



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."

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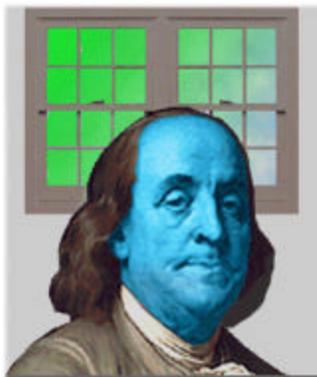
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It's still 72 Degrees.



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Ventilation Control

Comfort Is More Than Just The Right Temperature...

Comfort =
Temperature + Ventilation

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Why Ventilation?



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Ventilation Provides

- Comfort
- Health & Safety
- Compliance



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Ventilation Control

How is ventilation provided in buildings today?

The same way it was in 1930.

With Fixed Ventilation!

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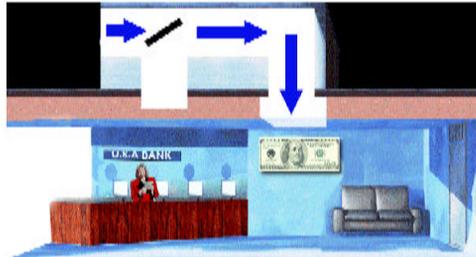


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Fixed Ventilation

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

Actual Occupancy: 1 person = 500cfm



Inefficient!

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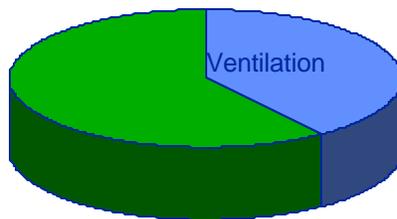
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Ventilation Control

Total Building Heating and Cooling Costs



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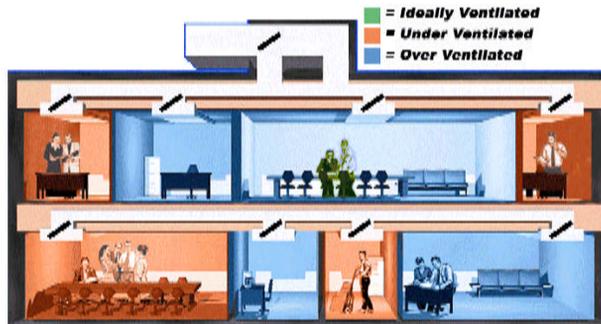
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Ventilation Control

Fixed Ventilation In a Multi-Zone VAV Building

Total cfm = Max occupants X 20 cfm



There Is No Control!

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Ventilation Control

Is There A Better Way?

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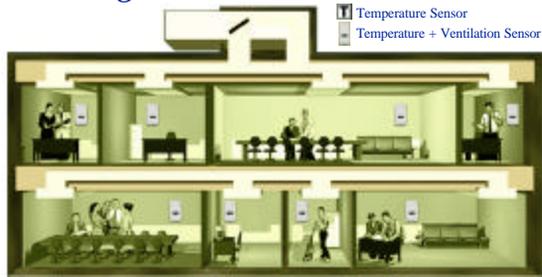
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Ventilation Control

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?

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Zone Ventilation Control

Great Idea!

Delivers

The **RIGHT** Amount of Fresh Air,

But How Does It Work?

At The **RIGHT** Time...

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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!

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Zone Ventilation Control

Actual Occupancy 1 person = 20cfm



Ventilation based on actual occupancy!

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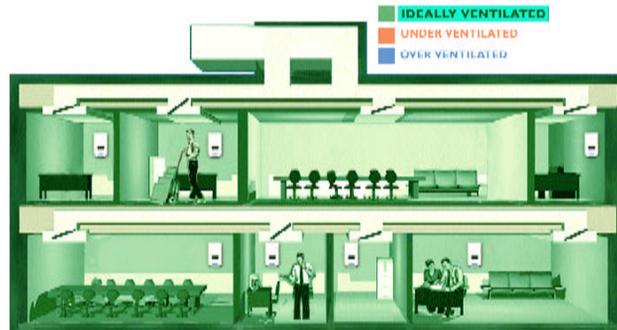
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Zone Ventilation Control

With Zone Ventilation Control In a VAV Building



Healthy & Efficient!

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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

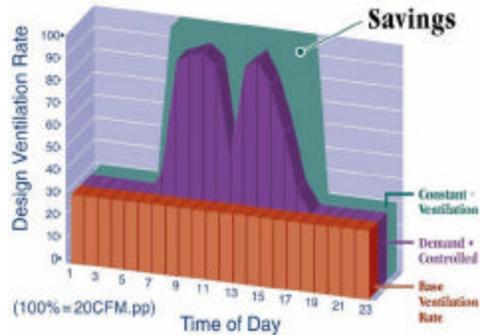
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VENTILATION COMPARISON



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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).

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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...**

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Zone Ventilation Control

Ensure for every zone...

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

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Zone Ventilation Control

A Better Operating Building

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



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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!**



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