**Facility Planning & Control**

**5. GUIDELINES FOR MECHANICAL DESIGNERS**

The following are instructions for the Designer's Mechanical Engineer's use in preparing Mechanical Designs for State Owned projects:

1. Mechanical submittal requirements for the Schematic Design and Design Development Phases can be found in the General Instructions to Designers. Mechanical Design/Documenta-tion services during the Construction Documents Phase consisting of final working drawings and equipment specifications including but not limited to the following:

a. Mechanical Site Plan shall include water supply location and test information.

b. Plumbing details, including water and sewage riser diagrams for all plumbing fixtures

c. Plumbing fixture schedules shall be shown either on the drawings or in the Mechanical Specifications

d. Heating, ventilating and air conditioning plans with double line ductwork shown where required, and CFM requirements at each supply, return and exhaust outlet.

e. HVAC Details and Equipment Schedules

2. Facility Planning prefers to use proprietary specifications above all others, whenever possible. See Instructions on Standard Forms and Specifications for specifics.

3. Use either NPLV or IPLV as defined by ARI Standard 550/590-98 in denoting the efficiency of chillers. When the type and size of a chiller is determined, contact two major manufacturers to obtain the efficiency of the unit. In all cases, at least two manufacturers must be able to meet the efficiency listed in the specification. This efficiency rating method shall be used in lieu of the KW/Ton rating that FP&C has historically used. Chillers shall be ARI certified and bear the ARI label.

4. The use of multiple compressors and multiple refrigerant circuits is strongly recommended where practical in order to insure that users are not left without any cooling when chiller problems occur.

5. The choice of refrigerants shall be discussed with the User Agency and FP&C early during design. Refrigerant R-22 shall not be specified without the approval of FP&C.

6. Include in the Mechanical Specifications that the Mechanical Contractors shall submit to the designer, as soon as feasible after award of the Contract, equipment room layouts at a scale not less than 1/4"=1' showing the layout of the actual equipment to be used. The Designer shall ensure that all specified models fit in the equipment room(s.)

7. Do not provide hot water to rest rooms in general purpose buildings. If you have any questions, contact FP&C.

8. Use of any asbestos containing materials is strictly prohibited.

9. Minimum size of plumbing vents through the roof shall be 2".

10. All HVAC penetrations, equipment, pipe and conduit curbs shall be carefully coordinated with the Mechanical Layout, taking care not to have roof penetrations of any kind or runs of pipes within a minimum of one foot from any edge curb, expansion or control joint.

11. Details which deal with roof penetrations, supports for mechanical equipment and other related details occurring on roofs such as drains, shall be shown on the Architectural Drawings. The Mechanical Engineer shall verify with the Architect that these details have been provided.

12. All air handlers and water heaters shall have 16 gage galvanized steel safety drip pans. Water collected by these pans shall be piped to a floor drain.

13. All air handlers shall have double wall construction. The cooling coil casing and the internal drain pan shall be made of stainless steel or other non-corrosive material. The drain pan shall have a 2-way slope and be IAQ (ASHRAE) specified.

14. For new construction, no air conditioning units, ductwork, or cooling towers will be located on the building roof without the written approval of FP&C. For renovation work, this equipment shall be removed from the roof wherever possible. Minimize roof penetration.

15. Indicate walking surfaces on roof (to be provided by others) for all Mechanical Equipment that has to be maintained by the User Agency. Verify and coordinate the detail with the Architect.

16. For the Construction Documents Phase transmittal, all ductwork from the air handling units through congested areas such as corridors shall be shown double line and shall be drawn to scale. Cross sections of these areas shall be detailed showing all ductwork, piping, etc. to insure that conflicts do not occur.

17. Underground chilled and hot water piping and fittings shall be pre-insulated steel unless approved otherwise by FP&.C. All joints shall be insulated in a manner approved by the piping manufacturer.

18. Both Variable Air Volume (VAV) and Direct Digital Control (DDC) systems should be strongly considered by the Mechanical Engineer wherever practical. Pneumatic controls shall not be specified without the approval of FP&C.

19. Fume hoods may be equipped with Variable Air Volume (VAV) exhaust and make-up air systems if appropriate. Constant flow and low flow fume hood designs should also be considered. Ceiling diffusers in the vicinity of fume hoods shall be either perforated or dome-shaped type. Coordinate the connection of fume hoods and fume hood ductwork with the architect. Where possible, connect multiple fume hoods to a single exhaust fan plenum in order to reduce the number of required exhaust fans.

20. Use variable speed drives instead of adjustable inlet vanes on variable air volume air handling units.

21. All Mechanical components shall be chosen with efficiency in mind. Variable speed drives shall be specified where practical.

22. Water piping in HVAC systems shall be color coded and shall have directional flow arrows along its entire length in the mechanical equipment room. All zone valves shall be identified by unique numbers in the field and on the drawings.

23. Air handlers shall be of double wall construction with access doors and external lube lines for any internal bearings.

24. Multi-zone air handlers shall not be used without the written approval of FP&C.

25. The engineer shall not specify that a factory test of any mechanical equipment should be performed in his presence or otherwise. Instead, he/she shall specify that equipment must meet commonly used national Standards such as those of ARI or CTI.

26. Buildings and other locations having a fire protection sprinkler system shall be of an approved piping material as listed in the latest adopted edition of NFPA 13 except that non-metallic pipe may not be used. When steel pipe is used, it shall be schedule 40 through 4” diameter. At the designer’s discretion, schedule 10 steel pipe may be used for larger pipe sizes.

27. It shall be the responsibility of the designer to, determine the hazard classification of the sprinkler system and identify the hazard classification in the Construction Documents, have performed a flow test during the Schematic Design phase to determine that the quantity and pressure of the water is sufficient for the sprinkler system (with a mandatory 15 pound cushion), show the location where the fire line enters the building, the location of the fire department connection, the location of the sprinkler heads throughout the building and, where required, the location of the fire pump, dry pipe valves, and fully specify the construction materials required for the sprinkler system. The sprinkler contractor shall prepare and submit shop drawings to the design professional for his review and approval. The design professional shall submit the shop drawings bearing the design professionals shop drawing review stamp to the Fire Marshal's office after it is determined by the Designer that the design is correct. Plans shall show all areas protected by sprinklers and alternative forms of suppression as well as areas that need special consideration such as dry pipe areas, anti-freeze areas, pipe routes through unheated attics, etc.

28. Rolled groove pipe fittings shall be used in sprinkler systems wherever possible. The use of flanged pipe is discouraged.

29. Schedule 40 galvanized steel pipe with rolled grooved fittings shall be used when possible in all dry or pre-action sprinkler systems in order to limit corrosion. Both the interior and exterior of the galvanized pipe shall be inspected after the grooving process to check for damage to the galvanizing. Any damaged areas must be repaired before the pipe is put in place.

30. Design of any sprinkler system other than wet pipe shall require written approval from Facility Planning and Control**.**

31. Water heaters, both electric and gas, shall have installation approval certificates from the state boiler inspector.

32. Use external duct insulation where possible to avoid problems with indoor air quality. The use of internally lined duct will be allowed in special cases where noise attenuation is necessary.

33. Heating, where VAV systems are used, shall be an integral part of the VAV box. Separate perimeter heating shall not be used in such cases without the approval of FP&C.

34. Under no circumstances shall a room’s temperature be controlled or influenced by two or more thermostats.

35. Economizers shall not be used unless approved by FP&C. The designer will be expected to document expected performance and effectiveness before acceptance is granted.

36. Heating coils shall be included in all areas of the top floor of every building. Heating coils shall be used in internal areas on floors other than the top floor at the designer’s discretion.

37. Cooling coils shall not have more than 10 fins per inch so that the coils can be easily cleaned.

38. Avoid mixing such diverse areas as offices, labs, conference rooms or classrooms on the same VAV box. A single VAV box shall not serve more than three (3) offices/or similar areas.

39. All non-metallic underground lines shall be equipped with a tracer wire and identification tape at the time of installation.

40. The latest version of ASHRAE Standard 62 shall be used during design in order to provide acceptable indoor air quality.

41. Provide opposed blade dampers at each supply register or grille. The dampers shall be adjustable from within the room.

42. Flexible duct attached to ceiling diffusers shall not be more than 5' long.

43. The use of duct board for ductwork is prohibited.

44. Cooling towers of stainless steel construction is preferred and shall be specified unless approval of FP&C is obtained to do otherwise. The use of corrosion resistant cooling towers may be considered by the design engineer, also with approval of FP&C. Cooling towers of galvanized steel construction is prohibited. Cooling towers shall be Cooling Tower Institute (CTI) certified and bear that label. Both cross flow and counter flow type cooling towers will be allowed unless the User Agency provides a reasonable, written objection to the use of one of the two types.

45. The engineer shall consider the long term cost of both hot water heating and electric heating before choosing the type of heating to use in a building.

46. General purpose buildings shall be kept under a positive pressure of approximately 0.02" water gauge in order to limit the infiltration of indoor air quality contaminants.

47. Coordinate required size of equipment rooms with prime designer (from small air handling rooms to main boiler rooms) in order to maintain a minimum allowance of three feet around each major piece of equipment. This applies to each side that requires maintenance of any type and a minimum of 3 sides for access purposes. Provide additional space for changing filters, motors, shafts, bearings, pumps, etc. Provide sufficient space for cleaning and/or replacing tubes in boilers and chillers, shafts, etc. as per the manufacturer’s recommendations.

48 Designer shall insure on drawing and specifications that all penetrations (i.e. ductwork, piping etc.) in rated vertical and horizontal partitions are properly protected in accordance with referenced codes to maintain the rating of the partition.

49. Floor drains in restrooms, janitor’s closets, etc. shall be equipped with a device to insure that the trap does not dry out. It is suggested that the flush valve for a toilet or urinal near the floor drain be equipped with a trap adapter so that a small amount of water from the flush valve can be routed through a copper line to the p-trap in the floor drain each time the valve is used.

50. For new construction, mechanical rooms used as return air plenums shall not be allowed unless prior approved by FP&C. No floor drains are allowed in the mechanical equipment rooms that are used as return air plenums. Water collected must be piped out of the equipment room. For renovations, existing floor drains in equipment rooms used as return air plenums may remain as long as the total project cost for plumbing work does not exceed $15,000.

51. Mechanical equipment rooms on exterior walls are preferred by FP&C wherever possible.

52. The contractor shall hire a Testing and Balancing firm to perform testing and balancing on each project. Specific requirements concerning this matter are on the following section.

53. Designer shall contact the local fire department to determine the need for fire hydrants. If new fire hydrants are need for the protection of this facility, they shall be included in the construction contract with approval of Facility Planning & Control.

54. Due to homeland security concerns, consider isolating the air flow in mail rooms, lobbies, waiting rooms, and such to insure that air from those areas is not distributed to other parts of a building. Fresh air intakes should be located well above the ground when possible, and greater than normal filtration should be considered in order to reduce or eliminate potential chemical and biological agents.

55. All installed ductwork shall be in a clean, new, first class condition. The designer shall specify that the contractor is responsible for keeping the ductwork clean during construction as required using such methods as sealing all openings except when attaching additional sections. Specifications shall state that air handling units, ductwork and all associated items shall be cleaned or replaced at no cost to the Owner if allowed to get dirty. All air systems shall have appropriate filters in place during construction and replaced with permanent filters upon completion of project.

56. For all air handling systems 2000 cfm and above, minimum filtration that includes two media banks with the first having a 30% nominal efficiency and the second having a 65% nominal efficiency shall be required.

**Facility Planning & Control**

**Testing and Balancing Requirements**

**State of Louisiana**

1. The TAB (Testing and Balancing) contract shall be between the contractor and the TAB firm.

2. All TAB deficiencies shall be corrected when found. Any deficiencies that are (for whatever reason) not corrected immediately shall be shown in the TAB report and listed on a summary sheet in the front of the TAB report. **The TAB report should be submitted and reviewed by the Mechanical Engineer as part of the process to determine substantial completion.** All items on the summary sheet shall become punch list items with dollar values assigned to them.

3. TAB firms must be certified by either the AABC (Associated Air Balance Council) or the NEBB (National Environmental Balancing Bureau), or other Owner approved organization, in order to perform work on state projects. Falsification of a TAB report will not be allowed and will lead to the reporting of that firm to the respective national certification agency.

4. Verification of TAB firm certification may be confirmed by contacting the certification agencies.

5. FP&C reserves the right to hire a second TAB firm to review the TAB report of the first. FP&C also reserves the right to hire a second TAB firm to check the work of the first TAB firm.

6. The following “verification” statement shall be included in the TAB section of the Specifications:

“At the time of final inspection, the TAB agency may be required to recheck, in the presence of the owner's representative, specific and random selections of data, air quantities, and air motion recorded in the certified report. Points and areas for recheck shall be selected by the owner's representative. Measurements and test procedures shall be the same as approved for the initial work for the certified report. Selections for recheck, specific plus random, shall not exceed 10% of the total number tabulated in the report.”

7. Shop drawings must be provided to the TAB firm no later than 30 days after the final, approved shop drawings have been returned by the designer to the contractor.

8. Coordination between the TAB firm and the contractor shall be left strictly to those parties.

9. Duct leakage testing shall be the responsibility of the mechanical contractor or his subcontractor.

10. Fire and smoke damper testing shall be done by the contractor and **witnessed** by the TAB firm.

11. The designer shall only include TAB work that he/she feels is required for the project.