SPECIAL SPECIFICATION

SECTION 15510S

HEATING BOILERS AND ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Boilers, controls and boiler trim, hot water connections, fuel burning system and connections, collector, draft hood, draft fan, chimney connections and circulator, expansion tank and tankless water heater options.

1.02 RELATED SECTIONS

A. Section 13085**S** – Seismic Protection

B. **Section 15051S – Piping System**

C. Section 15120S - Piping Specialties.

D. Section 15170S – Motors: Product requirements for electric motors for placement by this section.

E. Section 15550S - Chimneys and Stacks.

F. Section 16001 – Electrical Work: Execution requirements for electric connections to boilers specified by this section.

1.03 REFERENCES

A. AGA - Directory of Certified Appliances and Accessories.

B. AGA Z21.13 - Gas-Fired Low-Pressure Steam and Hot Water Boilers.

C. ASME SEC I - Boiler and Pressure Vessels Code - Rules for Construction of Power Boilers.

D. ASME SEC IV - Boiler and Pressure Vessels Code - Rules for Construction of Heating Boilers.

E. ASME SEC VIII DIV 1 - Boilers and Pressure Vessels Code - Rules for Construction of Pressure Vessels.

F. HI - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.

G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

H. NFPA 54 (AGA Z223.1) - National Fuel Gas Code.

I. NFPA 58 - Storage and Handling of Liquefied Petroleum Gases.

J. UL 726 - Oil-Fired Boiler Assemblies.

1.04 SUBMITTALS

A. Product Data: Submit general layout and dimensions. Include size and location of water, fuel, electric and vent connections, electrical characteristics, weight and mounting loads.

B. Test Reports: Indicate specified performance and efficiency is met or exceeded. Provide combustion test that includes boiler firing rate, over fire draft, gas flow rate, heat input, burner manifold gas pressure, percent carbon monoxide (CO), percent oxygen (O), percent excess air, **no_x emissions** flue gas temperature at outlet, ambient temperature, net stack temperature, percent stack loss, percent combustion efficiency, and heat output.

C. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturers Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.

1.05 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

1.06 QUALITY ASSURANCE

A. Conform to ASME SEC IV and UL 726 for construction of boilers. The boiler shall be registered with the National Board Of Boiler And Pressure Vessel Inspectors

B. Unit Certification: AGA certified.

C. Conform to NEC for internal wiring of factory wired equipment.

D. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

E. Maintain one copy of each document on site.

F. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

G. Installer Qualifications: Company specializing in performing Work of this section with minimum three years documented experience.

1.07 PRE-INSTALLATION MEETING

A. Convene minimum one week prior to commencing Work of this section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Accept boilers and accessories on site in factory shipping packaging. Inspect for damage.

B. Protect boilers from damage by leaving packing in place until installation.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Provide five-year manufacturers warranty for boilers.

1.11 MAINTENANCE SERVICE

A. Provide service and maintenance of boilers for one year from Date of Substantial Completion.

1.12 MAINTENANCE MATERIALS

A. Provide wire brush and handle for fire tube boiler cleaning.

1.13 EXTRA MATERIALS

A. Supply one set of circulator pump seals.

PART 2 - PRODUCTS

2.01 FIRE TUBE BOILERS

A. Manufacturers:

1. Cleaver Brooks.
2. Industrial Steam.
3. Johnson Boiler Co.
4. Teledyne Laars.

B. Description: Factory assembled, factory fire tested, self contained, readily transported unit ready for automatic operation except for connection of water, fuel, electrical, and vent services.

C. Unit: Mount on integral structural steel frame base and include integral forced draft burner, burner controls, boiler trim, refractory, insulation and jacket.

2.02 FIRE TUBE BOILER SHELL

A. Construct to applicable ASME Boiler and Pressure Vessels Code for allowable working pressure of 125 pounds per square inch water.

B. Provide two lifting eyes on top of boiler.

C. Hinged front and rear doors, gas tight, insulated, and secured with heavy-duty cap screws and replaceable brass nuts.

D. Front and rear tube sheets and flue fully accessible for inspection and cleaning when doors are open.

E. Provide observation ports at each end of boiler.

F. Provide hand holes and arm holes for boiler inspection and cleaning.

G. Insulate casing with readily removable, 2-inch thick glass fiber blanket insulation covered by sectional preformed sheet metal jacket. Boiler casing temperature not to exceed ambient room temperature by 18 degrees F maximum with surface air velocity of 1 foot per second.

H. Factory-paint boiler, base, and other components with hard finish silicone enamel.

I. Water entering hot water boiler thoroughly mixed with hot boiler water through jet induced circulation.

J. Provide bi-metal type thermometer, 3-1/2 inch diameter with black letters on white background.

2.03 FIRE TUBE HOT WATER BOILER TRIM

A. ASME rated pressure relief valve, 100 pounds per square inch-gage.

B. Water temperature gage.

C. Water pressure gage.

D. Low water cut-off to prevent burner operation when boiler water falls below safe level.

E. Operating temperature controller to control burner to maintain water temperature set point.

F. High limit temperature controller with manual reset for burner to prevent boiler water temperature from exceeding safe system temperature.

G. Boiler air vent, automatic.

2.04 FIRE TUBE BOILER FUEL BURNING SYSTEM

A. General: Forced draft automatic burner integral with front head of boiler designed to burn natural gas, modulating with low fire ignition position and automatically maintains fuel-air ratio.

1. Blower: Statically and dynamically balanced to supply combustion air; direct connected to motor.

2. Damper Motor: Single motor controlling combustion air damper and fuel valves.

3. Gas Pilot: The gas pilot shall be premix type with automatic electric ignition. An electronic detector shall monitor the pilot so that the primary fuel valve cannot open until pilot flame has been established. The pilot train shall include 2 manual shut off valves, solenoid valve, pressure regulator and pressure gauge.

B. **Low Emissions:**

1. Each boiler shall be equipped with a low emission (LE) option for guaranteed NO_x performance at 20 ppm, corrected to 3% O2 when firing natural gas. Boiler turndown shall be 10:1 on natural gas at the stated NO_x levels.

2. The low emission option shall include an integral front head, burner and boiler package providing NO_x reduction through an internal system using the combusion air fan, high turndown/low NO_x burner, and low NO_x furnace design to achieve the guaranteed NO_x levels. Boiler efficiency shall be guaranteed while the boiler is operating at the low NO_x performance levels.

C. Gas Burner: Forced draft, high-radiant multi-port power burner with electric ignition. Natural gas burner piping, include on unit complete **I.R.I.** gas train including high and low gas pressure switches, plug valve, and gas pressure regulator.

D. Gas Burner Piping:

1. Gas burner piping on all units shall include priary gas shutoff valve, motor operated with spring return to start or stop the gas burner and to close automatically in the event of power failure, flame failure or a low water condition. A lubricated plug or butterfly shutoff valve shall be located ahead of the motorized valve for manual shutoff.

2. A plugged leakage test connection and a second lubricated plug cock or butterfly valve shall be provided as a means for a tightness check or the primary shutoff valve.

3. A proof of closure switch on the primary shutoff valve plus high and low gas pressure switches shall be provided. A second motorized safety shutoff valve, plus an additional plugged leakage test connection shall be provided. A vent valve shall be located between the safety shutoff valves.

2.05 FIRE TUBE BOILER CONTROL PANEL

A. Mount panel on boiler. Hinged metal cabinet with key lock shall contain programming relay, blower motor starter.

B. Program relay to control ignition, starting and stopping of burner and provide both pre-combustion purge and post combustion purge. Burner to shut down in event of ignition, pilot, or main flame failure. Interlock to shut down burner upon combustion air pressure drop.

C. Manual/automatic selector switch and damper motor positioning switch to permit automatic firing in accordance with load demand, or manual control of firing rate at any desired point between low fire and maximum rating.

D. Electronic detector to prevent primary fuel valves from opening until pilot flame is established.

E. Panel shall include indicating lights to show low water level, flame failure, fuel valve open and load demand. Mount indicating lights and switches in hinged drop-panel for wiring access.

F. Boiler shall be controlled from the FCS and from the FCS shall have start/stop, temperature reset, temperature read out, monitor safeties, etc.

2.06 FIRE TUBE BOILER PERFORMANCE

A. Minimum Efficiency: Minimum 80 percent from 30 to 100 percent of full load firing rate, certified by factory tests.

B. Capacity:

1. Fluid: Hot water. **Reference Drawings.**

2. Input at sea level: Reference Drawings

3. Output at sea level: Reference Drawings

4. Capacities and performance shall be rated at 5,500 ft. altitude.

2.07 SOURCE QUALITY CONTROL (AND TESTS)

A. Make completed steel water tube and fire tube boilers available for inspection at manufacturer's factory prior to packaging for shipment. Notify Owner at least seven days before inspection is allowed.

B. Allow witnessing of factory inspections and tests at manufacturers test facility. Notify Owner at least seven days before inspections and tests are scheduled.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with NFPA 54 and I.R.I.

B. Install boiler on concrete housekeeping base, minimum 3-1/2 inches high and 6 inches larger on each side than boiler base. Refer to Section 03300.

C. Provide connection of natural gas service in accordance with NFPA 54.

D. Provide piping connections and accessories as indicated; refer to Section 150**51 and** Section 1540**1** .

E. Pipe relief valves and drain valves to nearest floor drain.

F. Install circulator and diaphragm expansion tank on boiler.

G. Provide for connection to electrical service. Refer to Section 16150.

H. Mount thermometer in boiler breeching within 12 inches of flue nozzle for fire tube boilers. Refer to Section 15550**S**.

3.02 DEMONSTRATION AND TRAINING

A. Demonstrate operation and maintenance procedures.

3.03 SCHEDULES

A. As scheduled on the drawings.

END OF SECTION