Suggested Specification:
AM 399P, 500P, 750P, 1000P Skid Style
Gas-Fired Pool Heater(s)

Furnish and install as shown on AERCO International plans and operation and maintenance manuals, with all applicable codes and authorities having local, state and federal jurisdiction, AM Series Boiler Model AM _____P pool heater. The pool heater skid package shall consist of AERCO AM Series boiler, external shell and tube heat exchanger, pump, expansion tank, air vent and fittings piped together along with makeup water connection. Each boiler shall be CSA Listed, CSD-1 compliant; ASME coded and stamped, and incorporate gas train designed in accordance with Factory Mutual. Each boiler shall have an input of ____MBH with a gross output according to the table below (dependent upon return water temperature) when fired at full fire with natural gas. Electrical service to each boiler shall be 120V/1ϕ/60Hz 15 amp service. The boiler control panel shall be proprietary in design and incorporate the functions of thermal controller, combustion safeguard control, message annunciation, and fault diagnostic display, on individual field replaceable circuit boards mounted within a single housing. Each pool heater skid package shall have a footprint of no more than 28" W, 74" D, and 50.1" H for 399P-500P or 75.8" H for 750P-1000P. The shipping weight shall not exceed the weights shown below. Each boiler module shall have an ASME approved relief valve setting of 50 psig.

Model	Input (MBTU)	Output (BMTU)	Shipping Weight (lbs.)
AM 399P	399	351-395	920
AM 500P	500	440-495	930
AM 750P	750	660-742	1205
AM 1000P	1000	880-990	1290

This specification should be used in conjunction with the specifications of individual components on this pool heater skid.

CONSTRUCTION

Boiler modules shall be gas fired (natural gas or propane unit), condensing, modular, stainless steel water-tube design with a modulating forced draft power burner and positive pressure vent discharge.

The compact and sturdy design **shell and tube heat exchanger** shall be constructed of Cupro Nickel, Stainless Steel or Titanium on tube side for pool water and Bronze or Cast Iron on shell side for boiler water with a working pressure of 87 psig. Heat exchanger shall be sized to at least meet or exceed the capacity of the boiler and heat the pool water with high efficiency. Heat exchanger tube stacks shall be easily removable to facilitate cleaning and maintenance in the field.

Circulation pump shall be appropriately sized to circulate water through piping loop including boiler and heat exchanger. Pump shall be wired to internal boiler controls.

Low Water Cut-Off shall be wired to internal boiler safety controls to prevent boiler operation in case of insufficient boiler water flow.

Expansion tank shall be properly sized to protect boiler water piping loop from excessive pressure and keep the pressure below relief valve setting. Expansion tank shall be rugged, diaphragm type.

Air vent shall be provided at highest level to automatically purge the unwanted air in the closed

boiler water loop.

Makeup water connection shall be provided to boiler water loop for fast fill and contain pressure reducing fill valve along with shutoff valve.

All components shall be piped together and secured to the carbon steel support base for ease of handling and installation.

Burner, Modulating Gas Valve, and Variable Speed Fan

The boiler shall consist of the number of thermal modules, and have a total turndown ratio, as shown in the table below, without loss of combustion efficiency. Each module shall have a dedicated isolation valve on the inlet side of the module. Each thermal module's premix burner shall be metal fiber mesh covering a stainless steel head, with spark ignition and flame rectification. All burner material exposed to the combustion zone shall be of stainless steel construction. There shall be no moving parts within the burner itself. The burners shall produce <20 ppm of NOx corrected to 3% excess oxygen. A modulating gas valve and variable speed fan shall meter the natural gas and air input, respectively.

Model	Thermal Modules	Turndown Ratio
AM 399B	2	8:1
AM 500B	2	10:1
AM 750B	3	15:1
AM 1000B	4	20:1

Boiler Heat Exchanger

The heat exchanger is constructed of stainless steel and shall be capable of handling return water temperatures down to 40ºF without any failure due to thermal shock or fireside condensation. It shall be ASME stamped for a working pressure not less than 160 psig. The water tubes shall have a maximum water volume of 4 gallons per module. The boiler water connections shall be 2" NPT for 399-500 and 2 ½" NPT for 750-1000. Inspection openings in the pressure vessel shall be in accordance with ASME Section IV pressure vessel code.

The boiler shall be designed so that the thermal efficiency increases as the boiler firing rate decreases. The heat exchanger shall be stainless steel construction. Access to the fireside of the thermal modules is available by burner assembly removal. Minimum access opening shall be no less than 6 ¼" diameter circle per thermal module.

Each module shall have a dedicated water flow meter installed that is capable of detecting water flow rate and displaying through the boiler's display board.

Exhaust Manifold, Condensate Trap, and Condensate Neutralizer

The exhaust manifold shall be of polypropylene with a 4" diameter flue connection for 399-500, or 6" diameter for 750-1000. The exhaust manifold shall terminate in a condensate trap. The condensate trap shall have a gravity drain for the elimination of the condensation into an integrated condensate neutralizer.

BOILER CONTROLS

The boiler control system shall consist of a master controller (Argus Controller) to which individual thermal module controllers are linked as slaves. The entire system shall be CSA or UL Recognized. Each of the thermal module controllers shall consist of a combustion safeguard and flame monitoring system. Individual thermal module controllers shall be field replaceable. The combustion safeguard/flame monitoring system shall utilize spark ignition and a rectification type flame sensor. The boiler control system shall annunciate boiler & sensor status and include extensive self-diagnostic capabilities.

An optional second communications board shall allow third party Building Automation System (BAS) to control and monitor the boiler via Modbus RS-485 communications.

Each boiler shall incorporate dual over-temperature protection with manual reset and low water cut out, both in accordance with ASME Section IV and CSD-1.

Temperature Control Modes

The AM series boiler(s) shall operate in the control modes listed below:

__ 1. Internal Setpoint
__ 2. Indoor/Outdoor Reset
__ 3. 0 to 10VDC Temperature Setpoint
__ 4. Network Temperature Setpoint
__ 5. AM Boiler – Multiple boiler controller (Tekmar 294)

The first four control modes refer to independent boiler settings, while the last control modes refer to banks of boilers operated as a system by AERCO supplied multiple boiler controller (Tekmar 294). The following is a description of each control mode.

Internal Setpoint: Boiler shall include integral factory wired operating controls to control all operation and energy input of the boiler. Control of discharge water temperature shall be set through an internal setpoint with an adjustment of 68ºF to 189ºF. The individual thermal module controllers shall vary their respective thermal module's input throughout its full range to maximize the condensing capability of the boiler.

The boiler will operate to maintain a constant pool water temperature. Unit shall operate with an Inverse Efficiency Curve, with known Part Load Value Efficiencies. Maximum efficiency shall be achieved at minimum firing input. Controls shall be fully field adjustable from 68ºF to 189ºF in operation. The boiler shall have LCD display for monitoring of all sensors and interlocks.

Indoor/Outdoor Reset: Boiler shall include integral factory wired operating controls to control all operation and energy input of the boiler plant. The individual thermal module controllers shall vary their respective thermal module's input throughout its full range to maximize the condensing capability of the boiler. The boiler will operate to vary header temperature setpoint on an inverse ratio in response to outdoor temperature to control discharge temperature. The boiler shall be

furnished with an outdoor air temperature sensor.

Unit shall operate with an Inverse Efficiency Curve, with known Part Load Value Efficiencies. Maximum efficiency shall be achieved at minimum firing input. The boiler shall have LCD display for monitoring of all sensors and interlocks.

0 to 10 VDC Temperature Setpoint: Boiler shall include integral factory wired operating controls to control all operation and energy input of the boiler. The individual thermal module controllers shall vary their respective thermal module's input throughout its full range to maximize the condensing capability of the boiler.

The boiler will operate to vary pool water temperature setpoint linearly as an externally applied 0 to 10 VDC signal is supplied to the Argus Controller. Unit shall operate with an Inverse Efficiency Curve, with known Part Load Value Efficiencies. Maximum efficiency shall be achieved at minimum firing input. The boiler shall have LCD display for monitoring of all sensors and interlocks.

Network Temperature Setpoint: Boiler shall include integral factory wired operating controls to control all operation and energy input of the boiler. The individual thermal module controllers shall vary their respective thermal module's input throughout its full range to maximize the condensing capability of the boiler.

The boiler will operate to vary header temperature setpoint as an external communication utilizing the MODBUS protocol is supplied to the boiler's communications module via the RS-485 port. Unit shall operate with an Inverse Efficiency Curve, with known Part Load Value Efficiencies. Maximum efficiency shall be achieved at minimum firing input. The boiler shall have LCD display for monitoring of all sensors and interlocks.

AM Boiler – Multiple boiler controller (Tekmar 294): The Boiler Manufacturer can supply as part of the boiler package – a multiple boiler controller (Tekmar 294) to control up to four (4) AM Series Boilers. The Tekmar 294 operates the AM Boilers via remote setpoint. It determines a header setpoint (programmed as a constant setpoint or calculated from indoor/outdoor reset curve) and sends a 0-10V analog signal to the AM boilers. The AM boilers interpret the signal as an internal setpoint. The AM boiler's algorithm will manage the firing rate of the individual modules and maintain a steady boiler outlet temperature.

CONTROLS INTEROPERABILITY

The communications module shall utilize the MODBUS open protocol to interface with third party Building Automation Systems (BAS).

Controls interface with BACnet, LonWorks, and N2 shall utilize an optional AERCO Communications Gateway to act as a MODBUS interface/translator between the boiler and BAS. The AERCO Communications Gateway shall be comprised of a microprocessor-based control utilizing the MODBUS protocol to communicate with the boilers. Non-volatile backup of all point mappings and programs shall be internally provided as standard. Connection between Gateway and individual

boilers shall be "daisy chain" with shielded, twisted-pair, low voltage wiring for ease of installation.

INSTALLATION

All aspects of installation of Pool Heater Plant shall be in strict accordance with manufacturer's instructions. The vent system *must conform to* all manufacturer's recommendations and shall utilize UL listed stainless steel AL-29-4C, Polypropylene, PVC, or CPVC Positive Pressure venting materials. The vent must be sized in accordance with AERCO's recommendations.

Pool water piping shall be field constructed of materials as specified. Piping shall have individually isolating shutoff valves by installing contractor for service and maintenance. Each natural gas boiler shall require a minimum gas pressure of 3" W.C. at gas flow rates indicated in the table below (full load rated capacity). For applications with gas supply pressure greater than 13" W.C., each boiler shall be provided with an individual supply gas regulator by installing contractor for proper gas regulation.

Model	Gas Flow (SCFH)
AM 399B	399
AM 500B	500
AM 750B	750
AM 1000B	1000

WARRANTY

The pressure vessel/heat exchanger of the boiler shall carry a 7-year from shipment, non-prorated, limited warranty against failure due to condensate corrosion, thermal stress, mechanical defects or workmanship. All other boiler components except for ignitor and flame rod shall carry an 18-month warranty from shipment against failure due to defective materials or workmanship.

If any part of skid package fails because of a manufacturing defect within one year from system startup date or 18 months from the ship date, factory shall furnish from manufacturer's organizations, without charge, the required replacement part.

Note: Refer to the AERCO website (www.aerco.com) for specific warranty information concerning the AM Series Boiler used in the AM Series pool heater

FIELD SERVICES

Contractor shall provide the services of a local factory authorized representative to supervise all phases of equipment startup. A letter of compliance with all factory recommendations and installation instructions shall be submitted to the engineer with operation and maintenance instructions.