

DESIGN CHECKLIST

PROJECT NAME _____

DISCIPLINE _____ DATE _____ TYPE REVIEW _____

REVIEWER _____ DRAWINGS REVIEWED _____

EVERY ITEM WILL BE REVIEWED AND NOTED FOR COMPLIANCE (C), OR NON-APPLICABILITY (NA).

MECHANICAL ENGINEERING – HEATING, VENTILATION, AIR
CONDITIONING, AND REFRIGERATION SYSEMS

1. HEATING SYSTEMS:

A. GENERAL

ITEM NO. CHECK

ITEM

- 1. ___ Equipment room layouts and access to those rooms afford adequate space for operation and maintenance or replacement of the equipment to be installed. Check against the dimensions of a minimum of three manufacturers.

- 2. ___ No interference exists between heating layout and items shown on structural, electrical, and architectural drawings.

- 3. ___ Control sequence of operation outlined in the specifications agrees with design and the control diagram on the drawings. All mechanical equipment with controls should be included in the control diagram and this diagram located on the mechanical drawings.

- 4. ___ Fire damper and fire door located as shown on the design drawings coincide with the locations of fire rated separation. In addition fire dampers and fire doors are properly detailed.

5. ___ Duct-mounted smoke detectors are properly located, interlocked with the building fire alarm system and connected to provide desired control function.
6. ___ The design incorporates seismic requirements based on the seismic zone for the project location.

2. VENTILATION SYSTEMS

A. GENERAL

<u>ITEM NO.</u>	<u>CHECK</u>	<u>ITEM</u>
1.	___	Fire damper and fire door locations as shown on the design drawings coincide with the locations of fire rated separation. In addition fire dampers and fire doors are properly detailed.
2.	___	Specification reference “where shown”, “as indicated”, etc., are included on plans.
3.	___	In explosion proof areas, explosion proof and spark proof requirements are met.
4.	___	Electrical characteristics for fans, damper motors, etc., are shown on mechanical sheets.
5.	___	Fan openings in buildings and louver openings in walls, doors, and ceilings are shown and detailed on plans. Are proper access openings to piping and equipment shown on plans? Coordinate with the architectural and structural plans.
6.	___	Fan curb details at all building penetrations are detailed completely.
7.	___	All areas requiring mechanical ventilation have both supply and return air paths completely detailed and shown.
8.	___	Pressure classifications of ductwork are shown where required.

9. ___ Shower rooms are well ventilated with either a clean sweep of air across the top of all showers or that an individual exhaust register is provided in each shower enclosure.

10. ___ Pits in automotive shops and other areas where concentrations of vapors can be hazardous or dangerous, are properly ventilated and comply with the appropriate NFPA Code.

11. ___ Fans or equipment located in or adjacent to sleeping rooms and other “quiet” areas such as conference rooms, auditoriums, libraries, or office space will not create a noise problem. This equipment should be provided with suitable vibration isolation or acoustical treatment.

12. ___ Clear control or operation instructions are provided. Drawings are to indicate location for all control items.

13. ___ All openings or louvers are equipped with dampers or backdraft devices to prevent sand and dirt entry during sandstorms in accordance with MED criteria.

14. ___ All buildings are maintained at a positive pressure to eliminate sand and dirt infiltration.

15. ___ Insect or bird screen are provided on all openings such as outside air intakes and louvers where required.

16. ___ All equipment rooms and janitor closets are properly ventilated.

17. ___ The drawings provide flow diagrams for all systems so that the system logic is immediately obvious.

18. ___ Exhaust fans in the vicinity of dishwashers have sufficient capacity for the hot, moist air present.

19. ___ Duct-mounted smoke detectors are properly located, interlocked with the building fire alarm system and connected to provide the desired control function.

20. ___ A complete legend and list of abbreviations for ventilation systems is provided.

- 21. ___ Domestic clothes driers have proper air vents to outside and make-up air is provided for them.
- 22. ___ The design incorporates seismic requirements based on the seismic zone for the project location.

3. AIR-CONDITIONING SYSTEMS

A. GENERAL

<u>ITEM NO.</u>	<u>CHECK</u>	<u>ITEM</u>
1.	___	The schedules on the plans are complete with all of the details necessary to purchase equipment. The information scheduled (e.g. heat loads) will be used by an equipment buyer to purchase a specific manufacturer's piece of equipment. The information must be the calculated values required, not an amount available from a particular manufacturer's product.
2.	___	Minimum outside air requirements are indicated in the equipment schedule and at the outside air intake or on the control diagram and that the figure indicated on the drawings agrees with the design analysis.
3.	___	Adequate space is available around condensers or chillers to allow for rodding or removal of tube banks, or any other service or replacement.
4.	___	Details are provided on the plans of evaporators and coils showing proper valves, strainers, gages, thermometers, sight glasses, equipment controls, piping connections, etc.
5.	___	Adequate room around air handling units is shown on plans to provide maintenance of filters, coil cleaning, valve and damper adjustment, etc.
6.	___	Plans or standard details indicate pumps and control valves to be flanged or unions provided to allow removal for maintenance.
7.	___	Duct runs and piping are not in conflict with the work shown on other sheets of the plans or with architectural or structural features of the facility.

8. ___ Access panels are provided on architectural plans to permit access to concealed duct dampers, heating coils, etc., that must be adjusted or maintained.

9. ___ An isometric layout is included on the drawings for the refrigerant piping, showing the relationship of the piping to equipment as well as to the walls, floor and ceiling of the space, and the amount and direction of pitch and suction and hot gas lines and oil traps for proper oil return. In the absence of an isometric, several sections through the equipment room containing this information should be shown.

10. ___ The condensing water pump is low enough with respect to the cooling tower basin to provide flooded suction at all times.

11. ___ Refrigeration piping is designed in accordance with ASHRAE handbook or in accordance with manufacturer's recommendation.

12. ___ Air cooled condensers have been selected based on temperature conditions prescribed in the Design Instructions Manual. Adequate space and arrangements for condenser installations shall be referred to prevent cooling air flow from being obstructed or short circuited.

13. ___ For package equipment, the unit selected will provide the sensible heat capacity required, especially where the SHF is high. This means that the total unit capacity will probably be considerably greater than the calculated total capacity but that the calculated and scheduled sensible capacity will be the same.

14. ___ Field and shop fabricated items are adequately detailed as to materials, methods of fabrication and installation. Indicating a hood, for instance, by a rectangle with dimensions only is inadequate to show the Contractor what is to be provided. Showing wall mounted equipment with the note "provide suitable supports" is not acceptable. Details must be shown so that there is no doubt in the mind of the contractor and the Corps' inspectors as to what and how an item is to be installed.

15. ___ All items on the drawings are identified, especially for ductwork and piping. Branch dampers shall be shown, and identified in the legend.

16. ___ Single-line control diagrams and sequence of operations of equipment are provided. Also, that the control scheme shown on the drawings agrees with the specifications and is clearly written using proper English in a manner that is directive in nature relative to the Contractor. Thus the term “shall” is to be used generally in lieu of will”. For example: “Pressing the button shall energize the control circuit and ...”.
17. ___ Drain lines required for condensate from cooling equipment and overflow and bleed from cooling towers are shown on the drawings. Also where equipment rooms contain water pumps or possible sources of water drainage on the floors, floor drains should be provided.
18. ___ Control panels specified are located on the drawings.
19. ___ Electrical duct heaters and controls indicated on the drawings are adequately specified. The main specification for HVAC work contains a paragraph for electric duct heaters.
20. ___ Where Government-furnished, contractor-installed items are involved, suitable specifications are included for installation and testing.
21. ___ HVAC calculations performed by computers have detailed and explanations and backup for the logic used. Check that the columnar listings of information are properly defined and headed.
22. ___ Volume control dampers are provided in all branch ducts for initial balancing and continual maintenance of the HVAC systems.
23. ___ Duct mounted smoke detectors are properly located, interlocked with the building fire alarm system and connected to provide the desired control function.
24. ___ The complete system control air flow diagram is presented and that major components are shown on the piping and equipment layout drawings. The drawings provide flow diagrams for all systems so that the system logic is immediately obvious.
25. ___ Pressure classifications of duct work are shown where required.

26. ___ All standby equipment is so noted.
27. ___ Isolation valves are provided in all branch lines and at all equipment which will require service.
28. ___ Motors and starters are correctly scheduled and coordinated with the electrical characteristics of the system.
29. ___ Fire damper and fire door locations as shown on the design drawings coincide with the locations of fire rated separation. In addition fire dampers and fire doors are properly detailed.
30. ___ Supply air outlets, return air inlets, etc., have velocities which are below that necessary to achieve the appropriate indoor acoustical design levels.
31. ___ Duct velocities are below those required to achieve the appropriate indoor acoustical design levels.
32. ___ Return air openings near or close to mechanical rooms, air handling units, etc. have been properly treated with lining and/or attenuators to achieve the appropriate indoor acoustical design levels.
33. ___ Water sources and water piping should not be located above (or on the floor above) electrical switch gear or transformer rooms.
34. ___ Automatic Vane Control is specified for Vane axial fan applications. Space requirements have been coordinated between Vane axial fan and air flow measuring device manufacturers to assure a satisfactory installation.
35. ___ A complete legend and list of abbreviations for HVAC is provided.
36. ___ For large district type chilled water systems, verify that chilled water piping manholes are sited to prevent the entrance of ground or surface water and are adequately provided with natural ventilation.
37. ___ Review the requirement for water strainers in circulating pump suction lines.
38. ___ Review the need for diesel engine exhaust line thermal expansion compensation.

- 39. ___ For POL and district type heating and cooling systems, verify that components are specified with correct pressure ratings and are protected from surge.
- 40. ___ For POL tanks, verify that tank sampling tubes and automatic level indicator tubes are specified or shown as appropriate.
- 41. ___ That the design incorporates seismic requirements based on the seismic zone for the project location.
- 42. ___ For projects in Qatar, design air conditioning systems for indoor temperature of 23 degrees C (73.5 degrees F) to comply with local Qatari requirements.

4. REFRIGERATION

A. GENERAL

ITEM NO. CHECK

ITEM

- 1. ___ That two-speed unit coolers are not provided unless specifically indicated in the design instructions. The requirement indicated in TM 5-840-1, Cold Storage Facilities, paragraph 14(2) (b), is no longer applicable unless indication is given that the frozen product will arrive at a temperature above 15° F. Where the two speed cooler is to be provided, the two speeds are to be indicated and the unit selected to cool the product at the delivery temperature indicated. Controls should provide the necessary sequencing and include the proper thermostat to control the two speeds.
- 2. ___ That the design incorporates seismic requirements based on the seismic zone for the project location.

5. SPECIAL NOTES

- 1. ___ That liquid refrigerant receivers are specified to have a charging valve and capacity not less than 25 percent in excess of the system charge. Drawings will often show the charging valve somewhere else on the system and will indicate a specific capacity for the receivers. The

designer is not in a position to determine what the system charge is since the type of refrigerant and equipment plus, to a certain extent, the piping arrangement is optional or variable depending on the equipment furnished. If the designer desires to indicate capacity information on the drawing for this item, it should be in the form of "system charge plus 25 percent."

2. ___ That minutes of all conferences are reviewed to ensure that all comments have been complied with.
3. ___ All applicable preliminary review comments have been incorporated in design document.
4. ___ To see the instructions with respect to listing Government-furnished equipment have been complied with.
5. ___ Mechanical Design Manuals against design analysis.

6. PROPRIETARY MATERIALS AND EQUIPMENT

INITIAL

_____ To The best of my knowledge, the specifications and drawings do not include any proprietary or sole source materials or equipment except for the following approved items: