



Trinity Tft High Efficiency Gas Condensing Boiler & Water Heater

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.
- B. 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.
- C. 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 field conversion to LP gas operation.
- D. The boiler shall have an AFUE rating of __%, with a minimum input of _____ BTU/hr [__kW] and a maximum input of _____ BTU/hr [__ kW].
- E. The boiler shall be certified to the ANSI Z21.13 / CSA 4.9 Gas-fired Boiler Standard.
- F. 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.
- G. The boiler stainless steel heat engine 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 engine in a readily viewable location.
- H. The heat engine shall have a limited lifetime warranty. All other parts shall have a five year limited warranty covering defects in materials and workmanship. The warranty period is based from the date of manufacture or one year from date of installation (which ever period is longer). (*effective 2014-03-06*)

II. PRODUCT

- A. Acceptable manufacturers
 - 1. The boiler shall be a Trinity Tft___ manufactured by NY Thermal Inc. (NTI).
- B. Boiler Construction
 - (a) Heat Engine
 - (b) The heat engine shall be a vertical firetube down-fired design. The combustion chamber, firetubes, tubesheets and shell shall be constructed of Type 439 (ASME SA240, UNS S43932) stainless steel. The heat engine assembly shall be of all-welded construction. The heat engine for models Tft60-110 shall be rated for 30psi [206.8kPa] maximum operating pressure. The heat engine for models Tft155-399 shall be rated for 80psi [551.6kPa] maximum operating pressure.



**Trinity Tft
High Efficiency Gas
Condensing Boiler & Water Heater**

**Suggested
Specification**

- (c) The heat engine shall be able to accept up to 35% mixture of inhibited propylene glycol HVAC antifreeze, without damage to the heat engine or other components.
 - (d) The heat engine shall be accessible for inspection and cleaning via a removable burner access cover. The cover shall include a flame observation port.
 - (e) The heat engine shall be provided with an automatic air vent (field installed).
 - (f) A factory-supplied field-installed anti-siphon trap shall be connected to the combustion chamber for collection and removal of condensate. The trap shall be translucent to permit visual inspection and shall be easily disassembled for cleaning.
2. Gas Train and Combustion System
- (a) The combustion system shall be fully modulating with a ___: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 with woven stainless steel mesh covering
 - 5) Dual-electrode spark igniter
 - 6) Independent flame sensing electrode.
3. Venting and Combustion Air
- (a) The boiler shall be designed for venting with ___ inch diameter Schedule 40 PVC, Schedule 40 CPVC, AL29-4C stainless steel or Polypropylene pipe. Maximum exhaust vent length shall be ___ equivalent ft. [___m]. Maximum combustion air inlet length shall be ___ equivalent ft. [___m]. Maximum exhaust vent length with ___ inch pipe with LP gas shall be ___ equivalent ft. [___m]. Maximum combustion air inlet length with ___ inch pipe with LP gas shall be ___ equivalent ft. [___m].
 - (b) The combustion chamber exhaust outlet shall include a 1/2" [12mm] diameter port with a removable EPDM plug to permit insertion of a combustion analyzer probe.
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 line-voltage barrier strip shall be provided for connection of supply power and up to three (3) circulator pumps. The boiler shall be capable of powering each pump up to a maximum of 1/6HP or 3 Amps @ 120VAC.
 - (c) Two (2) low-voltage barrier strips shall be provided. One shall be for connection of:



Trinity Tft High Efficiency Gas Condensing Boiler & Water Heater

Suggested Specification

- 1) Outdoor temperature sensor
- 2) System temperature sensor
- 3) DHW indirect tank aquastat or DHW temperature sensor
- 4) 4-20mA signal from external control for burner modulation
- 5) EIA-485 communication for Lead-Lag cascade control.

The second low-voltage barrier strip shall be for connection of:

- 1) Two (2) heating thermostats
- 2) External safety limit
- 3) Alarm signal to a building automation system

6. Controls

- (a) The boiler control system shall operate on 24VAC provided by an internal 40VA transformer.
- (b) 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)
- (c) The controller shall incorporate a proportional-integral-derivative (PID) algorithm for three (3) separate temperature controls: two (2) for space heating with independent setpoints; one (1) for domestic hot water.
- (d) The controller shall permit field selection of the boiler control response to a high temperature limit excursion to either Lockout or Recycle and Delay. The factory set response shall be Recycle and Delay.
- (e) 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) Field-adjustable outdoor reset to automatically set system water temperature based on outdoor air temperature. An outdoor sensor shall be factory-supplied for field installation
 - 4) Manual firing rate control, adjustable between minimum and 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 outlet water temperature falls below 45°F [7.2°C], and fire the burner at minimum modulation when the outlet temperature falls below 38°F [3.3°C]
- 8) Field setting of the following:
 - Low temperature central heat (CH1) setpoint from 60°F [15°C] to 190°F [88°C]
 - High temperature central heat (CH2) setpoint from 60°F [15°C] to 190°F [88°C]
 - Outdoor reset parameters – low temperature central heating



Trinity Tft High Efficiency Gas Condensing Boiler & Water Heater

Suggested Specification

- Outdoor reset parameters – high temperature central heating
 - Domestic hot water (DHW) setpoint from 60°F [15.6°C] to 190°F [88°C]
 - Boiler pump overrun time from 0 to 30 minutes
 - CH and DHW pump overrun time from 0 to 10 seconds
 - CH and DHW pump start delay from 0 to 5 seconds
 - Warm weather shutdown (WWSD) temperature from 50°F [10°C] to 90°F [32.2°C]
 - DHW priority override timer from 0 to 18 hours
 - CH modulation source (inlet, outlet or system water temperature)
 - DHW modulation source (DHW indirect tank, inlet or outlet water temperature)
 - Lead and lag selection method (sequence order or measured runtime)
 - Lead rotation time from 0 to 960 hours
 - Slave order priority method (equalize runtime, use first or use last)
 - Anti short-cycle interval from 0 to 60 minutes
 - Temperature units, °F or °C.
- (f) The control system shall include a built-in colour touchscreen display to permit monitoring of unit operation and field adjustment of control parameters. The control shall support three (3) levels of password-protected access permission: User (no password), Installer, and OEM. The display shall be capable of showing:
- 1) Heat demand source
 - 2) Burner state
 - 3) Demanded firing rate in RPM
 - 4) Actual blower RPM
 - 5) Current setpoint
 - 6) Heat engine entering water temperature
 - 7) Heat engine exiting water temperature
 - 8) Exhaust gas temperature
 - 9) Outdoor Temperature
- (g) The controller shall be capable of Lead-Lag staging and rotation of up to eight (8) Tft-series boilers with no additional control hardware required, apart from the necessary field-supplied cabling to connect the units via terminals provided on the low-voltage barrier strip. Field configuration of Lead-Lag operation shall be accomplished through the built-in touchscreen display.
- (h) The controller shall provide integrated 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:
- a) communicate with the boiler controller(s) at 38,400 bits/second
 - b) be equipped with DIP switches for field selection of node address and protocol
 - c) auto-discover Modbus addresses of up to 8 connected boilers.



Trinity Tft High Efficiency Gas Condensing Boiler & Water Heater

Suggested Specification

- (i) When two (2) or more boilers are connected in a Lead-Lag cascade configuration, the control shall allow for connection of an outdoor temperature sensor on any slave unit, thereby permitting connection of a system temperature sensor on the master unit.

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, 0-30psi
 - (c) Qty. 1 - 3/4 inch NPT ASME relief valve, 30psi
 - (d) Qty. 1 - LP conversion kit
 - (e) Qty. 2 - ___ x 3/4 inch Bushing, Brass
 - (f) Qty. 1 - 5 inch length, ___ inch CPVC Schedule 40 pipe
 - (g) Qty. 1 - ___ x 1/2 x ___ inch NPT Tee
 - (h) Qty. 2 - ___ inch diameter anti-bird screen
 - (i) Qty. 1 - Wall Mount Bottom Support Bracket

D. Manuals

1. Each boiler shall include the following manuals:
 - (a) Installation and Operating (I&O) manual
 - (b) Controller and display reference manual
 - (c) application 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*):



Trinity Tft High Efficiency Gas Condensing Boiler & Water Heater

Suggested Specification

- (i) ___ inch diameter 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 engine is less than 140°F [60°C]).
 - 3) A ___ x ___ reducer shall be field-supplied if ___ inch pipe is used.
 - 4) Exhaust vent length shall not exceed ___ equivalent ft. [___m] of pipe including fittings. (*LP gas only*) Exhaust vent length with ___ inch pipe shall not exceed ___ equivalent ft. [___m] of pipe including fittings.
- (c) Combustion air inlet
- 1) Combustion air inlet material shall be (*select one*):
 - (i) ___ inch Schedule 40 PVC pipe, Schedule 40 CPVC pipe, or (to be inserted by specifier using material acceptable to the local AHJ).
 - 2) A ___ x ___ inch reducer shall be field-supplied if ___ inch pipe is used.
 - 3) Combustion air inlet length shall not exceed ___ equivalent ft. [___m] of pipe including fittings. (*LP gas only*) Combustion air inlet length with ___ inch pipe shall not exceed ___ equivalent ft. [___m] of pipe including fittings.