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| **Typical Specification** |
|  **FBNT-SPEC-11** |

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**Typical** **Specification** **for Lochinvar® Crest Heating Boiler**

***Models 750,000 – 6,000,000 Btu/Hr***

The **BOILER** shall be a **LOCHINVAR Crest** Model **FB(N,L)\_**\_\_\_\_\_\_\_\_having a modulating input rating of \_\_\_\_\_\_\_\_\_ Btu/Hr, an output of \_\_\_\_\_\_\_\_\_ Btu/Hr and shall be operated on (Natural Gas) (L.P. Gas). The **BOILER** shall be capable of following performance:

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| --- | --- | --- | --- |
| Model | Turndown | Minimum Input | Maximum Input |
| FB 0751 | 15:1 | 50,000 | 750,000 |
| FB 1001 | 20:1 | 50,000 | 999,000 |
| FB 1251 | 20:1 | 62,500 | 1,250,000 |
| FB 1501 | 25:1 | 60,000 | 1,500,000 |
| FB 1751 | 25:1 | 70,000 | 1,750,000 |
| FB 2001 | 25:1 | 80,000 | 1,999,000 |
| FB 2501 | 20:1 | 125,000 | 2,500,000 |
| FB 3001 | 20:1 | 150,000 | 3,000,000 |
| FB 3501 | 20:1 | 175,000 | 3,500,000 |
| FB 4001 | 12:1 | 333,300 | 3,999,000 |
| FB 5001 | 10:1 | 499,900 | 4,999,000 |
| FB 6001 | 10:1 | 600,000 | 6,000,000 |

Maximum unit dimensions shall be: Length \_\_\_\_\_\_\_\_inches, Width \_\_\_\_\_\_\_\_inches and Height \_\_\_\_\_\_\_\_\_\_ inches. Maximum operating (wet) unit weight shall be\_\_\_\_\_\_\_\_\_pounds.

The **BOILER** shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. The **BOILER** shall have a fully welded 316L stainless steel interior with a carbon steel shell fire tube heat exchanger. There shall be a single pressure vessel. Multiple pressure vessels are not acceptable. Fire Tube shall be of the Wave Fire Tube design and capable of transferring 16,000 to 20,000 Btu’s per tube. A liquid impact die shall be used to form the Wave Fire Tube. There shall be no banding material, bolts, gaskets or "O" rings in the heat exchanger construction. The Wave Fire Tube shall be robotically welded to the tube sheets. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. Pressure drop shall be no greater than 6.5 psi at 180 gpm. The condensate collection basin shall be constructed of welded 316L stainless steel. The complete heat exchanger assembly shall carry a ten (10) year limited warranty.

The heat exchanger shall contain a volume of water no less than:

|  |  |
| --- | --- |
| Model | Water Content |
| FB 0751 | 73 gallons |
| FB 1001 | 77 gallons |
| FB 1251 | 87 gallons |
| FB 1501 | 94 gallons |
| FB 1751 | 106 gallons |
| FB 2001 | 111 gallons |
| FB 2501 | 157 gallons |
| FB 3001 | 156 gallons |
| FB 3501 | 202 gallons |
| FB 4001 | 201 gallons |
| FB 5001 | 254 gallons |
| FB 6001 | 304 gallons |

The **BOILER** shall be certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13 test standard for the U.S. and Canada. The **BOILER** shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard and the minimum efficiency requirements of the latest edition of the AHRI BTS-2000 Standard as defined by the Department of Energy in 10 CFR Part 431. The **BOILER** shall operate at a minimum of 96.2% thermal efficiency (models FB 751 – FB 2001) or 96% thermal efficiency (models FB 2501 – FB 6001), at full fire as registered with AHRI. The registered combustion efficiency must be equal to or greater than the registered thermal efficiency. All models shall operate up to 98% thermal efficiency with return water temperatures at 70°F or below at 20°F temperature rise. The **BOILER** shall be certified for indoor installation.

The **BOILER** shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. Two burner/flame observation ports shall be provided. The single burner shall be a premix design constructed of high temperature stainless steel with a woven Fecralloy outer covering to provide modulating firing rates. The **BOILER** shall be supplied with two gas valves designed with negative pressure regulation and be equipped with a pulse width modulation blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The **BOILER** shall operate in a safe condition with gas supply pressures as low as 4 inches of water column on Natural and as low as 8 inches of water column on Propane. The FB 6001 shall be supplied with a proof of closure valve (POC) and shall prevent the boiler from firing if the POC valve seat is detected open. Upon a call for heat, once the POC valve seat is proven to be closed, the pre-purge cycle will begin and the POC valve will begin to open. The burner flame shall be ignited by direct spark ignition with flame monitoring via a flame sensor.

The **BOILER** shall utilize a 24 VAC control circuit and components. The control system shall have a display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The **BOILER** shall be equipped with a temperature/pressure gauge; high limit temperature control with manual reset; ASME certified pressure relief valve set for 50 psi (standard); outlet water temperature sensor (dual thermistor); return water temperature sensor; outdoor air sensor, flue temperature sensor (dual thermistor); high and low gas pressure switches, low water cut off with manual reset, blocked drain switch and a condensate trap for the heat exchanger condensate drain.

The **BOILER** shall feature the “SMART TOUCH™” control with CON-X-US which is standard and factory installed with an 8” liquid crystal touch screen display, password security, outdoor air reset, pump delay with freeze protection, pump exercise, ramp delay featuring six steps, domestic hot water prioritization with limiting capabilities and PC port connection. A secondary control that is field mounted outside or inside the appliance is not acceptable. The **BOILER** shall have alarm contacts for any failure, runtime contacts and data logging of runtime at given modulation rates, ignition attempts and ignition failures. The **BOILER** shall have a built-in “Cascade” to sequence and rotate while maintaining modulation of up to eight boilers of different Btu inputs without utilization of an external controller. The internal “Cascade” function shall be capable of lead-lag, efficiency optimization, front-end loading, and rotation of lead boiler every 24 hours. The control must include cascade redundancy to allow a member boiler to become the temporary leader if the original lead boiler shall loose communication with the members. The **BOILER** shall be capable of controlling an isolation valve (valve shall be offered by manufacturer) during heating operation and rotation of open valves in standby operation for full flow applications. The control must be equipped with standard BACnet MSTP and Modbus communication protocol with a minimum 55 readable points. The **BOILER** shall have an optional gateway device which will allow integration with LON or BACnet (IP) protocols.

The “SMART TOUCH™” control shall include CON-X-US communication platform that will allow remote access via a smart phone or Tablet. This will allow the ability to monitor and manage multiple Crest Boilers and send alerts via text or e-mail notifying of changes in system status. A user shall have the ability to check system status or re-program any boiler function remotely.

The “SMART TOUCH™” control shall increase fan speed to boost flame signal when a weak flame signal is detected during normal operation. A 0 -10 VDC output signal shall control a variable speed boiler pump (pump to be offered by manufacturer) to keep a fixed delta t across the boiler regardless of the modulation rate. The **BOILER** shall have the capability to receive a 0 – 10 VDC input signal from a variable speed system pump to anticipate changes in system heat load in order to prevent flow related issues and erratic temperature cycling.

The **BOILER** shall have available as an option RealTime O2 Feedback™. The O2 sensor shall be made by a top automotive supplier and is only available through Lochinvar. The O2 sensor shall be located in the combustion chamber. The feedback shall be in real time and displayed via a gauge on both the boiler touchscreen and the CON-X-US communication platform.

The **BOILER** shall be equipped with two terminal strips for electrical connection. A low voltage connection board with 30 data points for safety and operating controls, i.e., Alarm Contacts, Runtime Contacts, Louver Proving Switch, Tank Thermostat, Remote Enable/Disable, System Supply Sensor, Outdoor Sensor, Tank Sensor, Modbus Building Management System signal and Cascade control circuit. A high voltage terminal strip shall be provided for Supply voltage. Supply voltage shall be 120V/1PH/60Hz (FB 751 – FB 2001), 208V/3PH/60Hz (FB 2501 – FB 3501), or 480V/3PH/60Hz (FB 4001 – FB 6001). The boiler may be factory trimmed for optional supply voltages, i.e. 208V/3PH/60Hz, 480V/3PH/60Hz and 600V/3PH/60Hz. The high voltage terminal strip plus integral relays are provided for independent pump control of the System pump, the Boiler pump and the Domestic Hot Water pump.

The **BOILER** shall be installed and vented with a (select one):

 **(a) Direct Vent** **system with horizontal sidewall termination** of both the exhaust vent and combustion air. The flue shall be Category IV approved PVC, CPVC, PP (FB 0751 – 4001) or Category IV approved Stainless Steel (FB 0751- 6001) sealed vent material terminating at the sidewall with the manufacturer’s specified vent termination. A separate pipe shall supply combustion air directly to the boiler from the outside. The air inlet pipe must be sealed and may be other materials listed in the Installation manual. The boiler’s total combined air intake length shall not exceed 100 equivalent feet. The boiler’s total combined exhaust venting length shall not exceed 100 equivalent feet. The air inlet must terminate on the same sidewall as the exhaust.

**(b) Direct Vent** **system with vertical roof top termination** of both the exhaust vent and combustion air. The flue shall be Category IV approved PVC, CPVC, PP (FB 0751 – 4001) or Category IV approved Stainless Steel (FB 0751 – 6001) sealed vent material terminating at the rooftop with the manufacturer’s specified vent termination. A separate pipe shall supply combustion air directly to the boiler from the outside. The air inlet pipe must be sealed and may be other materials listed in the Installation manual. The boiler’s total combined air intake length shall not exceed 100 equivalent feet. The boiler’s total combined exhaust venting length shall not exceed 100 equivalent feet. The air inlet must terminate on the rooftop with the exhaust.

**(c) Vent** **system with Vertical rooftop or Horizontal sidewall exhaust** with the combustion air intake in different pressure zones. The flue shall be Category IV approved PVC, CPVC, PP (FB 0751 – 4001) or Category IV approved Stainless Steel (FB 0751 – 6001) sealed vent material terminating at the rooftop or sidewall with the manufacturer’s specified vent termination. A separate pipe shall supply combustion air directly to the boiler from the outside in a different pressure zone from that of the exhaust vent. The air inlet pipe must be sealed and may be other materials listed in the Installation manual. The boiler’s total combined air intake length shall not exceed 100 equivalent feet. The boiler’s total combined exhaust venting length shall not exceed 100 equivalent feet.

**(d) Vertical rooftop or Horizontal sidewall exhaust** with the combustion air drawn from the equipment room. The flue shall be Category IV approved PVC, CPVC, PP (FB 0751 – 4001) or Category IV approved Stainless Steel (FB 0751 – 6001) sealed vent material. The boiler’s total exhaust venting length shall not exceed 100 equivalent feet (FB 751-2001) or 150 equivalent feet (FB 2501 – FB 6001). Combustion air draw from the equipment room shall be supplied with properly sized combustion and ventilation air openings based on NFPA requirements.

**(e) Common Vented** with multiple Crest boilers. The flue shall be Category II/IV approved PVC, CPVC, PP or Stainless Steel sealed vent material for models FB 0751 – FB 4001. Models FB 5001 – FB 6001 shall be Category II/IV approved Stainless Steel sealed vent only. The exhaust and air intake venting must use the exact diameter, length, placement, and terminations as specified by the designer.

The **BOILER** shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments. High altitude operation shall be certified at a minimum of 4,500 feet above sea level by a 3rd party organization.

The **BOILER** shall be suitable for use with polypropylene glycol, up to 50% concentration. The de-rate associated with the glycol will vary per glycol manufacturer.

**STANDARD CONSTRUCTION**

The **BOILER** shall be constructed in accordance with the following code requirements as standard equipment. Manufacturing of special models to meet the below code requirements is not acceptable.

**California Code**

**CSD1 / Factory Mutual / GE Gap**

**Massachusetts Code**

**KY Kentucky Code**

**CRN Approval in Canada**

**Note: Due to the large disparity in CSD-1 interpretation from state to state, please confirm to the factory all controls required in your jurisdiction.**

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