Date: Bid Date:

Project #: Location:

Project Name: Engineer:

Contractor: Prepared By:

PENNANT
Pool Heater

Model PNCP 500-2000 Indoor/Outdoor

Specification

LAARS Heating Systems Company

Contractor shall supply and install Qty.: Laars Model No. PNCP pool heater(s).

The heater shall be Laars Pennant Model PNCP , 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 Z21.56 / CSA 4.7 Standard for Gas Fired Pool Heaters, 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. Cupronickel tubes shall be optionally available. 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 five-year warranty.

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

The heater shall be built with an automatic mixing system, to protect the heat exchanger from excessive condensation due to low return water temperature, down to 70°F (21°C). The mixing system temperature shall be adjustable, but not be allowed to be set below the heater's condensing temperature. The heater shall be built with an integral volute-mounted pump that is sized to provide the correct flow rate for the heater, flow for the mixing system, and 30 feet (9.1m) of full-sized piping.

The heater shall be built with a back-flush operation switch. Switch shall allow shut off of the heater for back-flushing the system, but allow the pump to run for its time delay, to prevent temporary overheating of the heat exchanger, or manual reset high limit trip.

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 heater 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.

Heaters shall have a forced draft design and shall have a 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 heater 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.

The heater(s) shall have on/off firing, with 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 heater control shall be an integrated electronic temperature and ignition control with a color touchscreen display. It shall control the heater operation, ignition, mixing system, and communication. The heater 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, pump status, and heater run status. Icons on the home screen shall indicate the active parameters that are currently in demand. A graphical depiction of the heater shall indicate real-time 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 heater 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.

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The control and display shall both hold the heater'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 heater to another, and will allow a heater's history data to be transferred to a USB memory device.

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 firing or temperature set point.

The control shall have the ability to control the heater pump and the pool system pump, each with a 0-10 minute adjustable time delay.

The control shall use two sensors in the pool system loop. One sensor that is placed in the return side of the pool system loop shall be used for temperature control, and the other sensor shall be installed in the supply side of the pool system loop as an automatic high limit, in accordance with the high limit requirements of ANSI Z21.56 / CSA 4.7. The controller shall also have a heater inlet sensor and heater outlet sensor, as standard equipment, so the controller can have programmed automatic and manual reset high limits, and can display the heater's temperature rise. The control shall be UL353 rated for high and low limits, such that a separate manual reset controller is not required.

Allowable control adjustments shall include: pool system temperature set point; heater auto reset high limit differential; heater and pool system automatic reset high limit; heater and pool system manual reset high limit; PID gain parameters; pump time delays; anti-short cycle; anti-frost.

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, pumps, blower(s), etc.); temperature sensors (heater inlet/outlet, pool supply/return); analog inputs (remote firing or remote set point); analog outputs. 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, 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 heater pump, or the burners and pump, at a user-selected temperature. 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 firing & ignition control with LCD touchscreen
- Adjustable heater and pool system pump time delays
- 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
- Sensors on pool supply, pool return, heater inlet, and heater outlet
- Manual reset heater high limit
- Automatic reset heater high limit
- Automatic reset pool loop high limit
- Dry run and alarm contacts
- Anti-frost mode
- Anti-short-cycle mode
- Pump, mounted and wired
- Anti-Condensing mixing system
- 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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