

SECTION 23 52 00 – HEATING BOILERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes design and performance requirements for electric boilers, condensing boilers, and other boilers, for space heating and/or Process use. Boilers for domestic hot water production are addressed in Section 22 34 00.
- B. The section does not apply to boilers greater than 5 MMBTU No. 2 fuel oil input, 10 MMBTU natural gas input, or boilers requiring additional permitting by virtue of their emissions or alternative fuel input.
- C. Related Sections (applies to all types of boilers):
 - 1. Section 01 13 01 – Design Guidelines for Energy and Environment
 - 2. Section 01341C – FM Global Criteria
 - 3. Section 23 00 10 – HVAC Design Criteria
 - 4. Section 23 09 00 – Building Automation Systems Design Criteria

1.2 WARRANTY:

- A. Boiler pressure vessels containing water or steam, as well as boiler heat exchangers, shall be provided with a minimum 5-year extended warranty, parts and labor.

1.3 SUBMITTALS:

- A. Product Data: Submit product literature detailing ratings, dimensions, materials of construction, mounting and installation details, applicable wiring diagrams and accessories.

1.4 GENERAL REQUIREMENTS:

- A. For natural gas burners, confirm operating gas pressure requirements of the boiler with the available minimum gas pressure available from the local utility.
- B. Boilers shall be rated at less than, or equal to, 30 boiler horsepower (BHP) and 1 MMBTU input, each. For locations where boilers need to be of larger capacity, additional Building Automation System (BAS) monitoring shall be provided to meet the City of Providence Ordinance requirements.
- C. Burners shall be selected to achieve modulation over the full firing range with a minimum natural gas input pressure of 5 inches water gage.
- D. Fuel oil burners shall not be used, unless natural gas is unavailable. Oil and gas trains shall, as a minimum, meet the safety criteria of the University's insurance underwriter, FM Global. Additionally comply with all applicable local, state, and national Code requirements.
- E. Unless specified otherwise in the Basis of Design, analyze all options for boiler types to determine the option with the lowest life cycle cost. Options include condensing vs. near-condensing vs. campus Central Heating systems.

- F. Show Manufacturer's recommended service clearances and pull clearances as shaded areas on mechanical plans.
- 1.5 ELECTRIC BOILERS:
- A. Limited to special applications, such as service for individual autoclaves, or low-capacity heating or humidification where exhaust venting is not possible or desirable.
 - B. Electric boilers shall be provided with high quality feedwater systems to mitigate corrosion and minimize insulation of electrodes. All wetted parts in electric boilers shall be constructed from stainless steel.
- 1.6 CONDENSING BOILERS:
- A. Condensing boilers shall be direct-vent, sealed combustion type. Exhaust venting material shall be AL29-4C, only.
 - B. Minimum firing turndown ratio shall be 5:1.
- 1.7 OTHER BOILERS:
- A. Use of cast iron, fire-tube or water-tube boilers on campus is restricted to steam-only or large-capacity applications.
- 1.8 BOILER TRIM AND ACCESSORIES:
- A. Provide means of isolating boiler trim components to facilitate service and maintenance thereon, using unions, flanges, and isolation valves.
 - B. Provide petcocks for all pressure gauges and sight level gauges.
 - C. Use thermowells in place of in-situ thermometers.
 - D. Provide condensate neutralization tanks with replaceable elements (condensing boilers only).
 - E. For water boilers:
 - 1. Extend safety relief valve drain to within 6 inches of existing floor drains with full-size ASTM B88 copper or ASTM A53 iron pipe.
 - 2. Support piping every 6 feet maximum, with wall or floor anchors.
 - 3. For boilers over 1 MMBTH: Low water cut-off, or loss-of-flow sensor, and alarm contacts.
 - F. For steam boilers:
 - 1. Provide drip elbows for safety relief valves and extend drain to within 6 inches of existing floor drains with ASTM A53 iron pipe.
 - 2. Provide surface blowdown and pipe to drain.
 - 3. Support piping every 6 feet maximum, with wall or floor anchors.
 - 4. Terminate safety relief vent outside in accordance with local Code requirements.
 - 5. For Boilers over 1MMBTH: low and high water level switches and alarm contacts
- 1.9 BOILER FEED AND MAKEUP WATER:
- A. Provide backflow prevention on all feed and makeup water lines and branches to boilers in addition to existing backflow prevention which may exist and remain on existing headers from which makeup is drawn.

- B. In addition to separate feedwater systems (steam boilers) or regulated city water pressure (water boilers) provide auxiliary 5/8" hose connections on feedwater piping at the main feedwater connection to the boiler(s).
- C. Provide water softeners or utilize a Reverse Osmosis/De-Ionized (RO/DI) water system on incoming water supply for all steam boilers.

1.10 CONTROLS:

- A. Use manufacturer-furnished controls for individual boiler control only. Multiple boilers shall be sequenced and staged on and off by the Building's BAS (Building Automation System).
- B. All boilers shall, at a minimum, each have an on/off status contact output and a common alarm contact output to the BAS for monitoring, and a remote enable contact to allow for unit operation.
- C. The following control points shall be monitored by the BAS for all steam boilers over 30HP (1 MMBTU):
 - 1. On/Off Status
 - 2. Low Water Level Alarm (Low Water cut-off switch)
 - 3. High Water Level Alarm (High Water cut-off switch)
 - 4. High Steam Pressure Alarm
 - 5. Common Boiler Alarm (if provided)
 - 6. Steam Pressure (analog input - may be common for multiple-boiler installations).
- D. The following control points shall be monitored by the BAS for all hot water boilers over 30HP (1 MMBTU):
 - 1. On/Off Status
 - 2. Low Water Level Alarm (Low Water cut-off switch) Alarm
 - 3. Loss of Water Flow Alarm
 - 4. Common Boiler Alarm (if provided)
 - 5. Hot Water Temperature (analog input - may be common for multiple-boiler installations).

PART 2 – PRODUCTS:

- A. All equipment and components shall be new and the manufacturer's current model.
- B. Acceptable Manufacturers:
 - 1. Condensing Boilers: Camus (DF Series), Lochinvar (Knight or SYNC Series), Harsco (MACH Series), or RBI (Infinite).
 - 2. Electric Boilers: Sussman, Lochinvar and Cleaver-Brooks.
 - 3. Other boilers: Weil-McLain, Cleaver-Brooks, Bryan and Burham.

PART 3 – EXECUTION:

3.1 GENERAL:

- A. Install boilers with either a structural steel base or a concrete housekeeping pad, minimum 4" thick.

- B. Provide adequate clearance around boiler to comply with manufacturers' recommendations for service and maintenance. Provide 3 foot minimum clearances between boiler jacket and adjacent fixtures.
- C. Provide thermal cutouts for all boiler types. Thermal cutouts shall be hard-wired to burners and power sources and upon activation, shall shutoff or disconnect fuel or power to the boiler.
- D. Steam boilers shall be repeatedly skimmed when first placed into service to remove mill scale, rust, and oils until no residue appears in the sight glass.

3.2 STARTUP AND TRAINING:

- A. Prior to project completion, manufacturer's factory trained representative shall program, start up, thoroughly test and calibrate boiler system and controls, and verify that system is in compliance with the project Design criteria.
- B. Furnish written report certifying that work has been accomplished with intended results.
- C. Coordinate with project BAS vendor to ensure and test that all boiler system monitored points and alarms are properly reporting into the BAS and that all system interlocks are functional.
- D. Provide training for University staff in the operation, use and maintenance of the boiler system.

END OF SECTION