Mold & Moisture Control in Federal Buildings

TEGA Update - ASHRAE Winter Meeting 2004

- Why the concern?
- Measures taken to address the concern
- Why *these* measures and not others
- Suggestions for implementation

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Why the concern about moisture & mold?

- Outside GSA - Mold claims in commercial buildings between $3 and $12 billion in 2003
- Within GSA - Sometimes multimillion-dollar mold problems, often in courthouses
- GSA plans to build over 140 new courthouses in the near future
- Fact 1 - Buildings don’t fall down very often… a good thing.
- Fact 2 - More often, buildings grow mold… a bad thing.
Basic Strategy - Build robust buildings instead of fragile ones

- **1st principle: Design a dry building**
  - Architect - a building which sheds water (rather than collecting it)
  - HVAC designer - a ventilation system which dries the building (rather than adding moisture)
  - Builder - keep it dry during construction

- **2nd principle: When moisture gets in anyway… drain it out and dry it out, quickly.**
  - Architect - Walls which drain water outwards (rather than trapping it).
  - HVAC designer - HVAC system which pushes dry air into walls (rather than sucking in humid air)
  - Building manager - Keeps the walls draining and HVAC system drying (rather than ignoring maintenance)
1st - Designing a dry building

- **Architect - Keep rain off the walls**
  - Overhangs
  - Projections

- **Architect - Keep rain away from the foundation**
  - Slope the finish grading away from the building
  - Foundation drain and crushed stone under basement

- **HVAC designer - Keep humid air out**
  - Dedicated ventilation dehumidification system
  - Positive air pressure when it’s humid outdoors
2nd - Draining and drying the building

- Architect - Flashing details which drain any leaks outwards
  - Drawn in 3-d using layers, especially the corners
  - Mocked-up on-site for approval

- HVAC Designer - Gently push dry air outward through the walls
  - Positive internal pressure with dry air during humid weather
  - Neutral pressure during cold weather
The importance of dedicated ventilation dehumidification

**Miami 6-Story Office Moisture Load Estimate (lb/h)**

- People: 60 lb/h
- Ventilation (PPL): 406 lb/h
- Ventilation (VOCs): 229 lb/h
- Infiltration (Walls): 76 lb/h
- Door Activity: 76 lb/h
- Humid Products: 25.0 lb/h
- Wet Carpet: 25.0 lb/h
- Permeation (Walls): 3.5 lb/h

**TOTAL LOAD = 799 lb/h, or 96 gallons/hour**

Negative Pressure
0.3 air changes/hr

400 People
20 cfm/person
Representative peak hour ventilation moisture loads in U.S. locations
Also, outdoor moisture loads are high for MANY hours per year.
...running the ventilation DH system eliminates infiltration moisture

- **Occupied 835 lb/hr**
  - 400 people @ 20 cfm and negative pressure infiltration @ 0.3 air changes/hr (835 lb/h total load)

- **Unoccupied - Without positive pressure, 80 lbs/hr infiltration load remains**
Consequently…
Chapter 5 of the P-100 Facility Standard now requires:

- 1. Dedicated ventilation system which dries air to 50°F dew point, all the time
- 2. Positive internal air pressure until outdoor temperature falls below 37°F
- 3. 24-7 operation (at reduced air volume during unoccupied hours)
Side benefits of required mold and moisture control system:

- Simplifies and reduces cost of ventilation security
- Reduces cooling tonnage requirement in other systems
- Dedicated ductwork improves chances of ventilation air reaching the breathing zone
- Probably saves energy
  - No need to operate large, main systems to provide minimal comfort and assure IAQ for after-hour operations
  - Low dew point allows raising thermostat without sacrificing comfort
Suggestions for implementation, based on recent experience...

- **1. Understand the logic and plan your system**
  - BEFORE competing for a Federal project
    - GSA is serious about this requirement
    - Your competitor will do so if you don’t

- **2. Take advantage of side-benefits**
  - Reduce tonnage in other systems
  - Add air flow monitoring to OSA systems to document IAQ compliance and eliminate over-ventilation
  - Try raising thermostat after commissioning is complete

- **3. Talk with your architects now, rather than later...**
The HVAC designer will have to tell the architect about this requirement at some point...

- **BEFORE design competition:**
  - “Great! We’ll highlight this mold-avoidance feature during our short-list interview”

- **AFTER the design award:**
  - “Nice to have, but it won’t fit into OUR SUCCESSFUL design.”
  - “It costs too much”
  - “The floor plate is set and there’s no space”
Summary:
Let your architects know that dedicated ventilation DH systems are:

- Helpful to highlight during federal design competitions
- Excellent insurance against the effects of rain leaks or construction shortcomings
- A great way to reduce the risk of mold lawsuits and occupant concerns about IAQ and comfort
- The basis of the benchmark cost estimate... the money IS in the budget
- Required by P-100 Federal Facility Standards