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Watertube Boilers

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A. Summary

This section contains design criteria for watertube boilers.

B. System Design and Performance Requirements

1. Use watertube boilers for boilers of 50 hp and above.
2. General requirements include showing the location of utility service connection points, verifying the capacity of these connection points, and installing equipment in a safe, well lit, and accessible location.
3. Do not use watertube boilers outside of the powerhouse jurisdiction, without coordinating with the Yale University Facilities group.
4. Individual boilers must be the cast iron, sectional-type.
5. All closed-loop, hot water systems must be piped to allow for chemical injection, as needed, for proper water treatment.
6. Equip heating systems with isolation and backflow prevention valves to prevent the cross flow of water systems.
7. The temperature drop across the boiler must match the boiler manufacturer's criteria and be within the stipulated supply and return temperature ranges.
8. The tube thickness must be in accordance with Yale university specifications.
9. Consider using a tankless heater at the boiler for heating domestic water.



10. Alternate fuel source:
 - a. Consider uninterrupted gas, or use dual fuel-fired units as an alternative.
 - b. When equipping boilers for #2 diesel fuel, ensure all lines are a minimum of 1/2" OD and are equipped with the appropriate fire and check valves.
11. For planned shutdown procedures, consult with the Yale Project Manager.
12. To ensure sufficient excess or redundant capacity, install two boilers, each capable of handling 70 percent of the total load.
13. Verify the turndown ratio and the minimum steam and hot water usage. Verify that the system design can accommodate minimum and maximum loads.
14. Check boiler room ventilation to ensure that adequate combustion air has been provided.
15. Ensure that the boiler is not located in the same space as refrigerant-using machines.
16. Verify the stack height with local codes and manufacturer requirements.
17. To comply with applicable codes and preclude drawing stack discharge into intakes due to wind circulation patterns around the building, verify that stack discharge is located away from outdoor air intakes.
18. Verify emergency power supply to boiler fans, valves, and controls.
19. For steam boiler maintenance, verify that bypass has been provided around the feedwater heater.
20. Determine maximum loads by adding existing steam demands and new connected loads, applying diversity factors, and allowing credit for heat recovery devices. Include boiler plant auxiliary equipment and distribution line losses in the load calculations. Determine existing loads from boiler plant records.
21. The plant must be capable of supplying the maximum steam demand with the largest boiler not operating, and with the largest pump of each service not operating.



22. The plant must be capable of supplying the minimum steam demand with the smallest boiler in a normal mode of operation, and with all auxiliary equipment operating within recommended turn-down ranges. The capacity of the smallest boiler must be sufficient for peak demand in the non-heating season.
23. Coordinate with the Yale University Facilities group regarding plant sizing for future steam loads.
24. Do not consider heat recovery boilers part of the boiler plant capacity unless they can operate with their own burners, independently of the heat-generating device.
25. Provide 10 January days storage for plants which have natural gas and oil capability and 15 January days storage for plants which have capability for oil only. Where unusual local conditions exist, the design engineer may recommend deviation from these requirements.

C. Submittals

Submit the following design and certification documentation.

1. Designer Submittals

- a. See [Section 01330: Designer Submittals](#).
- b. Submit calculations for:
 - Connected steam loads with future load considerations
 - Condensate loads with future load considerations
 - Heating hot water loads with future load considerations
- c. Submit a boiler combustion test report.

2. Product Certificates Signed by Manufacturer

Specify that boilers be inspected by the manufacturer's authorized representative who shall submit a written report to the engineer with copy to Yale University stating that the boilers have been properly installed, are operating correctly, and the installation is acceptable to the manufacturer in every respect.



D. Accessories or Special Features

1. If the manufacturer is to provide economizers, non-return valves, stacks, drum-level controls, microprocessors, and similar components, ensure that they are included in the specifications, along with required performance.
2. Provide the gas train specified by the Yale University insurance underwriter.

E. Installation Guidelines

1. Allow building access for replacement of boilers and boiler components. List maximum permissible boilers dimensions in the specifications.
2. Allow space around boilers for tube pull and replacement.
3. Provide adequate access to boiler components, especially on top where a catwalk might be required.

F. Quality Control

If this portion of the project includes commissioning, verify that insertions in the project specifications have been made that refer to the commissioning procedures in the commissioning specification section. Verify that the systems and equipment identified in this section of the standards, and listed in the project specifications, do not conflict with commissioning procedures for testing and training.

End of Section



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Firetube Boilers

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A. Summary

This section contains design criteria for firetube boilers.

B. System Design and Performance Requirements

1. Use firetube boilers for boilers of 50 hp and above.
2. General requirements include showing the location of utility service connection points, verifying the capacity of these connection points, and installing equipment in a safe, well lit, and accessible location.
3. Do not use firetube boilers outside of the powerhouse jurisdiction, without coordinating with the Yale University Facilities group.
4. All closed-loop, hot water systems must be piped to allow for chemical injection, as needed, for proper water treatment.
5. Equip heating systems with isolation and backflow prevention valves to prevent the cross flow of water systems.
6. Whenever possible, steam systems must be metered at the central monitoring systems. Individual boilers need not be metered. See [Section 01350: Special Project Procedures](#) on metering.
7. The temperature drop across the boiler must match the boiler manufacturer's criteria and be within the stipulated supply and return temperature ranges.
8. The ΔT across the boiler must match the boiler manufacturer's criteria.



9. The tube thickness must be in accordance with Yale university specifications.
10. Consider using a tankless heater at the boiler for heating domestic water.
11. Alternate fuel source:
 - a. Consider uninterrupted gas, or use dual fuel-fired units as an alternative.
 - b. When equipping boilers for #2 diesel fuel, ensure all lines are a minimum of 1/2" OD and are equipped with the appropriate fire and check valves.
12. For planned shutdown procedures, consult with the Yale Project Manager.
13. To ensure sufficient excess or redundant capacity, install two boilers, each capable of handling 70 percent of the total load.
14. Verify the turndown ratio and the minimum steam and hot water usage . Verify that the system design can accommodate minimum and maximum loads.
15. Check boiler room ventilation to ensure that adequate combustion air has been provided.
16. Ensure that the boiler is not located in the same space as refrigerant-using machines.
17. Verify the stack height with local codes and manufacturer requirements.
18. To comply with applicable codes and preclude drawing stack discharge into intakes due to wind circulation patterns around the building, verify that stack discharge is located away from outdoor air intakes.
19. Verify emergency power supply to boiler fans, valves, and controls.
20. For steam boiler maintenance, verify that bypass has been provided around the feedwater heater.
21. Determine maximum loads by adding existing steam demands and new connected loads, applying diversity factors, and allowing credit for heat recovery devices. Include boiler plant auxiliary equipment and distribution line losses in the load calculations. Determine existing loads from boiler plant records.
22. The plant must be capable of supplying the maximum steam demand with the largest boiler not operating, and with the largest pump of each service not operating.



23. The plant must be capable of supplying the minimum steam demand with the smallest boiler in a normal mode of operation, and with all auxiliary equipment operating within recommended turn-down ranges. The capacity of the smallest boiler must be sufficient for peak demand in the non-heating season.
24. Coordinate with the Yale University Facilities group regarding plant sizing for future steam loads.
25. Do not consider these heat recovery boilers part of the boiler plant capacity unless they can operate with their own burners, independently of the heat-generating device.
26. Provide 10 January days storage for plants which have natural gas and oil capability and 15 January days storage for plants which have capability for oil only. Where unusual local conditions exist, the design engineer may recommend deviation from these requirements.

C. Submittals

Submit the following design and certification documentation.

1. Designer Submittals

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If the manufacturer is to provide economizers, non-return valves, stacks, drum-level controls, microprocessors, and similar components, ensure that they are included in the specifications, along with required performance.

E. Installation Guidelines

1. Allow building access for replacement of boilers and boiler components. List maximum permissible boilers dimensions in the specifications.
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End of Section