

# Louisiana State University Design Standards

## DIVISION 23 – HEATING, VENTILATING & AIR CONDITIONING (HVAC)

### 1 GENERAL DESIGN CONDITIONS

- 1.1 Design occupied spaces to maintain 72°F.
- 1.2 Chilled water coils controlled by both space dry bulb and relative humidity with humidistat and thermostat.
- 1.3 Coils for comfort heating in the re-heat position.
- 1.4 Thermostat temperature range: 68F-74F.

### 2 AIR HANDLING UNITS

- 2.1 All new air handling units shall be Variable Air Volume (VAV) with terminal re- heat utilizing hot water coils.
- 2.2 All new air handling unit cooling coils shall be chilled water cooling coils as follows.
  - 2.2.1 Casing – minimum 16 gauge stainless steel
  - 2.2.2 Tubing – minimum 0.020 inch thick wall thickness copper
  - 2.2.3 Fins – minimum thickness 0.007 inches- continuous sheet, solid fin fabrication-copper of aluminum
  - 2.2.4 Fin density – no more than 10 fins per inch
  - 2.2.5 Coil section shall be no more than 8 rows.
- 2.3 Coil selections shall utilize 45F chilled water supply. Coils shall be of counter flow configuration.
- 2.4 All new air handler unit casings shall be double wall construction. Wall panels shall have a minimum R-Value of 13.0 BTU/°F-ft<sup>2</sup> and shall be capable of withstanding 5 inches of water gauge of differential static pressure without permanent deflection.
- 2.5 Access panels shall be removable, bolt on hinge and with a gasket.
- 2.6 All new air handling units shall have pleated high efficiency media in angle filter racks or shall be bag type. Filter Face Velocity shall not exceed 400 feet per minute.
- 2.7 All new air handling units shall have stainless steel secondary safety pans. Pans shall allow 4" clearance on all sides of the unit footprint. Pans shall be a minimum 18 gauge, minimum of 3" deep all welded seam construction with a safety edge.
- 2.8 Pipe secondary drain pans to most convenient sanitary sewer. Allow a minimum ½" air gap to drain overflow rim. Provide valve in secondary drain. Provide float switch. RE: controls
- 2.9 Secondary drain pans shall lay flat on concrete house-keeping pads, minimum 3½" high. Pads shall have 1" chamfer on all sides and shall completely contact entire drain pan bottom. Provide block outs in pads and bottom drain connections on secondary drain pans. (Detail sketches of Unit/Pan/Pad configurations are available for review). Designer must provide pad detail for LSU approval.
- 2.10 AHU fans shall be modulated using variable frequency drives (VFDs). Use of inlet valves or discharge dampers is unacceptable.
- 2.11 Draw through fans are preferred.
- 2.12 Fan Arrays are preferred if applicable.
  - 2.12.1 Sheet metal separator shall be installed between fans.

### 3 AIR HANDLING UNIT PIPING: Chilled Water & Heating Water

- 3.1 Piping 2" and below shall be piped with Type L hard drawn copper.
- 3.2 Greater than 2" shall be steel. Schedule 40. Black steel.
- 3.3 All water coils shall have union or flanged connections-
- 3.4 2" piping and below shall have union fittings.
- 3.5 Greater than 2" piping shall have flange fittings.
- 3.6 All water coils shall have shut-off service valves in supply and return run outs. Service valves shall be for isolation purposes only.
- 3.7 Maximum pressure loss of piping shall be 4.5" per 100 ft.

- 3.8 Groove fittings are acceptable upon LSU approval.
- 3.9 Risers through floors should be curbed and sleeved.
- 3.10 Steam coil shall have manual air vent with vacuum breaker.
- 3.11 All water coils shall have a strainer with a valve blow down with a hose bibb connection with cap.
- 3.12 All water coils shall have thermometers in thermometer wells and pressure gauges with gauge cocks in both the supply and return run outs which are easily accessible.
- 3.13 Return run out pressure gauges shall be downstream of all control and balancing devices. An additional gauge cock and plug shall be installed between the discharge of the coil and any control or balancing device.
- 3.14 All air unit control valves shall be two-way and shall be located in the return piping.
- 3.15

#### **4 TERMINAL HEATING PIPING**

- 4.1 All terminal reheat coils on both constant and variable air volume systems shall have isolation valves in the supply and return run out.
- 4.2 Shut off valves shall be for isolation purposes only.
- 4.3 Pipe re-heat coils with union of flanged joints to expedite coil change out.
- 4.4 Provide an independent strainer for each coil run out. Strainer shall have a valve blow-down with a capped hose-bibb connection.
- 4.5 Provide P&T plugs with brass caps upstream and downstream of the strainer, the coil, the flow control valve, and the flow balancing valve.
- 4.6 In variable volume pumping systems provide two-way control valves at each coil and three way valves for the most remote locations suitable to handle 20% of the total re-heat system volumetric flow rate.
- 4.7 Re-heat systems should be designed for 180°F supply and 160°F return temperatures.

#### **5 DUCTWORK**

- 5.1 All ductwork shall be constructed to SMACNA and ASHRAE standards.
- 5.2 Duct systems shall be low pressure unless warranted otherwise and approved by LSU.
- 5.3 All ductwork shall be galvanized sheet steel construction, except for special ducts carrying corrosive or dangerous fumes.
  - 5.3.1 Special duct systems shall be specifically called out in construction documents.
  - 5.3.2 Designer shall consult with the Planning, Design & Construction department concerning all special duct system.
- 5.4 All ductwork shall be flange connected or lock seam connected with mastic sealed joints.
- 5.5 All supply ductwork shall be wrapped with 2" minimum thickness, 1½ pound density duct wrap with reinforced, foil vapor barrier.
  - 5.5.1 With LSU Approval, Ductwork serving acoustically sensitive areas may be lined.
  - 5.5.2 All lined duct shall be specifically called out in construction documents.
- 5.6 Ductwork shall not be run over electrical panels, electrical switch boards or the working clearances of such items.
- 5.7 All rectangular duct take-offs shall be SMACNA standard angle take-offs.
- 5.8 Provide manual balancing dampers with locking quadrants at each duct take off. Splitter dampers are not acceptable.
- 5.9 All dampers shall be high efficiency, low leakage type.
- 5.10 All supply air diffusers shall be insulated with minimum 1.5" thick duct wrap
  - 5.10.1 Duct wrap on supply air diffusers shall have vapor barrier on ambient air side
  - 5.10.2 Seal duct wrap vapor barrier to supply air diffuser edge
- 5.11 RA grilles need to be insulated.
- 5.12 Flexible ductwork is acceptable on supply air duct runouts. 5ft max.
- 5.13 There shall be a hard 90 at each supply air diffuser.

## **6 COOLING TOWERS**

- 6.1 All Cooling Towers shall be induced flow design.
- 6.2 Distribution (hot) basins and collection (cold) basins shall be of stainless steel construction.
- 6.3 Sleeve bearings are unacceptable.
- 6.4 Drives shall be gear type only.

## 7 PIPE IDENTIFICATION

PIPE	COLOR
Chilled Water Supply	Dark Blue
Condenser Water Supply (From cooling tower collection basin to chiller condensing barrel)	Dark Green
Condenser Water Return (From chiller condensing barrel to cooling tower distribution basin)	Light Green
Steam	Dark Grey
Steam Condensate	Light Grey
Natural Gas	Yellow (ANSI Standard)
Chemical Feed	Purple
Heating Water Supply	Brown
Heating Water Return	Tan
Fire Suppression Systems	Red
Fire Suppression Systems Distribution	Red (or to match architectural features)

- 7.1 Provide ANSI standard labels at wall, floor and ceiling/roof penetrations and every 15 feet in machine rooms.
- 7.2 Provide direction arrows at all changes in direction and at label.

## 8 PUMPS

### 8.1 Hydronic Pumps

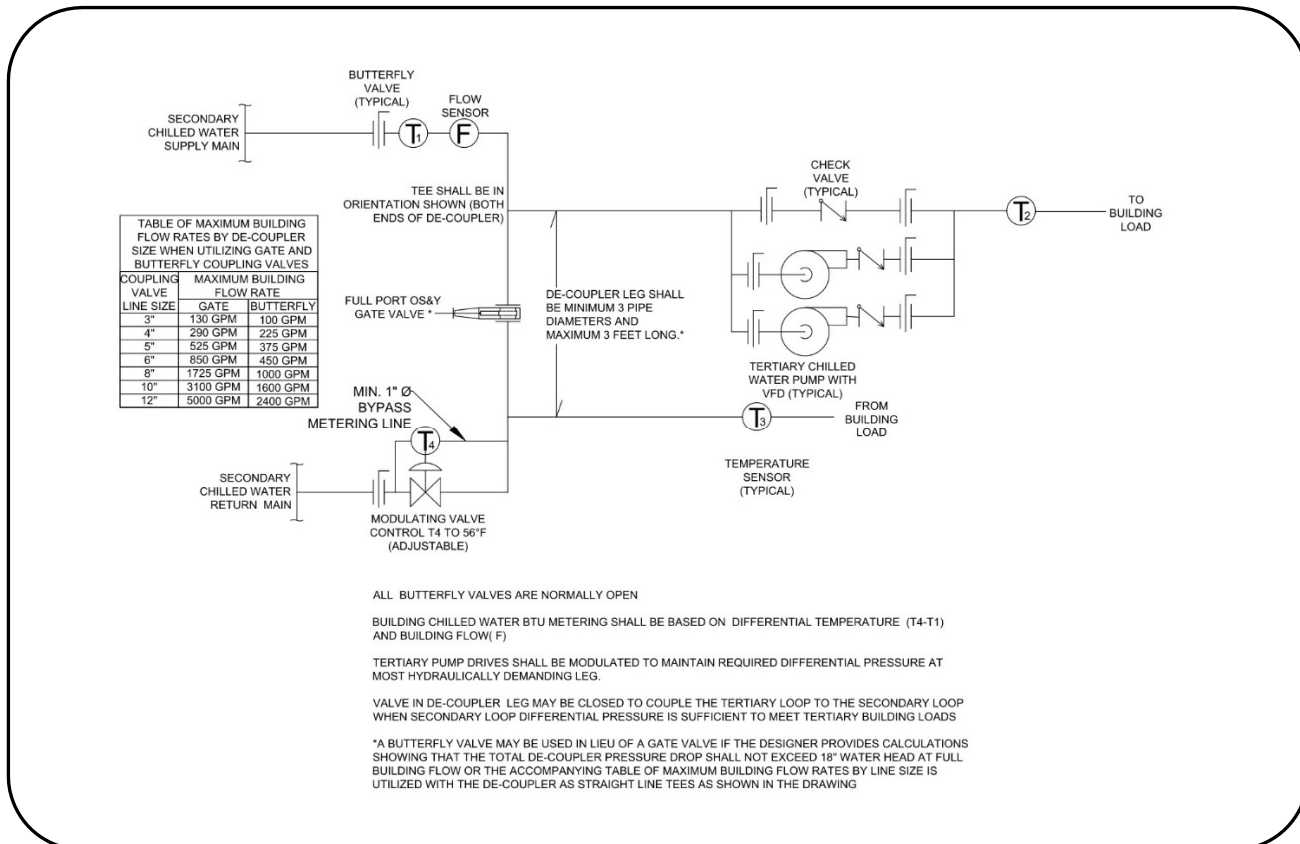
8.1.1 Select all pumps to operate within 15% to the right of maximum efficiency point (MEP) and 10% to the left of MEP.

## 9 Chilled Water Pumps

9.1 Pump Quantities: N+1 Redundancy Required

9.2 Pumps shall use variable frequency drives (VFD).

9.3 Chilled Water Pump Schematic below



## 10 Heating Water Pumps

10.1 Pump Quantities: N+1 Redundancy Required

10.2 Pumps shall use variable frequency drives (VFD).

## 11 PIPE INSULATION

11.1 Above Grade Piping Insulation (all thicknesses and installation procedures as recommended by material manufacturer)

### 11.1.1 Chilled Water Piping

11.1.1.1 Steel piping shall be insulated with foam-glass insulation.

11.1.1.2 Copper piping shall be insulated with elastomeric foam insulation.

11.1.2 Heating Water Piping shall be insulated with preformed fiberglass pipe insulation.

11.1.3 Steam and Steam Condensate Piping shall be insulated with preformed fiberglass pipe insulation.

11.1.4 Condensate lines from Air Handling Units and Ice Making Machinery shall be insulated with

elastomeric foam insulation.

11.1.5 Direct Expansion Cooling Piping shall be insulated with elastomeric foam insulation.

11.2 Below Grade Piping Insulation (all thicknesses and installation procedures as recommended by material manufacturer)

11.2.1 Steam and Condensate Piping shall be pre-insulated piping with aluminum exterior PVC lagging.

## **12** Central Heating Equipment

12.1 Hydronic Boilers

12.1.1 Near condensing is preferred.