

**SECTION 23 5233.13**  
**FINNED WATER-TUBE BOILERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Boilers.
- B. Controls and boiler trim.
- C. Hot water connections.
- D. Fuel connection.
- E. Collector, induced draft fan, and chimney connection.
- F. Circulator.
- G. Expansion tank.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 23 0913 - Instrumentation and Control Devices for HVAC.
- C. Section 23 2114 - Hydronic Specialties.
- D. Section 23 2214 - Steam and Condensate Heating Specialties.
- E. Section 23 5100 - Breechings, Chimneys, and Stacks.

**1.03 REFERENCE STANDARDS**

- A. ANSI Z21.13 - American National Standard for Gas-Fired Low-Pressure Steam and Hot Water Boilers; 2012.
- B. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2015.
- C. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; 2015.
- D. HI BTS-2000 - Testing Standard, Method to Determine Heating Efficiency of Commercial Space Heating Boilers; 2007.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- F. NFPA 54 - National Fuel Gas Code; 2015.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Performance rating shall be in accordance with Hydronics Institute HI BTS-2000.
- B. Rating:
  - 1. Input at sea level altitude: \_\_\_\_\_ Btu/hr.
  - 2. Output at sea level altitude: \_\_\_\_\_ Btu/hr.

**1.05 SUBMITTALS**

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide data indicating general assembly, components, controls, safety controls, and wiring diagrams with electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start up instructions.
- D. Manufacturer's Field Reports: Indicate condition of equipment after start-up including control settings and performance chart of control system.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

#### **1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Protect units before, during, and after installation from damage to casing by leaving factory shipping packaging in place until immediately prior to final acceptance.

#### **1.08 WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide a five year warranty to include coverage for heat exchangers.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURED UNITS**

- A. Hot water natural draft boiler with horizontal grid, finned tube heat exchanger, gas burning system, refractory combustion chamber, controls, and boiler trim including circulator and fill system consisting of diaphragm type expansion tank, fill and check valve, and automatic air vent.

#### **2.02 FABRICATION**

- A. Assembly: Finned copper tube heat exchanger assembled within combustion chamber conforming to ASME BPVC-IV and BPVC-VIII-1 requirements, and tested for maximum working pressure of 160 psi.
- B. Combustion Chamber: Line with interlocking refractory insulating panels of vermiculite, high temperature cements, asbestos fiber and refractory clay for service temperatures to 2100 degrees F.
- C. Exchanger: Fabricate of finned copper tubing with stainless steel baffles and sealed into bronze, steel, or cast iron headers with silicone O-ring gaskets.
- D. Jacket: Galvanized steel with factory applied baked enamel, insulated with foil faced fiberglass insulation.

#### **2.03 FUEL BURNING SYSTEM**

- A. Induced Draft Gas Burner: Stainless steel burners for on-off firing and natural gas with adjustable combustion air supply, gas pressure regulator, diaphragm gas valves, manual shut-off, intermittent spark or glow coil ignition, thermistor flame sensing device, and automatic 100% safety gas shut-off.
- B. Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven allow gas valve to open.

#### **2.04 TRIM**

- A. ASME rated pressure relief valve set at 45 psi.
- B. Low water cut-off and inlet flow switch to automatically prevent burner operation when water falls below safe level or on low flow through boiler.

#### **2.05 CONTROLS**

- A. Operating Controls: Pre-wired, factory assembled electric control including pilot safety and thermocouple transformer, 24-volt gas valve, manual main and pilot valves, and junction box.
- B. Operating temperature controller with outdoor reset to control burner operation to maintain supply water temperature.
- C. Electronic operating temperature controller:
  - 1. NEMA 250 Type 1 enclosure with full cover for wall mounting.

2. Ambient temperature range minus 30 to 150 degrees F.
  3. Adjustable reset ratio of outside air temperature change to discharge control point change 1:2 to 100:1.
  4. Integral set point adjustment 80 to 230 degrees F.
  5. Electronic primary and outdoor sensors.
- D. High limit temperature controller with automatic reset for burner to prevent boiler water temperature from exceeding safe system temperature.

## **2.06 CIRCULATOR**

- A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in line mounting, oil lubricated, for 125 psi maximum working pressure.
1. Casing: Cast iron.
  2. Impeller: Cadmium plated steel, keyed to shaft.
  3. Bearings: Two, oil lubricated bronze sleeves.
  4. Shaft: Alloy steel with copper sleeve, integral thrust collar.
  5. Seal: Carbon rotating against a stationary ceramic seat, 225 degrees F maximum continuous operating temperature.
  6. Drive: Flexible coupling.

## **2.07 DIAPHRAGM TYPE EXPANSION TANK**

- A. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; rated for working pressure of 125 psi, with flexible diaphragm sealed into tank, and steel legs or saddles.
- B. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psi.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install boiler and provide connection of natural gas service in accordance with requirements of NFPA 54 and applicable codes.
- C. Install boiler on concrete housekeeping base, sized minimum 4 inches larger than boiler base. Refer to Section 03 3000.
- D. Provide piping connections and accessories as indicated; refer to Section 23 2114.
- E. Pipe relief valves to nearest floor drain.
- F. Install circulator and diaphragm expansion tank on boiler.

### **3.02 SYSTEM STARTUP**

- A. Provide the services of manufacturer's field representative for starting and testing unit.

### **3.03 CLOSEOUT ACTIVITIES**

- A. Train operating personnel in operation and maintenance of units.
- B. Provide the services of manufacturer's field representative to conduct training.

**END OF SECTION 23 5233.13**

