

## AIR HANDLING UNITS

### DESIGN GUIDELINES

1. Summary
2. Design
  - a. AHUs serving critical spaces such as BSL3, Vivarium's and other Animal holding spaces shall have redundancy by crosstie of two AHUs with isolation dampers or equal approved by facilities.
  - b. Maximum capacity of a single air handler shall be no more than 50,000cfm. Several smaller units will provide some redundancy. Coordinate quantity of AHUs on each project for redundancy requirements.
  - c. Multiple fans shall be included in AHUs serving Animal holding, Vivarium's or other critical spaces.
  - d. Units shall be draw through arrangement. Blow thru arrangements are not allowable.
  - e. Coils
    - Chilled water coils shall not be less than 6 rows and not more than 8.
    - Chilled water coils shall be sized for maximum 55°F temperature leaving the AHU on a design day.
    - Where mixed air temperature is less than 35°F, provide preheat coils with glycol hot water. Integral face and bypass coils are not preferred since they have had maintenance issues with dampers failing over time.
    - Use of ethylene glycol is not permitted as an anti-freeze agent. Propylene glycol shall be used where needed. See Cleaning of piping systems for additional information.
    - Each coil shall have a minimum of 24" upstream and downstream access for Inspection and cleaning.
    - Layout shall be arranged to facilitate air handling maintenance including coil cleaning, coil replacement and filter replacement. Where coil connection sizes are smaller/larger than the line sizes associated with the system piping, a reducer/increaser shall be Installed Immediately at the coil flanges to adapt to the indicated line size. All specialties and service valves associated with the coil piping shall be line size, and not coil connection size.
    - Cooling coil face velocity shall not exceed 450 fpm.
    - Piping design shall locate flanges/unions and service valves to allow removing the coil by removing a minimal amount of piping.
    - Piping at coils shall be labeled on AHUs. Piping and piping connections shall be labeled so that coils are piped correctly. Details shall be provided on drawings for coil connection details. Coils have been piped backwards by accident.
    - Coil connection details on the drawings shall include mechanical joints or unions located in piping so that coil can be easily pulled in the future for replacement.
    - Provide differential pressure magnahelic gauges and sensors for each coil section.

- f. Where room air can be returned back to the air handler, provide a dedicated return or relief air fan for each air handling unit. Provide controls of supply and return fan with DDC controls. See DDC Controls section.
- g. Limit inlet, discharge and casing radiated noise with maximum NC values in occupied spaces of NC35.
- h. Provide general and special exhaust fans interlocked with AHU supply air fan. Multiple fans may be interlocked with one supply fan. BSL3 spaces or other pressure sensitive areas are exception to this. Refer to BSL3 guideline. If shutting down exhaust fans affect pressure sensitive spaces, other design considerations to be included.
- i. On the drawings indicate the required service clearance, including coil replacement pull space, filter replacement pull space, fan/motor replacement pull space, and access to an inspection doors and maintenance points.
  - Door swings shall be indicated on drawings for clearance coordination.
- j. The designer shall locate the equipment such that it can be replaced at the end of its life without removing building structural components.(i.e. provide area ways, louvers, removable panels, doors, etc.)
- k. Internal Lights
  - Provide 4 foot long lights in each section.
  - Provide LED lighting rated for temperature of section.
  - Incandescent lights are not allowable.
- l. Humidifiers
  - Provide Humidifiers on Vivarium's and Data Centers.
  - Other AHU humidification requirements to be assessed on a project basis and used only when requested by the Owner.
- m. Filters. See Air Filtration section
  - 24" x 24" filter sizes are preferred to reduce stock.
  - Use external filter section when necessary.
  - Face velocity shall not exceed 500 fpm.
  - Filtration for Academic, Office, and Residential buildings shall meet the general purpose air handling applications.
  - Provide differential pressure magnahelic gauges and sensors for each filter section.
- n. Designer shall calculate the condensate trap height for each unit, indicate additional supporting steel where condensate trap height is greater than the height available from the unit base rails and housekeeping pad.
  - AHUs shall be raised up enough to obtain adequate static head for the installation of cooling coil condensate traps.
  - Condensate drain shall have a vented trap with a union on each side of the trap.
- o. Energy Recovery Wheels – see Heat Exchanges - Airside

- p. Provide blender section where warranted to mix the return and outside air and prevent stratification. Blender with good mixing to eliminate freeze stat nuisance trip.
  - q. Freezestat shall have remote manual reset mounted in an accessible location coordinated with facilities.
  - r. Evaporative coolers are not allowable.
  - s. All 120v wiring shall be in conduit, MC cable or seal tight.
3. Specifications
- a. Specify that the manufacturer shall use the most energy efficient fan option within the manufacturer's line for the unit size but in no case will the wheel be smaller than the diameters scheduled.
  - b. Specify that water coil connections are copper or brass.
  - c. Warranty shall be specified to be included from time of substantial completion of project and not at AHU startup.
4. Related Sections
- a. HVAC Fans - General
  - b. HVAC Fans - Laboratory
  - c. Air Filtration
  - d. Heat Exchanges – Airside

#### EQUIPMENT and PRODUCT REQUIREMENTS

1. Approved Manufacturers
- a. Packaged - Trane, Johnson Controls, Carrier, Daiken
  - b. Custom – (In order of preference)
    - Air Enterprise
    - Buffalo, Webco, Marcraft
  - c. Energy Recovery Wheels – SEMCO (see Heat Exchangers – Airside)
2. Units shall have the following minimum characteristics:
- a. Insulated, double wall with material selected based on project type. Stainless steel interior liner required in wet sections. Perforate liner is not allowable.
  - b. AHU Casing shall be foam injected with a thermal insulation value to prevent condensation on the exterior surface of the unit. Minimum insulation values shall also meet the latest energy code requirements. Bottom of casing shall be insulated similar to sides and top of unit.
  - c. Fans. See also HVAC fan section.
    - Air foil or backward Inclined fans.
    - Plenum fans or centrifugal fans.

- Plenum fans shall be direct drive.
  - Fan arrays are acceptable in air handlers. Provide motorized shutoff damper on each fan where multiple fans are included. Provide a minimum of two variable frequency drives on fan arrays.
  - All fan sections shall include protection with a guard or other means for safety. Label section and guard to read, "Caution if guard is removed, rotating equipment inside."
  - Fan guards shall not inhibit the airflow and shall be certified from the factory for the design airflow with the guards included.
  - Provide internal seismic isolation for fans.
  - Stainless steel fan shafts in units larger than 15,000 cfm.
- d. Motors. See motor section.
- NEMA premium efficiency motor, inverter rated motor for use with VSD.
  - ECM motors are not acceptable.
  - Provide structural internal support for motor replacement capability of any motors above 10 HP.
  - NEMA starters, if furnished with unit.
  - Units that have supply and/or return fan motor(s) of 25 HP or greater that utilize V belt drive systems shall utilize PolyChain Belts from Gates.
- e. Coils
- Coils -1/2" diameter x .020" wall thickness copper tubes and .0075" aluminum or copper fins spaced not closer than 10 per Inch. Coil fins shall be flat type. Wave type fins are not allowable due to the difficulty of cleaning.
  - Stainless steel cooling coil casing
  - Stainless steel drain pans, IAQ double pitched
  - Intermediate drain pans for stacked cooling coils
  - Stacked coils shall have Independent coil frames
  - Heating coil control valves shall have their actuators mounted on 45-90degree angle to avoid overheating. See also temperature controls guideline.
  - Coil piping connections shall be labeled from the factory on the AHU casing.
- f. Hinged access doors with quarter tum handles
- Doors shall open against pressure in the casing.
  - Door handles shall be heavy duty and operable from both outside and inside of unit.
3. Large roof mounted equipment shall have the following additional characteristics
- a. Walk-In sections or service vestibule
  - b. Rain gutters
  - c. Electrical receptacles

- d. Condensate Piping
- Piping shall be copper. PVC is not acceptable.
  - Route to the nearest roof or floor drain.
  - Condensate piping shall be gravity fed with cleanouts at turns in direction.
  - Do not spill condensate onto roof.
  - Condensate piping from humidifier that drains on roof shall have heat tracing.
  - AHUs above ceilings may have condensate drain piping terminate at a indirect hub drain with visible access panel.
  - Condensate piping shall have a union prior to elbow at floor drain for access to floor drain for cleaning.
- e. Rooftop air handling unit installation, where permitted, shall address and resolve coordination issues, including but not limited to:
- Structural integrity of the roof to bear the load
  - Access for repairs, removal, and replacement of equipment
  - Screening needs to meet local ordinances
  - Walking pads to reach equipment
  - Minimize exposed piping on the roof and install underneath the unit wherever possible.
  - Vibration and Noise generated from the equipment.

END OF SECTION

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