U.S. Department of Energy
Energy Efficiency and Renewable Energy

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An Indoor Air Quality Goal

- ***Provide Good Indoor Air Quality For: Health, Comfort, & Learning***
- By: Energy Efficient Re-design & Ongoing Maintenance

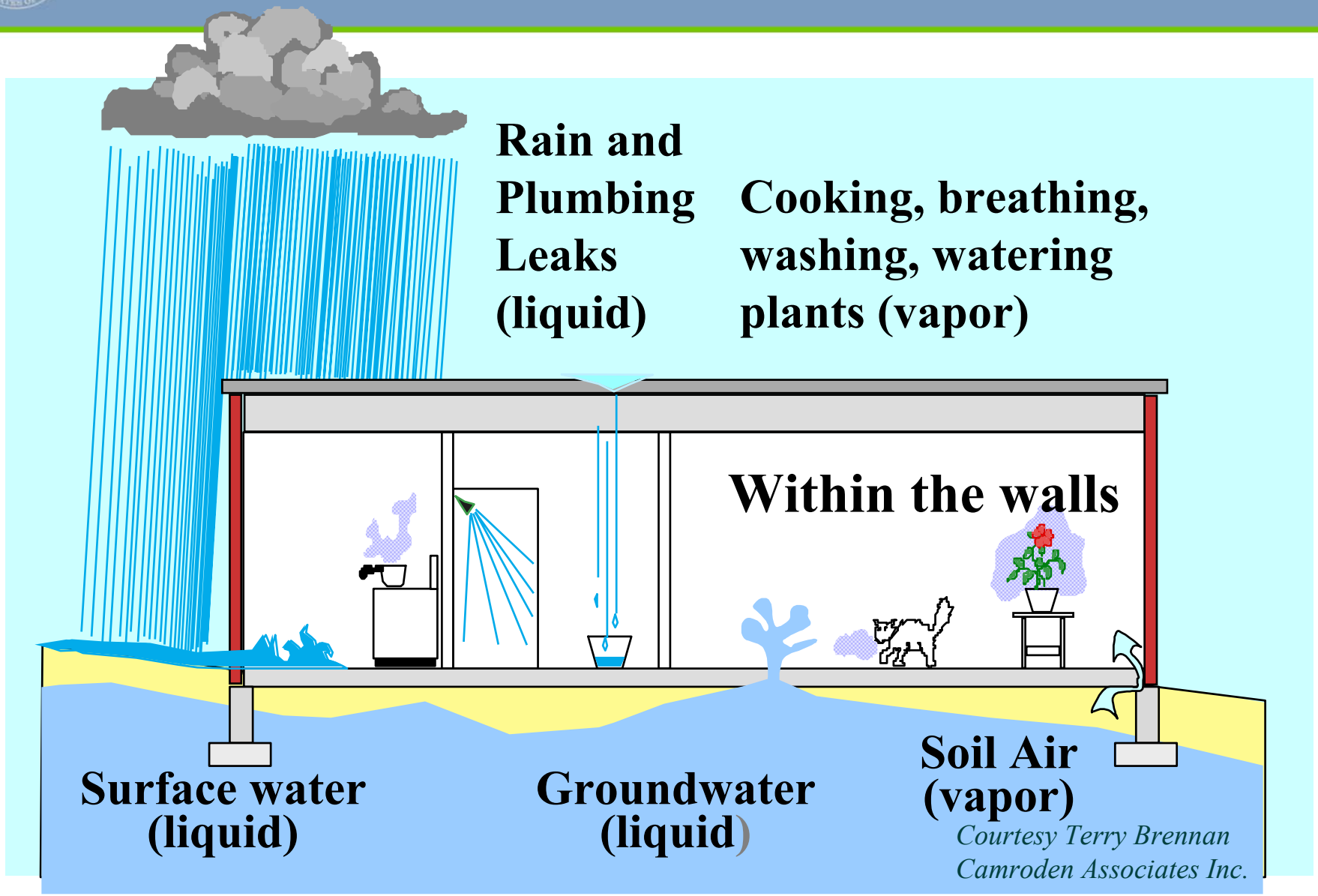
Provide Local Exhaust

It's Most Energy Efficient For Particles and Odors & Supply Balanced Conditioned Make-up Air

Manage Moisture

Capture Winter Moisture & De-humidify Summer OA

How does the water get in ?



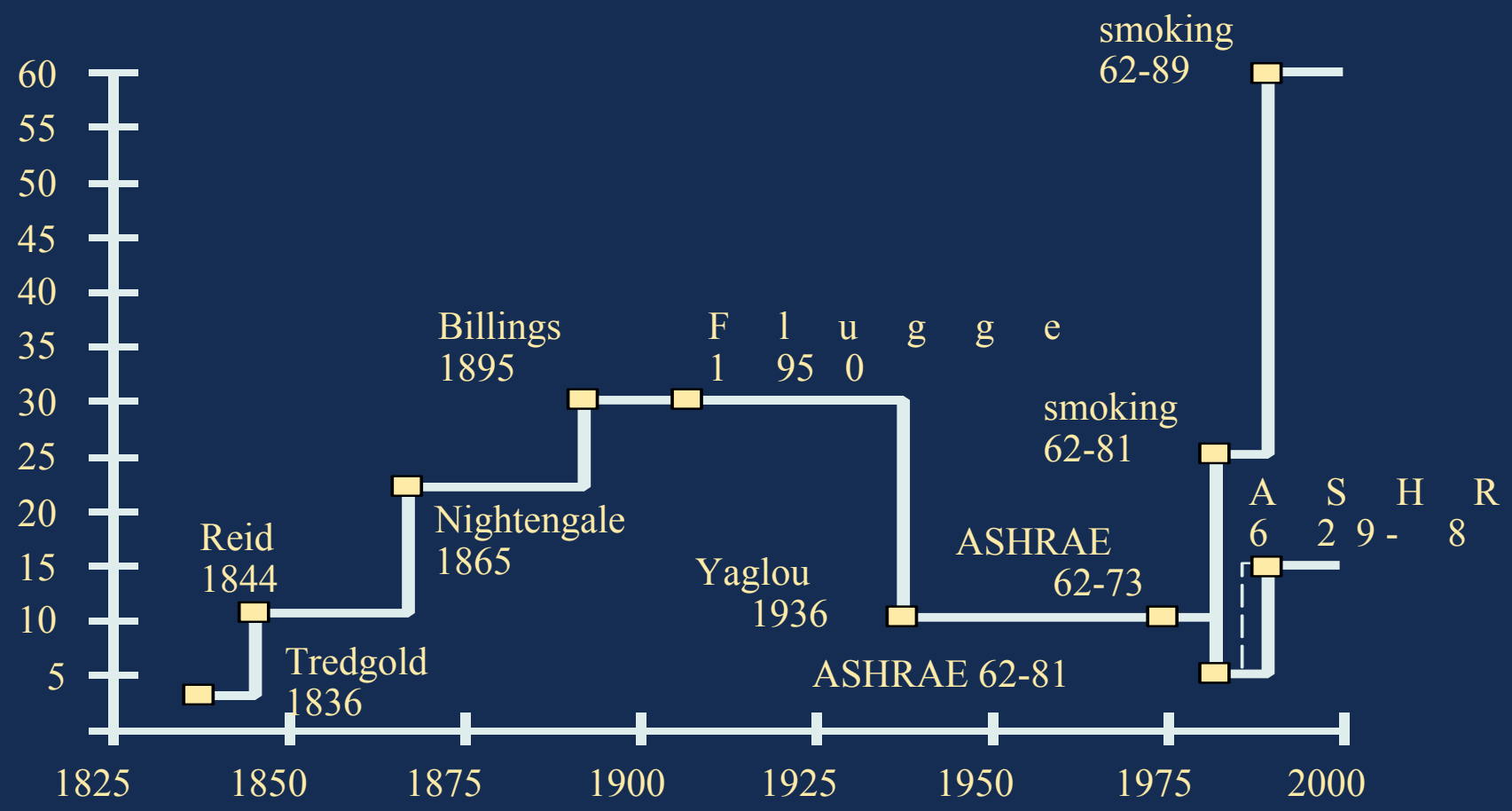
Courtesy Terry Brennan
Camroden Associates Inc.

Provide Room Control

Room / Zone Controls, No Uncomfortable Drafts / Noise

Recover Total Energy

Meet ASHRAE Guidelines (Std. 62- 99?)



Use Natural Airflow?

Fan Laws: -20% Flow => 50% less power use

- Use Variable Frequency Drives
- Use Variable Air Volume Systems
- Use Demand Control by CO2
- Consider Vertical Displacement Airflow with 100% Outside Air in Classrooms
- Consider Natural Ventilation w. High Ceilings

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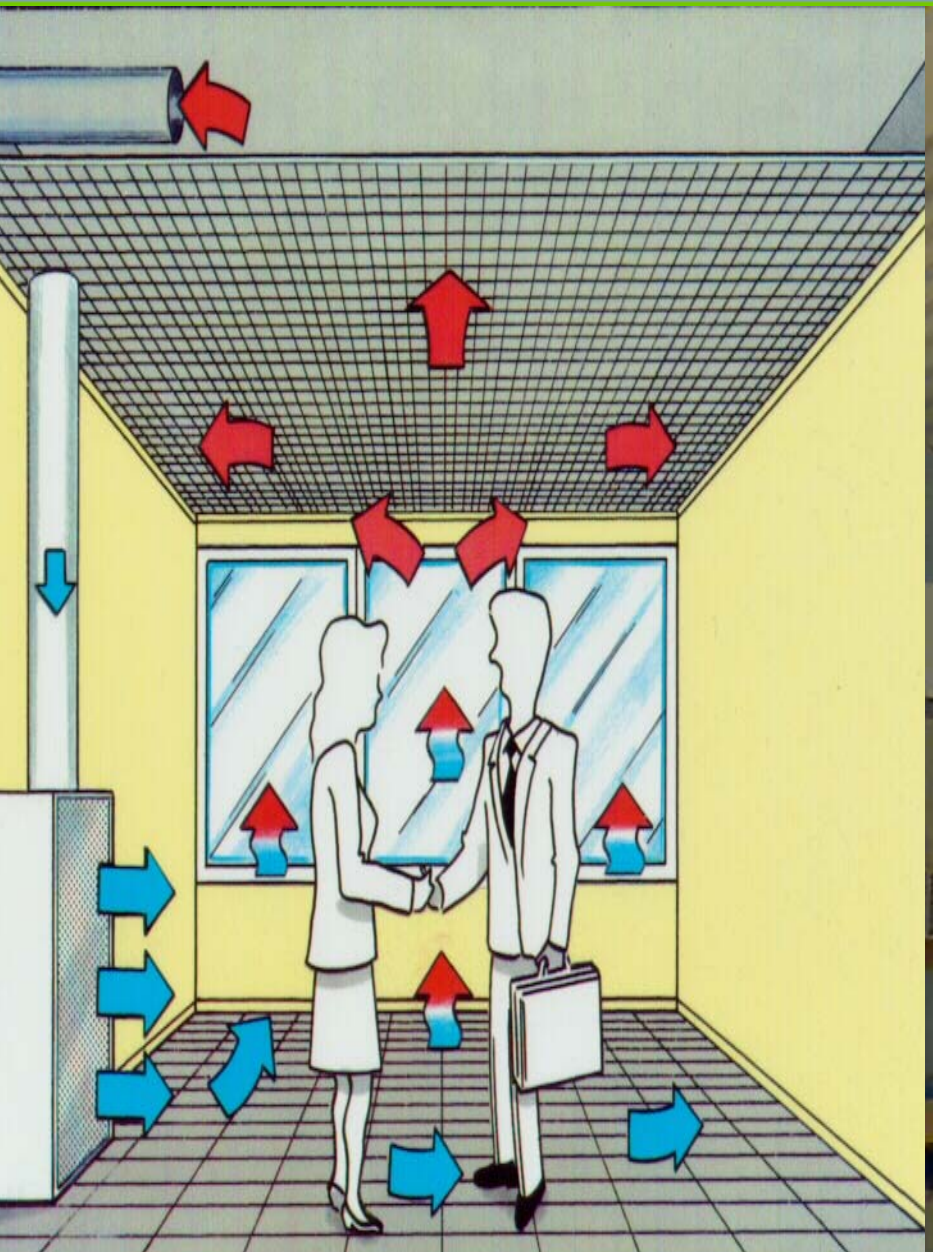
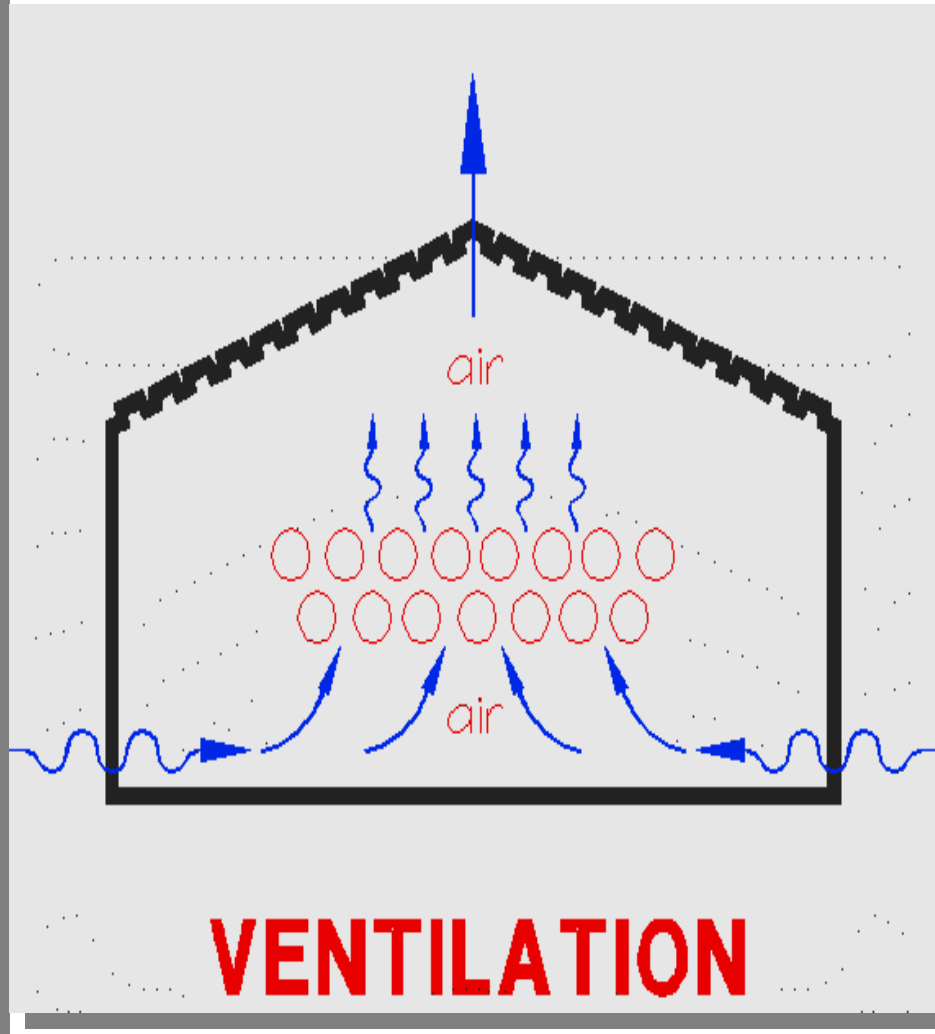
How Displacement Works

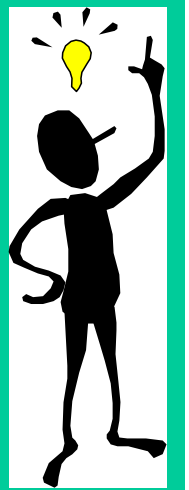


How Displacement Works



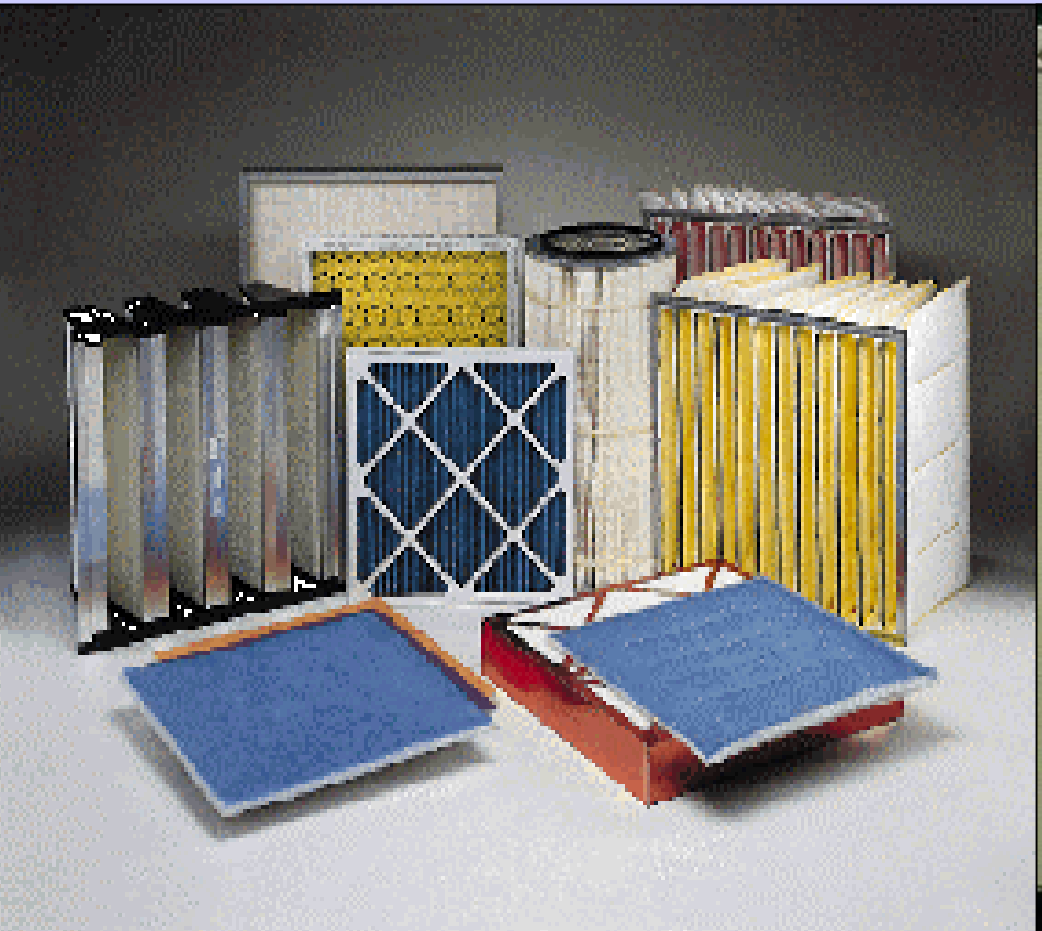
Advantages

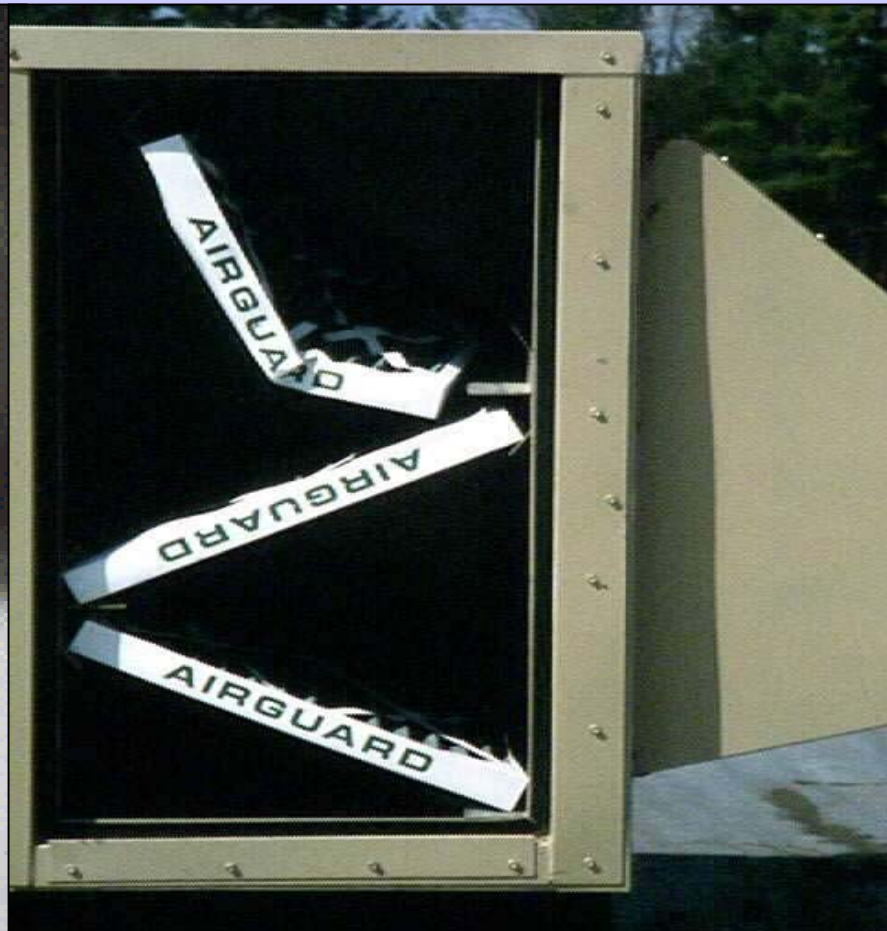
- Contaminant exposure reduction
- Improved comfort w.De-humidification
- Energy savings using Heat Recovery
- Reduction in drafts
- Reduction in noise
- Reduced size of mechanical system
- Improved air filtration
- W.100% OA Avoid distribution of pollutants



Filter Supply Air

Min. MERV 7, 2 inch Filters, (3- 4 times per year)



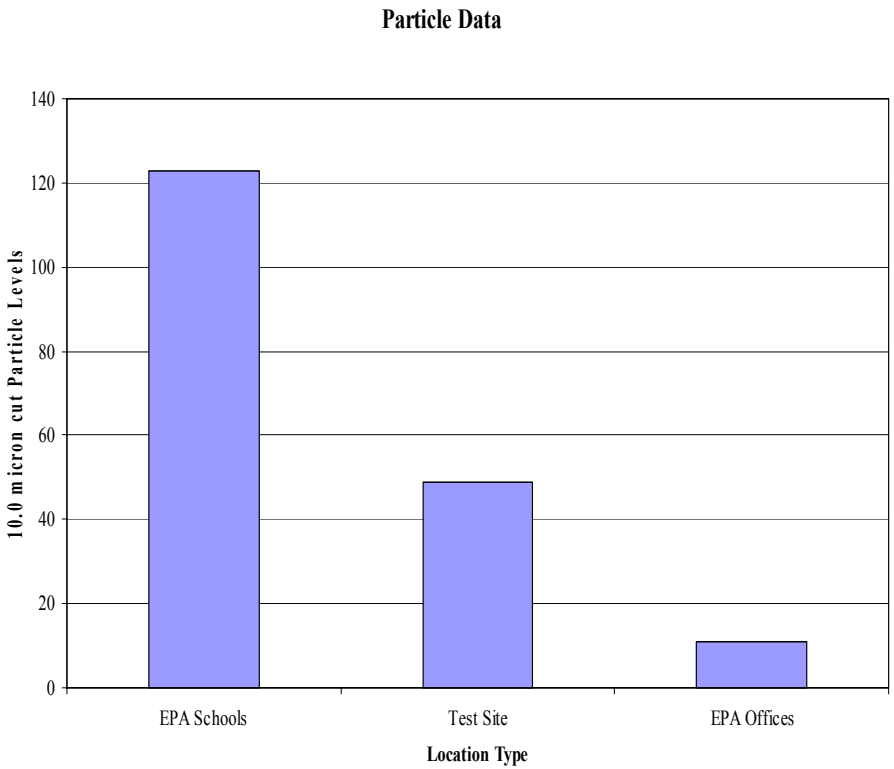


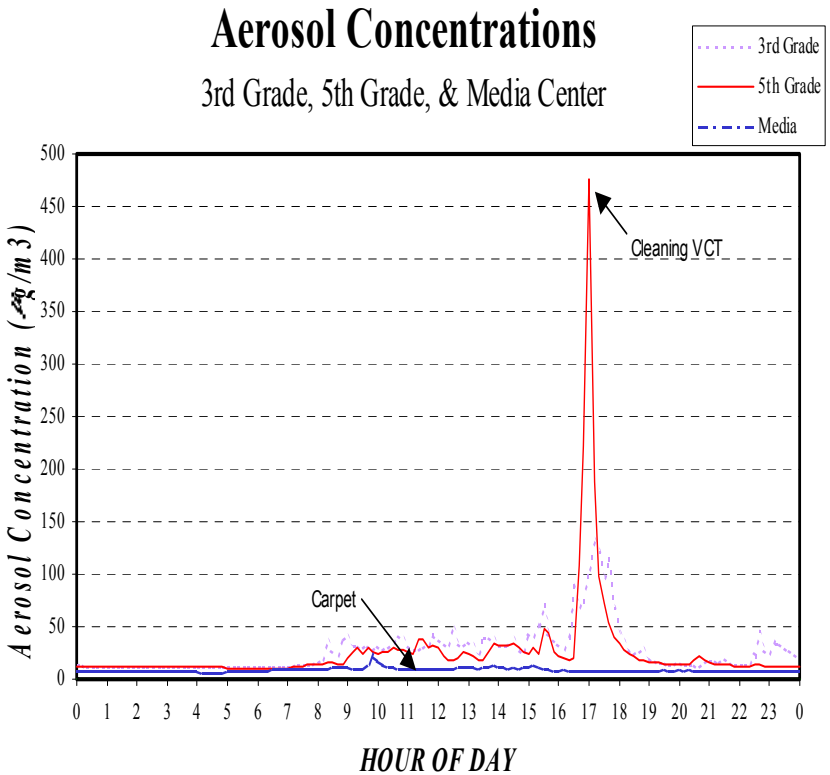
Move Beyond Unit Ventilators

● Best ◐ Good ○ Fair

	Displacement w/ Dehumidification	Conventional Mixing Central Air Handlers	Standard Unit Ventilators
Fresh Air	●	◐	○
Temperature Control	●	●	◐
Humidity Control	●	○	○
Comfort Perception	●	◐	○
Maintenance	●	●	○
Energy Cost	●	◐	○
Noise	●	◐	○
Initial Cost	◐	◐	●
Long Term Cost	●	◐	○

Clean the Floor for Health Reasons





Ex: Timberlane Schools

Plaistow,NH, six schools, 32 million $ CIP

600,000 sq. ft. of renovation

Priority: Indoor Air Quality

(15 CFM OA w. Dehumidification)

Energy Efficiency (HRV)

Enhance Learning Environment

HVAC Commissioning

Completed in 2003

Contact: Mr. Peter Taylor 603-382-6119

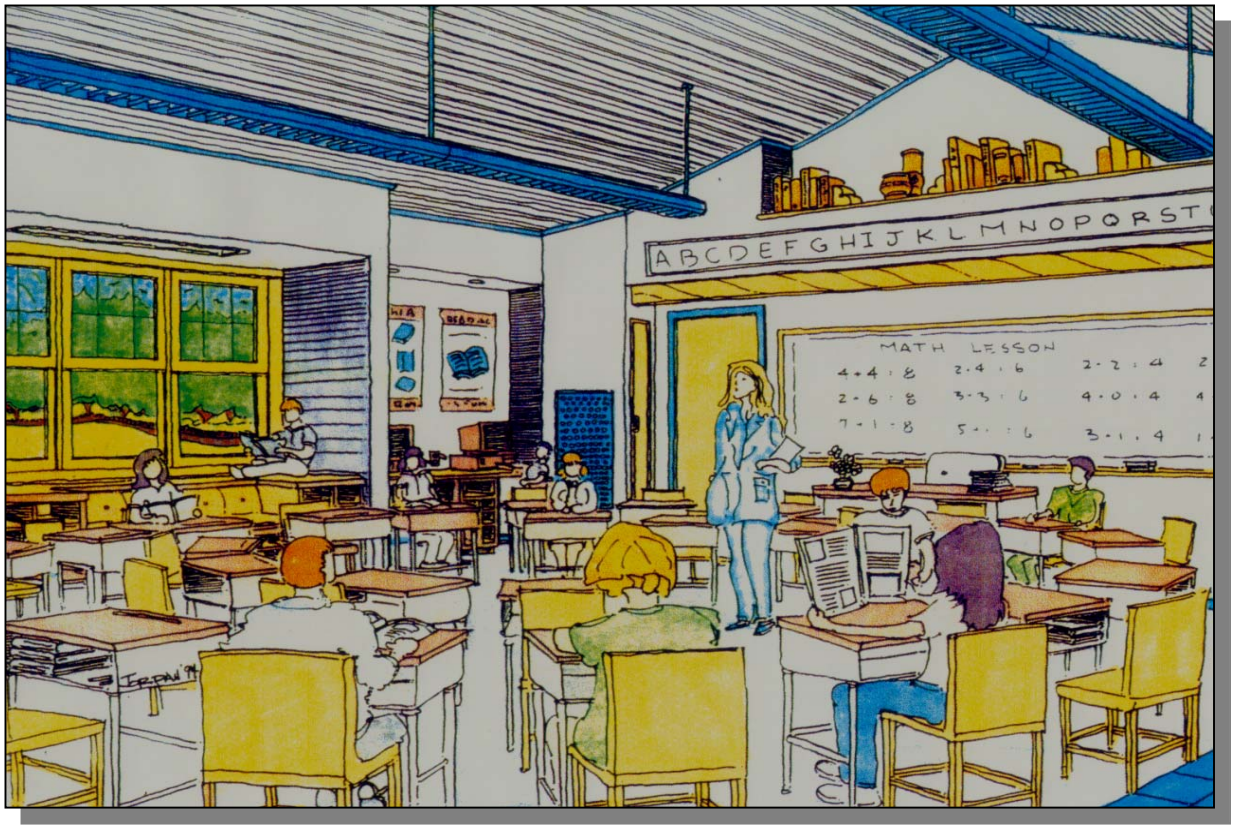
"How"

- Clarify Design Intent Up-Front
- Use high quality, commercial grade built-up mechanical systems with "Commissioning"
- Use energy recovery systems
- Walk off mats and flooring choices
- Moisture management
- Consider100% Outside Air Systems
- HVAC controls maintenance support contracts?
- Thorough Commissioning, and on-going training for all maintenance personnel

21st Century Classroom…..

- Indoor Air Quality/ Ventilation
- Lighting
- Acoustics
- Materials
- Space
- Color

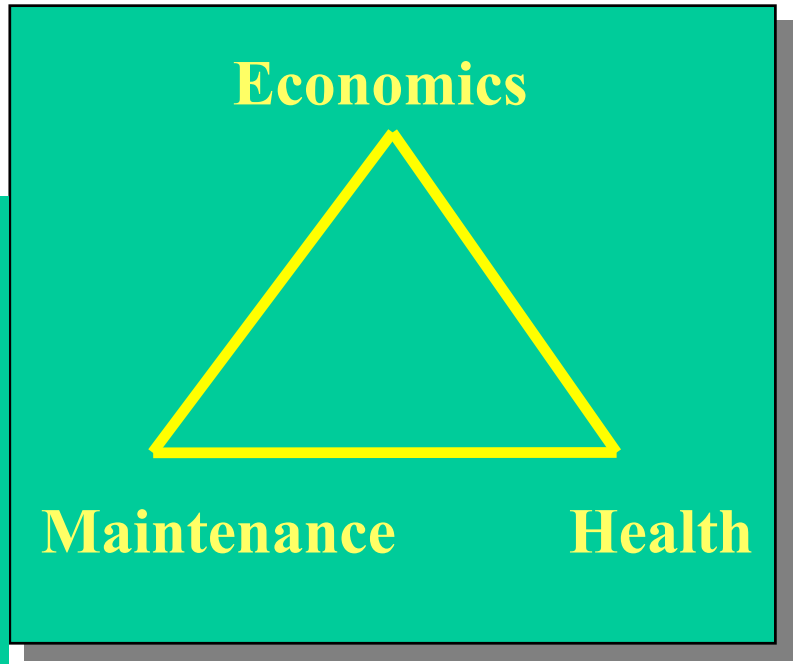
"Healthy Schools"



Sustainable Schools

Designing Differently ~ From The Inside Out

- ***Create space that is:*** **Healthy, Comfortable,Stimulating**
- **Enhances functions within**
- **Promotes social interaction**
- **Conserves natural resources**
- **Is readily maintained**
- **Economical to construct**



Tom Kelly, UNH
Director of
Sustainable Programs

"Sustainable Design enhances the built environment for the benefit of all life, present and future." ***Loren M. Belida, AIA***