

1. DESIGN STANDARD:

- 1.1 The design professional must review system types to be employed with the Rice University's Project Manager. This will be done during the Schematic Design and Design Development Phases of each project.
- 1.2 In general the following system types may be employed in typical applications.
 - 1.2.1 Classrooms - Single zone fan coil units (one zone per classroom); single duct VAV; double duct VAV terminals; bypass multizone air units.
 - 1.2.2 Dormitories - Single zone fan coil units (one per residential unit). Systems that return air from multiple residences should be avoided.
 - 1.2.3 Science Labs - Single zone air unit per lab with separate pressurization control air unit. Central outside air make up unit with VAV pressurization/temperature control for each lab.
 - 1.2.4 Libraries - Single duct VAV terminals in thermostatic zones; Double duct VAV terminals; Bypass multizone with separate outside air pressurization unit(s).
 - 1.2.5 Offices - Same as libraries. Thermostatic zones should be arranged by exposure and common heat gain/loss. (Approximately three offices per thermostat/zone).
 - 1.2.6 Residential Dwellings - Single zone DX air units with suitable zone control for the application. Master houses provide separate zones for 1st floor and 2nd floor.
 - 1.2.7 Equipment Areas (Electrical, telephone, elevator equipment, IT rooms) - Use separate fan coil or air unit serving each space or supply ventilation systems. These spaces will normally be required to operate 24-7.
 - 1.2.8 Computer Rooms: Packaged Computer Room Air Units (PCRU's) Units may include electric infrared reheat, electric humidifiers, high efficiency filters, stand alone or site wide controls, ZN redundant cooling coils (chilled water primary with direct expansion back-up), N + 1 air system redundancy. Verify temperature humidity and redundancy criteria with the Rice University's Project Manager.
 - 1.2.9 Cross zoning is not acceptable under any circumstances. Careful consideration should be given to zoning offices with high heat load rooms. Conference rooms must be provided their own zone and thermostat control.
- 1.3 Reheat systems are to be avoided. Do not use electric reheat except as approved by the Rice University's Project Manager for Humidity Control. Reheat in other than critical laboratories must be approved by the Rice University's Project Manager and allowed by

Energy Code.

- 1.4 If reheat is to be employed for humidity control, the air system must be capable of 50% reduction in air flow prior to application of heat. Humidity sensors should control cooling output as an extension of the cooling cycle. Do not open cooling coil valves fully on first humidity control demand. Cooling coil discharge temperature will be limited to 55°F in dehumidification cycle.
- 1.5 Do not use multizone units with hot deck and cold deck controls. Bypass multizone units may be employed if the cold deck damper is fully closed before zone heat is applied.
- 1.6 Separate ventilation control using 100% outside air units are preferred in many system types.
 - 1.6.1 If bypass multizone, double duct, individual fan coil units or other systems that do not promote dehumidification of the supply air stream are employed, the outside air must be conditioned by a separate cooling/heating air unit.
 - 1.6.2 Heat recovery or other means of dehumidification efficiency must be employed on 100% outside air units. Ref: IECC.
 - 1.6.3 Hot water heating is preferred. However, steam coils may be employed on outside air units for pre-heat when approved by the Rice University's Project Manager.
- 1.7 Fan powered or side pocket fan VAV terminals are not desired. If approved for use by the Rice University's Project Manager, the secondary (plenum) air must be filtered or ducted to the space.
- 1.8 Double duct VAV must employ hot deck reset. Constant volume mixing boxes must be employed only in specialized areas where pressure to the space is critical and must be approved by the Rice University's Project Manager.
 - 1.8.1 Double fan units operated as separate VAV units for hot and cold deck supply air are preferred. If a single fan is to control pressure in both hot and cold deck, suitable logic must be employed to prevent over pressurization of the separate duct systems. (Cool-down/Warm-up/and seasonal operation).
 - 1.8.2 Cold deck and hot deck reset should be employed based on ambient temperature for double duct systems.
- 1.9 Outside air handling units must have automated inlet dampers which are hardwired to the freeze thermostat and motor starter. Unit will have freeze stat, preheat temperature

sensor, cooling coil discharge temperature sensor and reheat coil discharge temperature sensor. All points to be alarmable. Dampers will provide feedback proof of open to start fan. Temperatures will be re-settable based on outside air conditions.

2 PRODUCT STANDARD

- 2.1 Air handling units and terminal unit design should promote good indoor air quality.
- 2.2 Internally insulated air units and terminal units should be constructed as double wall systems with fully cleanable internal surfaces. Terminals and fan coil units may be internally lined with “fiber free” rubber insulation.
- 2.3 Where multiple coils are used in air units, ensure that 24" minimum access section is employed between coils. Each side of coils will be accessible through hinged doors
- 2.4 Coil drain pans will be sloped to coil drains for cooling coils.
- 2.5 Heating coils, humidifiers and the like should include drain pans in base of unit.
- 2.6 U.V. lights and other forms of source control of mildew should be typically provided.
- 2.7 The following standards for air unit design should be employed:
 - 2.7.1 Cooling coil casings and tube sheet supports should be stainless steel.
 - 2.7.2 Depth of coil and fin spacing must be selected such that coils are cleanable. (8 row max/10 fpi).
 - 2.7.3 Tube velocity and circuiting should be selected to promote turbulent flow at 25% design flow.
 - 2.7.4 Casing should be supported by structural steel rails.
 - 2.7.5 Drain pans will be welded Stainless Steel. Provide overflow switch in pan.
- 2.8 Floor of units wider than sixty inches should be reinforced for “walk-in” accessibility. Access space between coils should be increased based on unit width. “True walk-in” units should have lights and receptacles. All access must be through hinged doors. True walk-in units will be constructed of 10 gauge metal.
- 2.9 Air units designed for exterior or ventilated mechanical room applications must have “no through metal” design to prevent condensation on unit exterior.
- 2.10 Unit structure must be un-effected when the coil or modular section is removed.
- 2.11 Filters must be suitable for the application. 30% efficiency based on ASHRAE standard 52 is minimum. (Except for residential units).

- 2.12 Fan coil unit construction standards should be as follows:
 - 2.12.1 Except for residential units, fan static pressure must allow for 0.3 inches W.G. loading of filter.
 - 2.12.2 Filter access should be hinged. Filter rack must accept filters with adequate retention to minimize bypass air.
 - 2.12.3 Removable access panels should have fasteners retained with the panel.
 - 2.12.4 Cooling and heating must be separate coils slabs. One common coil with chilled and hot water circuits are not acceptable.
 - 2.12.5 Dual wall units preferred. "Fiber free" internal insulation with Armaflex rubber insulation may be acceptable.
 - 2.12.6 Casing should be galvanized or painted furniture steel.
 - 2.12.7 Designer should work with Rice University's Project Manager to determine whether unit should be belt drive.

- 3. PERFORMANCE STANDARDS:
 - 3.1 Outside air units will have dampers upstream of coiling coils. On remodels, add dampers where space allows.
 - 3.2 Adequate service access to be provided and approved by University's Project Manager. Specify retainable fasteners.
 - 3.3 Specify safety guards for externally mounted motors.