**Laars Heating Systems Company – NeoTherm XTR Models NT2V 399-1500**

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 Thermal Shock: 25 years.

Heat Exchanger Failure Due to Other Than Thermal Shock: 5 years, non-prorated.

Components Other Than Heat Exchanger: 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 XTR model NT2V, 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 heaters.
        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 natural gas.

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

Gas/Air System: The heater shall have as standard equipment the Laars X-TracTM efficient dual-venturi combustion system, with two independently controlled air and gas injection ports for wide, responsive control range.

Modulating Range: From 10-100% of full fire (10:1 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.

Modulates from 10 percent to 100 percent of full fire (10:1 turndown).

Quick start mode to access the most common parameters.

Screen settings timeout, allowing user to choose the amount of time the touch screen backlight remains lit, and/or the touch screen remains unlocked, after user interaction has ceased.

Allows access to history of heater operations, demand cycles, burner cycles, pump cycles, 10 most recent lockout conditions, unit temperatures and firing statistics.

Factory reset to default settings.

Restart and recalibrate/realign the display.

USB connection that allows the user to upload and download heater parameters, to copy parameters from one heater to another, or to document parameters in a tab deliminated text file.

Control transformer.

Maximum vent temperature cutoff.

Adjustable set points:

Domestic water set point and offset.

Heater manual and automatic high limits.

Deg F or deg C display.

Cascade setpoint, rotation, and redundancy.

PID gain parameters.

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

Pump exercise mode.

Pump time delay.

Anti-short cycle.

Anti-frost parameters.

Dry alarm contacts for ignition failure.

Pump control for heater pump, with delay.

Spark to pilot ignition.

24-V ac control circuit.

Accepts 4-20 mA or 0-10 V dc modulation signal from external control or building automation system, for user-selectable set point or firing rate control.

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.

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

Heater display homescreen shall show:

Intuitive, icon-based menu system.

Visual display of real-time heater status that includes inlet & outlet temperatures, heat temperature rise, flue gas temperature, and firing rate.

Time and date.

Set points.

Pump status.

Active demands.

Lockouts and alerts.

Message system.

Quick start, configure, and service menu shortcuts.

Three levels of password protection: user level, installer level, and OEM level.

Control shall have BACnet MSTP and Modbus RTU on board, standard. Optional gateways for BACnet IP and LonWorks shall be available from the heater manufacturer.

Building automation systems shall be able to read:

Inlet water temperature sensor.

Outlet water temperature sensor.

Flue gas temperature sensor.

DHW temperature sensor.

Flame signal.

0-10VDC or 4-20mA input for BAS.

0-10VDC or 4-20mA input for fan speed.

0-10VDC or 4-20mA output for pump.

0-10VDC or 4-20mA output for fan speed.

Safety chain status.

Non-safety chain status.

Demand source.

Digital output status.

Gas valve status.

Pilot valve status.

Fan speed modulation.

Burner modulation.

All lockout codes.

All error codes.

History of demand cycles.

History of pump cycles.

History of average, maximum, and minimum heater outlet temperature.

History of average, maximum, and minimum firing time.

Cascade firing rates and heater states.

Active set point.

Burner status.

Pump status.

Burner run time.

Building automation systems shall be able to read and write:

DHW demand.

DHW set point.

P, I, and D parameters.

Control diagnostics and service accessibility shall include the following digital inputs:

Flow switch.

Low water cutoff.

Manual reset high limit.

Thermal cutout.

High gas pressure switch.

Low gas pressure switch.

Additional high limit.

Condensate level.

Spare (for user-supplied item).

Control diagnostics and service accessibility shall include the following digital outputs:

Run.

Alarm.

Safety satisfied.

DHW pump.

Auxiliary power output.

Auxiliary dry contact.

Control diagnostics and service accessibility shall include the following analog inputs:

Inlet water temperature.

Outlet water temperature.

Flue gas temperature.

DHW temperature.

Flame signal.

DMS voltage/current.

Control diagnostics and service accessibility shall include the following analog outputs:

Pump speed percent.

Fan speed percent.

Mixing valve percent.

Auxiliary percent.

Control shall have a clock with battery backup.

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.

Water flow switch.

Pressure relief valve: 125 psig (861 kPa).

Pressure and Temperature Gage: Minimum 2-1/2-inch- (64-mm-) diameter, combination water-pressure and -temperature gage, in compliance with ASME pressure vessel code.

Manual reset high limit.

On/off toggle switch, lighted.

Air filter.

* + - * 1. Options - Heater Mounted:

ASME CSD-1.

Low water cutoff with manual reset and test.

Heater pump for normal water.

Heater pump for hard water.

Alternate relief valves.

* + - * 1. Options - Field Installed:

Kit for outdoor placement.

Pump housing for outdoor placement.

Alarm bell with silence switch.

CSD-1 field install kit.

Low water cutoff with manual reset and test button.

High/low gas pressure switches.

Additional auto-reset high limit.

Heater pump for 5-12 gpg hardness.

Heater pump for 12-15 gpg hardness.

Pump contactor.

BACnet gateway.

Lonworks gateway.

PVC concentric vent terminal.

CPVC concentric vent terminal.

Concentric flush-mount vent terminal.

Condensate neutralizer kit.

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

Recovery:

NT2V 0399: 460 gph (0.48 L/s) at 100°F (56°C) temperature rise.

NT2V 0500: 576 gph (0.60 L/s) at 100°F (56°C) temperature rise.

NT2V 0650: 749 gph (0.79 L/s) at 100°F (56°C) temperature rise.

NT2V 0800: 922 gph (0.97 L/s) at 100°F (56°C) temperature rise.

NT2V 0999: 1151 gph (1.21 L/s) at 100°F (56°C) temperature rise.

NT2V 1500: 1728 gph (1.81 L/s) at 100°F (56°C) temperature rise.

Fuel Gas Input:

NT2V 0399: 399 Mbh (117 kW).

NT2V 0500: 500 Mbh (147 kW).

NT2V 0650: 650 Mbh (190 kW).

NT2V 0800: 800 Mbh (234 kW).

NT2V 0999: 999 Mbh (293 kW).

NT2V 1500: 1500 Mbh (440 kW).

Inlet Natural Gas Pressure: 3.5- to 10.5-in. wg (995 to 3235 Pa).

AHRI Certified Thermal Efficiency:

NT2V 0399: 98 percent.

NT2V 0500: 98 percent.

NT2V 0650: 97 percent.

NT2V 0800: 97 percent.

NT2V 0999: 97 percent.

NT2V 1500: 99 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, stainless steel, or polypropylene. Air pipe diameter and length may be:

NT2V 0399: Up to 150 equivalent feet of 4 inch diameter pipe.

NT2V 0500: Up to 150 equivalent feet of 4 inch diameter pipe.

NT2V 0650: Up to 150 equivalent feet of 6 inch diameter pipe.

NT2V 0800: Up to 150 equivalent feet of 6 inch diameter pipe.

NT2V 0999: Up to 150 equivalent feet of 6 inch diameter pipe.

NT2V 1500: Up to 150 equivalent feet of 8 inch diameter pipe.

Exhaust vent is Category II or Category IV. Vent pipe material in the U.S. must be stainless steel UL 1738, PVC sch 40 UL1738 / ULC S636 / ANSI/ASTM D1785 / ANSI/ASTM D2665, CPVC sch 40 UL1738 / ULC S636 / ANSI/ASTM F441, or polypropylene UL1738 / ULC S636. Vent pipe material in Canada must be ULC S636 certified. Category II vent pipe is typically 12” diameter pipe, but must be sized per the job. Category IV vent pipe diameter and length may be:

NT2V 0399: Up to 150 equivalent feet of 4 inch diameter pipe.

NT2V 0500: Up to 150 equivalent feet of 4 inch diameter pipe.

NT2V 0650: Up to 150 equivalent feet of 6 inch diameter pipe.

NT2V 0800: Up to 150 equivalent feet of 6 inch diameter pipe.

NT2V 0999: Up to 150 equivalent feet of 6 inch diameter pipe.

NT2V 1500: Up to 150 equivalent feet of 8 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**