



Trinity Tx non-Combi High Efficiency Gas Condensing Boiler

Suggested Specification

Part I - General
Part II - Product
Part III - Installation

Project Name: _____ **Date:** _____
Location: _____
Engineer: _____
Contractor: _____ **Rep:** _____

I. GENERAL

- A. Supply and install ___ modulating and condensing boiler(s) as specified herein. Each boiler shall be factory assembled and tested. Each boiler shall be shipped self-contained and ready for operation except for connection at the installation site of heating piping, fuel, electrical, combustion air, exhaust venting, condensate drainage and relief valve discharge piping.
- B. The boiler shall be capable of operating on natural gas or LP gas. The boiler shall be capable of normal operation and full rated input with natural gas supply pressure between 4 inches w.c. [1.0kPa] and 10.5 inches w.c. [2.6kPa], or LP gas supply pressure between 8 inches w.c. [2.0kPa] and 13 inches w.c [3.2kPa]. The boiler shall be factory set for natural gas, and shall include a factory-supplied kit for conversion to LP gas operation.
- C. The boiler shall have an AFUE rating of ___%, with a minimum input of _____ BTU/hour [___ kW] and a maximum input of _____ BTU/hour [___ kW].
- D. The boiler shall be certified to the ANSI Z21.13 / CSA 4.9 Gas-fired Boiler Standard.
- E. The boiler shall be certified for installation with zero clearance to combustibles, and shall be certified for closet and alcove installation when vented in accordance with the manufacturer's instructions.
- F. The boiler stainless steel heat exchanger shall be designed and constructed in compliance with the ASME Boiler and Pressure Vessel Code Section IV. A permanent nameplate bearing the "H" stamp and National Board registration number shall be attached to the heat exchanger in a readily viewable location.
- G. The boiler heat exchanger shall have a fifteen (15) year limited warranty, and other parts shall have a sixteen (16) month limited warranty covering defects in materials and workmanship. The warranty period is based from the date of manufacture.

II. PRODUCT

- A. Acceptable manufacturers
 - 1. The boiler shall be Trinity Tx___ manufactured by NY Thermal Inc. (NTI).
- B. Boiler Construction
 - 1. Heat Exchanger and Combustion Chamber
 - (a) The heat exchanger shall be constructed of SA-268 S43940 stainless steel, and mounted in a sealed composite shell. The heat exchanger shall be rated for 50psi [345kPa] maximum operating pressure.
 - (b) The heat exchanger shall be able to accept up to 35% mixture of inhibited propylene glycol HVAC antifreeze, without damage to the heat exchanger or other components.
 - (c) The heat exchanger shall be accessible for inspection and cleaning via a removable burner access cover. The cover shall include a flame observation port.
 - (d) The heat exchanger shall be provided with an automatic air vent.



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- (e) The composite shell shall collect condensate and provide an outlet for drainage. Transparent flexible tubing shall be factory installed to drain condensate to an exterior connection at the base of the boiler cabinet. An anti-siphon condensate trap shall be factory-supplied for field installation.
- 2. Gas Train and Combustion System
 - (a) The combustion system shall be fully modulating with a 5:1 turndown ratio.
 - (b) The combustion system shall contain:
 - 1) Adjustable air/gas ratio valve with integral regulator
 - 2) Mixing venturi
 - 3) Variable speed blower utilizing pulse width modulation
 - 4) Stainless steel cylindrical premix burner
 - 5) Dual-electrode spark igniter
 - 6) Independent flame sensing electrode.
- 3. Venting and Combustion Air
 - (a) The boiler shall be designed for venting with 2 inch or 3 inch diameter Schedule 40 PVC, Schedule 40 CPVC, AL29-4C stainless steel or Polypropylene pipe. Maximum exhaust vent length with 3 inch pipe shall be 150 equivalent ft. [45.7m]. Maximum combustion air inlet length with 3 inch pipe shall be 150 equivalent ft. [45.7m]. Maximum exhaust vent length with 2 inch pipe shall be 100 equivalent ft. [30.5m]. Maximum combustion air inlet length with 2 inch pipe with shall be 100 equivalent ft. [30.5m].
 - (b) The combustion chamber exhaust outlet shall include an access port to permit insertion of a combustion analyzer probe. The access port shall be provided with a threaded cap.
- 4. Cabinet
 - (a) The unit internal structure shall be constructed of 16ga galvanized steel.
 - (b) The cabinet jacket shall be constructed of removable panels fabricated from 20ga steel finished with a durable factory-applied coating on both sides. Removal of jacket panels shall not compromise sealing of the combustion chamber.
- 5. Electrical
 - (a) The boiler shall operate from a 120VAC/1 phase/60Hz power supply with a current draw of 12A.
 - (b) A single barrier strip shall be provided for both line and low voltage electrical field connections.
 - (c) Line-voltage connections shall consist of supply power and up to three (3) circulator pumps. The total load of the Boiler pump in combination with either the Central Heat pump or Domestic Hot Water pump shall not exceed 2.6 Amps @ 120VAC.
 - (d) Low-voltage terminals shall be provided for connection of:
 - 1) Outdoor temperature sensor
 - 2) System temperature sensor
 - 3) DHW indirect tank sensor or aquastat
 - 4) Heating thermostat
 - 5) External safety limit



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- 6) Communication wiring for Lead-Lag cascade control.
6. Controls
- (a) The integrated microprocessor-based controller shall incorporate all operational and safety control functions, including:
- 1) Burner spark ignition
 - 2) Flame detection and supervision
 - 3) Burner firing rate modulation
 - 4) High temperature limit (UL353 rated)
- (b) The controller shall incorporate a proportional-integral-derivative (PID) algorithm for two (2) separate temperature controls: one (1) for space heating with independent setpoint; one (1) for domestic hot water with independent setpoint.
- (c) The controller shall provide:
- 1) Operation of up to three (3) pumps: Boiler, Central Heating and Indirect Domestic Hot Water
 - 2) Domestic hot water prioritization with a field-adjustable priority time
 - 3) Outdoor reset to automatically set system water temperature based on outdoor air temperature. An outdoor sensor shall be factory-supplied
 - 4) Manual firing rate control, settable to minimum, ignition or maximum firing rate
 - 5) Warm weather shutdown to disable heating, with field adjustable setpoint
 - 6) Pump exercise for 10 seconds at 24 hour intervals
 - 7) Freeze protection to operate the boiler and central heat pumps when inlet or outlet water temperature falls below 50°F [10°C], and fire the burner at minimum modulation when either inlet or outlet temperature falls below 41°F [5°C]
 - 8) Field setting of the following:
 - Central heat setpoint (cold weather) from 80°F [26.7°C] to 190°F [87.8°C]
 - Central heat setpoint differential 3°F [1.7°C] to 36°F [20°C]
 - Central heat mode
 - Central heat setpoint (warm weather) from 60°F [15.6°C] to 140°F [60°C]
 - Outdoor reset temperature boost
 - Domestic hot water (DHW) setpoint from 104°F [40°C] to 190°F [87.8°C]
 - DHW mode (tank sensor or thermostat)
 - Minimum firing rate
 - Maximum firing rate for CH
 - Service reminder reset
 - Adjustable post purge for DHW, CH and Boiler circulator outputs
 - Cascade emergency setpoint from 104°F [40°C] to 190°F [87.8°C]
 - Cascade rotation interval from 0 to 30 days
 - Combustion fan post purge time 5 to 60 seconds
 - Temperature units, °F or °C.
- (d) The control system shall include a backlit LED display with keypad to permit monitoring of unit operation and field adjustment of control parameters. The display shall be capable of showing:
- 1) Heat demand source



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- 2) Burner state
 - 3) Heat exchanger entering water pressure
 - 4) Heat exchanger exiting water temperature
 - 5) Current target temperature
 - 6) CH setpoint
 - 7) DHW temperature (or tank thermostat condition)
 - 8) DHW setpoint
 - 9) Actual blower RPM
 - 10) Flame signal strength
 - 11) Outdoor Temperature
 - 12) Heat exchanger entering water temperature
 - 13) Exhaust gas temperature
 - 14) Boiler, CH and DHW pumps status
 - 15) System sensor temperature
 - 16) Accumulated flame failures
 - 17) Accumulated successful ignition attempts
 - 18) Accumulated failed ignition attempts
 - 19) Blocking and lockout error code numbers
- (e) The controller shall be capable of Lead-Lag staging and rotation of up to sixteen (16) Tx-series boilers with no additional control hardware required, apart from the necessary field-supplied cabling to connect the units via terminals provided on the field wiring barrier strip. Field configuration of Lead-Lag operation shall be accomplished through the built-in display.
- (f) A factory-optional module shall be available for communication capability using the Modbus RTU protocol over an EIA-485 interface. Communication with external third-party building management networks utilizing BACnet MS/TP, BACnet/IP, Johnson Metasys N2, or LonWorks protocol shall be accomplished with ___ factory-optional NTI communication gateway(s). The gateway shall map factory-selected internal controller data registers to (*select one*): BACnet objects, Johnson Metasys N2 data points or LonWorks SNVTs. The gateway shall:
- 1) communicate with the boiler controller(s) at 38,400 bits/second
 - 2) be equipped with DIP switches for field selection of node address and protocol
 - 3) auto-discover Modbus addresses of up to eight (8) connected Tx-series boilers.

C. Trim kit

1. The following shall be factory supplied with each boiler, for field installation:
 - (a) Qty. 1 - Outdoor air temperature sensor, 10k thermistor
 - (b) Qty. 1 - Pressure gauge, 0-60psi
 - (c) Qty. 1 - ¾ inch NPT ASME relief valve, 30psi
 - (d) Qty. 1 - LP conversion kit
 - (e) Qty. 1 - ¾" inch 90 Degree Street Elbow, Brass
 - (f) Qty. 1 - 1 x 1 x ¾ inch NPT Tee, Brass
 - (g) Qty. 2 - 3 inch diameter vent screen
 - (h) Qty. 2 - 2 inch diameter vent screen
 - (i) Qty. 1 - Wall Mount Bracket



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D. Manuals

1. Each boiler shall include the following manuals:
 - (a) Installation and Operating (I&O) manual
 - (b) LP conversion manual
 - (c) User manual

III. Installation

A. Boiler shall be installed and vented in accordance with manufacturers' instructions.

B. Venting

1. The boiler shall be vented as shown on the plans and specified below:

(a) Venting method (*select one*):

- 1) Sidewall Direct Vent with exterior termination of separate exhaust and combustion air pipes
- 2) Sidewall Direct Vent with termination by manufacturer specified sidewall termination kit of separate exhaust and combustion air pipes
- 3) Sidewall Direct Vent with termination by manufacturer specified concentric vent termination kit of separate exhaust and combustion air pipes
- 4) Vertical Direct Vent with exterior roof-top termination of separate exhaust and combustion air pipes
- 5) Vertical Direct Vent with termination by manufacturer specified concentric vent termination kit of separate exhaust and combustion air pipes

(b) Exhaust venting

- 1) Foam Core pipe is not an approved exhaust vent material and shall not be used.
- 2) Exhaust vent material shall be (*select one*):
 - (i) 2 inch/3 inch Schedule 40 PVC pipe, Schedule 40 CPVC pipe, AL29-4C stainless steel pipe, or Polypropylene pipe (**Note to specifier - In Canada: all vent pipe materials must meet ULC S636; PVC venting is limited to applications where exiting water temperature from heat exchanger is less than 140°F [60°C]**)
- 3) A reducer shall be field-supplied if 2 inch pipe is used.
- 4) Exhaust vent length shall not exceed 100 equivalent ft. [30.5m] of 2 inch pipe including fittings. Exhaust vent length with 3 inch pipe shall not exceed 150 equivalent ft. [45.7m] of pipe including fittings.

(c) Combustion air inlet

- 1) Combustion air inlet material shall be (*select one*):
 - (i) 2 inch/3 inch Schedule 40 PVC pipe, Schedule 40 CPVC pipe, or (*to be inserted by specifier using material acceptable to the local AHJ.*)
- 2) A reducer shall be field-supplied if 2 inch pipe is used.
- 3) Combustion air inlet length shall not exceed 100 equivalent ft. [30.5m] of 2 inch pipe including fittings. Combustion air inlet length with 3 inch pipe shall not exceed 150 equivalent ft. [45.7m] of pipe including fittings.