronickel finned-tube domestic water heater(s)

2.2 WATER HEATERS

A. General

1. The water heater(s) shall be fired with _____ gas at a rated input of ____ BTU/hr.
2. The water heater(s) shall be CSA tested and certified with a minimum thermal efficiency of 85% at full fire (up to 88.4% at part load).
3. The water heater(s) shall be ASME inspected and stamped and National Board registered for 160 PSIG working pressure and 210°F maximum allowable temperature, complete with a Manufacturer's Data Report.
4. The water heater(s) shall have a floor loading of 124 lbs. /square foot or less.

B. Heat Exchanger

1. The heat exchanger shall be of a single-bank, vertical multi-pass design and shall completely enclose the combustion chamber for maximum efficiency. The tubes shall be set vertically and shall be rolled into a powder-coated, ASME water heater quality, carbon-steel tube sheet.
2. The heat exchanger shall be sealed to 160 PSIG-rated bronze headers with high-temp silicone "O" rings.
3. The low water volume heat exchanger shall be explosion-proof on the waterside.
4. The headers shall be secured to the tube sheet by stud bolts with flange nuts to permit inspection and maintenance without removal of external piping connections. A heavy-gauge stainless steel slotted heat exchanger wrap shall ensure proper combustion gas flow across the copper or cupronickel finned tubes.
5. The water heater(s) shall be capable of operating at inlet water temperatures as low as 120°F without harmful condensation.
6. The water heater(s) flue connection, combustion air opening, gas connection, water connections and electrical connections shall be located on the rear.
7. The primary heat exchanger shall have accessible water heater drain valves with hose bibs to drain the water section of the primary heat exchanger.

C. Burners

1. The combustion chamber shall be of the sealed combustion type employing the Raypak high temperature radially-fired knit burner, mounted in a vertical orientation.
2. The burner 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 natural gas pressure, 8.0" WC when supplied with propane gas, 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 Pulse Width Modulation (PWM) signal supplied directly from the VERSA IC® modulating temperature controller, thereby electronically and precisely adjusting the volume of air and gas supplied for combustion. Minimum fire shall be 60% percent under normal conditions and as low as 14% of rated input when necessary (natural gas).

D. Ignition Control System

1. The water heater(s) shall be equipped with a 100 percent safety shutdown.
2. The ignition shall be Hot Surface Ignition type with full flame rectification by remote sensing

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separate from the ignition source, with a three-try-for-ignition sequence (single-try optional), to ensure consistent operation.

3. The igniter will be located to the side of the heat exchanger to protect the device from condensation during start-up.
 4. The ignition control module shall include an LED that indicates fifteen (15) individual diagnostic flash codes and transmits any fault codes to the 7" capacitive color touchscreen display.
 5. An external viewing port shall be provided, permitting visual observation of burner operation.
- E. Gas Train
1. The water heater(s) shall have a firing/leak test valve and pressure test valve.
 2. The water heater(s) shall have dual-seated main gas valve.
 3. Gas control trains shall have a redundant safety shut-off feature, main gas regulation, shut-off cock and plugged pressure tapping to meet the requirements of ANSI Z21.10.3/CSA 4.3.
 4. High gas pressure safety switch
- F. Water Heater Control
1. The following safety controls shall be provided:
 - a. High limit control with manual reset
 - 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
 2. The water heater(s) shall be equipped with the following:
 - a. VERSA IC integrated modulating controller with 7" color touch screen display
 - b. Two adjustable energy-saving pump control relays (system, indirect DHW)
 - c. Freeze protection
 - d. Three (3) water sensors included (system sensor is loose).
 - e. Each water heater shall have the ability to receive a 0-10 VDC signal from the Central Energy Management and Direct Digital Control System (EMCS) to vary the setpoint control or firing rate. Each water heater shall have an alarm contact for connection to the central EMCS system.
 3. The water heater(s) shall have built-in "Cascade" function for up to eight (8) units of same or different BTUH inputs without utilizing an external controller or sequencer.
 - a. .
 - b. System shall be capable of leader redundancy and lead rotation every forty-eight (48) hours.
 - c. Cascade function shall allow users to enable or disable alarm sharing across cascaded appliances when an alarm condition occurs
 - d. Cascade functions shall include an interstage delay setting with auto delay option to prevent overshooting of supply target temperatures.
- G. Firing Mode: Provide electronic modulating control of the gas input to the water heater.
- H. Water Heater Diagnostics
1. Provide external LED panel displaying the following water heater status/faults:
 - a. Power on – Green
 - b. Call for heat – Amber
 - c. Burner firing – Blue
 - d. Service – Red
 2. Provide monitoring of all safeties, internal/external interlocks with fault display on the 7" touch screen display:
 - a. System status
 - b. Ignition failure
 - c. Condensate blockage
 - d. Blower speed error
 - e. Low 24VAC
 - f. Manual reset high limit

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- g. Blocked vent
- h. High gas pressure switch
- i. Controller alarm
- j. Flow switch fault
- k. Sensor failure
 - 1. Inlet sensor (open or short)
 - 2. Outlet sensor (open or short)
 - 3. Tank sensor (open or short)
- l. Internal control fault
- m. ID card fault
- n. Cascade communications error

Specifier Note: The remaining items in this section are options. Delete those that are not being specified.

- o. Auto reset high limit (optional)
 - p. Low water cut-off (optional)
 - q. Low gas pressure switch (optional)
- I. Combustion Chamber: The combustion chamber wrapper shall be sealed to reduce standby radiation losses, reducing jacket losses and increasing unit efficiency.
- J. Cabinet
 - 1. The corrosion-resistant galvanized steel jackets shall be finished with a baked-on PolyTuf epoxy powder coat, suitable for outdoor installation, applied prior to assembly for complete coverage, and shall incorporate louvers in the outer panels to divert air past heated surfaces.
 - 2. The water heater(s), if located on a combustible floor, shall not require a separate combustible floor base.
 - 3. The water heater(s) shall connect both the combustion air and flue products through the back of the unit.
 - 4. The water heater shall have as standard an internal, high capacity combustion air filter rated to MERV 8 (>95% arrestance)
- K. Water Heater Pump - Refer to Equipment Schedule
- L. Cold Water Protection – Variable Speed Injection System
 - 1. The water heaters shall be configured with a proportional variable-flow injection pumping system controlled by the onboard VERSA IC that ensures the water heater will experience inlet temperatures in excess of 120°F in less than 7 minutes to avoid damaging condensation. The unit can be user-configured to automatically shut down or continue to operate if the inlet temperature is not achieved within the 7-minute time frame and will provide alarm output.
 - 2. The Cold Water Protection Function is user-adjustable to allow for custom tuning for varying lengths of piping. The PID logic shall be capable of limiting system overshoot to a maximum of 10°F on initial start-up or call-for-heat.
 - 3. The system shall be completely wired and mounted at the factory

2.3 WATER HEATER OPERATING CONTROLS

- A. Raymote™ Connectivity
 - 1. The VERSA IC shall include the Raymote connectivity feature to allow remote access to boiler or water heater data, and to provide maintenance reminders and error notifications on iOS and Android devices or by website access.
 - 2. The Raymote system allows for registering of multiple devices at various locations and multiple devices in a single cascade installation. The system also allows separate Groups to be established with various levels of access and control permission to be set by the equipment owner. The Groups feature will also allow for quick and efficient troubleshooting service by Raypak's Service Team.
 - 3. Raymote will provide reminders and alerts via iOS or Android notification, text, or email. All notification features are user set.
 - 4. The Raymote app and website will allow remote monitoring of the following:
 - a. Outlet and inlet temperature monitoring

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- b. Vent temperature
 - c. Flow (if equipped)
 - d. Blower speed
 - e. Modulation percentage
 - f. Flame current
 - g. Run time
 - h. Heater Status
 - i. Cycles
 - j. Historical data
- 5. The Raymont App and Website will allow remote control/adjustment of the following:
 - a. Temperature setpoint
 - b. Temperature differential
 - c. Outdoor Reset settings
 - d. Indirect Setpoint
 - e. Indirect differential
 - f. Custom notification
 - g. Full historical data reports will be available for review on the Raymont website.
 - 6. One (1) year of Raymont service is included with boiler/water heater purchase.
- B. Each water heater shall be equipped with Modbus communications compatibility with up to 146 points of data available.
- a. B-85 Gateway – BACnet MS/TP, BACnet IP, N2 Metasys or Modbus TCP shipped loose/installed (optional – please specify shipped loose or installed)
 - b. B-86 Gateway – LonWorks shipped loose/installed (optional – please specify shipped loose or installed)

2.4 DIRECT VENT

- A. Water heater(s) shall meet safety standards for direct vent equipment as noted by the 2015 Uniform Mechanical Code, section 1107.6, and ASHRAE 15-1994, section 8.13.6.
- B. Water heater shall be capable of combined combustion air duct and vent lengths not to exceed 100 equivalent feet each.

2.5 SOURCE QUALITY CONTROL

- A. The water heater(s) shall be completely assembled, wired, and fire-tested prior to shipment from the factory.
- B. The water heater(s) shall be furnished with the sales order, ASME Manufacturer's Data Report, 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, NFPA 54/ANSI Z223.1 – 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 (2.2)
 - 2. Operating Controls (2.3)
 - 3. Static and full load gas supply pressure

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4. Gas manifold and blower air pressure
 5. Combustion analysis using a flue gas analyzer
 6. 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