

SECTION 15750
HEATING EQUIPMENT

A. GENERAL

1. Safety controls and equipment shall comply with the requirements of Factory Mutual insurance underwriters.
2. Steam from the central heating plant is the preferred source of heating for buildings on Bloomington campus.
3. Provide minimum 4" high concrete pad for floor mounted equipment.
4. All pressure vessels shall be installed per the factory Mutual, ASME and manufacturer's recommendations. State and local building codes regarding pressure vessel installation shall supercede manufacturer's recommendations.

B. BOILERS

1. Natural gas is the preferred fuel .
2. Boiler construction shall comply with ASME Boiler and Pressure Vessel Code.
3. Campus Central Heating Plant
 - a. Steam water tube boilers - design steam pressure 150 psig.
 - b. Boiler efficiency 82 % minimum. Install economizers, combustion air preheaters, insulation etc. as needed to achieve this efficiency. Recover heat from blowdown. Tune burner so that excess air is minimized yet carbon monoxide (CO) in the flue gas does not exceed 200 ppm.
 - c. Burner controls shall conform with NFPA 85A Standard for Prevention of Furnace Explosions in Fuel Oil- and Natural Gas-Fired Single Burner Boiler-Furnaces.
4. Distributed Boiler Plant
 - a. Use stand-alone gas-fired boiler to heat buildings in areas where steam from central heating plant is unavailable. Generate hot water from multiple modular boilers.
 - b. Specify high efficiency (80% minimum) boilers. Vent each module individually when possible.
 - c. Combustion air from outside connected directly to boiler is preferred. When

combustion air from outside is introduced into mechanical room provide motorized damper interlocked with burner of the boiler. Provide adequate heat to boiler room for freeze protection.

- d. Route safety relief valve from each boiler to floor drain.
- e. Hot water design supply temperature 180^oF design return temperature 160^oF.
- f. Distributed boiler plant shall be completely automatic. Provide sequencing/step controller. Arrange controls so any module can be made inoperative without interfering with operation of the other modules. Provide a boiler failure alarm to building EMS System.

C. FORCED AIR FURNACES

- 1. Natural gas is the preferred fuel. Furnace seasonal efficiency not less than 90%. Avoid one furnace serving multiple floors. One furnace per floor is preferred. Utilize PVC combustion air and exhaust piping.
- 2. Fan to be of backward curved centrifugal type with multiple speed motor.
- 3. Specify electronic ignition.

D. HEAT EXCHANGERS

- 1. Factory assemble and test in accordance with the ASME Boiler and Pressure Vessel Code.
- 2. Shell and Tube Heat Exchangers
 - a. Heating medium in the shell and heated fluid in the tubes.
 - 1. Shell - welded steel.
 - 2. Tubes - copper, U-bend style.
 - 3. Header - cast iron.

3. Plate and Frame Heat Exchangers

- a. Plates - stainless steel. Be aware of chloride attack on austenitic stainless steels.
- b. Frames - carbon steel with baked epoxy enamel paint. Bolted construction to enable assembly on location.
- c. Gaskets - snap-on type. Select materials to suit the fluids. Gasketing shall have relieving grooves to prevent intermixing of fluids and to direct leaks outside the unit.
- d. Fluids flow counterflow - average temperature difference 3°F
- e. Design for a fouling factor equivalent (total) of 0.001.

E. PERIMETER HEATING SYSTEM

- 1. Provide perimeter heating system when building skin heat loss is greater than 200 BTU per linear feet.