SECTION 235213 - ELECTRIC BOILERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes electric boilers, trim, and accessories for generating hot water or steam.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For boilers, boiler trim, and accessories.

1. Include plans, elevations, sections, and details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for boilers, accessories, and components, from manufacturer.

B. Source quality-control reports.

C. Field quality-control reports.

D. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace pressure vessels of boilers that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Reimers Electra Steam Inc, Chromalox, or approved equal.

2.2 MANUFACTURED UNITS

A. Description: Factory-fabricated, -assembled, and -tested electric boilers with trim and controls necessary to generate hot water or steam.

B. Pressure Vessel: Carbon-steel pressure vessel mounted on structural-steel base.

C. Nozzles: Flanges for water inlet and outlet and heating element inserts; threaded connections for trim and controls.

D. Insulation: One layer of minimum 2-inch-thick, glass-fiber insulation.

E. Jacket: sheet metal casing with baked-enamel or powder-coated protective finish and removable panels with snap-in or interlocking closures for access to pressure vessel.

F. Lifting Lugs: Welded to pressure vessel, extending above jacket.

G. Heating Elements: Incoloy-sheathed, replaceable electric-resistance element, rated 20-kW maximum, with maximum 75 W/sq. in. over heat-transfer length.

H. Mounting Base: For securing boiler to concrete base.

1. Seismic Fabrication Requirements: Fabricate mounting base and attachment to boiler, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC" when mounting base is anchored to building structure.

I. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

J. ASME Compliance: Fabricate and label boilers to comply with 2013 ASME Boiler and Pressure Vessel Code.

K. NFPA Compliance: Design and fabricate boilers to comply with NFPA 70, Article 424, Paragraphs G and H.

L. UL Compliance: Test boilers for compliance with UL 834. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

2.3 ELECTRIC POWERED HOT-WATER BOILERS

A. Trim:

1. Include devices sized to comply with ASME B31.9.
2. Aquastat Controllers: Operating auto-reset high limit.
3. Safety Relief Valve: ASME rated.
4. Pressure and Temperature Gage: Minimum 3-1/2-inch-diameter, combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges, so normal operating range is about 50 percent of full range.
5. Boiler Air Vent: Automatic.
6. Dip-tube in water outlet.
7. Drain Valve: Minimum NPS 3/4 hose-end ball valve sized according to requirements of authorities having jurisdiction.

2.4 ELECTRIC POWERED STEAM BOILERS

A. Trim: Trimmed at 100 psig for operation to 90 psig.

B. Features:

1. Heavy Duty Vacuum Breaker: Prevents siphoning of condensate in condensate return systems.
2. Automatic Blow Down System
3. Blow Down Separator for blow down of a boiler where steam and hot water cannot be discharged directly into a drain.
4. Electronic Water Level Control with automatic water feed and low water cutoff (dual probe).
5. Proportional Control with electronic solid state sequencer for modulated pressure control.

2.5 CONTROLS

A. Refer to Section 230923 "Direct Digital Control (DDC) System for HVAC" and Section 230993.11 "Sequence of Operations for HVAC DDC."

B. Boiler operating controls shall include the following devices and features:

1. Control transformer.
2. Step controller.
3. Recycling relay returns controller to off position after power failure.
4. Multistage thermostat.
5. Control-circuit switch.
6. Visual indication for each step.
7. Supply-voltage indicator.
8. Set-Point Adjust: Set points shall be adjustable.
9. Sequence of Operation: Electric, factory-fabricated and field-installed panel to control element sequence controller to maintain desired temperature in response to thermostat with heat anticipator located in heated space.

    a. Include automatic, alternating-operation sequence for multiple boilers to provide equal runtime for boilers.

C. Safety Controls: To maintain safe operating conditions, safety controls limit boiler operation.

1. High Cutoff: Automatic reset stops boiler if operating conditions rise above set point or maximum boiler design temperature.
2. Low-Water Cutoff Switch: Electronic probe shall prevent boiler operation on low water. Cutoff switch shall be manual-reset type.
3. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.

2.6 ELECTRICAL POWER

A. Single-Point Field Power Connection: Factory-installed and -wired switches, transformers, and electrical devices necessary shall provide a single-point field power connection to boiler.

1. Field power interface shall be to nonfused disconnect switch.

B. Electrical Enclosures: NEMA 250, Type 1 enclosure with hinged door and key-locking handle.

C. Install factory wiring outside of an enclosure in a metal raceway.

D. Comply with NFPA 70.

1. Electrical Circuits: 48 A, maximum.

E. Connectors: Mechanical lugs bolted to copper bus bars or distribution blocks with pressure connectors.

F. Fuses: NEMA FU 1, Class J or K5; 60 A, maximum.

G. Contactors: Three-pole magnetic contactors, listed for 500,000 cycles at full load.

H. Factory-wired internal control devices and heating elements.

1. Wiring shall be numbered and color coded to match wiring diagram.

2.7 CAPACITIES AND CHARACTERISTICS

A. See Electric Boiler Schedule on Mechanical Drawings for capacities and characteristics

2.8 SOURCE QUALITY CONTROL

A. Test and inspect factory-assembled boilers, before shipping, according to 2013 ASME Boiler and Pressure Vessel Code.

B. Hydrostatic Test: Factory test assembled boiler, including hydrostatic test.

PART 3 - EXECUTION

3.1 BOILER INSTALLATION

A. Equipment Mounting:

1. Install boilers on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

B. Install electrical devices furnished with boiler but not specified to be factory mounted.

3.2 CONNECTIONS

A. Piping installation requirements are specified in Section 232113 "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Connect hot-water piping to supply- and return-boiler tappings, with shutoff valve and union or flange at each connection.

D. Install piping from safety relief valves to nearest floor drain.

E. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections.

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

a. Check and adjust initial operating set points and high- and low-limit safety set points of water level and water temperature.
b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

B. Remove and replace malfunctioning units and retest as specified above.

C. Boiler will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 235213