PART 1 - GENERAL

1.1 OVERVIEW

A. This section includes criteria for the design of building hot water heating systems including isolation valves, piping, fittings, hydronic specialties, control valves, pumps and boilers.

B. Refer to Design Guideline Element D3044 for waterside distribution requirements.

PART 2 - DESIGN CRITERIA

2.1 GENERAL

A. Boiler fuel selection and system design will be in accordance with the ASHRAE Handbooks and NFPA Standards.

B. Provide natural gas pressure and temperature compensation meters for the boilers 2 MMBTU or greater.

1. Provide a gas meter at the building.

2. Each boiler, 2MMBTu/hr or greater must be equipped with a natural gas totalizer for each boiler in accordance with 30 TAC 117.340(a) and 30 TAC 117.2035(a).

3. If the boilers to be installed have a maximum capacity less than 40 MMBTUs/hr, MDACC understands it is acceptable by TCEQ to design one flow meter for a set of identical boilers. MDACC requires one flow meter totalize per boiler.

C. Safety relief vent piping shall be extended above the roof and shall be independent of the other steam vent piping. To avoid long safety relief valve discharge piping, safety relief valves may be located close to the terminal point if there is no shut-off valve between the PRV and the safety relief valve.

D. Flue ducts shall be routed separate for each individual boiler. Avoid using 90 degree elbow bends. The procedures for correctly sizing vents and connectors is published by NFPA in a publication entitled, NFPA 54: National Fuel Gas Code Handbook latest Edition.

E. Every room or space containing boiler(s) shall be provided with combustion and dilution air as required by the latest editions of Chapter 7 of the International Mechanical Code, Texas Boiler Laws, NFPA 54, and Chapter 3 of the International Fuel Gas Code.

F. Design piping systems connected to boiler(s) to account for boiler and piping thermal expansion.

G. Provide boiler tube pull clearance for maintenance.

H. Design boiler systems for high efficiency (condensing style boilers operating with low heating water supply temperatures) operation where possible to promote highly efficient heat

generating systems. In new facilities, heating water supply temperatures should be 140 deg.F. or less and heating water temperature deltas should be maximized (approx. 30 deg. F.) to use reduced pipe sizes. Verify the air side pressure drop impacts of this low entering water temperature, especially on terminal units with integral coils.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.1 GENERAL

A. The A/E shall include a schematic of the boilers and associated equipment, in the contract documents. The boiler(s) and hot water piping distribution system including controls shall be shown on a control diagram. The control diagram shall be complete with, but not limited to, the following:

1. Isolation valves
2. Control valves
3. Mixing valve per boiler as required by boiler manufacturer
4. Pressure and temperature gauges
5. Pumps (e.g. recirculating dedicated boiler pump and secondary/building pump)
6. Water level controls, and alarms (interface with boiler)
7. Flow control and measuring devices
8. Flue gas monitoring system (CO Monitor) and controls (interface with boiler)
9. Variable frequency drives

B. Boilers shall be on emergency power. Refer also to Section D3000 for additional emergency power requirements.

C. Texas Commission on Environmental Quality Nitrogen Oxide Emission Compliance Requirements:

1. Emissions standards for any new boiler with a maximum rated capacity equal to or greater than 100 MMBtu/hr: i. 0.020 lb Nitrogen Oxides (NO x) per MMBtu; and ii. 400 ppmv carbon monoxide (CO), at 3.0 percent O2 dry basis. Reference: 30 TAC 117.310(a)(1)(A) and 30 TAC 117.310(c)(1).

2. Emissions standards for any new boiler with a maximum rated capacity equal to or greater than 40 MMBtu/hr, but less than 100 MMBtu/hr: i. 0.030 lb NO x per MMBtu; and ii. 400 ppmv carbon monoxide (CO), at 3.0 percent O2 dry basis. Reference: 30 TAC 117.310(a)(1)(B) and 30 TAC 117.310(c)(1).

3. Emissions standards any new boiler with a maximum rated capacity less than 40 MMBtu/hr but greater than 2.0 MMBtu/hr: i. 0.036 lb NOx per MMBtu (or alternatively, 30 ppmv NOx, at 3.0 percent O2 dry basis); and ii. 400 ppmv carbon monoxide (CO), at 3.0 percent O2 dry basis. Reference: 30 TAC 117.310 (a)(1)(C), 30 TAC 117.310(c)(1), 30 TAC 117.2010(c)(1)(A) and, 30 TAC 117.2010(i)(1).

4. A/E must inform the Owner's Project Manager to contact the Owner's EH&S department if a unit of the above sizes will be installed. A unit of this size may trigger some additional federal requirements under Title 40 of the Code of Federal Regulations (40CFR) as well as state and federal permitting requirements under 30 TAC 116 or 122.

5. Emissions standards any new boiler with a maximum rated capacity greater than 400,000 Btu/hr, but less than or equal to 2.0 MMBtu/hr: i. 30 ppmv NOx at 3.0 percent O2 dry basis; or ii. 0.037 lbs NOx per MMBtu of heat input. Reference: 30 TAC 117.3205(a)(4).

6. Emissions standards any new boiler with a maximum rated capacity greater than 75,000 Btu/hr, but less than or equal to 400,000 Btu/hr: i. 40 ng NOx per J of heat output; or ii. 55 ppmv NOx at 3.0 percent O2 dry basis. Reference: 30 TAC 117.3205(a)(3).

7. Emissions standards any new boiler with a maximum rated capacity less than or equal to 75,000 Btu/hr: i. 10 nanograms (ng) NOx per Joule(J) of heat output; or ii.15 ppmv NOx at 3.0 percent O2 , dry basis. Reference: 30 TAC 117.3205(a)(2).

D. The boiler must be able to achieve the applicable low Nox emission standards, as indicated above, 100 percent of the time. Flue gas recirculation or any other technology that will not obtain low Nox emissions 100 percent of the time is not acceptable.

PART 4 - PRODUCTS

4.1 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website:
http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Fire tube boilers are preferred for large scale building projects (to be discussed in design) that have a large heating demand requirement.

C. Specify condensing boilers for smaller scale buildings that utilize hot water for building heating purposes. Design Guideline Element D3044 Hot Water Distribution, provides additional information that applies to the use of this type of boiler.

D. Use condensing style heaters/boilers with fire-tube type heat exchangers with a robust design not subject to thermal shock of heat exchanger resulting from fluctuations in water

temperatures or flows. Provide burner modulation of 5:1 turndown where possible. Turndown shall meet or exceed minimum requirements of ASHRAE 90.1. (Consideration of facility operations with respect to dual-fuel operation is required when using condensing style boilers/heaters.)

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	20190301	Initial Adoption of Element	
Rev. 1			

END OF ELEMENT D302002