

SECTION 235223 - CAST-IRON BOILERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-iron boilers, trim, and accessories for generating hot water.
- B. Reference and Industry Standards

Enterprise Green Communities Criteria

- 1. Mandatory Requirements: See the current edition of NYC overlay of EGC reference standard for full specifications.
 - a. NYC New Construction projects must achieve at least 60 optional points, and Substantial and Moderate Rehab projects must also achieve at least 55 optional points.
 - b. Building Performance Standard Criterion 5.1b
 - c. Sizing of Heating and Cooling Equipment 5.6
 - d. Combustion Equipment 7.3
- C. Comply with the current edition of the New York City Energy Conservation Code.
- D. Comply with the relevant HPD design guidelines section or appendix.
- E. Project will elevate new equipment above 2050's SLR-adjusted DFE or above grade if applicable for projects in flood-prone areas.
- F. Floodproof equipment that cannot be elevated for projects in flood-prone areas.
- G. <https://www.nyc.gov/site/hpd/services-and-information/sustainability.page>
- H. <https://www.nyc.gov/site/hpd/services-and-information/blds.page>

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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.
- B. ASME Compliance: Fabricate and label boilers to comply with 2010 ASME Boiler and Pressure Vessel Code.
- C. ASHRAE/IES 90.1 Compliance: Boilers shall exceed efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements. "Boilers shall have annual fuel utilization efficiency (AFUE) ratings of 85% or greater and shall be non-condensing type to comply with Enterprise Green Communities and HPD Overlay.
- D. DOE Compliance: Minimum efficiency shall comply with 10 CFR 430, Subpart B, Appendix N.
- E. I=B=R Compliance: Boilers shall be tested and rated according to AHRI's "Rating Procedure for Heating Boilers" and "Testing Standard for Commercial Boilers," with I=B=R emblem on a nameplate affixed to boiler.
- F. UL Compliance: Test boilers for compliance with UL 726 and UL 795. Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.
- G. Mounting Frame: Steel rails used to mount assembled boiler package on concrete base.
- H. Boiler(s) shall be started up in accordance with manufacturer's checklist; boiler start-up must be performed by a factory-trained and certified start-up contractor. Start-up shall include control panel programming. A complete copy of the final list of control panel settings shall be provided by the installing contractor. A documented sign-off shall be provided by this contractor indicating that the boiler has been set-up, installed, wired, programmed and started in compliance with the manufacture's guidelines and building parameters.

2.2 MANUFACTURED UNITS

- A. Description: Factory fabricated and assembled.
 - 1. Cast-iron sections shall be sealed pressure tight and held together with tie rods set on an insulated steel base, including insulated jacket and flue-gas vent connection.
- B. Cast-Iron Section Design:
 - 1. Number of Passes: Multiple.
 - 2. Sectional Joints: High-temperature sealant to seal flue-gas passages not in contact with heating medium, tapered cast-iron push nipples, and held together with tie rods.
 - 3. Drain and blowdown tappings.
 - 4. Return injection tube to equalize water flow to all sections.
 - 5. Crown inspection tappings with brass plugs.

6. Built-in air separator.
- C. Combustion Chamber: Sealed type, equipped with refractory insulation and flame observation ports, front and back.
- D. Casing:
1. Jacket: Sheet metal, with snap-in or interlocking closures and baked-enamel protective finish.
 2. Insulation: Minimum **2-inch-** (50-mm-) thick, mineral-fiber insulation surrounding the heat exchanger.
 3. Combustion Chamber Access: Refractory lined, hinged, front.
 4. Access: For cleaning between cast-iron sections.
 5. Draft Hood: Flue canopy and top or rear flue connection shall be constructed of stainless steel containing adjustable outlet damper assembly.
 6. Insulated base constructed of aluminized steel to permit boiler to be installed on combustible floor.
 7. Control Cabinet: Sheet metal casing shall cover all controls, gas train, and burner.

2.3 TRIM FOR HOT-WATER BOILERS

- A. Include devices sized to comply with ASME B31.9.
- B. Aquastat Controllers: Operating and high limit.
- C. Safety Relief Valve: ASME rated.
- D. Pressure and Temperature Gage: Minimum **3-1/2-inch-** (89-mm-) 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.
- E. Boiler Air Vent: Automatic.
- F. Drain Valve: Minimum **NPS 3/4** (DN 20) hose-end gate valve.
- G. Boiler operating controls shall include the following devices and features:
1. Control transformer.
 2. Set-Point Adjust: Set points shall be adjustable.
 3. Low-Water Cutoff and Pump Control: Cycle feedwater pump(s) for makeup water control.
 4. Sequence of Operation: Electric, factory-fabricated and field-installed panel to control burner firing rate to reset supply-water temperature inversely with outside-air temperature. At **0 deg F** (minus 17 deg C) outside-air temperature, set supply-water temperature at **200 deg F** (93 deg C); at **60 deg F** (15 deg C) outside-air temperature, set supply-water temperature at **140 deg F** (60 deg C).

- a. Include automatic, alternating-firing sequence for multiple boilers to provide equal runtime for boilers.
- H. Safety Controls: To maintain safe operating conditions, burner safety controls limit burner operation.
1. Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be automatic-reset type.
 2. Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for above conditions.

2.4 ELECTRICAL POWER

- A. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.
1. House in NEMA 250, Type 1 enclosure.
 2. Wiring shall be numbered and color coded to match wiring diagram.
 3. Install factory wiring outside of an enclosure in a metal raceway.
 4. Field power interface shall be to circuit breaker.
 5. Provide branch power circuit to each motor and to controls with disconnect switch or circuit breaker.
 6. Provide each motor with overcurrent protection.

2.5 CAPACITIES AND CHARACTERISTICS

- A. Hot-Water Heating:
1. Design Water-Pressure Rating: 50 psig (345 kPa).
 2. Safety Relief Valve Setting: 60 psig (kPa).
 3. Entering-Water Temperature: 160deg F (deg C).
 4. Leaving-Water Temperature: 180deg F (deg C).
 5. System Design Water Flow Rate: 3 gpm (L/s).
- B. Minimum Thermal Efficiency: 85 percent.
- C. Number of Passes: Two.
- D. Electrical Characteristics:
1. Volts: 115 V.
 2. Phase: Single.
 3. Hertz: 60 Hz.

2.6 SOURCE QUALITY CONTROL

- A. Test and inspect factory-assembled boilers, before shipping, according to 2010 ASME Boiler and Pressure Vessel Code.
- B. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform 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."
- B. Install gas-fired boilers according to NFPA 54.
- C. Assemble and install boiler trim.
- D. Install electrical devices furnished with boiler but not specified to be factory mounted.
- E. Install control wiring to field-mounted electrical devices.

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 gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas-train connection. Provide a reducer if required.
- D. Connect hot-water piping to supply- and return-boiler tapings with shutoff valve and union or flange at each connection.
- E. Install piping from safety relief valves to nearest floor drain.
- F. 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.
- G. Connect breeching full size to boiler outlet. Comply with requirements in Section 235116 "Fabricated Breechings and Accessories" for venting materials.

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. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - a. Burner Test: Adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency.
 - b. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
- 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 235223