**Laars Heating Systems Company – FT Series 301-399 Wall-Mount Boilers**

SECTION 235216 - CONDENSING BOILERS

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			2. SUMMARY
				1. Section includes gas-fired, fire-tube condensing boilers, trim, and accessories for generating hot water.
			3. ACTION SUBMITTALS
				1. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, finishes for boilers, rated capacities, operating characteristics, and furnished options and accessories.
				2. Sustainable Design Submittals:

Product data showing compliance with ASHRAE 90.1.

* + - * 1. Shop Drawings: For boilers, boiler trim, and accessories.

Include plans, elevations, sections, and attachment details.

Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Include diagrams for power, signal, and control wiring.

* + - 1. INFORMATIONAL SUBMITTALS
				1. Coordination Drawings: Plans and sections, drawn to scale and coordinated with each other, using input from installers of the items involved.
				2. Source quality-control reports.
				3. Field quality-control reports.
				4. Warranty: Standard warranty, shown below.
				5. Product Certificates:

ASME Stamp Certification and Report: Submit ASME stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler. For Canadian installations, CSA B51 pressure vessel Canadian Registration Number (CRN).

* + - 1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.
			2. WARRANTY
				1. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period. Where "prorated" is indicated, the boiler manufacturer will cover the indicated percentage of cost of replacement parts. With "prorated" type, covered cost decreases as age of equipment increases.

Warranty Periods: Limited warranty is effective as of the date of installation or 6 months after the date of installation, whichever is first.

Heat Exchanger Failure: 10 years.

Components Other Than Heat Exchanger: 5 years (1 year for non-single family dwellings).

1. PRODUCTS
	* + 1. PERFORMANCE REQUIREMENTS
				1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
				2. ASME Compliance: Constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV, and labeled with ASME H-Stamp.
				3. ASHRAE/IES 90.1 Compliance: Boilers shall have minimum efficiency in accordance with Table 6.8.1-6 and other requirements in Ch. 6 of ASHRAE/IES 90.1.
				4. AHRI: Boiler A.F.U.E. shall be certified and listed by AHRI.
				5. CSA Compliance: Test boilers for compliance with the latest edition of ANSI Z 21.13/CSA 4.9.
				6. Air Quality Compliance: Meets or exceeds the requirements of the most stringent air quality management codes, including but not limited to: SCAQMD, Rules 1146, 1146.1, or 1146.2 and Texas Commission on Environmental Quality (TCEQ) Title 30 Chapter 117, and Rule 117.465.
				7. Mounting Base: For securing boiler to concrete base.
			2. WALL-MOUNT, FIRE-TUBE CONDENSING BOILERS
				1. Basis-of-Design Product: Subject to compliance with requirements, provide Laars Heating Systems Company FT Series Model LFTHW wall-mount boiler, or comparable product by one of the following:

Lochinvar.

Triangle Tube.

Weil-McLain.

* + - * 1. Description: Factory-fabricated, -assembled, and -tested, stainless steel fire-tube, condensing boiler with heat exchanger sealed pressure tight, built on a steel base, including powder coat, thermal set jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.
				2. Boiler shall be sold by itself as a wall-mounted unit, or as a package with a floor stand, for installation flexibility.
				3. Gas Connections: Gas connections shall be available on the top or bottom of the boiler. When top gas connection is used, bottom connection shall act as a drip leg.
				4. Water Connections: Water supply and return connections shall both be available on the top or bottom of the boiler, for installation flexibility.
				5. Heat Exchanger: Stainless steel heat exchanger with finned aluminum core fire tubes.
				6. Combustion Chamber: Stainless steel, sealed.
				7. Burner: Forced draft drawing from gas-premixing valve, for natural gas or propane.
				8. Blower: Operates during burner-firing , prepurge, and postpurge of the combustion chamber.

Motors: Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 “Common Motor Requirements for HVAC Equipment.”

Motor Sizes: Large enough so driven load will not require motor to operate in service factor range above 1.0.

* + - * 1. Gas Train: Equipped with a zero-governing, negative pressure regulator valve and manual shutoff valve. Boilers are shipped for natural gas, with propane conversions as standard equipment.
				2. Vent / Air Piping:

Boiler shall be designed and CSA certified for horizontal and vertical Category IV venting, using up to 150 equivalent feet of PVC, CPVC, polypropylene, or stainless steel vent material.

Air may be taken from the room, or ducted directly to the boiler using up to 150 equivalent feet of PVC, CPVC, galvanized steel, ABS, stainless steel, or polypropylene air pipe material.

* + - * 1. Modulating Range:

Model 301: From 13 -100% of full fire (7.5:1 turndown).

Model 399: From 10 -100% of full fire (10:1 turndown).

* + - * 1. Ignition: Spark ignition, with flame sensor with 100 percent main-valve shutoff and flame safety supervision.
				2. Casing:

Jacket: Sheet metal, with snap-in, mechanically fastened and/or interlocking closures.

Control Compartment Enclosures: Integral to boiler jacket.

Finish: Thermal set powder coat paint with textured finish or stainless steel.

* + - * 1. Capacities and Characteristics:

Heating Medium: Hot water.

Design Water-Pressure Rating: 80 psig (551 kPa).

Safety Relief Valve Setting: 30 psig (207 kPa).

Entering-Water Temperature: Minimum 40 deg F (4.4 deg C)>.

Leaving-Water Temperature: Maximum 195 deg F (90.5 deg C)>.

AHRI Certified Combustion Efficiency:

LFTHW301: 95.4 percent.

LFTHW399: 95.9 percent.

AHRI Certified Thermal Efficiency:

LFTHW301: 95.1 percent.

LFTHW399: 95.4 percent.

Maximum Input:

LFTHW301: 301,000 Btu/hr.

LFTHW399: 399,000 Btu/hr.

Minimum Input:

LFTHW301: 39,900 Btu/hr.

LFTHW399: 39,900 Btu/hr.

Gross Output:

LFTHW301: 286,000 Btu/hr.

LFTHW399: 379,000 Btu/hr.

Net AHRI Rating:

LFTHW301: 249,000 Btu/hr.

LFTHW399: 330,000 Btu/hr.

Electrical: 120-V ac, single phase, 60 Hz, 4A.

* + - * 1. Trim

Controller:

Modulating operating.

Ignition.

Manual reset high limit.

Safety Relief Valve: ASME rated, 30 psi.

Flue Gas Recirculation Sensor.

Propane Conversion Kit.

Outdoor Air Sensor.

O-Ring and Gasket Kit.

Boiler Water Pressure Switch.

Blocked Vent Pressure Switch.

Blocked Condensate Pressure Switch.

Wall-Mount Bracket.

Screens for Vent and Air Pipe.

Burner Site Glass.

Pressure Gauge.

Boiler Air Vent: Manual.

Drain Valve: Minimum NPS 3/4 (DN 20) valve in compliance with ASME pressure vessel code.

Condensate Trap: Condensate trap with overflow protection.

Options – Field Installed:

Floor stand

Concentric vent terminal

Concentric flush-mount vent terminal

4” Vent / air screen

DHW sensor

Mixing control sensor

Condensate neutralizer kit

Condensate neutralizer kit with pump

Cascade cables and sensors

High altitude (5001-10,000ft) conversion kit

* + - * 1. CONTROLS

Boiler operating controls shall include the following devices and features:

Large user interface with LCD display.

Modulates from 10 percent to 100 percent of full fire (10:1 turndown) on model 399. Modulates from 13 percent to 100 percent of full fire (7.5:1 turndown) on model 301.

Control transformer.

Manual reset high limit stops burner if operating conditions rise above maximum boiler design temperature.

Adjustable set points.

Two central heating set points and differential.

Minimum supply temperature.

Outdoor reset parameters.

Central heating temperature boost.

Central heating anti-cycling time.

Domestic water temperature set point and differential.

Central heating combustion rate.

Domestic water combustion rate.

Pump delay times.

Domestic water priority timer.

Boiler supply temperature to indirect water heater.

System freeze protection parameters.

Cascade system parameters.

Service reminder parameters.

Reset burner runtime and ignition cycle counter.

Deg F or deg C display.

Manual firing rate control (forced min or max firing rate).

Integrates indirect domestic water heating.

Indirect water heater priority, with the ability to intelligently run heating and domestic water together when conditions allow the boiler to serve both.

Recognizes DHW sensor or closure from tank stat.

Multiple pump control for boiler pump, low temperature zone pump, high temperature zone pump, and indirect domestic water pump.

Controls two independent heating zones, each with the ability to have its own outdoor reset heating curve.

Mixing valve control.

CO2 detection on/off, CO2 alarm range, CO2 error range.

Direct spark ignition

24-V control circuit.

Accepts 0-10 VDC modulation signal from external control or building automation system.

Outdoor Reset:

Customizable reset curves based on outdoor temperatures and desired system water temperature.

Warm weather shutdown.

Outdoor air temperature sensor included.

Cascade and lead-lag up to 4 boilers without additional controllers. Sizes can be mixed in cascade systems.

Selectable rotation methods:

Auto Rotation: The leader automatically rotates the order of boilers responding to a demand to equalize the run time of the all boilers in the cascade system.

Cascade Rotation Time: The installer can manually select the number of hours each boiler is fired first in response to a demand before the leader rotates the order.

Boiler control shall display information about the following for each boiler it is monitoring:

Temperature set points.

Fan operation.

Flame detection and signal.

Error and error history.

Service reminder.

Outside temperature detection.

Outdoor reset parameters.

Anti-freeze.

Domestic water.

Communication state.

Time and date.

Fan operation.

Boiler pump.

DHW pump.

System pump.

Heat demand.

Cascade connection and operation.

Six control modes:

Set point change mode.

Lock mode.

Error mode.

Status display mode.

Outside temperature mode.

Installer mode.

Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

Burner operating control shall be integral to the boiler control.

1. EXECUTION
	* + 1. EXAMINATION
				1. Examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting performance of the Work.

Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

* + - * 1. Examine mechanical spaces for suitable conditions where boilers will be installed.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			1. BOILER INSTALLATION
				1. Install floor-mounted boilers on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
				2. Install gas-fired boilers according to NFPA 54.
				3. Assemble and install any optional boiler trim.
				4. Install electrical devices furnished with boiler but not specified to be factory mounted.
				5. Install control wiring to field-mounted electrical devices.
			2. PIPING CONNECTIONS
				1. Comply with requirements for hydronic piping specified in Section 232113 "Hydronic Piping."
				2. Drawings indicate general arrangement of piping, fittings, and specialties.
				3. When installing piping adjacent to boiler, allow space for service and maintenance of condensing boilers. Arrange piping for easy removal of condensing boilers.
				4. Install condensate drain piping from equipment drain connection to nearest floor drain, or, if a neutralization system is used, to the condensate-neutralization unit and from neutralization unit to nearest floor drain. Piping shall be at least full size of connection. Install piping with a minimum of 2 percent downward slope in direction of flow.
				5. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas-train connection. Provide a reducer if required.
				6. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve, and union or flange at each connection.
				7. Install piping from safety relief valves to nearest floor drain.
			3. DUCT CONNECTIONS
				1. Boiler Intake and Exhaust Vent Piping:

Install flue-venting kit and combustion-air intake:

Intake air may be taken from the room, or ducted to the boiler. When ducted, air pipe material may be PVC, CPVC, galvanized steel, polypropylene, stainless steel, or ABS. Air pipe diameter may be up to 150 equivalent feet of 4” diameter pipe or up to 65 equivalent feet of 3” diameter pipe.

Exhaust vent is Category IV. Exhaust vent material in the U.S. must be stainless steel UL 1738, CPVC sch 40 ANSI/ASTM F441, PVC sch 40 ANSI/ASTM D1785, or polypropylene ULC S636 Class 2C. Vent pipe material in Canada must be ULC S636 certified. Vent pipe diameter may be up to 150 equivalent feet of 4” diameter pipe, or up to 60 equivalent feet of 3” diameter pipe. Up to 65 feet of 3” flexible polypropylene vent pipe may be used for vertical indirect systems.

Comply with all boiler manufacturer’s installation instructions.

* + - 1. ELECTRICAL CONNECTIONS
				1. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
				2. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
				3. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
			2. CONTROL CONNECTIONS
				1. Install control and electrical power wiring to field-mounted control devices.
				2. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."
			3. FIELD QUALITY CONTROL
				1. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
				2. Tests and Inspections:

Perform installation and startup checks in accordance with manufacturer's written instructions.

Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.

Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.

Set field-adjustable switches and circuit-breaker trip ranges as indicated.

* + - * 1. Boiler will be considered defective if it does not pass tests and inspections.
				2. Prepare test and inspection reports.
				3. Occupancy Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

**END OF SECTION 235216**