SECTION 23 52 33 - STEEL WATER-TUBE BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Contract Documents to include Conditions and Drawings.

1.2 SUMMARY

A. This Section includes packaged flexible water-tube boilers for generating hot water.
   1. Boilers.
   2. Controls and boiler trim.
   3. Fuel burning system.

1.3 SUBMITTALS

A. Product Information: Include rated capacities, shipping, operating weights and accessories for each model indicated on the schedule.

B. Shop Drawings: Provide detail on equipment assemblies and indicate dimensions, required clearances, components, and location and size of field connections.

   1. Wiring Diagrams: Show detail wiring for power, signal, and control systems and differentiate between factory and field wiring.

1.4 CONTRACT CLOSEOUT SUBMITTALS

A. Manufacturer’s Field Startup and Test Reports

B. Operation and Maintenance Data

1.5 REFERENCES-STANDARDS

A. ANSI Z21.13: Gas-Fired Low Pressure Steam and Hot Water Boilers

B. ASME Boiler and Pressure Vessel Code: Section IV, Heating Boilers

C. ASME Boiler and Pressure Vessel Code: Section I, Power Boilers
   1. High Pressure, High Temperature Water in excess of 160 PSIG/250°F.

D. ASME CSD-1: Control Standard

E. NFPA 31: Standard for the Installation of Oil-Burning Equipment

F. NFPA 54 (AGA Z223.1): National Fuel Gas Code

G. NFPA 58: Storage and Handling of Liquefied Petroleum Gases

H. NFPA 70: National Electrical Code.

I. Underwriters' Laboratories, Inc. (UL) Listed Products

1.6 QUALITY ASSURANCE

A. Factory tests to confirm construction of the unit per ASME

1.7 DELIVERY, STORAGE AND PROTECTION

A. Protect boiler package from damage by leaving factory inspection openings and shipping packaging in place until final installation.

B. If stored outside prior to final installation, boiler package must be protected from the elements and ground water with tarps and blocking as needed.

1.8 WARRANTY

A. General Warranty: Boiler Package shall be warranted against defects in workmanship and materials for 12 months after start-up or 18 months from ship date, whichever shall be less.

B. Thermal Shock Warranty: The boiler vessel shall be warranted for 25 years against thermal shock on a non-prorated basis.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer shall meet all aspects of the specifications: Provide boilers by one of the following:
   1. Bryan Steam (EB Series)
   2. Approved Equal Meeting Specifications

2.2 PACKAGED BOILER

A. Description: The boiler shall be constructed and assembled as a completely packaged unit ready for field connections to the water supply, return connection, electrical power supply, fuel supply(s), relief valve discharge, building management controls and flue-gas vent.
   1. The water boiler shall be manufactured in strict accordance with ASME Heating Boiler Code, Section IV, and shall bear the ASME "H" stamp for maximum working pressure of 160 PSIG and 250° F temperature.

a. Also available for higher pressures up to 250 PSIG and temperatures to 300°F per ASME Section I)

2. The boiler shall be built to withstand 150 degree delta "T"
3. A tube removal and replacement shall be demonstrated at time of start-up. Demonstration time not to exceed 40 minutes.

B. Vessel and Tube Construction

1. The boiler shall be constructed on a heavy steel frame.
2. The boiler pressure vessel shall be provided with adequately sized upper and lower drums.
3. A minimum of two downcomers shall be provided and shall be located inside furnace chamber to maximize proper thermal internal water circulation.
4. No external water circulation source shall be required.
5. Steel water tubes are to be 1½" O.D., .095 wall thickness, six-pass, flexible serpentine bend design, not subject to thermal shock damage.
6. Individual water tubes shall be easily removable and replaceable without either welding or rolling.
7. The boiler shall have no more than two tube configurations.
8. The boiler shall be furnished with an adequate number of tappings and inspection openings to facilitate internal boiler inspection and cleaning.

C. Furnace/Combustion Chamber Construction

1. Access to the furnace/combustion chamber is gained by a hinged access door(s) with an opening of no less than 26" wide x 62" high maximum to allow for inspection of the interior chamber and the burner head. All remaining panels shall be individually removable.
2. All access panels shall be affixed to the pressure vessel frame and insulated with 2" mineral fiber mono block and 2" high temperature ceramic blanket insulation and be fully gasketed for pressurized firing.
3. The furnace/combustion chamber shall be primarily of water-wall design with one side of removable panels.
4. The stationary interior wall shall be lined with 2" ceramic blanket insulation.
5. The front and rear walls are insulated with 5" mineral fiber mono block and 2" ceramic blanket insulation.
6. The floor beneath the tubes shall be lined with 2" mineral wool insulation, 1" mineral fiber mono block insulation and 2" ceramic blanket insulation.
7. The boiler furnace/combustion chamber and flueways shall be designed to operate at a positive 0.50" w.c. at the boiler flue outlet.
8. The boiler will require a "positive pressure" type metal flue.

D. Jacket Construction

1. The boiler shall be complete with a metal jacket, 16 gauge, zinc-coated rust resistant steel casing, finished with a suitable heat resisting paint and shall be constructed on a structural steel frame and properly insulated with no less than 1½" fiberglass insulation.
2. Complete jacket and insulation shall be easily removable and reinstalled.
3. The boiler shall incorporate individually removable jacket doors, with handles providing easy access to combustion chamber and access panels.
4. The entire tube area shall be easily accessible for fireside cleaning.
5. All appropriate controls where possible, shall be mounted on boiler front.

6. Any external downcomers shall be provided with factory supplied insulation, jacketing and guards to prevent human contact to high temperature surfaces while boiler is operating.

2.3 HOT-WATER BOILER TRIM

A. The boiler shall be provided with the following trim and controls
   1. Safety-Relief Valve(s)
   2. Combination thermometer and pressure gauge
   3. Water temperature control operator
   4. High limit safety control
   5. Low water cutoff

B. Optional boiler trim and controls
   1. Manual reset type high limit
   2. Manual reset type low water cutoff
   3. Auxiliary low water cutoff
   4. Low water cutoff feeder
   5. UL, CSD-1, FM, GE-GAP, NFPA-85 or other insurance requirements
   6. Barometric damper
   7. Other controls and boiler trim, as specified

2.4 GAS BURNER AND CONTROL EQUIPMENT

A. Boiler shall be furnished with a UL listed force draft flame retention gas burner. Burner shall be complete with integral motor and blower for supplying sufficient combustion air with normal vent conditions.

B. Fuel
   1. Natural gas
   2. Liquid Propane gas
   3. Digester gas

C. The following controls shall be furnished.
   1. Main manual gas shutoff valves
   2. Motorized gas valve operator and auxiliary safety shutoff gas valve (EB75 & EB100)
   3. Motorized gas valve with proof of closure operator and auxiliary safety shutoff gas valve (EB125 to EB240)
   4. High and low gas pressure switches
   5. Gas pilot shutoff and solenoid valves
   6. Gas pilot ignition assembly with ignition transformer
   7. Pilot and main gas pressure regulators
   8. Modulating burner (EB125 to EB240)
   9. Adjustable cam gas metering valve (EB125 to EB240)
   10. Burner mounted control panel containing:
      a. Four indicator lights – call for heat, ignition, fuel and flame safeguard alarm
      b. Air safety switch
      c. Fused on/off switch
      d. Firing rate potentiometer with manual / auto switch (EB125 to EB240)

e. Motor starter(s) – where applicable
f. Honeywell electronic combustion safety control

2.5 OIL BURNER AND CONTROL EQUIPMENT

A. Boiler shall be furnished with a UL listed force draft, pressure atomizing type oil burner, suitable for operation with No. 2 fuel oil. Burner shall be complete with integral motor and blower for supplying sufficient combustion air with normal vent conditions.

B. Fuel
1. No. 2 heating fuel oil
2. No. 2 diesel fuel oil
3. JP-8
4. Arctic fuel oil

C. The following controls shall be furnished
1. Oil valves – primary and auxiliary
2. Two-stage fuel oil burner mounted (EB75 & EB100)
3. Remote mounted oil pump (EB125 to EB240)
4. Direct spark oil igniter assembly (EB75 & EB100) with ignition transformer and oil ignition and nozzle assembly
5. Gas pilot oil ignition assembly (EB125 to EB240) with gas pilot shutoff valve, solenoid valve and gas pilot pressure regulator; Gas pilot ignition assembly with ignition transformer and an oil nozzle assembly.
6. Modulating burner (EB125 to EB240)
7. Adjustable cam oil metering valve (EB125 to EB240)
8. Burner mounted control panel containing:
   a. Four indicator lights – call for heat, ignition, fuel and flame safeguard alarm
   b. Air safety switch
   c. Fused on/off switch
   d. Firing rate potentiometer with manual / auto switch (EB125 to EB240)
   e. Motor starter(s) – where applicable
   f. Honeywell electronic combustion safety control

2.6 COMBINATION GAS/OIL BURNER AND CONTROL EQUIPMENT

A. Boiler shall be furnished with a UL listed force draft, pressure atomizing, dual fuel burner, suitable for operation with No. 2 fuel oil and natural gas (or other gas). Burner shall be complete with integral motor and blower for supplying sufficient combustion air with normal vent conditions

B. Fuel
1. Natural gas.
2. Liquid Propane gas
3. No. 2 heating fuel oil
4. No. 2 diesel fuel oil
5. JP-8
6. Arctic fuel oil

C. The following controls shall be furnished
   1. Main manual gas shutoff valves
   2. Motorized gas valve operator and auxiliary safety shutoff gas valve (EB75 & EB100)
   3. Motorized gas valve with proof of closure operator and auxiliary safety shutoff gas valve (EB125 to EB240)
   4. High and low gas pressure switches
   5. Gas pilot shutoff and solenoid valves
   6. Gas pilot ignition assembly with ignition transformer
   7. Pilot and main gas pressure regulators
   8. Oil valves – primary and auxiliary
   9. Two-stage fuel oil burner mounted (EB75 & EB100)
   10. Remote mounted oil pump (EB125 to EB240)
   11. Direct spark oil igniter assembly (EB75 & EB100) with ignition transformer and oil ignition and nozzle assembly
   12. Gas pilot oil ignition assembly (EB125 to EB240) with gas pilot shutoff valve, solenoid valve and gas pilot pressure regulator; Gas pilot ignition assembly with ignition transformer and an oil nozzle assembly.
   13. Modulating burner (EB125 to EB240)
   14. Adjustable cam gas metering valve (EB125 to EB240)
   15. Burner mounted control panel containing:
      a. Four indicator lights – call for heat, ignition, fuel and flame safeguard alarm
      b. Air safety switch
      c. Fused on/off switch
      d. Firing rate potentiometer with manual / auto switch (EB125 to EB240)
      e. Motor starter(s) – where applicable
      f. Honeywell electronic combustion safety control
      g. Manual fuel selection switch

D. Optional burner controls and accessories
   1. Two-stage high-low burner with proven LFS (EB75 & EB100)
   2. Modulating burner (EB75 & EB100)
   3. Auxiliary motorized safety shutoff gas valve
   4. Alarm bell(s) or horn(s)
   5. Fireye combustion safety control
   6. UL, CSD-1, FM, GE-GAP, NFPA-85 or other insurance requirements
   7. Indicator lights – as specified
   8. Direct spark ignition of oil (dual fuel burners)
   9. Boiler skid mounted burner control panel
   10. Boiler skid mounted burner oil pump set (EB75 & EB100)
   11. Adjustable cam gas or oil metering valve(s) (EB75 & EB100)
   12. Sub 30 PPM Low NOx burner
   13. Linkageless Controls
      a. Siemens LMV
      b. Honeywell ControLinks
   14. Other controls. As specified

2.7 BOILER INTERFACE TO BUILDING MANAGEMENT SYSTEM

A. The following points must be available to the building management, automation or energy system for status or adjust as specified.

1. Boiler Enable/Disable
2. Hot Water Supply Temperature Set-Point
3. Summary Alarm

B. Communications
   1. Specified points shall be available via (select)
      a. Dry Contacts
      b. ModBus
      c. Communications bridge to specified protocol

C. Lead/Lag Control Panel
   1. Boiler Supplier to provide Lead/Lag Control Panel to sequence and control boilers.

2.8 SPARE PARTS
   1. Boiler Manufacturer shall provide two spare boiler tubes for each different tube configuration used in each boiler. Boiler tubes shall be supplied to the owner at time of tube removal and replacement demonstration.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install boiler on concrete pad larger than boiler base according to manufacturer's written instructions and referenced standards.