SECTION 23 52 33 - STEEL WATER-TUBE BOILERS

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Contract Documents to include Conditions and Drawings.
			2. SUMMARY
				1. This Section includes packaged flexible water-tube boilers for generating hot water.

Boilers.

Controls and boiler trim.

Fuel burning system.

* + - 1. SUBMITTALS
				1. Product Information: Include rated capacities, shipping, operating weights and accessories for each model indicated on the schedule.
				2. Shop Drawings: Provide detail on equipment assemblies and indicate dimensions, required clearances, components, and location and size of field connections.

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

* + - 1. CONTRACT CLOSEOUT SUBMITTALS
				1. Manufacturer’s Field Startup and Test Reports
				2. Operation and Maintenance Data
			2. REFERENCES-STANDARDS
				1. ANSI Z21.13: Gas-Fired Low Pressure Steam and Hot Water Boilers
				2. ASME Boiler and Pressure Vessel Code: Section IV, Heating Boilers
				3. ASME Boiler and Pressure Vessel Code: Section I, Power Boilers

High Pressure, High Temperature Water in excess of 160 PSIG/250°F.

* + - * 1. ASME CSD-1: Control Standard
				2. NFPA 31: Standard for the Installation of Oil-Burning Equipment
				3. NFPA 54 (AGA Z223.1): National Fuel Gas Code
				4. NFPA 58: Storage and Handling of Liquefied Petroleum Gases
				5. NFPA 70: National Electrical Code.
				6. Underwriters’ Laboratories, Inc. (UL) Listed Products
			1. QUALITY ASSURANCE
				1. Factory tests to confirm construction of the unit per ASME
			2. DELIVERY, STORAGE AND PROTECTION
				1. Protect boiler package from damage by leaving factory inspection openings and shipping packaging in place until final installation.
				2. If stored outside prior to final installation, boiler package must be protected from the elements and ground water with tarps and blocking as needed.
			3. WARRANTY
				1. 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.
				2. Thermal Shock Warranty: The boiler vessel shall be warranted for 25 years against thermal shock on a non-prorated basis.
1. PRODUCTS
	* + 1. MANUFACTURERS
				1. Manufacturer shall meet all aspects of the specifications: Provide boilers by one of the following:

Bryan Steam LLC (RV Series)

Approved Equal Meeting Specifications

* + - 1. PACKAGED BOILER
				1. 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.

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.

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

The boiler shall be built to withstand 150 degree delta “T”

The boiler shall have no less than 5 sq. feet of heating surface per boiler horsepower, verified by documentation with 80% combustion efficiency standard.

A tube removal and replacement shall be demonstrated at time of start-up. Demonstration time not to exceed 40 minutes.

* + - * 1. Vessel and Tube Construction

The boiler shall be constructed on a heavy steel frame.

The boiler pressure vessel shall be provided with adequately sized upper and lower drums.

A minimum of two downcomers shall be provided and shall be located inside furnace chamber to maximize proper thermal internal water circulation.

No external water circulation source shall be required.

Steel water tubes are to be 1½” O.D., .095 wall thickness, six-pass, flexible serpentine bend design, not subject to thermal shock damage.

Individual water tubes shall be easily removable and replaceable without either welding or rolling.

The boiler shall have no more than two tube configurations.

The boiler shall be furnished with an adequate number of tappings and inspection openings to facilitate internal boiler inspection and cleaning.

* + - * 1. Furnace/Combustion Chamber Construction

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.

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.

The furnace/combustion chamber shall be primarily of water-wall design with one side of removable panels.

The stationary interior wall shall be lined with 2” ceramic blanket insulation.

The front and rear walls are insulated with 5” mineral fiber mono block and 2” ceramic blanket insulation.

The floor beneath the tubes shall be lined with 2” mineral wool insulation, 1” mineral fiber mono block insulation and 2” ceramic blanket insulation.

 The boiler furnace/combustion chamber and flueways shall be designed to operate at a positive 0.50” w.c. at the boiler flue outlet.

The boiler will require a “positive pressure” type metal flue.

* + - * 1. Jacket Construction

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.

Complete jacket and insulation shall be easily removable and reinstalled.

The boiler shall incorporate individually removable jacket doors, with handles providing easy access to combustion chamber and access panels.

The entire tube area shall be easily accessible for fireside cleaning.

All appropriate controls where possible, shall be mounted on boiler front.

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.

* + - 1. HOT-WATER BOILER TRIM
				1. The boiler shall be provided with the following trim and controls

Safety-Relief Valve(s)

Combination thermometer and pressure gauge

Water temperature control operator

High limit safety control

Low water cutoff

* + - * 1. Optional boiler trim and controls

Manual reset type high limit

Manual reset type low water cutoff

Auxiliary low water cutoff

Low water cutoff feeder

UL, CSD-1, FM, GE-GAP, NFPA-85 or other insurance requirements

Barometric damper

Indirect water heating coils for domestic, pool or process hot water

Other controls and boiler trim, as specified

* + - 1. GAS BURNER AND CONTROL EQUIPMENT
				1. 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.
				2. Fuel

Natural gas

Liquid Propane gas

Digester gas

* + - * 1. The following controls shall be furnished.

Main manual gas shutoff valves

Motorized gas valve operator and auxiliary safety shutoff gas valve (RV350 to RV500)

Motorized gas valve with proof of closure operator and auxiliary safety shutoff gas valve (RV550 to RV800)

High and low gas pressure switches

Gas pilot shutoff and solenoid valves

Gas pilot ignition assembly with ignition transformer

Pilot and main gas pressure regulators

Modulating burner (RV500 to RV800)

Adjustable cam gas metering valve (RV500 to RV800)

Burner mounted control panel containing:

Four indicator lights – call for heat, ignition, fuel and flame safeguard alarm

Air safety switch

Fused on/off switch

Firing rate potentiometer with manual / auto switch (RV500 to RV800)

Motor starter(s) – where applicable

Honeywell electronic combustion safety control

* + - 1. OIL BURNER AND CONTROL EQUIPMENT
				1. 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.
				2. Fuel

No. 2 heating fuel oil

No. 2 diesel fuel oil

JP-8

Arctic fuel oil

* + - * 1. The following controls shall be furnished

Oil valves – primary and auxiliary

Two-stage fuel oil burner mounted (RV350-RV500)

Remote mounted oil pump (RV550 to RV800)

Direct spark oil igniter assembly (RV350 to RV450) with ignition transformer and oil ignition and nozzle assembly

Gas pilot oil ignition assembly (RV500 to RV800) with gas pilot shutoff valve, solenoid valve and gas pilot pressure regulator; Gas pilot ignition assembly with ignition transformer and an oil nozzle assembly.

Modulating burner (RV500 to RV800)

Adjustable cam oil metering valve (RV500 to RV800)

Burner mounted control panel containing:

Four indicator lights – call for heat, ignition, fuel and flame safeguard alarm

Air safety switch

Fused on/off switch

Firing rate potentiometer with manual / auto switch (RV500 to RV800)

Motor starter(s) – where applicable

Honeywell electronic combustion safety control

* + - 1. COMBINATION GAS/OIL BURNER AND CONTROL EQUIPMENT
				1. 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
				2. Fuel

Natural gas.

Liquid Propane gas

No. 2 heating fuel oil

No. 2 diesel fuel oil

JP-8

Arctic fuel oil

* + - * 1. The following controls shall be furnished

Main manual gas shutoff valves

Motorized gas valve operator and auxiliary safety shutoff gas valve (RV350 to RV500)

Motorized gas valve with proof of closure operator and auxiliary safety shutoff gas valve (RV550 to RV800)

High and low gas pressure switches

Gas pilot shutoff and solenoid valves

Gas pilot ignition assembly with ignition transformer

Pilot and main gas pressure regulators

Oil valves – primary and auxiliary

Two-stage fuel oil burner mounted (RV350-RV500)

Remote mounted oil pump (RV550 to RV800)

Direct spark oil igniter assembly (RV350 to RV450) with ignition transformer and oil ignition and nozzle assembly

Gas pilot oil ignition assembly (RV500 to RV800) with gas pilot shutoff valve, solenoid valve and gas pilot pressure regulator; Gas pilot ignition assembly with ignition transformer and an oil nozzle assembly.

Modulating burner (RV500 to RV800)

Adjustable cam gas metering valve (RV500 to RV800)

Burner mounted control panel containing:

Four indicator lights – call for heat, ignition, fuel and flame safeguard alarm

Air safety switch

Fused on/off switch

Firing rate potentiometer with manual / auto switch (RV500 to RV800)

Motor starter(s) – where applicable

Honeywell electronic combustion safety control

Manual fuel selection switch

* + - * 1. Optional burner controls and accessories

Two-stage high-low burner with proven LFS (RV350 to RV450)

Modulating burner (RV350 to RV450)

Auxiliary motorized safety shutoff gas valve

Alarm bell(s) or horn(s)

Fireye combustion safety control

UL, CSD-1, FM, GE-GAP, NFPA-85 or other insurance requirements

Indicator lights – as specified

Direct spark ignition of oil (dual fuel burners)

Boiler skid mounted burner control panel

Boiler skid mounted burner oil pump set (RV350 to RV450)

Adjustable cam gas or oil metering valve(s) (RV350 to RV450)

Sub 30 PPM Low NOx burner

Linkageless Controls

Siemens LMV

Honeywell ControLinks

Other controls. As specified

* + - 1. BOILER INTERFACE TO BUILDING MANAGEMENT SYSTEM
				1. The following points must be available to the building management, automation or energy system for status or adjust as specified.

Boiler Enable/Disable

Hot Water Supply Temperature Set-Point

Summary Alarm

* + - * 1. Communications

Specified points shall be available via (select)

Dry Contacts

ModBus

Communications bridge to specified protocol

* + - * 1. Lead/Lag Control Panel

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

* + - 1. SPARE PARTS

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.

1. EXECUTION
	* + 1. INSTALLATION
				1. Install boiler on concrete pad larger than boiler base according to manufacturer's written instructions and referenced standards.