**Laars Heating Systems Company – NeoTherm Indoor Models NTV 150-850**

SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

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 commercial, coil-type, gas-fired, domestic-water heaters.
			3. ACTION SUBMITTALS
				1. Product Data: For each type of product, include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
				2. Sustainable Design Submittals:

Product Data for water heater compliance with ASHRAE's "Advanced Energy Design Guides."

* + - * 1. Shop Drawings: Include diagrams for power, signal, and control wiring.
			1. INFORMATIONAL SUBMITTALS
				1. Coordination Drawings: Equipment room drawing or BIM model, drawn to scale, on which the items described in this Section are shown and coordinated with all building trades.
				2. Product Certificates: For each type of commercial, gas-fired, domestic-water heater.
				3. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
				4. Source quality-control reports.
				5. Field quality-control reports.
				6. Warranty: Standard warranty, shown below.
			2. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.
			3. COORDINATION
				1. Coordinate sizes and locations of concrete bases with actual equipment provided.
			4. WARRANTY
				1. Manufacturer’s Warranty: Manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period. Where “prorated” is indicated, the heater manufacturer will cover the indicated percentage of cost or replacement parts. With “prorated” type, covered cost decreases as age of equipment increases.

Failures include, but are not limited to, the following:

Structural failures.

Faulty operation of controls.

Deterioration of metals, metal finishes, and other materials beyond normal use.

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

Heat Exchanger Failure Due to Other Than Thermal Shock: Eight years, with years 6 to 8 prorated.

Controls and Other components: 1 year.

1. PRODUCTS
	* + 1. PERFORMANCE REQUIREMENTS
				1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.
				2. ASHRAE/IES Compliance: Comply with efficiency requirements in ASHRAE 189.1, which supersede requirements in ASHRAE/IES 90.1.
				3. ASME Compliance: Constructed in accordance with ASME Boiler and Pressure Vessel Code, and labeled with ASME HLW stamp.
				4. AHRI: Heater thermal efficiencies shall be determined and listed by AHRI.
				5. CSA Compliance: Test heaters for compliance with the latest edition of ANSI Z21.10.3/CSA 4.3 for gas water heaters.
			2. COMMERCIAL, COIL-TYPE, GAS-FIRED, DOMESTIC-WATER HEATERS
				1. Basis-of-Design Product: Subject to compliance with requirements, provide Laars Heating Systems Company NeoTherm Indoor model NTV, vertical-standing, coil-type, gas-fired, domestic-water heater, or comparable product by one of the following:

Raypak, Inc.

RBI; A Division of Mestek, Inc.

Thermal Solutions LLC.

Lochinvar, LLC.

* + - * 1. Description: Packaged commercial, water tube type, gas-fired, domestic-water heater and controls.
				2. Heater Construction: ASME code with 160-psig (1100-kPa) working-pressure rating for commercial domestic-water heater.
				3. Heater Appurtenances:

Heat Exchanger: Helix or spiral, stainless steel tubes with stainless steel headers.

Combustion Chamber: Stainless steel, sealed.

Burner: Forced draft, drawing from gas premixing valve, available for:

150-285: natural gas or propane.

399-850: propane.

Blower: Operates during burner-firing, prepurge, and postpurge of the combustion chamber.

Gas Train: Equipped with a zero-governing, negative pressure regulator valve and manual shutoff valve.

Modulating Range: From 20-100% of full fire (5:1 turndown), without the use of gas valves that stage.

Ignition: ANSI Z21.10.3/CSA 4.3, direct spark ignition with flame sensor that includes flame safety supervision and 100 percent main-valve shutoff.

Jacket: Sheet metal with powder coat, thermal set textured finish.

Built and CSA certified for indoor installations.

CSA certified for category IV vent systems.

Temperature Control: Includes the following:

Large color touch screen user interface, includes cleaning mode that allows user to clean the screen without activating touch screen.

Modulates from 20 percent to 100 percent of full fire (5:1 turndown).

Control transformer.

Maximum vent temperature cutoff.

Adjustable set points:

Domestic-water set point.

Heater high limit.

Deg F or deg C display.

Domestic water temperature set point time schedule.

PID gain parameters.

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

Pump exercise mode.

Anti-short cycle.

Dry alarm contacts for ignition failure.

Pump control for heater pump, with delay.

Direct spark ignition.

24-V ac control circuit.

Accepts 4-20 mA or 0-10 V dc modulation signal from external control or building automation system, with automatic remote signal detection.

Cascade and lead-lag up to 8 heaters without additional controllers.

Selectable firing sequence methods:

Keep each heater at lowest firing rate and modulate together to maximize efficiency.

Each heater brought to high fire before additional heaters fired.

Automatic, alternating-firing sequence for multiple heaters to provide equal run time per heater.

Heater control shall graphically depict the firing rate of each heater in the system.

Heater control shall display information about the following for each heater it is monitoring:

Icon color shall indicate heater status; normal operation, lockout, hold state, communication error.

Domestic hot water.

Burner control.

Demand.

Modulation.

Inlet temperature.

Blower.

Domestic water pump.

Flame detection.

Statistics.

Vent temperature limit.

Frost protection.

Information available from Modbus connection:

Inlet water temperature.

Outlet water temperature.

Flue gas temperature.

DHW temperature.

Frost protection.

Status for all sensors.

Fan speed.

All setpoints.

Remote control input.

Burner status.

Lockout codes.

Alarm reasons.

Pump status.

Control diagnostics shall include:

Ignition failure.

Grounded flame rod.

Safety chain interrupt.

DHW high limit exceeded.

Temperature rise limit exceeded.

Flue gas temperature limit exceeded.

Pressure sensor fault.

Combustion pressure fault.

Blocked air inlet.

Sensor errors (open or short).

Control voltage high or low.

Modulation fault.

Pump fault.

AC input phases reversed.

Fan speed proving rate failure.

Control shall have a clock with battery backup.

Control shall have runtime indicators for burner runtime, burner cycle count, and heater pump.

The control shall differentiate between a lockout, a hold, or an alert. If an issue occurs, the system will display a message icon on the control screen. The user shall be able to tap the icon to be presented with a more detailed explanation of the issue.

Pressure relief valve: 125 psig (861 kPa).

Pressure and Temperature Gage: Minimum 3-1/2-inch- (89-mm-) diameter, combination water-pressure and -temperature gage, in compliance with ASME pressure vessel code.

Manual reset high limit.

On/off toggle switch, lighted.

* + - * 1. Options - Heater Mounted:

Additional auto reset high limit.

Alarm bell with silence switch.

Alternate relief valves.

Heater pump.

* + - * 1. Options - Field Installed:

Water flow switch

Low water cutoff with manual reset and test button.

High/low gas pressure switches.

Heater pump.

Common vent kit.

Concentric vent terminal.

Concentric flush-mount vent terminal.

BACnet gateway.

Lonworks gateway.

Condensate neutralizer kit.

* + - * 1. Support: Steel base or skids.
				2. Capacity and Characteristics:

Recovery:

NTV 150: 172 gph (0.18 L/s) at 100°F (56°C) temperature rise.

NTV 199: 232 gph (0.24 L/s) at 100°F (56°C) temperature rise.

NTV 285: 327 gph (0.34 L/s) at 100°F (56°C) temperature rise.

NTV 399: 461 gph (0.48 L/s) at 100°F (56°C) temperature rise.

NTV 500: 580 gph (0.61 L/s) at 100°F (56°C) temperature rise.

NTV 600: 691 gph (0.73 L/s) at 100°F (56°C) temperature rise.

NTV 750: 868 gph (0.91 L/s) at 100°F (56°C) temperature rise.

NTV 850: 973 gph (1.02 L/s) at 100°F (56°C) temperature rise.

Fuel Gas Input:

NTV 150: 150 Mbh (44.0 kW).

NTV 199: 199 Mbh (58.3 kW).

NTV 285: 285 Mbh (83.5 kW).

NTV 399: 399 Mbh (116.9 kW).

NTV 500: 500 Mbh (146.5 kW).

NTV 600: 600 Mbh (175.8 kW).

NTV 750: 750 Mbh (219.8 kW).

NTV 850: 850 Mbh (249.1 kW).

Inlet Gas Pressure: 4- to 13-in. wg (995 to 3235 Pa).

AHRI Certified Thermal Efficiency:

NTV 150: 95 percent.

NTV 199: 97 percent.

NTV 285: 95 percent.

NTV 399: 96 percent.

NTV 500: 96 percent.

NTV 600: 97 percent.

NTV 750: 94 percent.

NTV 850: 96 percent.

Available Voltages: 120-V ac, single phase, 60 Hz.

* + - * 1. Heater 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 heater. Air pipe material may be PVC, CPVC, galvanized steel, or ABS. Air pipe diameter and length may be:

NTV 150: Up to 100 equivalent feet of 3 inch diameter pipe.

NTV 199: Up to 100 equivalent feet of 3 inch diameter pipe.

NTV 285: Up to 100 equivalent feet of 4 inch diameter pipe or up to 20 equivalent feet of 3 inch diameter pipe.

NTV 399: Up to 100 equivalent feet of 4 inch diameter pipe.

NTV 500: Up to 100 equivalent feet of 4 inch diameter pipe.

NTV 600: Up to 100 equivalent feet of 6 inch diameter pipe or up to 40 equivalent feet of 4 inch diameter pipe.

NTV 750: Up to 100 equivalent feet of 6 inch diameter pipe or up to 40 equivalent feet of 4 inch diameter pipe.

NTV 850: Up to 100 equivalent feet of 6 inch diameter pipe or up to 40 equivalent feet of 4 inch diameter pipe.

Exhaust vent is Category IV. Vent pipe material in the U.S. must be stainless steel UL 1738, CPVC sch 40 ANSI/ASTM F441, or polypropylene ULC S636 Class 2C. Vent pipe material in Canada must be ULC S636 certified. Vent pipe diameter and length may be:

NTV 150: Up to 100 equivalent feet of 3 inch diameter pipe.

NTV 199: Up to 100 equivalent feet of 3 inch diameter pipe.

NTV 285: NTV 285: Up to 100 equivalent feet of 4 inch diameter pipe or up to 20 equivalent feet of 3 inch diameter pipe.

NTV 399: Up to 100 equivalent feet of 4 inch diameter pipe.

NTV 500: Up to 100 equivalent feet of 4 inch diameter pipe.

NTV 600: Up to 100 equivalent feet of 6 inch diameter pipe or up to 40 equivalent feet of 4 inch diameter pipe.

NTV 750: Up to 100 equivalent feet of 6 inch diameter pipe or up to 40 equivalent feet of 4 inch diameter pipe.

NTV 850: Up to 100 equivalent feet of 6 inch diameter pipe or up to 40 equivalent feet of 4 inch diameter pipe.

Comply with all heater manufacturer’s installation instructions.

* + - 1. SOURCE QUALITY CONTROL
				1. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, in accordance with ASME Boiler and Pressure Vessel Code.
				2. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
				3. Domestic-water heaters will be considered defective if they do not pass tests and inspections.
				4. Assembled heater must be factory tested for safety and functionality; heater filled with water, fired throughout firing range, with all burner safety components proven. Results recorded for future reference.
				5. Prepare test and inspection reports.
1. EXECUTION
	* + 1. DOMESTIC-WATER HEATER INSTALLATION
				1. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."
				2. Install domestic-water heaters level and plumb, in accordance with layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
				3. Install gas-fired, domestic-water heaters in accordance with NFPA 54.
				4. Assemble and install any additional or optional heater trim.
				5. Fill domestic-water heaters with water.
				6. Charge domestic-water expansion tanks with air to required system pressure.
			2. PIPING CONNECTIONS
				1. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
				2. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."
				3. Drawings indicate general arrangement of piping, fittings, and specialties.
				4. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.
			3. IDENTIFICATION
				1. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."
			4. FIELD QUALITY CONTROL
				1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
				2. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
				3. Perform tests and inspections in accordance with manufacturer’s written instructions..
				4. Tests and Inspections:

Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.

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

* + - * 1. Domestic-water heaters will be considered defective if they do not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. DEMONSTRATION
				1. Train owner's maintenance personnel to adjust, operate, and maintain the domestic-water heaters.

**END OF SECTION 223400**