

# INDOOR AIR QUALITY LEED<sup>®</sup>-NC

BUILDING ENVIRONMENTAL CONFERENCE  
OF OHIO (BECO)

Fall Conference: October 23, 2009

Presenter: Steven Rucker, Ecostratum, LLC

# To Test or Not to Test?

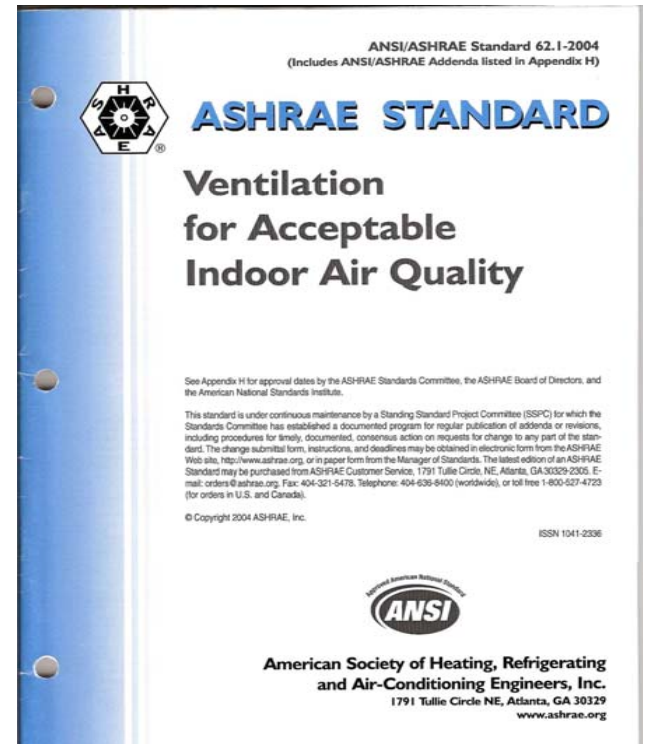


# Environmental Quality (EQ)

- Let's do our prerequisites first
- What are some really good, cost effective strategies that improve building IAQ?

# LEED EQ Prerequisite 1

**Prerequisite 1 – Comply with ASHRAE Standard 62 - 2004 ‘Ventilation for Acceptable Indoor Air Quality’, Sections 4 through 7. Naturally ventilated buildings shall comply with Section 5.1**



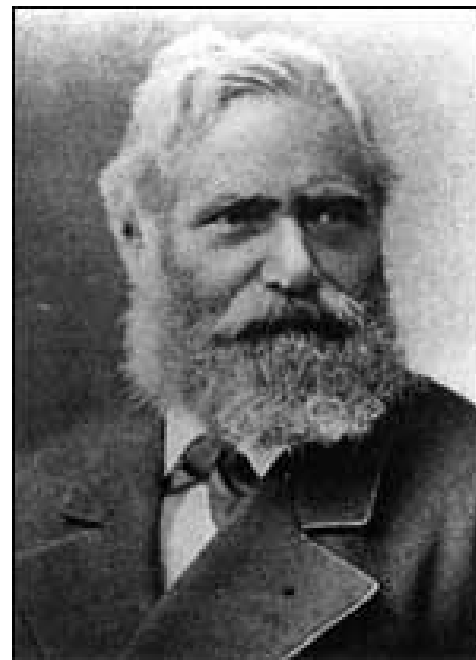
# LEED EQ Prerequisite 2

- **Prerequisite 2** –  
Prohibit smoking in the building or provide a designated smoking room designed to effectively contain, capture and remove ETS from the building



# EQ Strategies

“If there is a pile of manure in a space, do not try to remove the odor by ventilation. Remove the pile of manure.”



Max von Pettenkofer (1818-1901)

# Strategy – Source Elimination or Capture

- Environmental Quality (EQ) “Ventilation”
  - EQ Credit 5 – Design to minimize pollution cross-contamination of regularly occupied spaces
    - Vestibule design
    - Housekeeping and copy centers in a negative space
    - Separate drains for chemicals

# More Synergies - Pressure Zones

What is wrong with this picture?



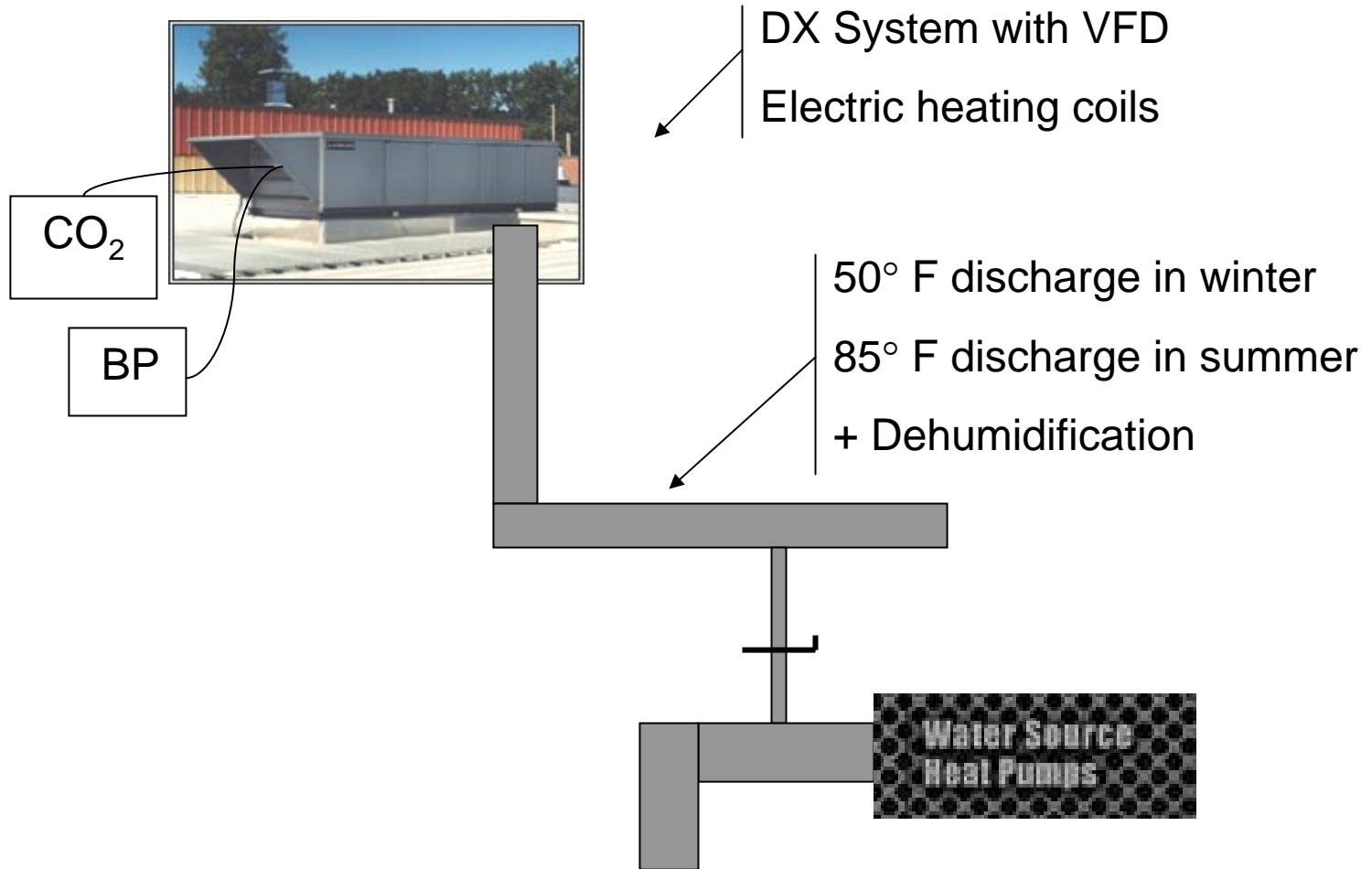
# Strategy – Carbon Monoxide Monitoring

- EQ Credit 1 – Carbon Dioxide (CO<sub>2</sub>) monitoring
  - Must be compared to outdoor levels
  - Maximum differential is equal to



$$\frac{8,600 \text{ CFM/Met} \times \text{Met level}}{\text{CFM of outside air per occupant}}$$

# Strategy – Dedicated Outdoor Air System (DOAS)

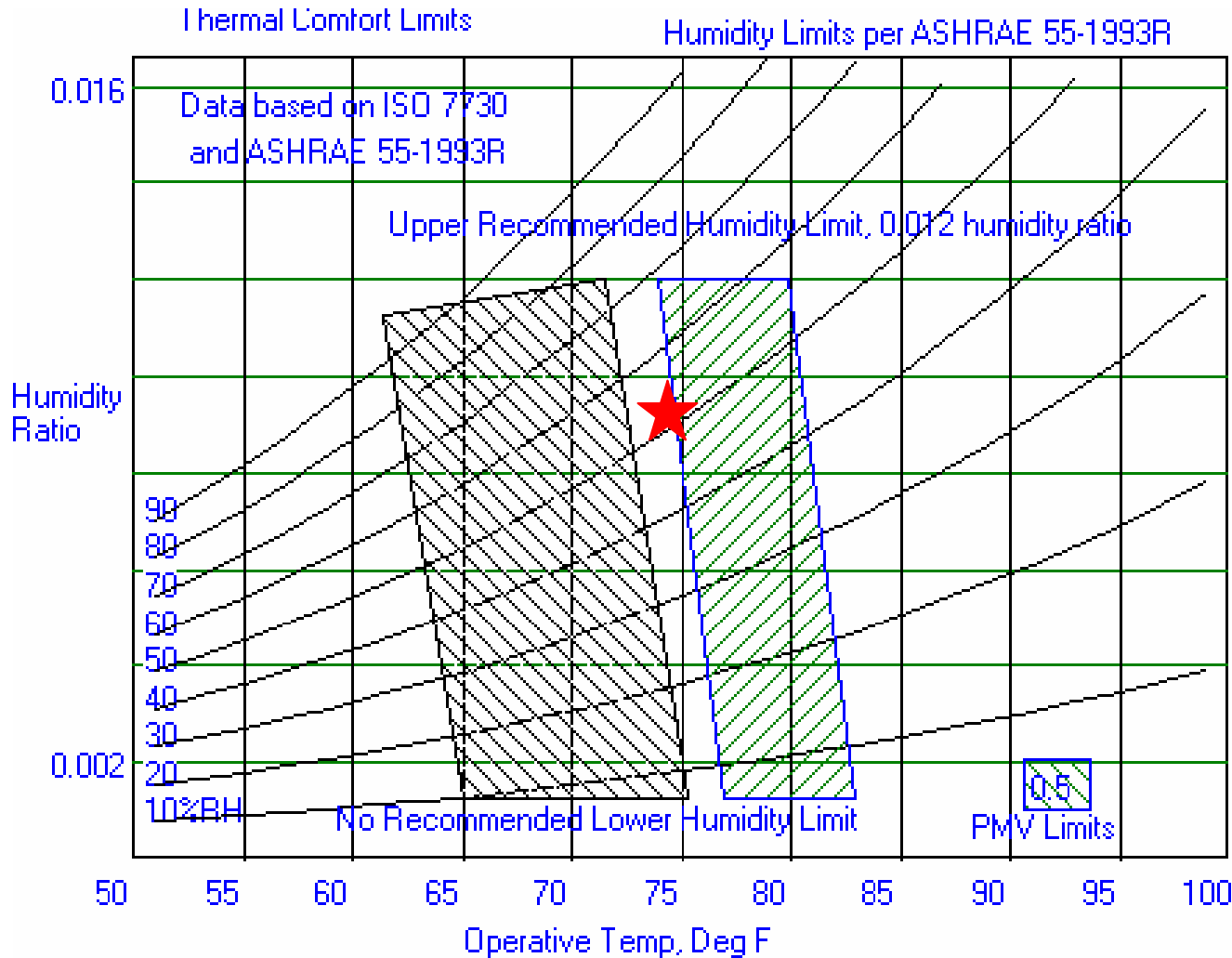


# Strategy – Thermal Comfort Design

- LEED EQ Credit 7.1
  - ASHRAE Standard 55
  - 2004, Thermal Comfort Conditions for Human Occupancy
- Warning! ASHRAE Standard 55 requires a 5° F differential within the occupied zone (i.e., discharge T of 90°F). If not achieved,  $E_v = .8$ .



# Zones with ASHRAE Standard 55



Data

Page1

Metabolic Rate  
▲ 0.9 Met ▼

Clothing Level  
▲ 0.9 Clo ▼

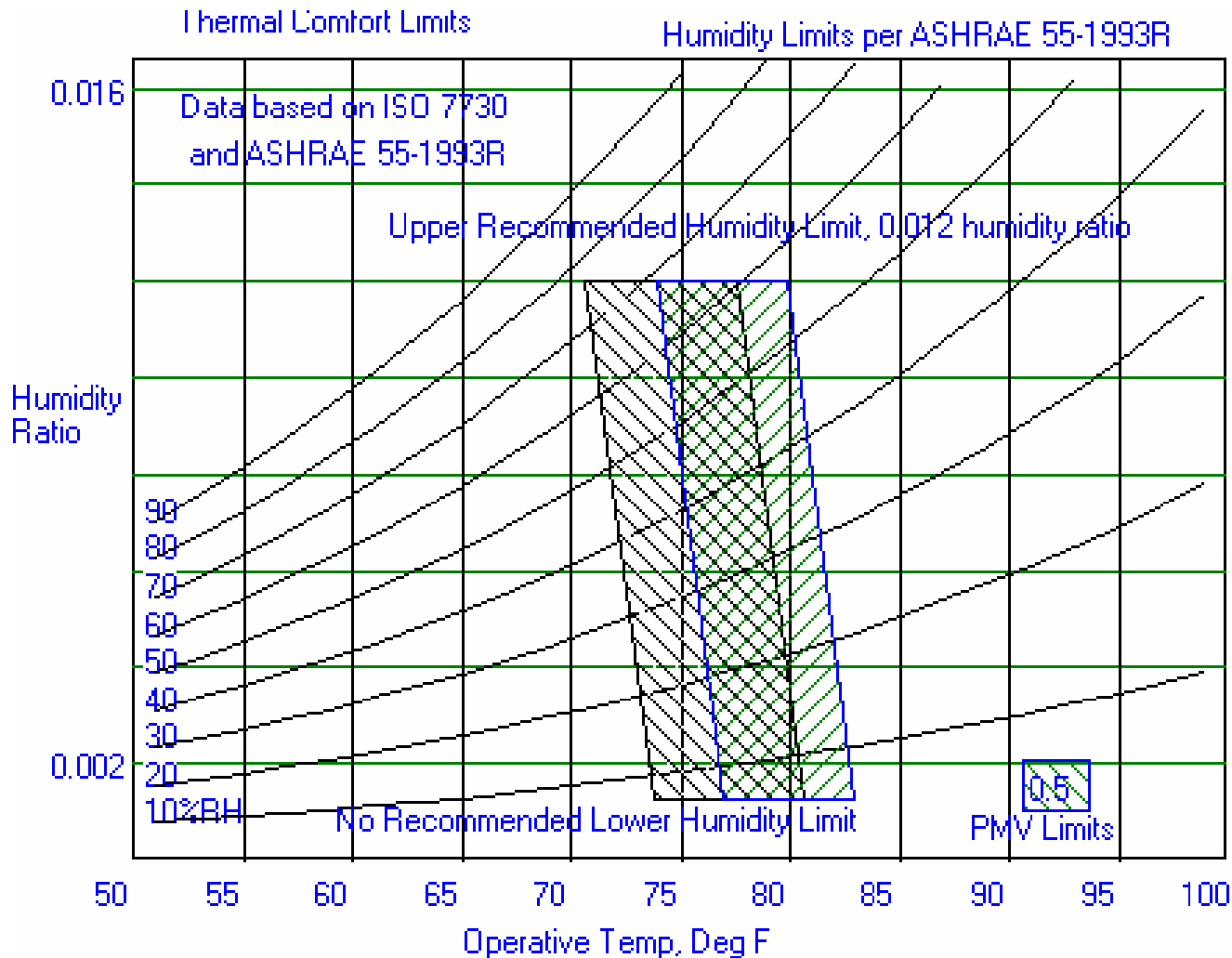
Air Speed  
▲ 20 FPM ▼

Barometric Press.  
▲ 29.9 mBar ▼

Show Clear

Data Output Defaults

# Zones with ASHRAE Standard 55



**Data** ✕

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Page1

**Metabolic Rate**  
 Met

**Clothing Level**  
 Clo

**Air Speed**  
 FPM

**Barometric Press.**  
 mBar

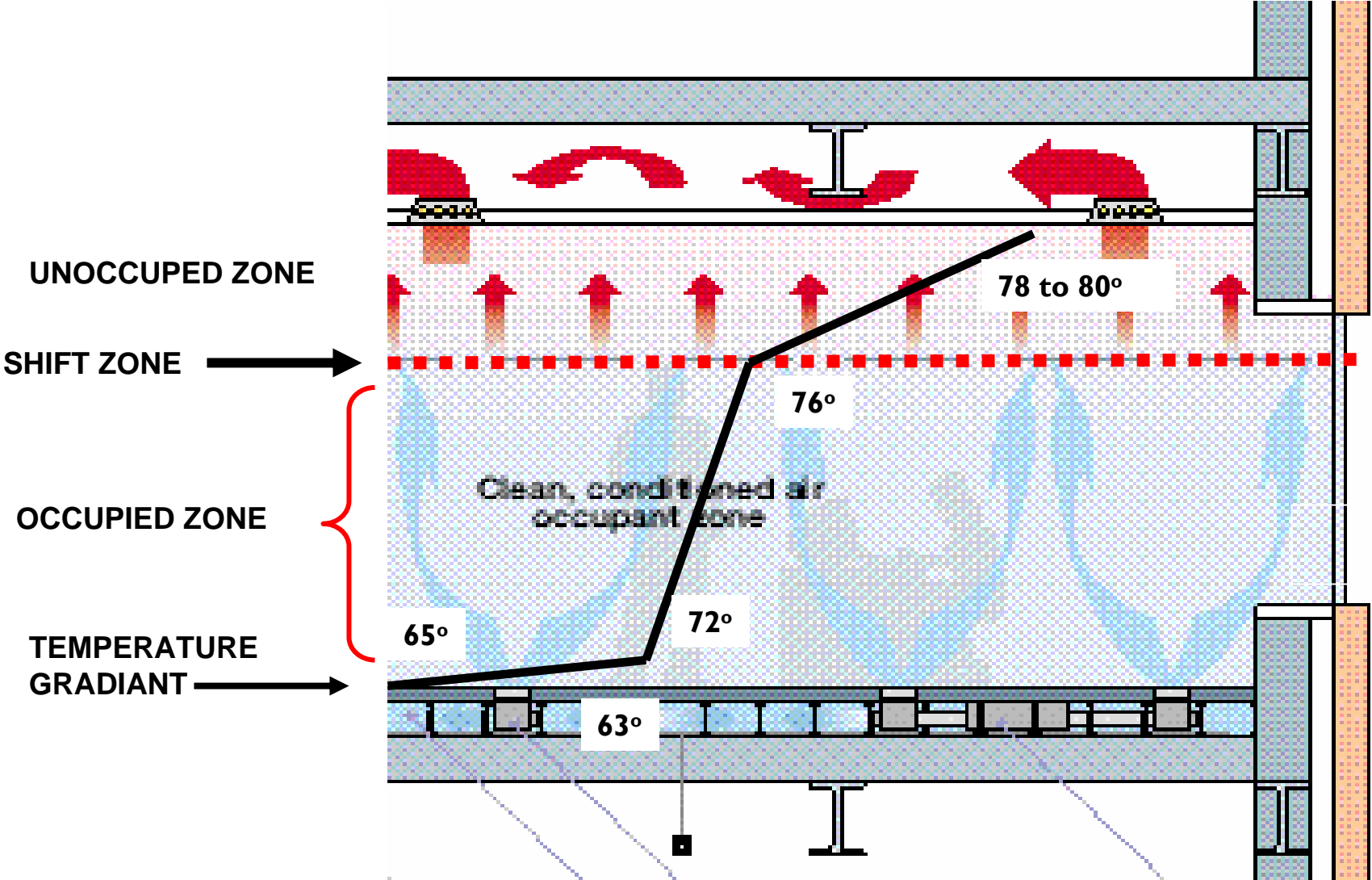
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Data / Output / Defaults

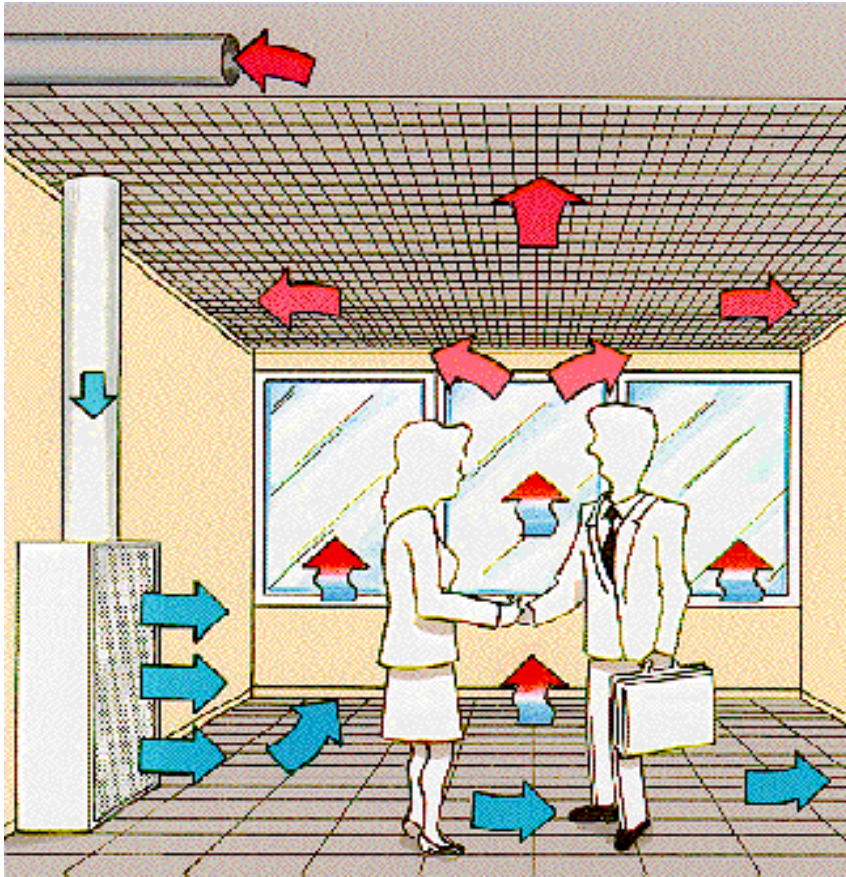
# Strategy – Increase Ventilation Effectiveness

- EQ Credit 2 Increase ventilation effectiveness
  - Increase breathing zone outdoor air ventilation rates to all spaces 30% above the minimum rates of ASHRAE 62.1-2004
- Strategies
  - Avoid supply and return in the ceilings
  - Displacement ventilation
  - Underfloor Air Distribution (UFAD)
  - Natural ventilation

# Design Principle: UFAD-HVAC Systems

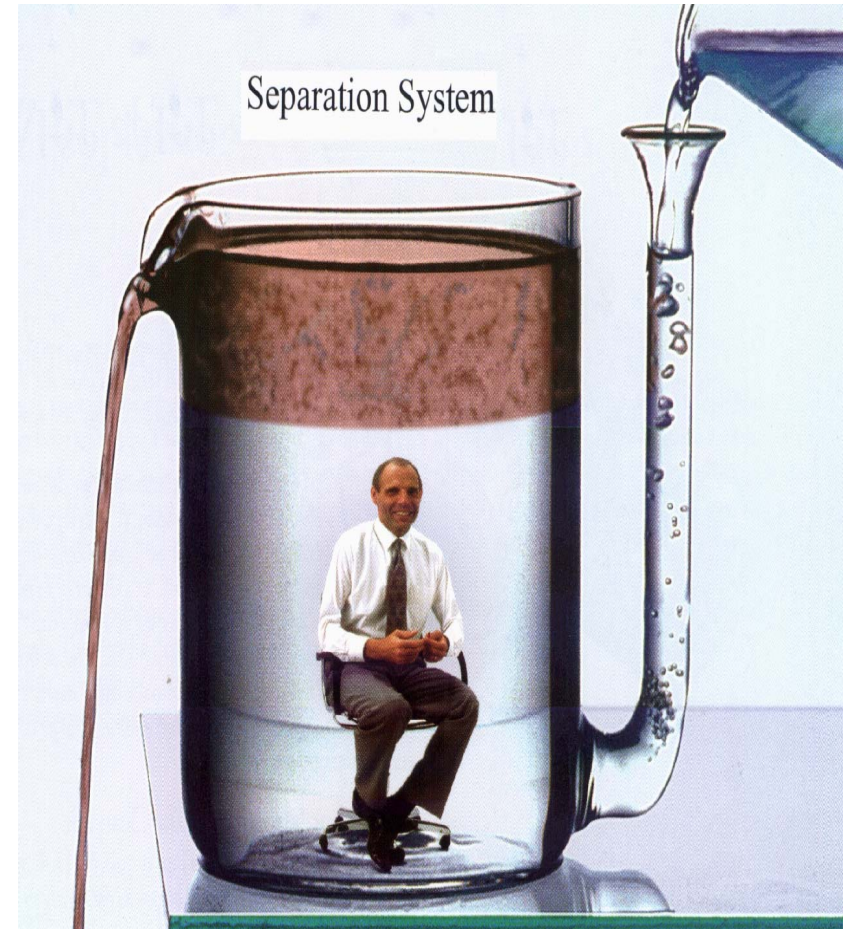


# Design Principle – Displacement System



# IAQ with Underfloor or Displacement Air Distribution

- Improved IAQ
  - No shared pollutants



# Strategy – Thermal Comfort & UFAD

- LEED EQ Credit 6.2
  - Provide comfort controls for 50% of the building occupants, and:
  - Provide comfort controls for all shared multi-occupant spaces



# Strategy – IAQ Management Plan

- EQ Credit 3.1 – Provide IAQ Management Plan
  - Meet or exceed SMACNA’s ‘Guidelines for Occupied Buildings under Construction’
  - Protect stored on-site or installed absorptive materials from moisture damage
  - Use MERV-8 filters at each return air grille if permanent air handling units are used during construction



# When Things Go Wrong

- Underfloor cooling system
- Mechanical Contractor required to certify that duct plenums were adequately protected



# When Things Go Wrong



# Conclusion

- Focus on expectations
- Search for a pool of right answers
- Look beyond the first right answer (synergies)

# Summary

- Air Testing Requirements Depend on LEED® Certification Program
- New Construction (LEED-NC), Core & Shell(LEED-CS), Commercial Interiors (LEED-CI), Schools (LEED-Schools)
- Existing Buildings (LEED-EB) Green Cleaning Policy presents possibility for validation testing.

## MESSAGE

LEED PROGRAMS EMPHASIZE

MECHANICAL SYSTEM DESIGN ELEMENTS SUCH AS SUPPLY AIR (30% OA, FLOOR VENTILATION) FITTED WITH CONTINUOUS MONITORING SENSORS (CO, CO<sub>2</sub>) AND HIGH EFFICIENCY AIR FILTRATIONS (MERV 13).

SOURCE CONTROL USING PRESSURE RELATIONSHIPS, ZONES, AND DEDICATED EXHAUST (ETS, CHEMICAL CLOSETS, GARAGES, PRINTING, LAUNDRY ECT.)

SOURCE CONTROL USING SPECIFICATIONS FOR LOW EMITTING FINISHES AND COATINGS (UREA-FORMALDEHYDE COMPOSITES, VOCS COATINGS, CARPETS)

