



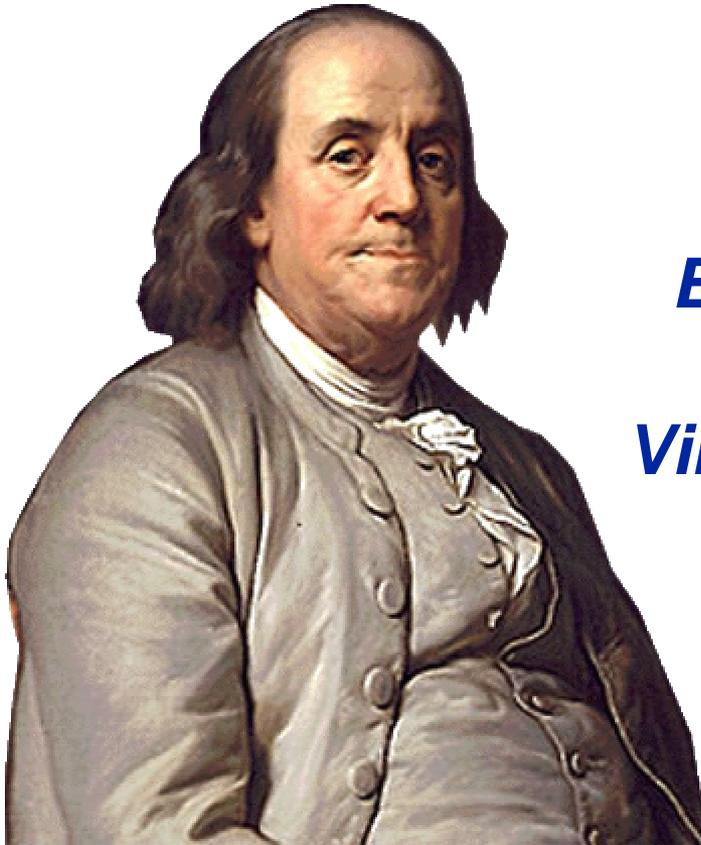
Please be courteous to our speakers

***Turn off all cell phones
and
Set pagers to vibrate***





Ventilation Control



***Benjamin Franklin
Speaks on the
Virtues of Ventilation
Control***



Ventilation Control

Benjamin Franklin On Ventilation Circa 1794

“I considered fresh air an enemy, and closed with extreme care every crevice in the rooms I inhabited...

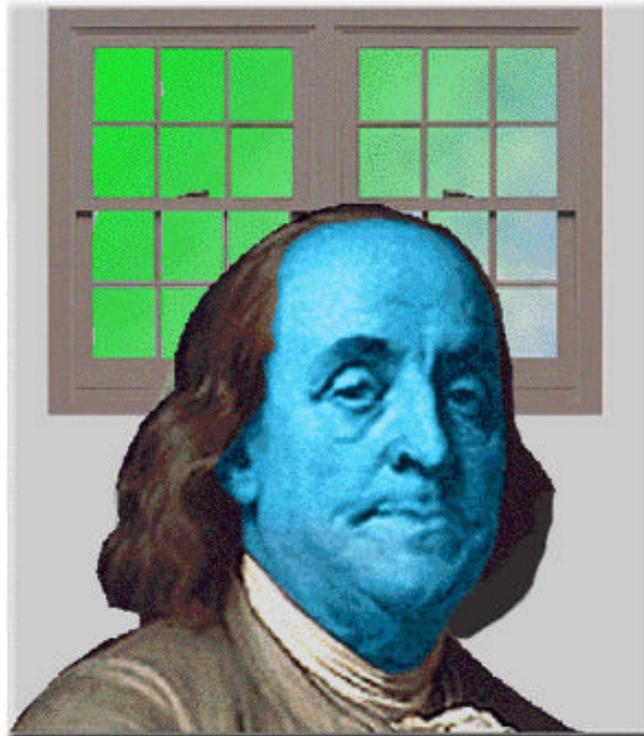
Experience has convinced me of my error. I now look upon fresh air as a friend. I even sleep with an open window...

I am persuaded that no common air from without is so unwholesome as the air within a closed room that has been often breathed and not changed.”



Ventilation Control

It's still 72 Degrees.



June 2-5, 2002

www.energy2002.ee.doe.gov

4



Ventilation Control

Comfort Is More Than Just The Right Temperature...

Comfort =
Temperature + Ventilation



Ventilation Control

Why Ventilation?



June 2-5, 2002

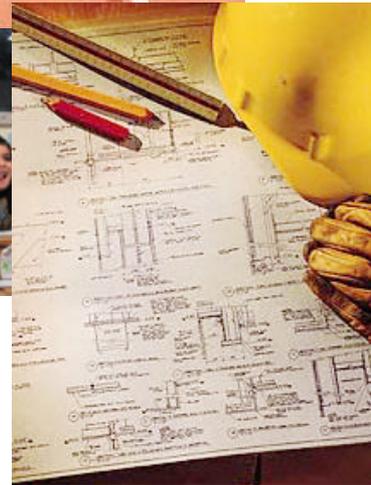
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Ventilation Control

Ventilation Provides

- Comfort
- Health & Safety
- Compliance





Ventilation Control

How is ventilation provided in buildings today?

The same way it was in 1930.

With Fixed Ventilation!

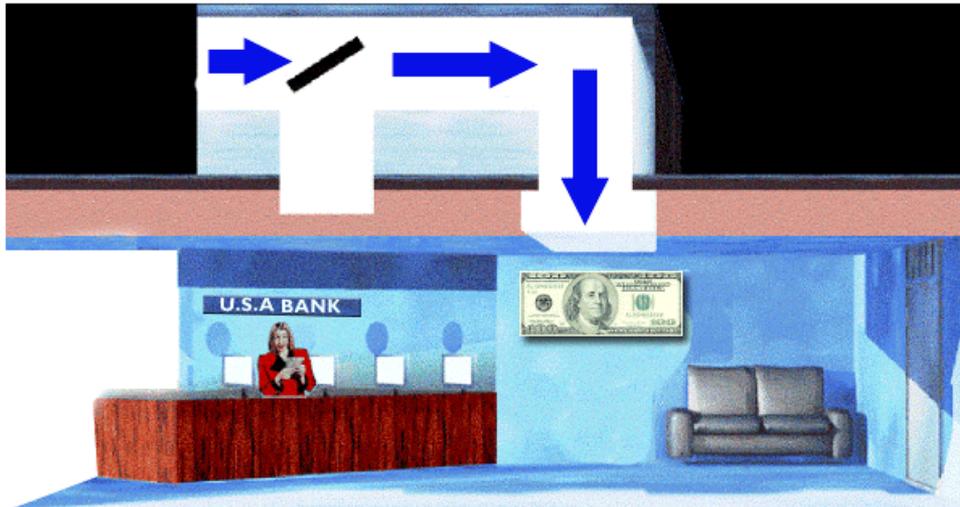


Ventilation Control

Fixed Ventilation

Building codes require ventilation rates based on cfm/person: (typically 20 cfm/person)

Actual Occupancy: 1 person = 500cfm

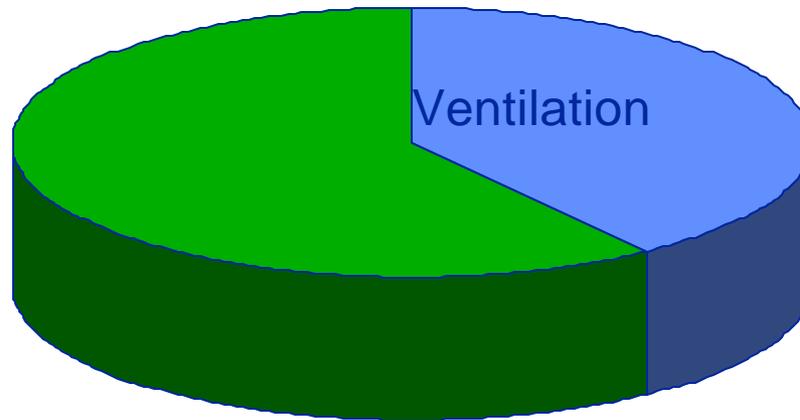


Inefficient!



Ventilation Control

Total Building Heating and Cooling Costs

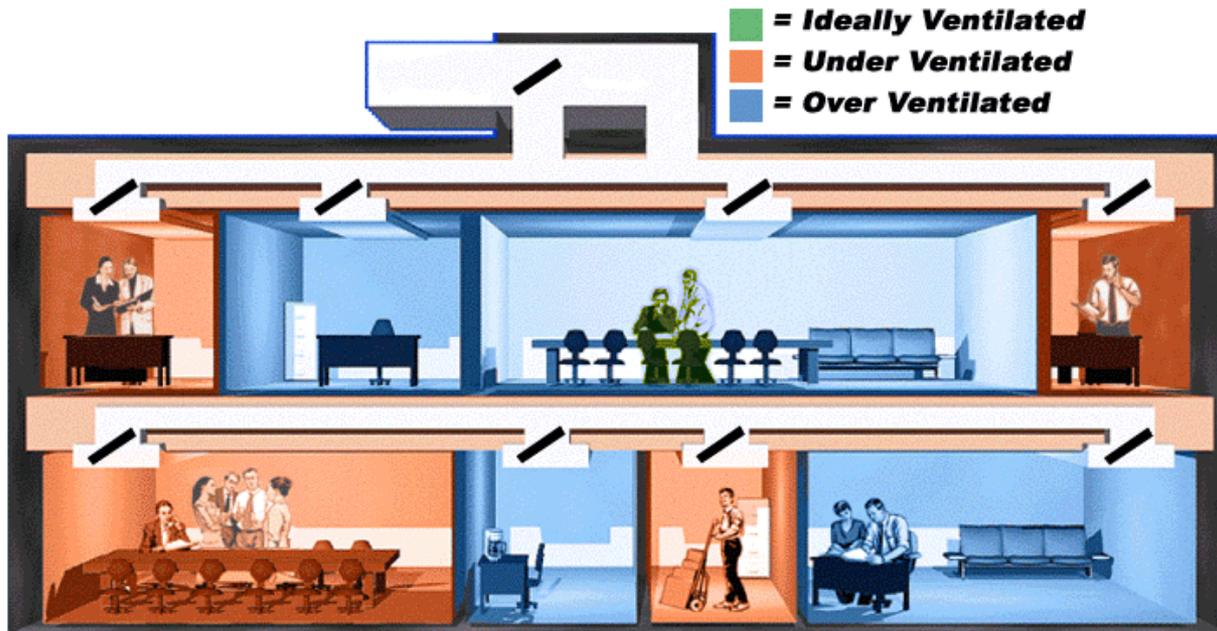




Ventilation Control

Fixed Ventilation In a Multi-Zone VAV Building

Total cfm = Max occupants X 20 cfm



There Is No Control!



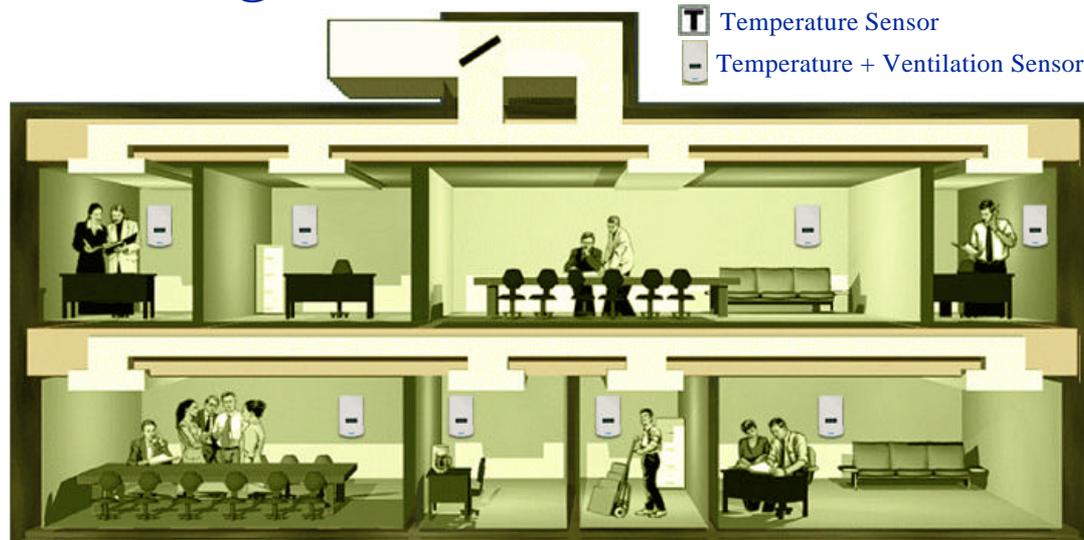
Ventilation Control

Is There A Better Way?



Ventilation Control

Temperature Control In A Multi-Zone VAV Building



- Measure In Each Zone
- Control Based On Actual Load

What if we did the same thing with ventilation?



Zone Ventilation Control

Great Idea!

Delivers

The **RIGHT** Amount of Fresh Air,
But How Does It Work?
To The **RIGHT** Place,
At The **RIGHT** Time...



Zone Ventilation Control

Controlling Ventilation

There is a clearly defined relationship between indoor CO₂ levels & ventilation rates established by:



ASHRAE 62.1 & 90.1



ASTM CO₂ & Ventilation Standard

Indoor CO₂ levels **are** a measure of ventilation rates (cfm/person)

CO₂ levels are **not** a measure of overall IAQ.



CO₂ is the control parameter for ventilation!



Zone Ventilation Control

Actual Occupancy 1 person = 20cfm

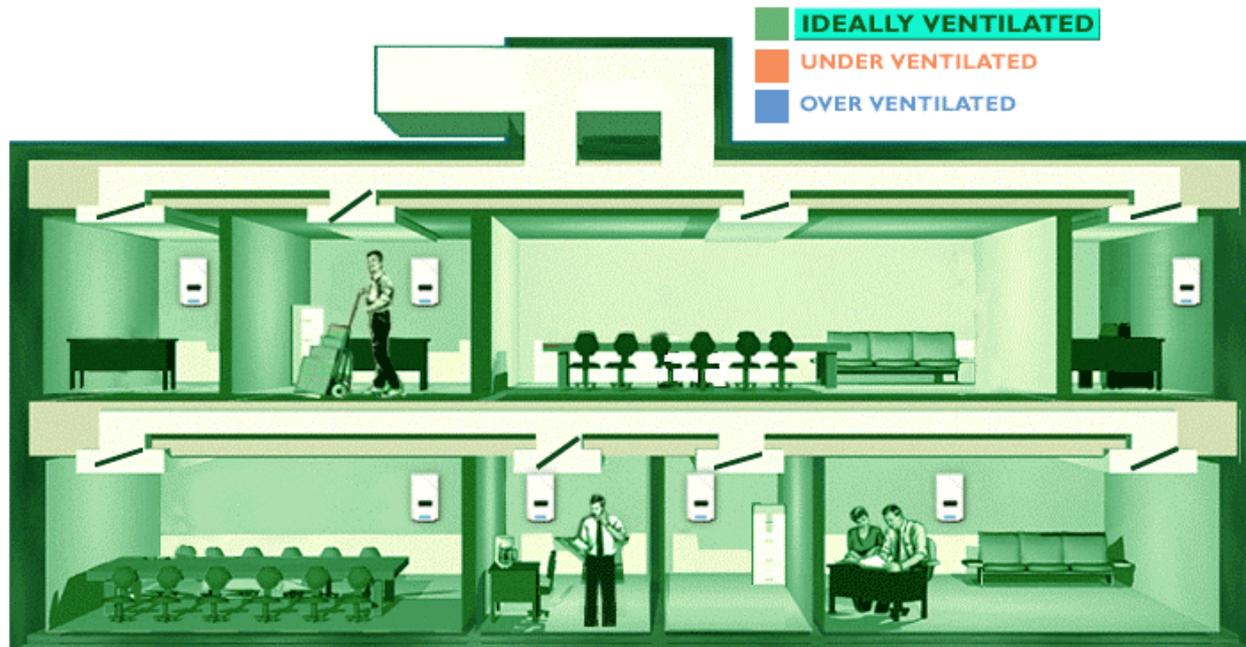


Ventilation based on actual occupancy!



Zone Ventilation Control

With Zone Ventilation Control In a VAV Building



Healthy & Efficient!



Zone Ventilation Control

Details of Zone Ventilation Control In a VAV Building

■ 2 stages of control

First Stage:

Open zone damper to dilute space with system air

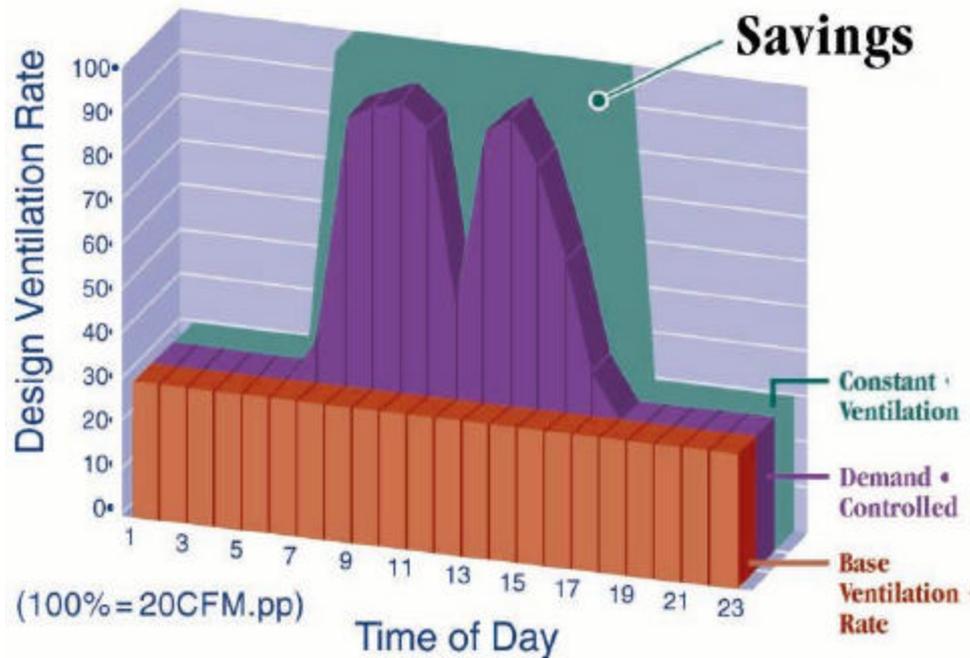
Second Stage:

Open OA damper to dilute system air

Results of 2 stage control:

- Reduced energy costs due to less OA being conditioned
- Zone maintains temperature as well as CO₂ control
- Utilization of system air keeps OA dampers at base ventilation rate longer
- Heating at zone level is much more cost effective than heating at Air Handler

VENTILATION COMPARISON





Zone Ventilation Control

Let's review the
benefits.



Zone Ventilation Control

Numerous Studies Confirm That Correct Ventilation ...

- Increases Productivity
- Improves Occupant/Customer Satisfaction
- Helps Prevent Sick Building Syndrome Health Affects

DOE/Lawrence Berkeley Labs Indoor Environment In Schools

Pupils Health & Performance In Regard To CO₂ Concentrations

- A significant correlation was found between decreased performance and high CO₂ levels (lower ventilation rates).



Zone Ventilation Control

Does controlling ventilation based on occupancy meet codes?

Accepted by: ASHRAE Standard 62



International Mechanical Code:

“Current technology (CO₂ sensors) can permit the design of ventilation systems that are capable of detecting the occupant load of the space and automatically adjusting the ventilation rate accordingly.”



Model, State & Local Codes

***Can Be Measured & Documented!
Compliance Assured...***



Zone Ventilation Control

Ensure for every zone...

- Comfort
- Health & Safety
- Compliance
- And...



Zone Ventilation Control

A Better Operating Building

- Ventilate to Actual vs. Assumed Occupancy
- Eliminate Wasteful Over-Ventilation
- Very Attractive ROI/Lower Operating Costs





Benjamin Franklin On Ventilation

- **Who says history does not repeat itself**
- **Like Ben, we have learned the error of our ways (closing with extreme care every crack and crevice).**
- **IAQ issues have "persuaded" us on the "Virtues of Ventilation"**
- **"Zone Ventilation Control" an old idea whose time has come!**

