Date: Bid Date:

Project #: Location:

Project Name: Engineer:

Contractor: Prepared By:

PENNANT
Non-Pump-Mounted and Pump-Mounted Boiler

Model PNCH 500-2000 Indoor/Outdoor

Specification

LAARS Heating Systems Company

Contractor shall supply and install Qty.: Laars Model No. PNCH boiler(s).

The boiler shall be Laars Pennant Model PNCH rated at the input and output shown on the schedule. The unit(s) shall be design certified to comply with the current edition of the Harmonized ANSI Z21.13 / CSA 4.9 Standard for Gas-Fired Low Pressure Steam and Hot Water Boilers, and shall be design certified for both indoor and outdoor use. The unit(s) shall be designed and constructed in accordance with the ASME Boiler & Pressure Vessel Code, Section IV requirements for 160 psi (1103 kPa) working pressure, and shall bear the ASME "H" Stamp. The unit(s) shall be constructed to comply with the efficiency requirements of the latest edition of ASHRAE Standard 90.1.

The water tube heat exchanger shall be a straight tube design with ten 7/8" (22mm) inner diameter integral finned copper tubes. The tubes shall be rolled directly into glass-lined cast iron headers, rated for 160 psi (1103 kPa) working pressure. The heat exchanger shall be a low water volume design. All gaskets shall be non-metallic, outside the jacket, and separated from the combustion chamber by at least 3½" (90mm) to eliminate deterioration from heat. Headers shall have covers permitting visual inspection and cleaning of all internal surfaces. The heat exchanger shall have a ten-year warranty.

The piping side header shall have removable flanges, and the boiler design shall permit removal of the complete heat exchanger for service from either the front or top, to facilitate maintenance.

Pennant boilers ordered as pump-mounted units shall be built with an integral volute-mounted pump that is sized to provide the correct flow rate for the boiler and 30 feet (9.1m) of full-sized piping.

The units shall use a proved hot surface ignition (HSI) with a 20-second pre-purge cycle to allow the ignitor adequate time to heat up and clean out the combustion chamber. Upon a call for heat, if a flame is not detected, the burner controller shall attempt two more times prior to a lockout condition requiring a manual reset. If there is a loss of flame signal during a successful call for heat cycle, the burner control shall attempt three re-ignition cycles before locking out. Units with options such as ASME CSD-1 are configured with single-attempt ignition controls. The burner circuit is 24VAC, whereas the safety circuit is 24VDC. The boiler shall be 120VAC, single phase.

Burners shall be multi-port design, and shall be constructed of high temperature stainless steel. The burners shall be designed to mix air and gas, and burn with NOx emissions not exceeding 10ppm. Burners shall be in easily-removable burner tray assemblies with no more than 4 burners per tray.

The combustion chamber shall be lined with lightweight, ceramic fiberboard insulation, and shall be approved for service temperatures of not less than 2000°F (1093°C). The outer jacket shall be a unitized shell finished with acrylic thermo-set paint baked at not less than 325°F (163°C). The frame shall be constructed of galvanized steel for strength and protection. Chamber shall include a sight glass for viewing flame.

Boilers shall have a forced draft design and shall have an AHRI certified minimum 85% combustion efficiency. The unit shall be designed for vertical venting with standard B-vent as a fan-assisted Category I appliance, and for horizontal venting as a Category III appliance, and shall not require an external draft hood. The unit shall accept ducted combustion air, or shall be able to pull combustion air from the room. Vent and ducted combustion air shall each be able to be piped to either the top or the back of the unit, in any combination. Changing from top-to-back or from back-to-top orientation shall be easily accomplished in the field.

The boiler shall be provided with an integral, washable combustion air filter. The air filter shall protect the burners and blower(s) from debris. The air filter shall be constructed of open-cell polyurethane foam.

Models 500 and 750 shall be two-stage firing, model 1000 shall be three-stage firing, and models 1250-2000 shall be four-stage firing. The unit(s) shall have multiple gas trains, such that each gas train has a maximum input of 399,000 BTU/hr. Each gas train shall have a gas shutoff valve and a main gas valve with built-in redundant valve seats and gas regulator. Unions shall be used before and after each main gas valve, to permit easy removal of individual valves, gas trains, and burner tray assemblies from the front of the unit.

The boiler control shall be an integrated electronic temperature and ignition control with a color touchscreen display. It shall control the boiler operation, ignition, staging, and communication. The boiler display shall be visible without the removal of any jacket panels or control panels.

The display shall be user-friendly, with intuitive icons to assist control navigation. The home screen of the display shall show all set points, status of each pump, status of each stage, and boiler run status. Icons on the home screen shall indicate the active parameters that are currently in demand. A graphical depiction of the boiler shall indicate real-time status of firing rate, temperatures, and temperature rise. A navigation bar shall indicate where the user is at any time, as the user navigates in and out of the menus. The home screen shall display the date and time, errors, lock indication (used for password security), and icons to access the quick start menu, the configuration menus, and the service menus. Messages about boiler operation shall be indicated by an icon on the home screen that can be touched to display the whole text message. If an error occurs, the system will display a brief description of the issue on the control home screen navigation bar.

The control and display shall both hold the boiler's configuration and programmed parameters. Each shall be able to upload/download those parameters to the other, allowing for each device to be replaced without re-programming. The control shall have a USB connection that will allow the transfer of parameter sets from one boiler to another, and will allow a boiler's history data to be transferred to a USB memory device.

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The control shall have user, installer, and OEM level passwords and verification features to ensure that safety-related parameters are not altered by mistake. The control shall have a service mode that allows a technician to access basic diagnostic and troubleshooting information, and shall allow the user to reset to factory default parameters.

The control shall have a "quick start" feature that displays the most commonly-used subset of all available parameters, for systems that don't require more advanced set up.

BACnet MSTP shall be standard on the control via a terminal strip. Modbus shall be standard on the control via RS-232 to 485 converter. LonWorks, Metasys, and BACnet IP gateways shall be available for use with the Pennant control. The control shall have the ability to accept a 4-20mA or 0-10VDC input signal from an external control or building automation system, to allow external control of staging or temperature set point.

The control shall be able to cascade and lead-lag up to eight Pennant units, without additional system controllers. When wired together, the controller on the lead unit shall have the ability to automatically detect and configure all units. The cascade system shall have built-in redundancy, via either a lag unit's internal setpoint, or a configurable redundant leader.

The control shall allow the user to configure the staging, if desired, by adjusting differential, stage delay on/off, and minimum stage on/off.

The control shall have the ability to control the boiler pump, system pump, and indirect domestic water pump, each with a 0-10 minute adjustable time delay.

The control shall have the ability to integrate system heating, and shall control to the system supply temperature sensor when attached. The control shall have the ability to integrate a system return temperature sensor. The control shall have the ability to integrate indirect domestic water heating with the boiler system. It shall have the ability to recognize a domestic water sensor or a closure from a tank stat as a call for DHW. The control shall have outdoor reset feature with customizable reset curves, based on the outdoor temperature and desired system water temperature. The control shall have a warm weather shutdown feature, and a summer pump exercise feature. The control shall allow the user to choose the demand priority, allowing the call for heat, domestic water, external demand, and building automation to be prioritized in any order that is desired. The boiler shall be shipped with boiler inlet and outlet sensor, system supply and return sensors, DHW sensor, and outdoor temperature sensor, as standard equipment.

Allowable control adjustments shall include: boiler temperature set point; domestic water temperature set point; system temperature set point; temperature differentials; automatic reset high limit; manual reset high limit; boiler PID gain parameters; DHW PID gain parameters; system PID gain parameters; manual staging control; pump time delay, pump exercise interval; outdoor reset parameters; anti-short cycle; anti-frost.

The control shall be UL353 rated for high and low limits, such that a separate manual reset controller is not required.

Control diagnostics shall include, at a minimum, the following: all digital inputs (safety chain or auxiliary); flame status or ignition failure; digital outputs (gas valves, boiler/system/DHW pump, blower(s), etc.); temperature sensors (boiler inlet/outlet, system inlet/outlet, DHW, outdoor); analog inputs (remote staging or remote set point); analog outputs (mixing valve or variable speed pump). Dry contacts shall be included for both running and alarm conditions.

The control shall have a clock with a battery backup and will allow the user to access the demand cycles, burner cycles, boiler/system/DHW pump cycles, minimum/maximum/average firing time, and the ten most recent lockout conditions.

The user shall be able to select between °F and °C display. The control shall have an anti-frost setting that attempts to run the boiler pump, or the burners and pump, at a user-selected temperature. The user shall be able to choose which pump or pumps to apply the anti-frost functionality. An anti-cycling feature shall allow the user to adjust the amount of time after a heat demand is satisfied that the Pennant will wait to satisfy the next heat demand.

Standard features shall include:

- ASME 160 psi working pressure heat exchanger
- ASME "H" stamp
- Electronic staging & ignition control with LCD touchscreen
- Cascades up to 8 boilers with redundancy options
- Multiple pump control (system, boiler and indirect water heater), each with time delay
- BACnet MSTP and Modbus (optional BACnet IP, Metasys, or LonWorks)
- Accepts external 0-10VDC or 4-20mA for remote control of temperature or stages
- Displays messages in clear text form
- Complete diagnostics for analog and digital inputs
- Password protected parameters
- Quick start configuration
- Hot surface ignition
- 24V control system
- On/off toggle switch
- 115/24VAC transformer
- Boiler, system, DHW, and outdoor temperature sensors
- Manual reset high limit
- Automatic reset high limit
- Dry run and alarm contacts
- Anti-frost mode
- Anti-short-cycle mode
- Pump, mounted and wired (when ordered as pump-mounted unit)
- Flanged water connections
- Glass-lined headers
- External header gaskets
- 75 psi (517kPa) ASME rated pressure relief valve
- Water flow switch
- Temperature/pressure gauge
- Multiple operating gas valve/pressure regulators
- Manual "A" gas valve
- Multiple removable burner trays
- Stainless steel burners
- Built-in draft fan for Category I or III vent systems
- Intake air filter
- Air pressure switch
- Burner site glass

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