**SECTION 235700 – HEAT EXCHANGERS for HVAC SYSTEMS**

PART 1 ‑ GENERAL

1.01 SUMMARY

1. This Section includes hydronic boiler packaged system construction, components, required trim, controls, and accessories necessary for hydronic space heating.

1.02 REFERENCES

1. Comply with applicable Codes/Standards of ANSI, ASME, AGA, NEC, UL, FM, and the State.
2. Section 15185 – Hydronic Pumps and Hydronic Specialties
3. Local air quality district emission requirements.

1.03 QUALITY ASSURANCE

1. Provide factory tests to check construction integrity and control function of the complete system.
2. Installed materials not meeting specification requirements of the Contract Documents will be subject to removal and replacement

1.04 SUBMITTALS

1. Comply with provisions of Section 01 30 00 - Submittals.
2. Manufacturer's descriptive literature, operating instructions, maintenance and repair data.
3. Manufacturer's installation instructions.
4. Detail Drawings showing dimensions and electrical diagrams.
5. Submit boiler start up, testing, and adjusting certificate.

PART 2 ‑ PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

1. Contractor to furnish and install a pre-assembled, pre-piped, hydronic heating equipment package as manufactured by FlowTherm Systems or approved equal. Alternate package system manufacturers must be able to demonstrate a successful history of manufacturing similar systems for a minimum of 10 years.

2.02 MOTORS AND CONTROLS

 A. Motors: Provided with equipment. Refer to Section 26XXXX ‑ ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT.

 B. Motors Starters: Provided with equipment. Refer to Section 26XXXX - ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT.

2.03 EQUIPMENT REQUIREMENTS

 A. General:

1. The packaged system shall include, as a minimum, the following components:
	1. Qty xxx(x) Shell and Tube heat exchanger
	2. Two (2) Secondary loop pumps.
	3. Expansion tank.
	4. Air separator.
	5. Control Panel with non-fused main power disconnect
	6. Parallel control valves sized for 1/3-2/3 capacity control
	7. Thermometers, gauges, isolation valves and inter-connecting piping.
2. All components shall be mounted on a structural steel baseplate covered with ¼” steel decking. The entire assembled unit shall be primed with red oxide and finished with a heavy coat of exterior-grade industrial enamel. It is acceptable to provide the packaged system as multiple skids which are field installed directly adjacent to one another with factory-supplied interconnecting piping and electrical.
3. The package(s) shall be designed to supply, monitor, and control the hydronic circulation loop within the specified flow and temperature conditions of the system.
4. The Package(s) shall be UL Listed according to Standard #508A for control panels and UL Standard #778 for Pumping Systems.
5. Performance: Refer to Schedule on Drawings.
	1. BOILER SKID CONSTRUCTION
6. HEAT EXCHANGER
	1. The packaged system shall include a B&G model SU steam-to-water shell and tube heat exchanger of the removable u-bend tube-bundle design. The heat exchanger shall be equipped with mounting saddles and supported to the package frame and shall be pre-piped in accordance to the manufacturer’s installation requirements.
	2. The front head assembly shall be of the bonnet design and shall be constructed of cast iron. The tube sheet, tie rods and spacers, baffles and shell shall be constructed of carbon steel. The tubes shall be constructed of 20.0 BWG copper with a ¾” OD. The gasket material shall be compressed fiber.
	3. The heat exchanger shall have adequate condensate drain piping equipped with a float and thermostatic steam trap properly sized for the load. The heat exchanger shall also be equipped with a vacuum breakers and vents as recommended by the manufacturer.
7. SECONDARY HEATING LOOP PUMP(S)

The secondary heating loop pumps shall have performance conditions as per equipment schedule and shall be:

* 1. Bell & Gossett Series 1510 base-mounted or 1531 close-coupled end suction pumps with cast iron body and stainless steel impeller with standard mechanical seal, TEFC Premium Efficient motor rated for VFD operation.
1. AIR SEPRARTOR
	1. Centrifugal air separator shall be furnished and installed as part of the packaged system. The inlet and outlet connections of the separator shall be tangential to the vessel shell. The vessel shell diameter shall be three times the nominal inlet / outlet pipe diameter.
	2. The separator shall have an internal steel air collector tube with 5/32” diameter perforations and 63% open area designed to direct accumulated air to a high capacity air vent via an NPT vent connection at the top of the unit.
	3. The air separator must be designed, constructed and stamped for 125 PSIG at 350oF in accordance with Section VIII, Division I of the ASME Board and Pressure Vessel Code Inspectors.
2. CONTROL PANEL

The control panel shall provide a single point power connection for all packaged equipment, PLC system control, variable frequency drives, and BACnet communication. The panel shall include:

* Single point power connection with non-fused main power disconnect
* NEMA 1 OR NEMA 3R enclosure
* PLC controller
* VFDs for secondary system pumps
* Wire-to-Water Power Optimization of secondary system pumps
* Through-the-door power disconnects for secondary system pumps
* Hand-Off-Auto selector switch with green “Run” light and red “Fail” light for each secondary system pump
* Local-Off-Remote system selector switch to allow for local “stand alone” operation or remote system enable/disable.
* BACnet field server to provide BMS interface to all equipment
* System differential pressure transmitter (shipped loose for field installation by others)
1. EXPANSION TANK

The boiler heating package shall include an ASME Section VIII rated expansion tank. Bell & Gossett B-LA Series bladder style construction with a one-piece replaceable heavy duty butyl bladder. The tank shall have an NPT system connection with a charging valve connection to facilitate on-site charging of the tank to meet system requirements.

1. CHEMICAL POT FEEDER

A chemical pot feeder with isolation and bypass valves shall be provided. The pot feeder shall have a maximum operating temperature of 200 o F at 200 PSI. The pot feeder shall have ¾” NPT connections and shall have a capacity of 2 gallons.

1. ISOLATION VALVES

Isolation valves shall be provided to service of all major components of the boiler heating package. These valves will facilitate the removal of a component for servicing without the need of draining the heating water from the system piping.

1. The following items shall be single point connections
	1. Power
	2. Steam inlet
	3. Condensate drain
	4. Hot Water Supply
	5. Hot Water Return
	6. Cold Water Make-up
2. Hydrostatic Test: Shop-assembled pressure parts of the boiler shall be hydrostatically tested at the factory at a pressure of 1‑1/2 times the design pressure. A manufacturer's Data Report to confirm compliance with ASME Code requirements shall be furnished by the boiler manufacturer.
3. Functionality Test: Perform a factory functional test of all system electrical components and skid wiring prior to shipment.

PART 3 ‑ EXECUTION

3.01 FIELD ASSEMBLY REQUIREMENTS

1. Place and mount skid on a level concrete equipment pad
2. Make utility and system connections as described in item 2.04.J of this section.
3. Boiler Venting – each boiler shall be vented according to manufacturer’s recommendation and shall conform to the requirements of the National Fuel Gas Code (American Standard Z223.1-Latest Edition).
4. Gas Regulator and Gas Train Vents – Pipe through roof to atmosphere

3.02 INSTALLATION

1. Install boiler on concrete pad as instructed by manufacturer.
2. Provide services of manufacturer's representative to supervise rigging, hoisting, and installation of the boiler.
3. Coordinate electrical and control work.
4. Install ship loose items, such as sensors, sight glasses, safety valves, and gauges.
5. Pipe safety valves to floor drain.

3.03 START UP

1. Provide services of manufacturer's representative to inspect boiler after installation is complete and submit report prior to start up, verifying installation is in accordance with specifications and manufacturer's recommendations.
	1. The package manufacturer shall provide the services of a trained technician to assist in starting up, adjustment and operation of boiler and firing equipment and all other equipment furnished by the boiler manufacturer. In addition, the technician shall perform requisite field tests and instruct the Owner's operating personnel in the proper operation and maintenance of the unit.

END OF SECTION