

Last Update: July 1, 2009

A. Standards

1. When designing building systems the most recent version of applicable ASHRAE standards should be followed and the criteria in them must be met or exceeded. The University guidelines outlined in this Handbook are designed to compliment, not replace, industry standards. Specific ASHRAE standards that apply include:
  - a) Standard 55 "Thermal Environmental Conditions for Human Occupancy"
  - b) Standard 62.1 "Ventilation for Acceptable Indoor Air Quality"
  - c) Standard 90.1 "Energy Standard for Buildings Except Low-Rise Residential Buildings"

B. Perimeter Radiation and the 'Cold Wall Effect'

1. Classrooms, laboratories, hallways, etc. typically do not require perimeter radiation
2. Offices, meeting rooms, etc. typically do require perimeter radiation. This radiation should be on independent piping circuits (based on building orientation) so the water temperature can be lower than the VAV reheat coil temperature.

C. Ceiling Plenums:

1. All supply and return ducts are to be solidly connected to the diffusion product.

D. Positive Building Pressure:

1. Provide for sufficient OA intake and appropriate controls to maintain the building at an appropriate positive static pressure.

E. Stairway Dehumidification:

1. Stairways must have temperature and humidity control, preferably using a dedicated AHU. If fan coil units are used they must have the heating coil in the reheat position with a dehumidification control sequence and cannot be used to bring in OA.
2. Stairways must be slightly pressurized with respect to the outside. This may be able to be accomplished by allowing the relief air from the positively pressurized building to exit through the stairs.

F. Space and OA Design Temperature & Humidity:

1. Most rooms will have the desired conditions outlined in the Architectural Program. If not covered in the Program then the guidelines delineated in ASHRAE 55 are to be used.

G. Guaranteed OA Flow:

1. For all systems there must be some way to guarantee minimum OA flows. Systems we have used successfully include:
  - a) Dedicated OA Air Handler: This unit can provide the entire minimum OA required by multiple

- air handlers. This unit can also fully dehumidify and filter that air, thus making the main air handlers sensible cooling only which can provide significant energy savings.
- b) Dedicated OA Fan: A constant volume OA fan could blow into the mixed air plenum during the occupied cycle. A building pressure sensor would modulate the relief air damper.
  - c) Dedicated Exhaust Fans: A constant volume exhaust fan sized for the minimum OA flow can be used so the AHU is always pulling in the appropriate CFM. The caution here is that you also need to maintain the building at a positive pressure.
  - d) Flow Monitoring / Measuring Station: Flow measuring stations have demonstrated poor performance for us in the past and will receive approval only with strong engineering design substantiation. Full commissioning of device by factory representative is required at start-up, at 6-months, and at 12-months.
  - e) CO2 Demand Controlled Ventilation: This method is acceptable for applications with a single zone for one air handler such as large auditoriums or classrooms.

**Comments:**

- B.2: Office occupants frequently push their desks against the outside wall creating a 'dead spot' where their feet will freeze while sitting at the desk, hence the need to continue with external wall radiation.*
- C.1: Do not allow supply plenums, they cause numerous problems in balancing and air distribution*
- C.1: Return plenum in interior spaces also cause balancing air distribution and moisture problems. The moisture problems are caused by the plenum having to be under a slight negative pressure, it will pull the air from all the wall cavities, not just the rooms. This has the real potential of pulling in untreated air, which will condense and cause mold and mildew problems.*
- C.1: The key is to keep the building pressurized and allow for air transfer to above a ceiling. A good example is the Food Science building. There were small holes in the exterior wall, allowing moisture to enter the above ceiling space. The moisture condensed on all the ductwork, dripped on the ceiling and made a mess. The solution was to pressurize the building and get a little air movement above the ceiling.*
- D.1: The goal is for all of our buildings to have a slightly positive static pressure which prevents numerous IAQ problems. There is no industry wide consensus as to the amount of negative static pressure but we have found 0.01" to 0.05" to work well.*
- E.1: Without definitive dehumidification and air movement there will likely be mildew and smell problems in a stairwell. The designers will say this isn't necessary; don't believe them*
- E.1: If the stairway doesn't have a dedicated AHU then we want air moving from the building to the outside through the stairs every time an exterior door is opened*