



DIVISION 23 52 33.13

COMMERCIAL CONDENSING TANKLESS GAS WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes tankless, condensing, gas-fired, commercial water heater

1.2 REFERENCES

- A. CSA/ANSI Z21.10.3:19 – Instantaneous Water Heaters
- B. CSA 2.17 – High Altitude
- C. ANSI Z223.1/NFPA 54 - National Fuel Gas Code
- D. ANSI/NFPA 70 – National Electrical Code
- E. NSF 5 – Sanitation
- F. NSF 372 – Low Lead

1.3 SUBMITTALS

- A. Product data sheet (including dimensions, rated-capacities, shipping weights, accessories)
- B. Wiring diagram
- C. Warranty information
- D. Use and Care instructions
- E. Rack installation instructions

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. CSA safety requirements
 - 2. DOE regulations regarding uniform energy factor and max GPM
 - 3. Local and national air quality regulations for ultralow NOx heaters.
 - 4. NSF sanitation regulations
 - 5. NSF low lead regulations
 - 6. IAPMO safety requirements
 - 7. Massachusetts Plumbing Product Database
 - 8. AHRI product listing database
 - 9. Energy Star product listing database
 - 10. NRCAN product listing database
 - 11. CEC product listing database
- B. Certifications
 - 1. CSA/ANSI Z21.10.3:19
 - 2. CFR Title 10, Chapter II, Subchapter D, Part 430, Subpart B, Appendix E
 - 3. SCAQMD Rule 1146.2 certified – NOx < 20 ppm
 - 4. SJVAPCD Rule 4308 certified – NOx < 77 ppm
 - 5. SDCAPCD Rule 69.2.1 certified – NOx < 77 ppm
 - 6. NSF/ANSI 5
 - 7. NSF 372 – Drinking Water System Components – Lead Content
 - 8. IAPMO Uniform Plumbing Code

1.5 WARRANTY

- A. Limited five-year parts warranty
 - 1. Limited three-year parts warranty for uncontrolled loop recirculation installs
- B. Limited eight-year heat exchanger warranty
 - 1. Limited three-year heat exchanger warranty for uncontrolled loop recirculation installs
- C. Limited one-year labor warranty for certain labor

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Rheem Manufacturing Company
 - 1. Contact: 800 Interstate Park Drive, Suite 700, Montgomery, AL 36109; Telephone: (866) 720-2076; Website: www.rheem.com

2.2 HEATERS

- A. General
 - 1. The Heater(s) shall be fired with _____ gas at a rated input of _____ BTU/hr.
 - 2. The Heater(s) shall be CSA tested and AHRI certified with a Uniform Energy Factor of 0.96
 - 3. The Heater(s) shall operate at elevations up to 10,200 feet without component changes.
 - 4. The Heater shall be capable of field-conversion between natural gas and propane
 - 5. The Heater shall be furnished with a 150 PSIG ASME pressure relief valve, included within the Heater packaging separate from the unit.
 - 6. The heater shall be of a down-fire, pre-mix combustion design
- B. Heat Exchanger
 - 1. The primary heat exchanger (HEX) shall be of a tube-fin design, comprised of stainless steel material, primarily 444 stainless steel. This shall be located above the secondary HEX.
 - 2. The secondary heat exchanger (HEX) shall be of a brazed-plate design, comprised primarily of 304 SUS stainless steel. This shall be located below the primary HEX.
- C. Condensate Drain
 - 1. The Heater(s) will feature a threaded condensate trap with a drain and ¾" fitting.
- D. Burner
 - 1. The combustion chamber shall be of the sealed-combustion type employing a fiber mesh burner, mounted in a horizontal orientation.
 - 2. The burner shall use a fully-sealed, non-sparking combustion air blower to precisely mix and control the flow of fuel/air mixture for maximum efficiency throughout the entire range of modulation.
- E. Combustion Chamber
 - 1. The combustion chamber shall be constructed of primarily 444 stainless steel and fully surround the burner for maximum efficiency
 - 2. The Heater shall be equipped with a sight glass to allow viewing of the flame during combustion operation, so as to assist with troubleshooting of poor combustion conditions.
 - 3. The igniter will be oriented horizontally.

F. Gas Train

1. The individual Heater(s) shall be configured for use with a Natural Gas (NG) gas supply and will include an optional conversion kit for use with a Liquid Propane (LP) gas supply. This kit shall include the needed conversion orifice, as well as the appropriate gas chip, to ensure proper operation.
2. The Heater(s) provided as part of a pre-built rack system assembly shall be configured for usage with either a Natural Gas (NG) gas supply or a Liquid Propane (LP) gas supply specifically.
3. The gas train shall have a redundant safety shut-off feature, main gas regulation, shut-off cock, and plugged pressure tapping to meet the requirements of ANSI Z21.13/CSA 4.9.
4. A gas sediment trap with flanged connection shall be included as a standard on the gas line connection point to the Heater.
5. The gas supply line shall be sized between ½ inch and 1 ½ inch. The corresponding maximum supply length shall be determined according to the supply diameter and supply pressure, per the National Fuel Gas Code.
6. The inlet gas pressure to the water Heater(s) MUST be between 4.0 IWC and 10.5 IWC for natural gas, or between 8.0 IWC and 13 IWC for LP gas installations. This is to maintain service under heavy demand conditions while also ensuring proper operation of the Heater(s)
7. The allowable gas supply pressure drop through the Heater(s) shall be between 0.3 IWC and 3.0 IWC. See National Fuel Gas Code for further details on allowable gas supply pressure drop.

G. Cabinet

1. The cabinet of the Heater(s) shall be comprised primarily of steel and shall be suitable for outdoor installation when an applicable outdoor conversion kit is installed.
2. The Heater(s) shall be mounted to a wall or rack such that the unit is suspended above the floor. A mounting bracket and the needed washers and screws shall be provided with the Heater(s)
3. The Heater(s) shall connect both the combustion air and the flue products through the top of the cabinet for indoor installation, and the flue products through the front of the unit for outdoor installations when an applicable outdoor conversion kit is installed.
4. The Heater shall have as standard an internal combustion air filter, referred to as a bird screen, to prevent significant debris from entering the Heater.
5. The water connection fittings (inlet and outlet), as well as the gas connection fitting, shall be of a 3/4" NPT size.
6. If the model of the Heater includes an internal recirculation pump, the recirculation water connection fitting shall be of a 3/4" NPT size.
7. The Heater shall include a water filter on the inlet water connection, so as to capture debris entering through the installation water line.

Specifier Note: The remaining item(s) in this section (2.1) are options. Delete those that are not being specified.

H. Built-In Recirculation Pump (Select Models Only)

1. Capacity - 130W or 0.17HP
2. All Heaters with the built-in recirculation pump have one additional water fitting for the installation of a dedicated ¾" recirculation line.

Specifier Note: An optional outdoor venting conversion kit shall be available for the Heater

I. Outdoor Kit

1. This outdoor kit shall connect to the top of the Heater to allow for outdoor installation in appropriate environments.
2. The outdoor kit includes the outdoor box, an outdoor overlay, a wire harness, and a supplement sheet detailing installation.
3. The outdoor box shall be made of 304 2B annealed stainless steel.
4. All outdoor overlays shall comply with flammability standard UL94 V-O and have 3M467MP adhesive strips.

Specifier Note: LP conversion kits shall be available to convert the gas type of the heater from natural gas to liquid propane.

J. LP Conversion Kit

1. Kits shall include the LP orifice plate, replacement rubber gaskets, screws, a LP program chip, a gas conversion label, a new English rating label, a new French rating label, fuel conversion instructions, and French fuel conversion instructions.

Specifier Note: Pre-Assembled rack systems below shall be available with several configurations of Heaters, to minimize labor and installation time

K. Rack System

1. Rack systems shall include the tankless water Heater(s), the rack frame, the gas/water/condensate manifolds, and the electrical power connections.
2. The frame of the rack shall be made of 14GA or 16GA galvanized steel with powder coat paint.
3. All gas manifolds shall be made of 1 ½" SCH40 steel pipe with ¾" MNPT fitting.
4. All water manifolds shall be made of 2 ½" diameter copper tube with ¾" MNPT fitting.
5. All condensate manifolds shall be made of ¾" diameter PVC pipe with 5/8" ID barbed tube fittings.

Specifier Note: Pre-Assembled rack systems below shall be available with several configurations of Heaters, to minimize labor and installation time

L. Modular Rack

1. The kits available for this purpose include the base rack kit, the add-on rack kit, and various manifold kits.
2. Both the rack kit and rack add-on kit shall be made of 2.0mm steel with powder coat finish and stainless steel screws.
3. The manifold kits include an instruction manual, struts, water valves, a 150 PSI pressure relief valve, a ¾" stainless steel corrugated water hose, 2" copper water manifolds, ball valves for gas, a ¾" gas flex tube, 1 ½" black iron gas manifold, manifold caps and unions.
4. The rack kit shall be used for installations of 1-2 Heater(s), while each add-on rack kit allows for 2 more units.

Specifier Note: An optionable modular rack frame shall be available separately for mounting of tankless water Heater(s).

M. Common Vent

1. Several configurations of common vent kits shall be available to connect the venting of several Heaters, for ease of installation and labor:
 - a. 6" Back to back starter exhaust kit
 - b. 6" Back to back starter intake kit
 - c. 6" Back to back extension exhaust kit
 - d. 6" Back to back extension intake kit
 - e. 6" Inline starter exhaust kit
 - f. 6" Inline starter intake kit
 - g. 6" Inline extension exhaust kit
 - h. 6" Inline extension intake kit
2. All common vent components available within these kits shall be comprised of UL 1738 compliant polypropylene

Specifier Note: A neutralizer is available for single unit installation, utilized to prevent corrosion or scale buildup which may be caused by incoming water or debris.

N. Single-unit Condensate Neutralizer

1. Included in the neutralizer is a provisionally patented manual reset float system, which indicates if the unit has become restricted.
2. The neutralizer shall have an integral bypass feature, which prevents condensate backflow into the Heater.
3. The neutralizer shall be made of corrosion resistant materials, and shall include a 1 liter capsule, a ¾"-14 FNPT inlet and outlet, a manual reset by-pass flow indicator, and a wall mounting bracket.

4. The maximum capacity of the neutralizer shall be 400,000 BTU/hr at 93% efficiency (1.6 Gal/hr).
5. Replaceable neutralizer media shall be available for this neutralizer.

Specifier Note: A neutralizer is available for installations containing multiple heaters, utilized to prevent corrosion or scale buildup which may be caused by incoming water or debris.

O. Multi-unit Condensate Neutralizer

1. The neutralizer shall include a 3.5 Gal. size corrosion resistant polypropylene tank with lid, three 1" NPT connections for inlet and outlet, the neutralizer media, and an instruction sheet.
2. The maximum capacity of the neutralizer shall be 3,000,000 BTU/hr at 96% efficiency (20 Gal/hr).
3. Replaceable neutralizer media shall be available.

Specifier Note: A crossover valve (or thermal bypass valve) shall be available to provide an alternate recirculation path for applications in which there is no dedicated recirculation line

P. Thermal Bypass Valve/Crossover Valve Kit

1. The kit shall include the crossover valve, two engineered polymer braided hoses, an instruction sheet, and mounting hardware (conical anchors and sheet metal screws).
2. The crossover valve shall be NSF61 compliant and have a built in check valve and a built in filter.
3. This kit shall be compatible for potable water application, meet rated temperature at 140F, have a maximum design pressure of 145 psi, have UL or CSA listing for any hoses or crossover valves, and shall meet the requirements for RYTAN R-4-220NA or an equivalent material standard for the crossover valve body material

Specifier Note: An expansion tank shall be available for usage with the water heater

Q. Expansion tank

1. The expansion tank shall have a minimum operating pressure of 150 psig
2. The total volume of the expansion tank shall be 2 gallons or more with ¾ NPTM fitting.

Specifier Note: An isolation valve kit shall be available, including a hot isolation valve, a cold isolation valve, a pressure relief valve, and an instruction sheet.

R. Isolation Valve Kit

1. Isolation valves shall be ANSI Z21.22 approved, pressure steam rating 200,000 BTU/hr, and be both design certified and listed by CSA.
2. Isolation valves shall be ¾" threaded full port forged brass, with lead-free brass complying with NSF/ANSI 61-G & NSF/ANSI 372, and shall be rated for CWP of 500 psi.
3. Pressure relief valves shall have a bronze body construction with both NPT threaded male inlet and NPT threaded female (drain) outlet connections, stainless steel springs, and a test lever.
4. Pressure relief valves supplied shall have a standard pressure setting at 150 psi (10.34 bar).
5. Pressure relief valves shall have both CSA discharge capacities and ASME pressure steam ratings of 200,000 BTU/hr, when utilizing the 150 psi pressure setting.

Specifier Note: A gas shutoff valve shall be available.

S. Gas shutoff valve

1. All valves shall be tested for maintaining 13 bar pressure for a minimum of 15 seconds, so as to confirm no internal or external leakage.
2. The valve shall comply with both the relevant CSA standards (CSA 9.1-2009 / ANSI Z21.15-2009 ; ASME B16.44-2002 ; CGA3.16-M88 ; ASME B16.33-2002) and casting tolerance requirements (ISO 8062:1994C710).

Specifier Note: An on-demand recirculation push button shall be made available, for use in recirculation applications where a manual call for heat is desired.

T. On-Demand Recirculation Push Button

1. A push button accessory shall be available for on-demand recirculation installations
2. This accessory shall be capable of being wired to the controlling Heater to allow for

manual calls for recirculation.

2.3 HEATER OPERATING CONTROLS

A. Heater Control

1. The following safety controls shall be provided:
 - a. Over-Heat Limiting device (OHL), which shall stop all Heater operation if it detects excessive heat near the heat exchangers of the unit
 - b. Temperature sensing thermistors within the water line of the Heater, to ensure water temperatures do not exceed safe limits
 - c. Temperature sensing thermistor within the exhaust venting of the Heater, to ensure exhaust temperatures do not exceed safe limits
 - d. Flame-sensing device, to confirm safe ignition
 - e. Water flow sensor, to confirm flow and modulate unit operation based on flow rate, as needed
 - f. Condensate overflow sensor, to confirm no blockage or issues with condensate flow
 - g. Fuses utilized throughout the wiring of the Heater and control board to protect electrical functions
2. Blower Fan
 - a. 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.
 - b. The blower shall vary its output in response to variation in water flow through the Heater, incoming water temperature, or any other parameters which could require a different output rate of heat into the water, thereby electronically and precisely adjusting the volume of air and gas supplied for combustion.
 - c. The Heater(s) shall modulate the fan speed as needed to adjust the gas input rate of the Heater(s) to meet hot water demands
3. Display
 - a. The Heater(s) shall be equipped with a multi-line LED display, capable of displaying text
 - b. The display shall be capable of displaying error codes/messages for troubleshooting purposes
 - c. The display shall allow for the user/installer to adjust settings for the operation of the Heater(s)
 - d. The display shall be capable of displaying both the set point of the Heater and symbols to indicate error codes, Heater/fan/recirculation pump operation, and other key factors
 - e. The display shall have Wi-fi connectivity
4. Ignition System
 - a. The Heater(s) shall be capable of detecting a flame during operation, allowing for a three-try-for-ignition sequence. If flame is not detected following this sequence, the Heater shall be able to purge the system of non-combusted gas before attempting this sequence again. In the event of repeated failures to ignite or detect flame throughout several sequences, the unit shall be capable of fully ceasing operation and alerting the user of an error with the Heater.
 - b. The Heater shall begin operation at a pre-determined blower fan speed, such that the gas and air inputs at initial ignition are consistent for a reliable ignition.
 - c. Following initial ignition, the Heater shall be able to adjust the speed of the blower fan to increase or decrease the effective gas input rate, so as to provide the needed thermal output to the water.
5. The Heater(s) shall be equipped with a replaceable control board, as well as a gas chip which must be replaced during gas type conversions
6. The Heater shall be equipped with an Overheat Limiting device (OHL), which will act as a safety shutoff for the Heater in situations where excess heat is detected from the heat exchanger(s)

7. The Heater (Select Models) shall be equipped with a leak sensing device, contained within the cabinet of the unit. This device shall be capable of alerting the consumer of leaks detected within the Heater, as well as be capable of disabling function of the unit until the leak has been addressed
8. The Heater shall be capable of, through the usage of various sensors throughout the Heater, detecting and/or reacting to any temperatures exceeding that which the unit determines as being within safe operating conditions.
9. The heater shall include an antifreeze system with heating elements to reduce the risk of damage to the Heater(s) during cold ambient conditions
10. Water Flow
 - a. The Heater shall activate with water flow as low as 0.4 GPM, and shall then be capable of operating with a water flow as low as 0.26 GPM before de-activating, under normal operating conditions and Heater condition
 - b. The Heater shall be equipped with an internal bypass/mixing line, capable of diluting hot water output with incoming cold water, so as to maintain the desired outlet water temperature
11. Cascade/Multi-Unit Control
 - a. The Heater(s) shall be capable of connected controls (manifolding) in installations with up to 32 separate Heaters
 - b. Manifolding connections shall be made with standard RJ25 or RJ11 communication cables
 - c. When operating in a manifolded installation, one unit shall serve as the "Manager" Heater, allowing the controls/settings for all manifolded units to be controlled through the Manager. This model shall be assigned during installation and will remain fixed unless altered by the user/installer
 - d. When operating in a manifolded installation, one unit shall serve as the "Starter" Heater, where it will be the first to activate during a call for hot water. This unit shall rotate between each of the manifolded Heaters, so as to promote even usage/runtime across the Heaters
12. The Heater can alert the user to an error code on the user display when the Heater detects abnormal operation. Further detail on this error can be accessed through the display
13. The Heater(s) shall be equipped with several different settings/operating modes, including the following:
 - a. Recirculation pump modes, for those models with a recirculation pump, including Energy Saving, Performance, and On-Demand mode
 - b. Altitude settings, including those for sea level and high altitude installations
 - c. Wi-fi connectivity
 - d. Manifold installation settings
 - e. Water Save mode settings
14. Condensate Drain
 - a. The condensate drain will be equipped with a blockage sensor which has been tested to ensure that the Heater operates and/or shuts down safely in the event of a blockage occurring.
15. Recirculation Pump (*Optional*)
 - a. Select models shall include an internal recirculation pump, capable of recirculating hot water through either a dedicated recirculation line or the existing water lines of an installation (when utilizing an optional thermal bypass/crossover valve)
 - b. Select models shall be capable of utilizing an external recirculation pump, capable of recirculating hot water through either a dedicated recirculation line or the existing water lines of an installation (when utilizing an optional thermal bypass/crossover valve)
 - c. The Heater(s) shall be capable of connecting to external devices/sensors which may operate the internal/external recirculation pumps
16. EcoNet Connection
 - a. The Heater(s) shall be capable of being linked to the EcoNet mobile app, via Wi-Fi connectivity, allowing for diagnostics or adjustment of Heater settings/operation away from the Heater itself.

- b. Through an EcoNet connection, the Heater(s) may be linked to external control devices, such as building automation controls, cellular devices, and smart home systems

2.4 ELECTRICAL POWER

A. Electrical characteristics:

	Non-Recirc Models	Recirc Models
Voltage (VAC)	120	120
Phase	Single	Single
Frequency (Hz)	60	60
Normal Operation (Amps)	0.7	0.83
Standby (Amps)	0.03	0.03
Anti-Freeze only (Amps)	1.1	1.67

2.5 SOURCE QUALITY CONTROL

- A. The Heater(s) shall be completely assembled, wired, and fire-tested prior to shipment from the factory.
- B. The Heater(s) shall be furnished with the wiring diagram, rating plate, Use and Care manual, and any other applicable literature.

PART 3 - EXECUTION

3.1 GENERAL 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. Standard for controls and safety devices for automatically-fired Heaters, ANSI/ASME CSD-1, when required.
 - 5. Canada only: CAN/CSA B149 Installation Code and CSA C22.1 CEC Part I.
 - 6. Manufacturer's installation instructions, including required service clearances and venting guidelines
- B. Manufacturer's representative to verify proper and complete installation.

3.2 VENTING AND COMBUSTION AIR REQUIREMENTS

- A. All venting components must be approved and certified for use with the Heater(s). Refer to the Use and Care manual for details on allowed venting types.
- B. If proper conditions are met for indoor installations, room air may be used for the Heater air intake.
- C. Venting length must not exceed the maximum equivalent vent length listed in the Use and Care manual for that vent diameter, not including the length of any termination.
- D. Common venting may be used for up to 12 Heaters, though the maximum allowed quantity is dependent on the venting diameter. Pre-built kits are available for this purpose, though common venting may be assembled from individual parts as long as the installation meets all requirements listed in the Use and Care manual.

3.3 DIRECT VENT INSTALLATION

- A. The 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. The Heater(s) shall utilize a dual-vent venting configuration when installed indoors, with one vent for the intake air and one vent for the flue gas exhaust. Exceptions to this can be made when the Heater(s) are appropriately installed in "room-air" conditions, where the intake venting is no longer required.
- C. When an appropriate outdoor conversion kit is installed, the Heater may operate without any direct vent equipment in outdoor installations.

3.4 START-UP

- A. Shall be performed according to instructions in the Use and Care manual
- B. Test per manufacturer specifications during operation and adjust if necessary:
 - 1. Safeties
 - 2. Operating controls
 - 3. Installation fuel type
 - 4. Static and full-load gas supply pressure
 - 5. Gas manifold and blower suction pressure
 - 6. Water supply pressure
 - 7. Combustion analysis
 - 8. Verify Heater settings are correctly adjusted – Recirculation mode, altitude setting, etc.
- C. Submit copy of start-up report to Architect and Engineer.

3.5 TRAINING

- A. It is strongly recommended that the Heater(s) shall be installed, serviced, and maintained by a contractor that is licensed, state qualified, and trained on Rheem's tankless products

END OF SECTION