

23 70 00 - Central HVAC Equipment (Air Handling Units)

1. Introduction

- A. In general, air handling units should be used for any air conditioning system where more than 2,000 cfm of air is required to maintain the design conditions. These units are manufacturers' standard products. Air handling units may be manufactured in one piece or may be modular units with sections for each function joined together. They typically consist of a casing containing a fan, a filter and cooling, heating and/or humidification coils. Depending on requirements, mixing boxes, return fans, damper sections and other equipment may be included. Units installed inside are typically referred to as air handling units (AHU); those installed exposed are rooftop units (RTU).
- B. Designers should coordinate with Duke Office of Project Management and Duke Utilities & Engineering Services, Department of Planning & Engineering (DUES Engineering) on all phases of projects requiring air handling units. These projects may include but are not limited to:
 - 1. New buildings
 - 2. Renovations to the existing building
 - 3. Replacement of existing equipment
- C. Designers are expected to share and review any project data, load calculations and site condition evaluations with DUES Engineering.

2. References

- A. ASHRAE Standard 52: Dust-spot testing of filters
- B. NFPA 90A: Flame spread, smoke developed characteristics of insulation
- C. ARI Standard 430: Centrifugal fan performance test
- D. AMCA 210: Vane axial fan performance test
- E. ARI Standard 410: Rating of coils containing water or glycol/water
- F. ARI Standard 260: Method of rating sound data for ducted air conditioning equipment

3. Design Standards

- A. Air Handling Units:

1. All air handling unit casings shall be double wall insulated with solid inner skin (minimum 18 gauge) and foamed in place insulation (minimum 2 inch thick). Casing panels shall be removable.
2. Structural integrity of air handling units shall not rely on casing panels.
3. Factory mounted lights shall be provided in each accessible section of the AHU. Lights shall be marine type LED (of corrosion-resistant materials) with vapor-tight seal. Provide lighted switch outside unit. Either one switch per light fixture or a single switch controlling all light fixtures is acceptable. Lights switches shall be controlled by 1 hour timers.
4. Hinged access doors shall be provided on each side of unit for access sections, filters, dampers, humidifiers and fans. Access door latches shall not require special tools for opening. Access doors in positively pressurized sections shall open inward or shall have safety catch to prevent sudden opening. Each access door shall have a view window (minimum 12 inch x 12 inch).
5. Access sections shall be provided between filter and coil section (minimum 16 inch) and between any two coil sections (minimum 24 inch).
6. Provide drain pan under each coil (full length of coil section) for coil cleaning. Provide outlet with ball valve on exterior of unit. Provide minimum 3 feet clearance at coil section on drain outlet side.
7. Fans and motors shall be internally isolated.
8. VFD's shall be mounted on a separate structure, never on or inside the unit itself.
9. VFD motors shaft be provided with an Aegis bearing protection shaft grounding ring.
10. All fans in a Fan Wall arrangement shall be verified at maximum BHP/speed. Provide capacity for failure of one fan.
11. Coils shall be copper with aluminum fins (maximum of 12 fins per inch).
12. Cooling coil casings shall be of stainless steel.
13. Maximum cooling coil face velocity is 550 fpm.
14. Condensate drain pan at cooling coil shall be stainless steel, insulated and sloped to the condensate outlet with outlet in bottom of pan to ensure full drainage. Condensate drain outlet shall be indirectly connected to sanitary waste system with trap designed to always provide water seal between AHU and building drain.
15. Inner skin of humidifier section shall be stainless steel.

16. Outside air and return air inlets shall be arranged to avoid stratification of air as it passes the coil.
17. Pre-filters for air handling units shall be minimum MERV 8, 2 inch throwaway, pleated type. Filters shall be minimum MERV 13, bag type. Filter racks shall be slide in type.
18. Provide plenum section downstream of pre-filter for AFMS where required.
19. Unit shall be selected so that required sound levels can be maintained in surrounding areas and in all areas served. Control of sound levels by proper equipment selection and duct layout and sizing is preferred; however, measures such as sound attenuators may be used if necessary.
20. Include minimum and maximum outside air requirements on equipment schedule.

B. Rooftop Air Handling Units

1. All rooftop unit casings shall be double wall insulated with solid inner skin (minimum 18 gauge) and foamed in place insulation (minimum 2 inch thick). Casing panels shall be removable.
2. Structural integrity of rooftop units shall be maintained when casing panels have been removed.
3. Factory mounted lights shall be provided in each accessible section of the RTU. Lights shall be marine type (of corrosion-resistant materials) with vapor-tight seal. Provide lighted switch outside unit, protected from weather. Either one switch per light fixture or a single switch controlling all light fixtures is acceptable.
4. Hinged access doors shall be provided on each side of unit for access sections, filters, dampers, humidifiers and fans. Access door latches shall not require special tools for opening. Access doors in positively pressurized sections shall open inward or shall have safety catch to prevent sudden opening. Each access door shall have a view window (minimum 12 inch x 12 inch).
5. Access sections shall be provided between filter and coil section (minimum 16 inch) and between any two coil sections (minimum 24 inch).
6. Provide drain pan under each coil (full length of coil section) for coil cleaning. Provide outlet with ball valve on exterior of unit. Provide minimum 3 feet clearance at coil section on drain outlet side.
7. Fans and motors shall be internally isolated.
8. VFD motors shaft be provided with an Aegis bearing protection shaft grounding ring.

9. All fans in a Fan Wall arrangement shall be verified at maximum BHP/speed. Provide capacity for failure of one fan.
 10. Coils shall be copper with aluminum fins (maximum of 12 fins per inch).
 11. Cooling coil casings shall be of stainless steel.
 12. Maximum cooling coil face velocity is 550 fpm.
 13. Condensate drain pan at cooling coil shall be stainless steel, insulated and sloped to the condensate outlet with outlet in bottom of pan to ensure full drainage. Condensate drain outlet shall be indirectly connected to sanitary waste system with trap designed to always provide water seal between AHU and building drain.
 14. Inner skin of humidification section shall be stainless steel.
 15. Outside air and return air inlets shall be arranged to avoid stratification of air.
 16. Outside air and relief air openings shall be arranged to avoid entrainment of relief air into outside air intake airstream.
 17. Pre-filters for air handling units shall be minimum MERV 8, 2 inch throwaway, pleated type. Filters shall be minimum MERV 13, bag type.
 18. Provide plenum section downstream of pre-filter for AFMS where required.
 19. Duct openings shall not be located in the bottom of the unit. Duct shall be horizontal to avoid collection of water (from coil cleaning) in ductwork.
 20. Unit shall be selected so that required sound levels can be maintained in surrounding areas and in all areas served. Control of sound levels by proper equipment selection and duct layout and sizing is preferred; however, measures such as sound attenuators may be used if necessary.
 21. Rooftop unit shall include an accessible compartment within the roof curb for valves and controls.
 22. Rooftop unit shall include a mounting location for VFD or control panel, accessible from exterior of unit without shutting down unit and ventilated or cooled to maintain manufacturer's recommended temperature range for the panel.
 23. Include minimum and maximum outside air requirements on equipment schedule.
4. Documentation and Review Requirements
- A. Documentation of factors used in equipment selection (heating and cooling load, diversity allowed for in air distribution, etc.) must be submitted for review at DD submittal

and each subsequent submittal if conditions have changed. Summary of factors shall identify which factors are known and which are assumptions.

- B. Detailed equipment selection (including expected sound levels for unit discharge, unit return, radiated sound and sound level in space served). Where multiple spaces are served, expected sound levels are required only for those spaces nearest the unit.
- C. Cost of operations and maintenance shall be included in system Life Cycle Cost Analysis. This information shall be reviewed at DD submittal.

5. Installation and Performance Requirements

- A. All units shall be installed level.
- B. All units shall be installed so that there is sufficient space to perform normal maintenance. This space shall be shown on project drawings.
- C. All units shall be installed at a height which allows proper installation of trap at condensate drain.
- D. Every effort shall be made to avoid the need for condensate pumps.
- E. Unit installation shall include services of a factory authorized service representative for unit start up.
- F. Provide auxiliary drain pan under entire unit, fitted with float switch to shut down unit as pan fills. Provide a drain with a ball valve at the bottom of one side wall.
- G. Filters shall be in place anytime the unit is running. During construction, filters shall be checked and changed regularly. New filters shall be installed in each unit at turnover. Do not provide spare set of filters for units.
- H. AHUs will not be energized as a means of heating/cooling during construction without an approved plan by Duke FMD.
- I. Coordinate all commissioning efforts with Duke Utilities and Engineering Services (DUES).

6. As-Built Requirements

- A. Designer must provide drawings showing all equipment locations. Drawings must include actual layout, details of all connection points and other pertinent data. Provide electronic copy of all drawings.
- B. Provide operations and maintenance manuals for each piece of air handling equipment. Where multiple units are covered by the same manual, duplicate manuals are not required. A list of all equipment (by equipment ID) will be provided in front of each

section of the O&M manual with equipment location, title and publication number of appropriate manual shown for each piece of equipment. Provide electronic copy of all components of O&M manuals.

- C. O&M manuals shall include fan curves for each fan provided. Each fan shall be represented by a separate fan curve.