Firetube Giant – FTG 2400 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.

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 Thermal Efficiency 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 installation. Warranty is subject to the terms and conditions stated in *NTI Limited Lifetime Warranty.*

II. PRODUCT

A. Acceptable manufacturers

1. The boiler shall be an FTG ___ manufactured by NY Thermal Inc. (NTI).

B. Boiler Construction

1. Heat Engine

(a) 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 shall be rated for 160 psi [1103 kPa] maximum operating pressure.

(b) The heat engine shall be able to accept up to 50% mixture of inhibited propylene glycol HVAC antifreeze, without damage to the heat engine or other components.

(c) The heat engine shall be accessible for inspection and cleaning via a removable burner access cover. The cover shall include a flame observation port.

(d) A factory-supplied condensate 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.

(e) The combustion chamber exhaust outlet shall include a ½" [12mm] diameter port with a removable EPDM plug to permit insertion of a combustion analyzer probe.

(f) The boiler shall employ a sealed cabinet and incorporate a serviceable built-in combustion air filter.

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. 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.

4. Electrical

(a) The boiler shall operate from a 240VAC/3 phase/60Hz power supply with a current draw of 16A.

(b) A line-voltage barrier strip shall be provided for connection of supply power and up to three (3) circulator pumps. Pump control relays shall be sized for 1.5HP @ 120VAC (3HP @ 240VAC).

(c) A low-voltage barrier strip shall be provided for connection of:

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.
6) Two (2) heating thermostats
7) External safety limit
8) Auxiliary proof
9) Time of day signal for night setback
10) Alarm signal to a building automation system

(d) A factory wired on-off switch shall be provided.

5. Controls

(a) The boiler control system shall operate on 24VAC provided by an internal 250VA transformer.

(b) A factory installed and wired, CSD-1 compliant, Low Water Cutoff (LWCO) shall be furnished with the boiler.

(c) High and Low Gas Pressure switches shall be factory installed and wired; opening of either switch shall cause a lockout requiring manual reset (CSD-1 compliant).

(d) 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)
5) Meets the following CSD-1 requirements:
   (i) CS-300 requirements as Primary Safety Control
   (ii) CW-400 requirements as Temperature Operation Control
   (iii) CW-400 requirements as a Temperature High Limit Control.

(e) 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.

(f) 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 195°F [90.5°C]
   - High temperature central heat (CH2) setpoint from 60°F [15°C] to 195°F [90.5°C]
   - Outdoor reset parameters – low temperature central heating
   - Outdoor reset parameters – high temperature central heating
   - Outdoor reset boost parameters (time, step & maximum off point)
   - Domestic hot water (DHW) setpoint from 60°F [15.6°C] to 195°F [90.5°C]
   - CH and DHW time-of-day setpoint from 60°F [15.6°C] to 195°F [90.5°C]

- Modulation parameters (minimum, CH maximum, DHW maximum & CH slow start enable/degrees/ramp)
- Postpurge parameters (time & rate)
- Ignition rate
- 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 sensor (inlet, outlet or system water temperature)
- CH modulation source (local or 4-20mA)
- CH setpoint source (local or 4-20mA)
- CH demand switch (thermostat or sensor only)
- DHW modulation sensor (inlet or outlet water temperature)
- DHW demand source (tank thermostat or sensor)
- 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.

(g) 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
10) System Temperature
11) Flame ionization current
12) Milliamp signal from external control device
13) Lockouts, Alerts and Holds

(h) The controller shall be capable of Lead-Lag staging and rotation of up to eight (8) FTG-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.

(i) 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.

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 – System temperature sensor, 10k thermistor
(c) Qty. 1 – Pressure/temperature gauge, 0-75 psi / 50-320 °F
(d) Qty. 1 – 1 ¼" inch NPT ASME relief valve, 50 psi
(e) Qty. 1 – LP conversion kit
(f) Qty. 2 – 3 inch grooved end coupling

D. Manuals

1. Each boiler shall include the following manuals:

(a) Installation and Operating Manual (IOM)
(b) Controller and Touchscreen Display reference manual
(c) User Information 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) Direct Vent system with sidewall termination of both the exhaust-vent and combustion air-inlet piping, using termination method detailed in the Installation and Operation Manual. Exhaust-vent and combustion air-inlet piping shall be sealed.
2) Direct Vent system with rooftop termination of both the exhaust-vent and combustion air-inlet piping, using termination method detailed in the Installation and Operation Manual. Exhaust-vent and combustion air-inlet piping shall be sealed.
3) Vent system with sidewall termination of the exhaust-vent piping and rooftop termination of the combustion air-inlet piping, using termination kit/method detailed in the Installation and Operation Manual. Exhaust-vent and combustion air-inlet piping shall be sealed.

4) Vent system with rooftop termination of the exhaust-vent piping and sidewall termination of the combustion air-inlet piping, using termination kit/method detailed in the Installation and Operation Manual. Exhaust-vent and combustion air-inlet piping shall be sealed.
5) Vent system with sidewall or rooftop termination of the exhaust-vent piping, using termination kit/method detailed in the Installation and Operation Manual. Exhaust-vent piping shall be sealed; combustion air-inlet shall be drawn from the equipment room in accordance with the *National Fuel Gas Code, ANSI Z223.1/NFPA 54* (U.S.), or Clause 8.2, 8.3 or 8.4 of *Natural Gas and Propane Installation Code, CAN/CSA B149.1* (Canada).

(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 8 inch diameter Category IV approved PVC, CPVC, PP or SS sealed vent material.
3) The boiler exhaust vent connection shall be designed to receive 8 inch FasNSeal® or Z-VENT™ single-wall special gas vent system piping.
4) An adapter shall be field supplied for adapting the boiler exhaust vent connection to receive other approved 8 inch Category IV vent material.
5) Exhaust vent length shall not exceed 150 equivalent ft. [45.7 m] of pipe including fittings.

(c) Combustion air inlet

1) Combustion air inlet material shall be 8 inch Schedule 40 PVC pipe, or *(to be inserted by specifier using material acceptable to the local Authority Having Jurisdiction)*.
2) The boiler combustion air-inlet connection shall be designed to receive 8 inch Schedule 40 PVC (or equivalent).
3) Combustion air inlet length shall not exceed 150 equivalent ft. [45.7 m] of pipe including fittings.