

# FACILITIES STANDARD

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NAME : Air Handling Systems  
NUMBER : 15600

ORIGINAL DATE : 03-01-94  
REVISION DATE : 11-24-98

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## PURPOSE:

1. The general purpose of each Facilities Standard is to provide minimal criteria for construction materials at University facilities regarding code compliance, warranty, approved products, execution and uniformity.
2. To protect the health and safety of patients, visitors, students, faculty and staff, in addition to protecting non-project UAB property, all construction must be in accordance with: NFPA 241 safeguarding construction, alteration and demolition operations; Standard Building Code, Chapter 33, regarding site work, demolition and construction; NFPA 101 Life Safety Code.
3. Construction safety is the responsibility of the contractor in accordance with the regulations and codes of the agency having jurisdiction, and according to the guidelines adapted by OSHA.
4. The **Air Handling Systems Facilities Standard** establishes a series of guidelines for specifying this particular item on any construction project at the University. ***This Facilities Standard is not to be regarded as a specification.***

## GENERAL:

1. The following abbreviations will be used within this facilities standard:

AFBMA	Anti-Friction Bearing Manufacturer's Association
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ISA	Instrument Society of America
NFPA	National Fire Protection Association
SMACNA	Sheet Metal & Air Conditioning Contractors' National Association, Inc.

2. The following standard shall be complied with in the design and installation of air handler units:
- 1) ARI 430 Standard for Central Station Air Handling Units.
  - 2) NFPA 90A – Installation of Air Conditioning and Ventilation System.
  - 3) ANSI/AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings.
  - 4) SMACNA – HVAC Duct Construction Standard.
  - 5) ARI/410 – Standard for Forced Circulation Air–Cooling and Air-Heating Coils.
  - 6) ANSI/UL 900 – Test Performance of Air Filter Units
  - 7) AMCA 300 – Reverberant Method for Sound Ratings for Air Moving Devices.
  - 8) ASHRAE 68 – Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans.
3. Air volume static pressure, fan speed, brake horsepower and selection procedures on *constant* volume air handling units shall be certified in accordance with ARI 430. If air handling units are not certified in accordance with ARI 430, Contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the Contractor.
4. Air volume, static pressure, fan speed, brake horsepower and selection procedures on *variable* volume air handling units shall be certified in accordance with ARI 430. If air handling units are not certified in accordance with ARI 430, Contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the Contractor.
5. AHU (Air Handling Units) for Hospital Operating Rooms applications shall have fan redundancy.
6. AHU's shall be draw-through design. Any deviations will require approval by resident mechanical engineer.
7. AHU's shall be arranged for and provided with controls for economizer cycle.
8. AHU drain pan shall be mounted at a height above the floor that will allow a drain trap not less than 150% deeper than the maximum system static pressure. All units must have an auxiliary drain pan underneath constructed of stainless steel and piped to a floor drain regardless of the location of the unit.

9. AHU casing shall be designed to withstand the full static pressure that the fan is capable of generating. All AHU's must be doubled wall construction.
10. Filters shall be provided to meet the requirements of the installation. Normally 60% disposable filters with 2" prefilters are minimum requirements. Higher efficiency filters and final filters may be required in project design. Filter specifications are addressed in UAB Facilities Standard No. 15605. Outside air plenum sections shall have filters as per the filter standard to pre-filter the outside air before the air enters the mixed air section.
11. Fans shall be designed so that the air required is delivered with minimum power and generated noise. Fans shall be centrifugal and of the class required for the design total static pressure (with filters loaded). Air foil fans shall be used on built up systems. The discharge duct shall recover at least 50% of discharge velocity pressure. Diffuser plates shall not be required or used to control discharge velocity. Fans shall be spring-mounted for sound isolation. Large fans shall have inertia bases approximately 1½ times the fan and motor combined weight. Vibration Mounting for Fans, Motors & Drives specifications are addressed in UAB Facilities Standard No. 15608.
12. Fan speed shall be controlled by a VFD (variable frequency drive) on systems serving variable air volume systems; no inlet vanes shall be used on any AHU's. Variable Frequency Drive specifications are addressed in UAB Facilities Standard No. 15958. Systems with below 5hp motors shall be inlet vanes.
13. Pre-heat and heating coils shall be hot water type (with glycol provided) where coils are subject to temperatures of less than 35°F under operating conditions. Provisions shall be made to assure the mixing of outside and return air so that stratification will not produce cold spots in unprotected coils. Reheat coils and heating coils not subject to freeze conditions shall not use freeze inhibitors.
14. Cooling coils shall be selected with a face velocity of 500 FPM(±) that will prevent water carry-over and a reasonable static pressure loss. Cooling coils shall be selected by a computer program to meet design entering and leaving design conditions specified by the design engineer, and shall be in accordance with ARI 410-87.
15. All units of 15,000 cfm capacity or greater shall have multiple coils of not more than 15,000 cfm. Each coil shall be provided with stainless steel drain pan piped to a common drain connection.

16. Chilled water coils served by central utility plants shall be selected with low gpm/ton and coil depth, as required to meet design conditions. Chilled water temperature rise across the coil shall not be less than 15° F. Design of no greater than 12 FPI (Fins Per Inch) shall be implemented.
17. Supply and return headers shall be clearly labeled on outside of units so that direction of coil water-flow is counter to direction of unit air-flow.
18. Coils shall be proof tested to 300 psig and leak tested to 200 psig air pressure under water and shall be manufactured by the same company as the supplier of the AHU.
19. Pre-heat and chilled water coils shall be separated by a distance of no less than 24 inches.
20. Each coil inlet and outlet shall be provided with ball type isolation valves, gauge and gauge lock with snubber, a 9" thermometer, and a control valve having an equal percentage characteristic, being properly sized to permit full throttling of flow from minimum to maximum without cavitation or excessive noise. Controls and Instrumentation specifications are addressed in UAB Facilities Standard No.15951.
21. Systems served by the central chilled water system shall have no less than 20 psi differential at the building connections. Design Engineer shall be responsible for verifying the current differential pressure at the building connection at which design is being executed.
22. Control valves for cooling coils shall be modulating two-way valves. Valves shall be sized according to the ANSI/ISA Standards 75.01, "Control Valve Sizing Equation." Pressure drop across the valve shall be determined based on the pressure available to the chilled water system and on the piping system losses. All sizing data and calculations shall be provided to the Owner for review and approval.
23. All exposed belts and pulleys shall have guards.
24. All AHU's with fan section equal to or greater than 36 cu.ft. shall have marine lights with rough service bulbs and cut-off switch located inside fan section. The unit bottoms shall be insulated with rigid, urethane foam to prevent warping of the bottom when walking inside the unit.

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25. Fan motor shall be heavy duty, high efficiency, operable at 60 hz, 3-phase. Voltage shall be determined in the field.
  26. All motors shall be factory installed on slide base to permit adjustment of belt tension.
  27. All V-belt drives shall be variable pitch matched pulleys rated at 1.5 times the motor nameplate.
  28. All outside air/return air dampers shall be opposed blade to modulate the volume of outside and return air. Leakage rate shall not exceed 5 cfm/sq. ft. at one inch water gauge and 9 cfm/sq. ft. at four inch water gage.
  29. Starter/disconnects shall be supplied with NEMA Type 4 Enclosures.
  30. All DX coils shall have equalizing type vertical distributors sized in conjunction with capacities of coils. Section and liquid connections shall be clearly labeled on the outside of the unit. Coils shall be proof tested to 450 psig air pressure under dry nitrogen, and leak tested to 300 psig air pressure under dry nitrogen.
  31. All AHU's shall have full size access doors on both sides of fan section.
  32. All AHU's with reheat coils and chilled water coils shall have full size access doors factory installed between coils.
  33. Self-aligning, grease lubricated pillow-block ball bearings shall be provided, selected for L-50 200,000 hour average life, per ANSI/AFBMA9. Grease lubrication fittings shall be located at drive side of unit with soft copper tubing and zerk fittings shall be rigidly attached to casing.
  34. Glycol based heat recovery systems shall be incorporated into the design of all AHU Systems with a capacity of greater than 50% outside air at any given time (excluding units with economizer cycles).

## SEQUENCE OF OPERATION

The following applies to air-handlers 10,000 CFM and above. The control sequence shall prevent cooling and heating the same air as it passes through the air-handler. Separate operations such as the mixed air, preheat and chilled water shall be separate control loops. The control strategy shall interlock the preheat, mixed-air and chilled water control setpoints. Maintenance operators will be able to override this

interlock; the override condition will be shown on the screen and alarmed to the printer at the building operators' station.

The preheat setpoint shall be configured to limit the control minimum setpoint for equipment and building safety.

When air economizers are used, they will be activated at 65 degrees outside air temperature. The chilled water valve will operate in conjunction with the mixed air dampers to maintain design discharge air temperatures.

Minimum outside volume will be determined by volume, not by damper position. Flow indications at the building management system shall be indicated in cubic feet per minute. This reading will be verified as part of the air balance report.

Multiple valves on the same coil, controlled with an electronic to pneumatic signal, will require each valve control signal to be 3 to 15 pounds per square inch gauge. Split ranging of these devices will be done with the electronic signal. If the Design Engineer determines that the above sequence of operation is not applicable to the systems application the Resident Mechanical Engineer and Energy Management shall be notified.

## INSTALLATION OF CONTROL SENSORS

Air temperature sensors used for control will be located at a distance from the controlled coil to allow for mixture of the air. Temperature sensors will not be located in a manner that will interfere with routine maintenance of the system.

All freeze safety sensing elements will cover each square foot of coil area according to provisions of UAB Facilities Standard No. 15950.

## **PRODUCTS:**

Acceptable manufacturers

1. Model Modular Climate Changer: Trane Company
2. Model: Airpak York
3. Model: Uniflex 39 NX: Carrier
4. Model: Season Master McQuay

5. Substitutions upon approval of Resident Mechanical Engineer

**EXECUTION:**

**CONTROLS DOCUMENTATION**

1. The following information on AHU schedule shall be furnished to the Owner by the manufacturer:

Manufacturer  
Model  
Type  
Arrangement  
Coil Velocity Max  
Filter Velocity Max  
Fan  
Capacity CFM  
ESP Inch wg  
TSP inch wg  
Motor hp  
Max Fan bhp  
Heating Coil  
    Fin Series  
    Type  
    Height Inch  
    Width inch  
    Rows  
    Capacity Btu/hr  
    Air entering deg F  
    Air leaving deg F  
    Air SP Drop inch wg  
    Water entering deg F  
    Water leaving deg F  
    Water pressure Drop ft.  
Cooling Coil  
    Fin series  
    Type  
    Height inch  
    Width inch  
    Rows  
    Capacity btu/hr

Air Entering  
Dry bulb deg F  
Wet bulb deg F  
Air Leaving  
Dry bulb deg F  
Wet bulb deg F  
Water GPM  
Water Entering deg F  
Water Leaving deg F  
Water Pressure Drop ft.  
Saturated Section deg F

2. Manufacturer shall issue four copies of complete catalog data on the total product.
3. Manufacturer shall furnish documentation of factory commissioning for all workable parts contained within AHU.
4. Manufacturer must clearly define any exceptions to plans and specifications, and Mechanical Contractor is responsible for expenses that occur as a result
5. Provide four (4) copies of as-built drawings that show total unit configuration in direction of air flow, unit dimensions, and field duct connection.
6. Provide four (4) copies of fan curves with specified operating point clearly plotted. Fan curves shall indicate air volume, static pressure, fan speed and brake horsepower.
7. Submit four (4) copies of OM (Operation and Maintenance) data according to provisions of UAB Facilities Standards No. 15950, 15951 and 15952. Included in the data shall be instructions for lubrication, filter replacement, motor and drive replacement, belt tension adjustment and wiring diagrams.
8. Commissioning of unit cannot be finalized until all equipment parts are functioning in accordance to design criteria and until all documents required under this standard have been received and reviewed.

## PROCEDURES

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1. Units shall not be operated for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test-run under observation.

#### DELIVERY, STORAGE, AND HANDLING

1. Products shall be delivered to the site according to provisions of UAB Facilities Standard No. 00821. Units shall be shipped fully assembled on factory-installed base rails up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and air flow arrows on each section to indicate location and orientation of airflow direction. Each section shall have lifting lugs or shipping skid to allow for field rigging and final placement of section. Factory representative shall be available, if needed, to provide assembling instructions.

#### INSTALLATION

1. AHU shall be located in sufficient space to allow for coil removal and service of unit. Where sufficient clearance is not provided to allow for removal of coils, access doors will be installed in walls. This will be coordinated between Design Engineer and Architect.
2. All chilled water coils will be piped to ensure counter flow operation.
3. Duct take-off on supply air side of AHU shall be connected in air flow direction to ensure no backflow on fan blower. The best application of such duct connections shall be provided by AHU manufacturer.
4. Duct take-off on return/fresh air side of AHU shall be connected and configured to ensure the blending of the fresh and return air. Stratification of air at the coils shall be avoided to prevent freezing problems.

#### END OF STANDARD

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