OUTSIDE AIR AND INDOOR ENVIRONMENTAL CONTROL

Presentation By:

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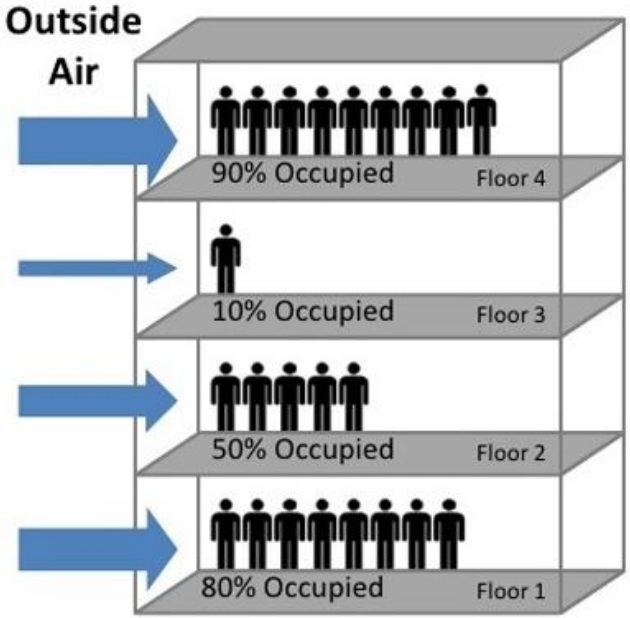
TOPIC OVERVIEW

AND WORDS FROM YOUR SPEAKER…

"Today's talk will cover the idea of Demand Ventilation. It has been part of my Design Build packages over the last several years, especially churches, classrooms, gymnasiums, and office areas (where there are large numbers of people during relatively short periods of time). I would imagine some school systems have major control providers, and possibly, this approach has been addressed and implemented. Demand Ventilation reduces the cost of heating and cooling outside air without the expense during times without large numbers of people for short periods. My presentation will address the different ways to accomplish those goals for comfort and affordability."

– John "Boogie" Bailey



DEMAND-CONTROLLED VENTILATION (DCV)

The automatic adjustment of ventilation rates depending upon real-time building needs

- Occupancy rates
- Indoor Air Quality
- Building layout/configuration
- Climate

CO_2-BASED DEMAND-CONTROLLED VENTILATION (DCV)

- CO_2 sensing is used to estimate occupant-related contaminant sources
- Breathing zone CO_2 concentration is the controller of the outdoor air (OA) damper

CHALLENGES OF COMPLYING WITH ASHRAE STANDARDS WITH DCV

Cannot have fixed CO_2 setpoint

Accounting for real-time system ventilation efficiency

Estimating bio effluent load and corresponding ventilation demand in zones

CO_2-BASED DCV OPTIONS

01 CO_2-Based Dynamic Reset (DR)

02 CO_2-Based Dynamic Reset (DR) with Zone Level Control using *Target Outside Air Rate*

03 CO_2-Based Dynamic Reset (DR) with Zone Level Control using *Target System Ventilation Efficiency*

CO_2-BASED DYNAMIC RESET (DR)

- Dynamically calculating the required setpoint for the system outside air rate
- Dampers modulate to maintain outside air rate based on new setpoint
- Sensors are used to determine Primary Airflow and zone CO_2 concentrations, thus calculating the required outside air rate
- Both varying occupancy and primary airflow rate are used to calculate real-time system ventilation efficiency

CO_2-BASED DYNAMIC RESET (DR)

Factors that Determine the System Outdoor Airflow Setpoint:

- Appropriate building pressure
- Economizer control logic
- DCV logic

CO_2-BASED DYNAMIC RESET (DR) WITH ZONE LEVEL CONTROL USING *TARGET OUTSIDE AIR RATE*

- Zone primary airflow rate minimum setpoint is reset
- Zone level resets the critical zone primary airflow minimum setpoint upward to decrease the primary outdoor air fraction and increase efficiency to decrease the current outdoor airflow rate as a target
- This reduces the system OA rate by increasing the zone primary airflow rates for the zones that require more outside air

CO_2-BASED DYNAMIC RESET (DR) WITH ZONE LEVEL CONTROL USING *TARGET SYSTEM VENTILATION EFFICIENCY*

- Zone primary airflow minimum setpoint reset is to maintain the value of system ventilation efficiency greater than or equal to a certain value
- Zone level control increases the zone primary airflow minimum setpoint upward to decrease the zone primary outdoor fraction and increase system ventilation efficiency to increase the current system ventilation to its target

CONSIDER THESE FACTORS TO PREVENT POTENTIAL ISSUES

Building Pressurization

- Outdoor air intake vs. exhaust

CO_2 Sensor Location, Installation, and Accuracy

- Avoid placing sensors in return air ducts, and near doors and windows
- Conduct periodic maintenance on sensors to maintain accuracy

KEY BENEFITS TO DCV

1) Reduced Energy Costs
2) Improved Indoor Air Quality
3) Increased Occupant Comfort

ENVIRONMENTAL IMPACT OF DCV

- Minimizes unnecessary natural resource consumption
- Less greenhouse gas emissions

Less Over-Ventilating → Less Energy Use → Less Carbon Emissions

BY THE NUMBERS

According to ASHRAE

AIRFLOW RATE FOR A SPACE =
(# OF OCCUPANTS) X (7.5 CFM) + (SQ/FT IN THE SPACE) X (0.06 CFM)

7.5 CFM

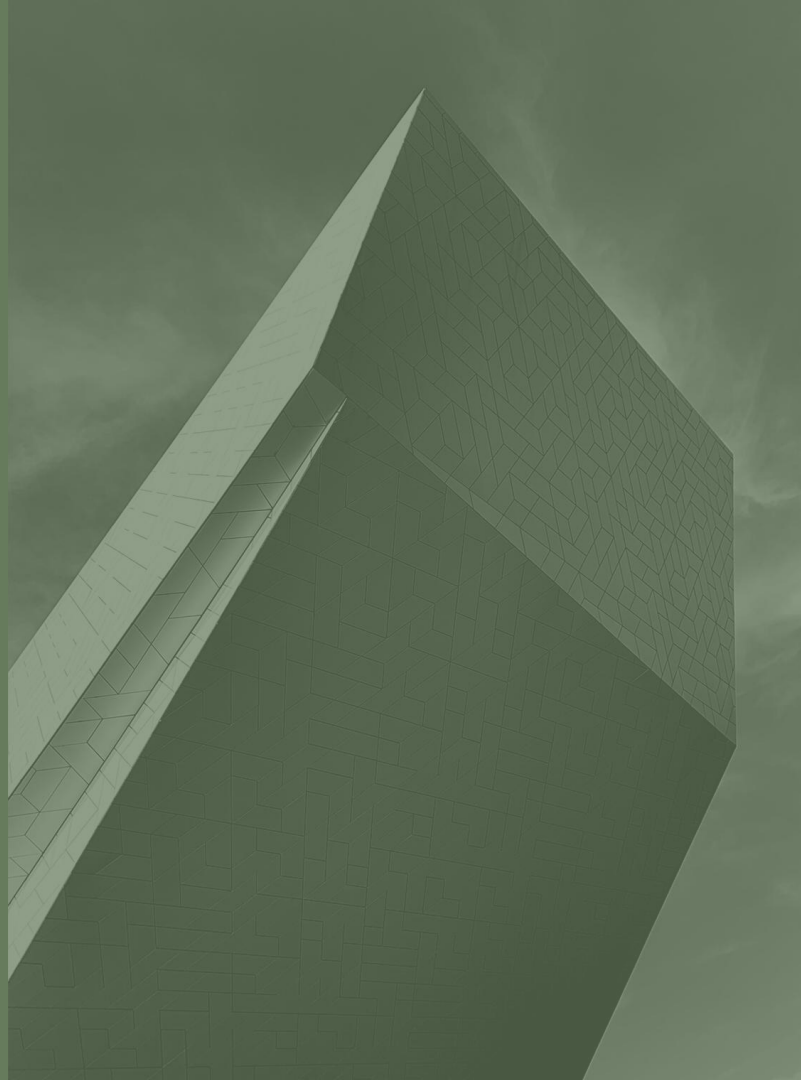
Outdoor air per person

0.06 CFM

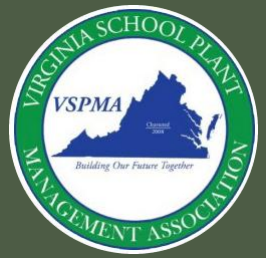
Outdoor air per sq/ft of floor space

UP TO **30%**

ENERGY SAVINGS IN BUILDINGS WITH FLUCTUATING OCCUPANCY RATES



THANK YOU FOR ATTENDING!



SOURCES

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