

Joseph Lstiburek, Ph.D., P.Eng, ASHRAE Fellow

Building Science

Ventilation and Air Tightness

www.buildingscience.com

Build Tight - Ventilate Right

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Build Tight - Ventilate Right

How Tight?

What's Right?

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Getting rid of most big holes	5 ach@50
Getting rid of all big holes	3 ach@50
Getting rid of small holes	1.5 ach@50
Getting German	0.6 ach@50

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Best

Getting Rid of all Big Holes - with -
Balanced Ventilation
Energy Recovery
Distribution and Mixing
Source Control - Spot exhaust ventilation
Filtration
Material selection

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Very Good

Getting Rid of all Big Holes - with –
Supply Ventilation
Distribution and Mixing
Source Control - Spot exhaust ventilation
Filtration
Material selection

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Good

Getting Rid of Most Big Holes - with –
Exhaust Ventilation
Distribution and Mixing
Source Control - Spot exhaust ventilation
Filtration
Material selection

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Get Away With

Leaky - with –
Spot Ventilation in Bathroom/Kitchen

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Worst

Leaky - with – Nothing


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Don't Do Stupid Things

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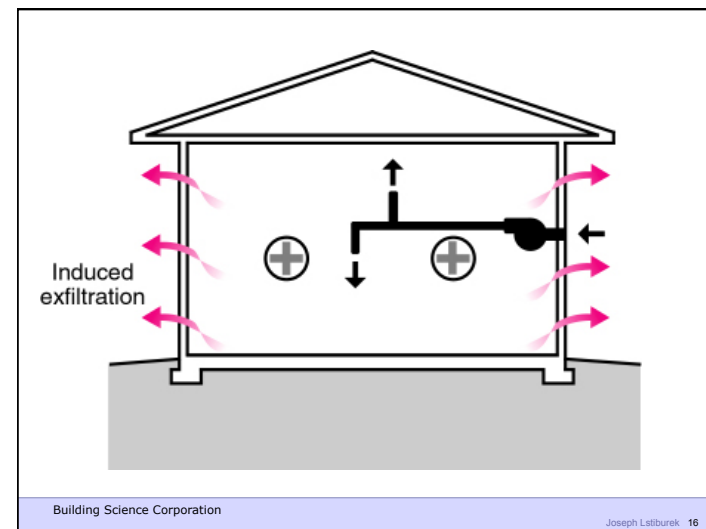
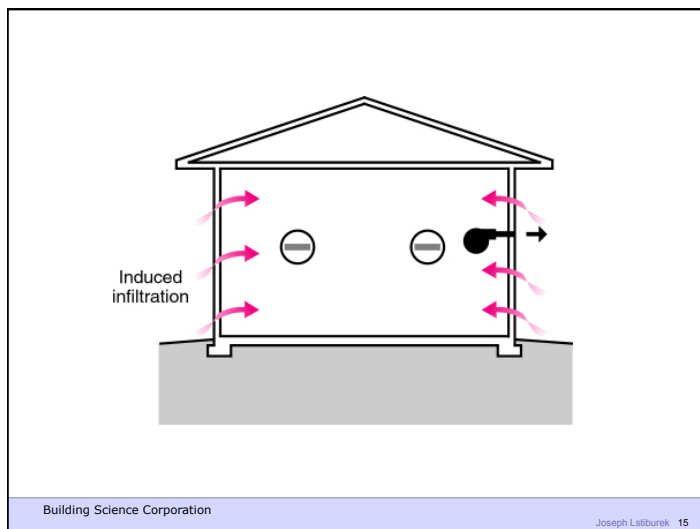
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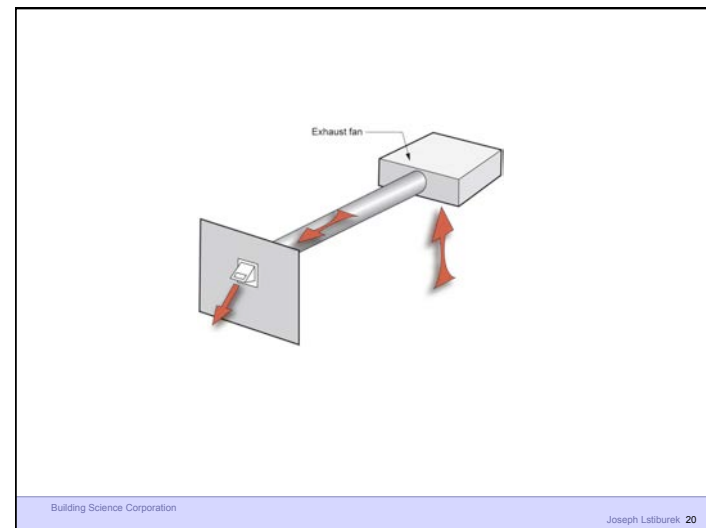
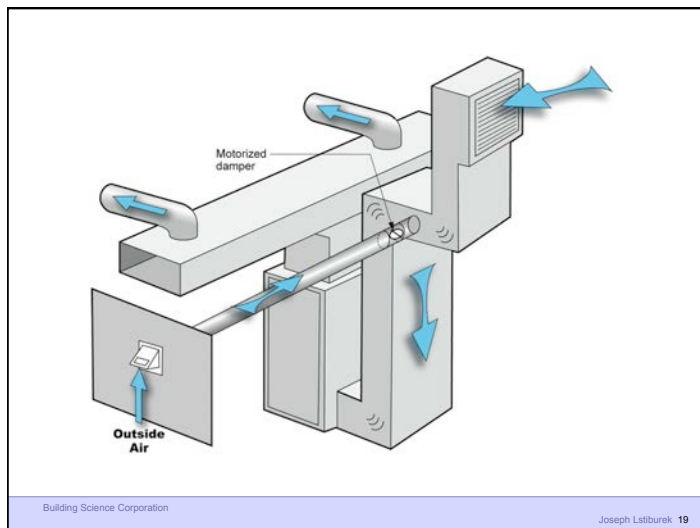
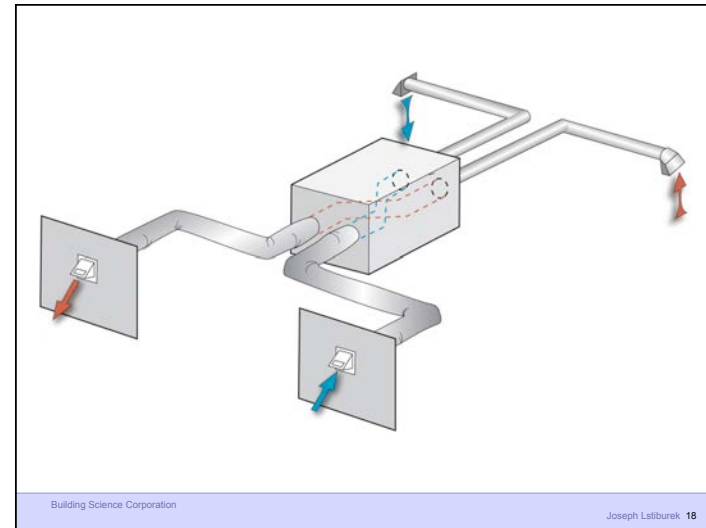
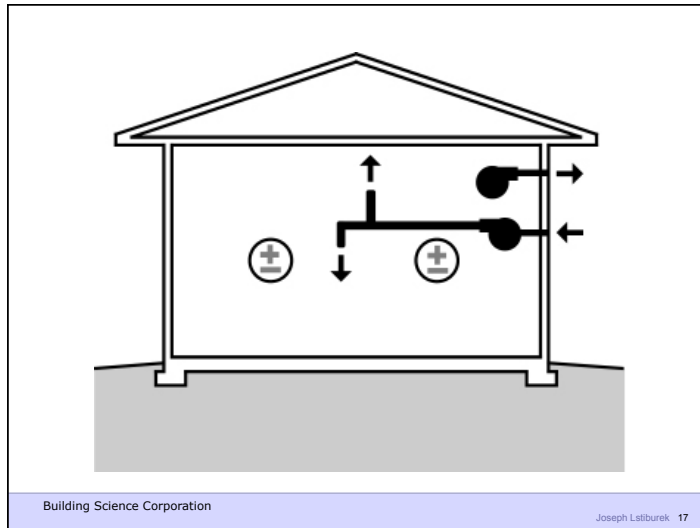


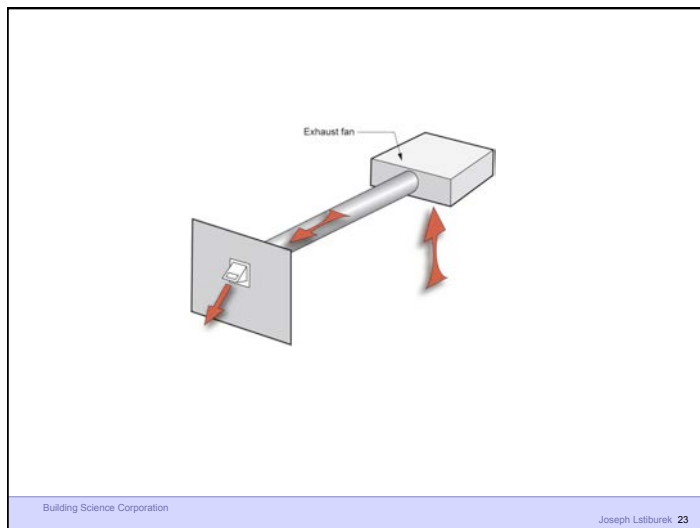
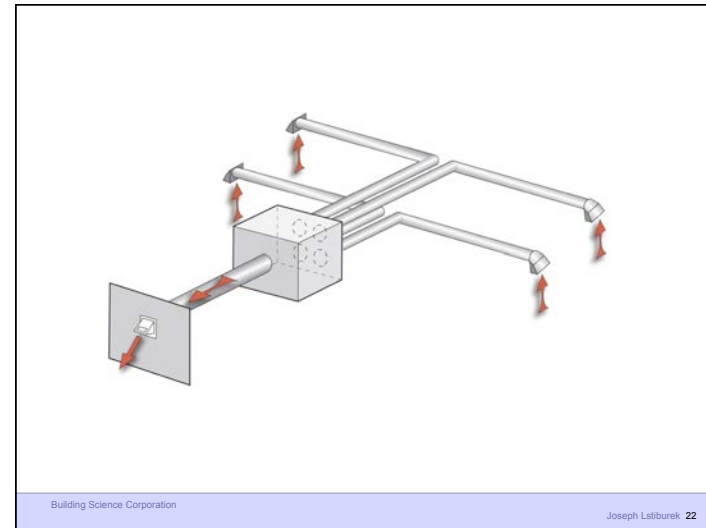
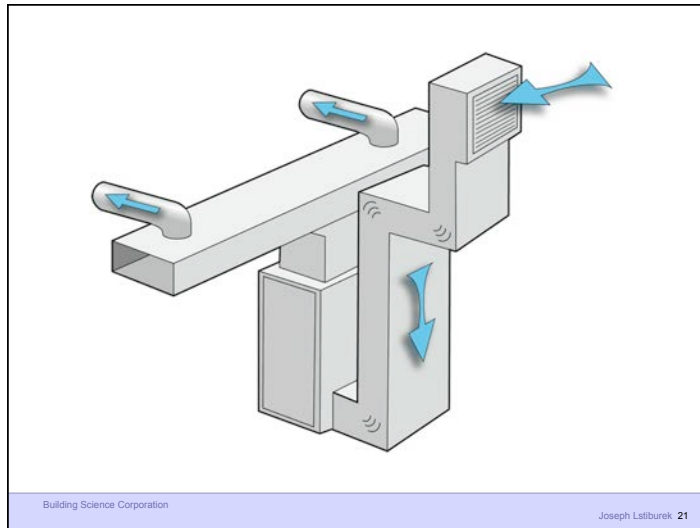
Three Types of Controlled Ventilation Systems

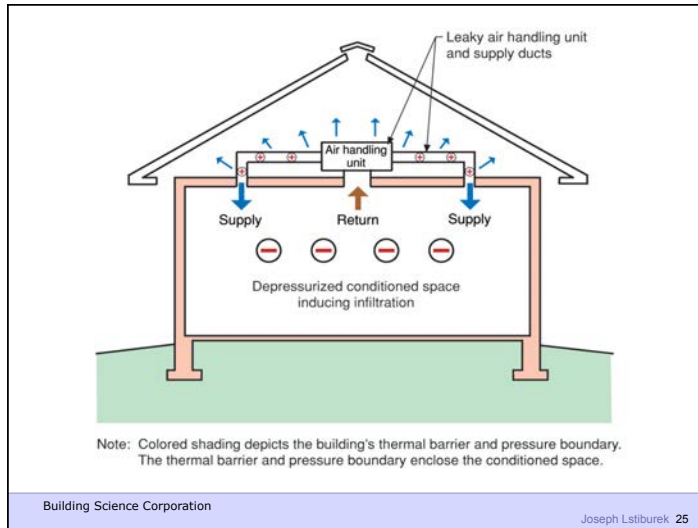
- Exhaust Ventilation
- Supply Ventilation
- Balanced Ventilation

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Duct Leakage Should Be Less Than 5% of Rated Flow As Tested by Pressurization To 25 Pascals

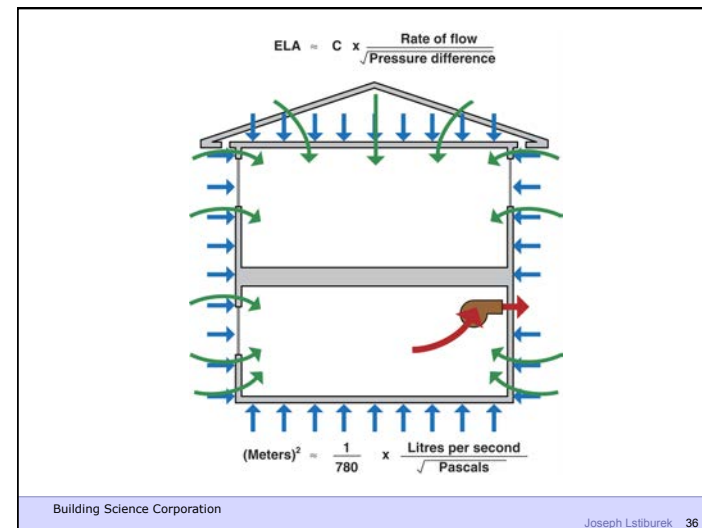
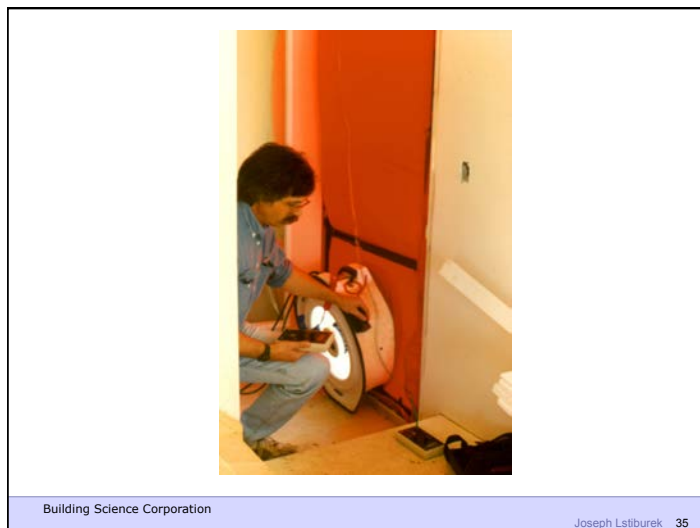
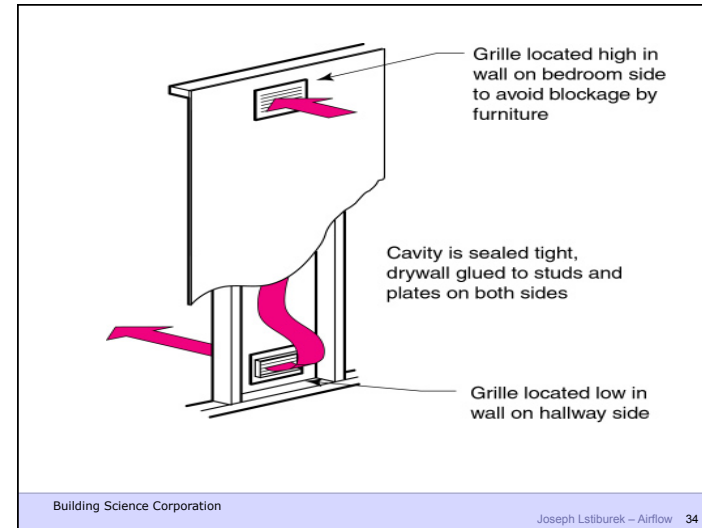
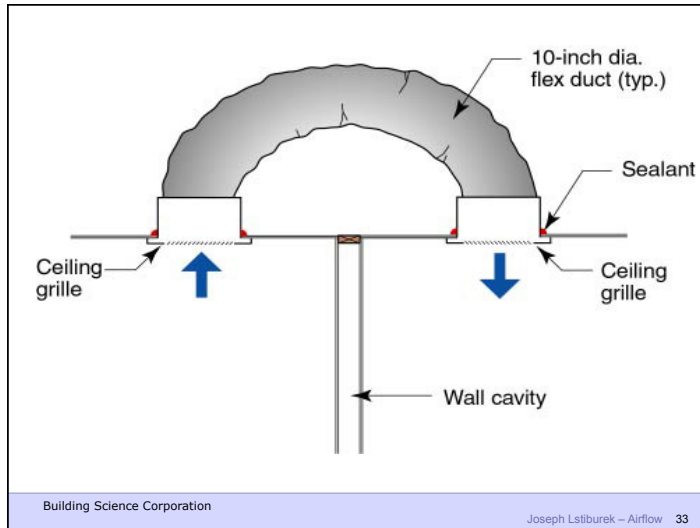
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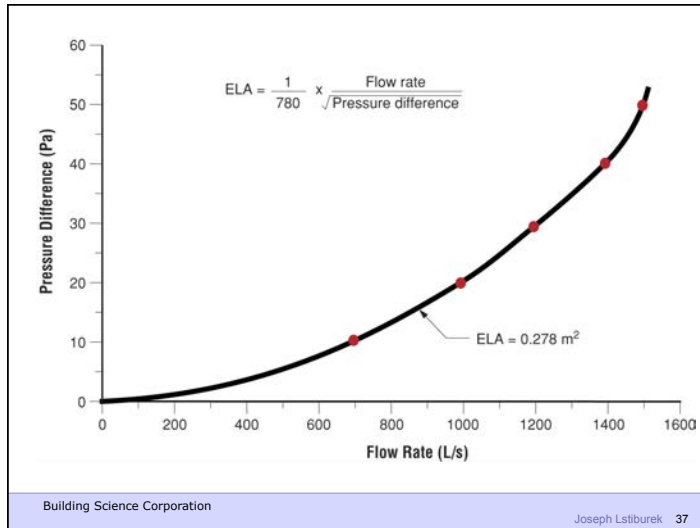
Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.

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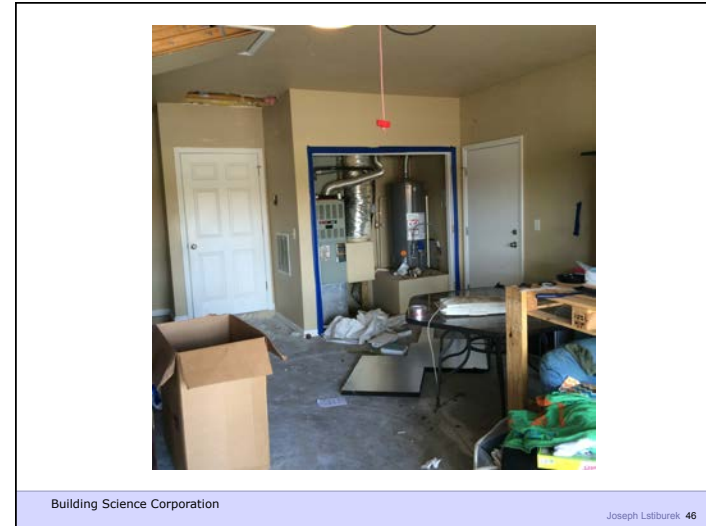
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Ventilation Rates Are Based on Odor Control

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This slide contains the text "Ventilation Rates Are Based on Odor Control" centered on the page. The text is in a simple, black, sans-serif font. At the bottom of the slide, there is a small footer with the text "Building Science Corporation" on the left and "Joseph Lstiburek 47" on the right.

Ventilation Rates Are Based on Odor Control
Health Science Basis for Ventilation Rates is
Extremely Limited

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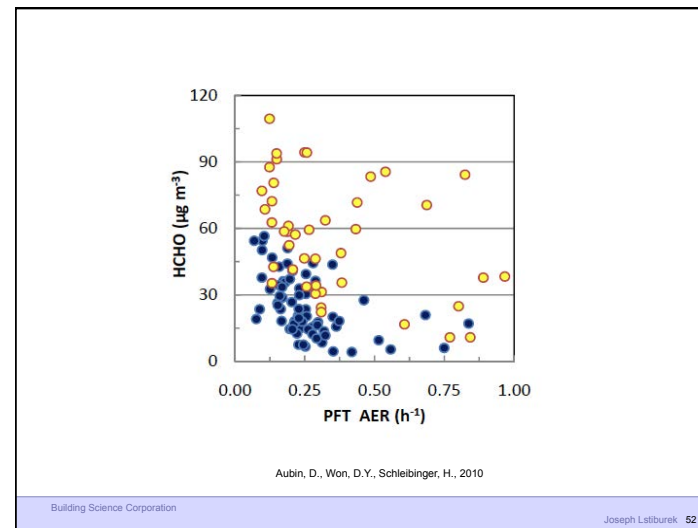
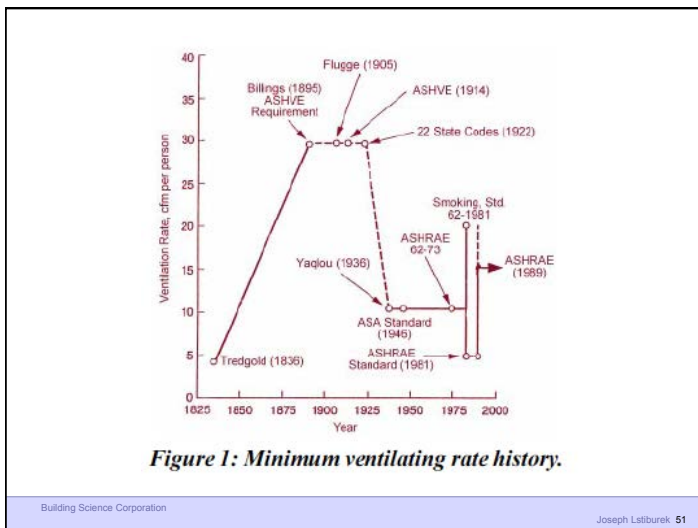
This slide contains the text "Ventilation Rates Are Based on Odor Control" and "Health Science Basis for Ventilation Rates is Extremely Limited" centered on the page. The text is in a simple, black, sans-serif font. At the bottom of the slide, there is a small footer with the text "Building Science Corporation" on the left and "Joseph Lstiburek 48" on the right.

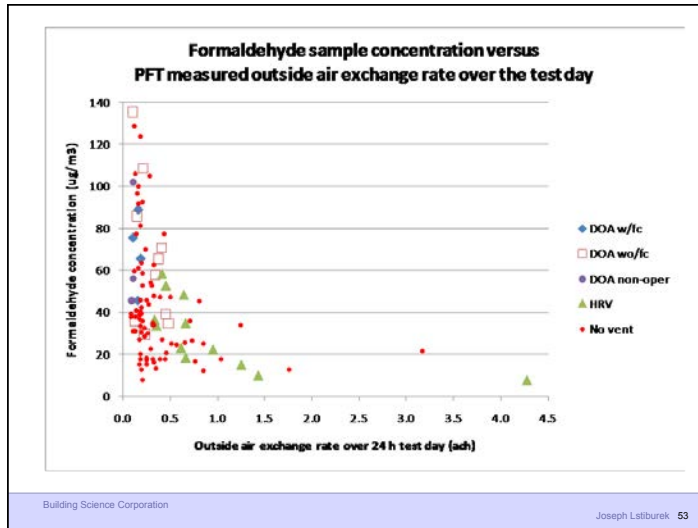
Ventilation Rates Are Based on Odor Control
 Health Science Basis for Ventilation Rates is
 Extremely Limited
 Almost Nothing Cited Applies to Housing

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Ventilation Rates Are Based on Odor Control
 Health Science Basis for Ventilation Rates is
 Extremely Limited
 Almost Nothing Cited Applies to Housing
 The Applicable Studies Focus on Dampness

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Dilution Is Not The Solution To Indoor Pollution
Source Control

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Dilution For People
Source Control For The Building

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ASHRAE Standard 62.2 – 2013 calls for 7.5 cfm per person plus 0.03 cfm per square foot of conditioned area
Occupancy is deemed to be the number of bedrooms plus one

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ASHRAE Standard 62.2 calls for 7.5 cfm per person plus 0.03 cfm per square foot of conditioned area

Occupancy is deemed to be the number of bedrooms plus one

Outcome is often bad – part load humidity problems, dryness problems, energy problems

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3 Bedroom House – 2,500 ft²

30 cfm plus 75 cfm

105 cfm

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ASHRAE Standard 62.2 – 2010 calls for 7.5 cfm per person plus 0.01 cfm per square foot of conditioned area

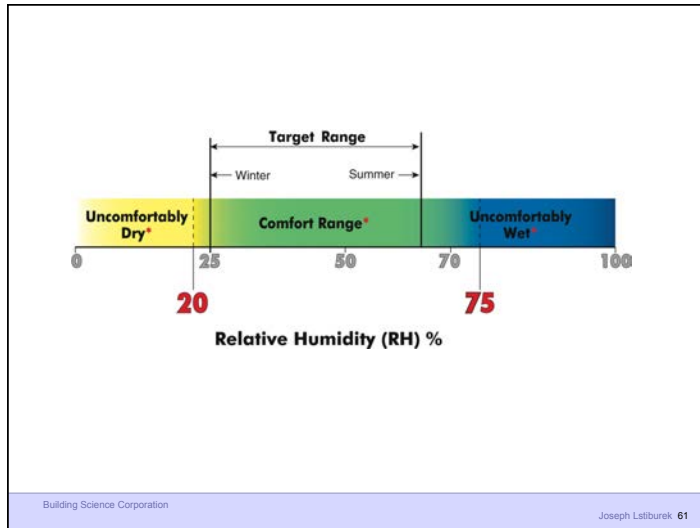
Building Science Corporation Joseph Lstiburek 59

3 Bedroom House – 2,500 ft²

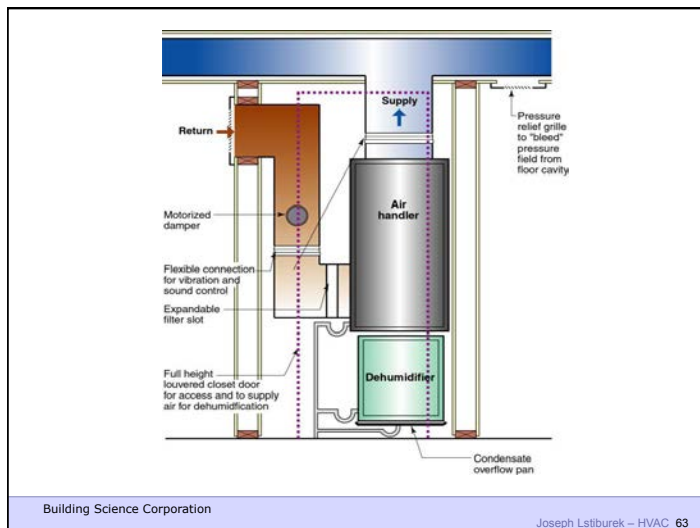
30 cfm plus 25 cfm

55 cfm

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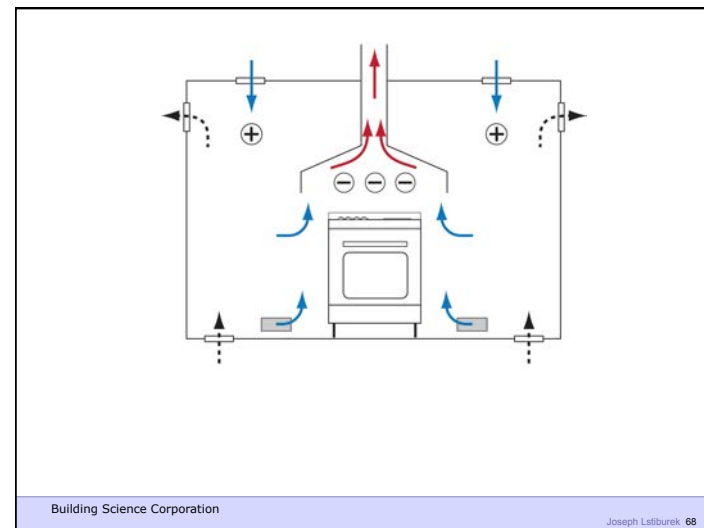
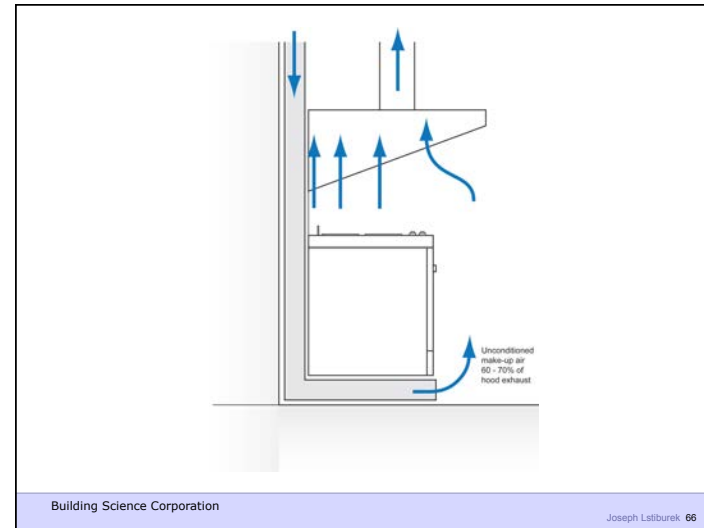


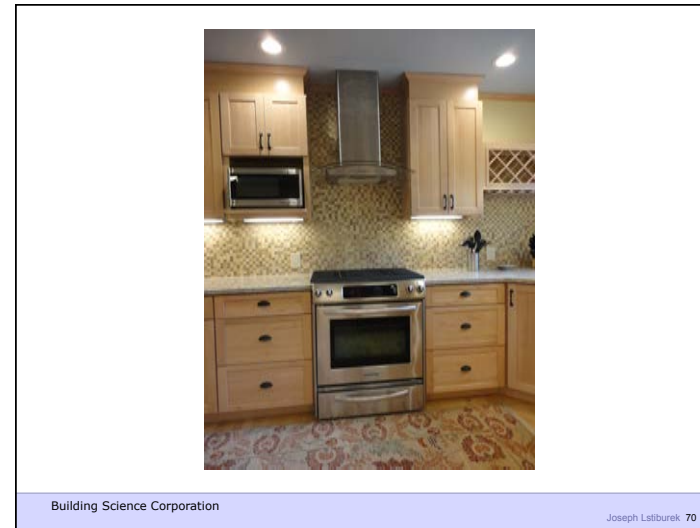
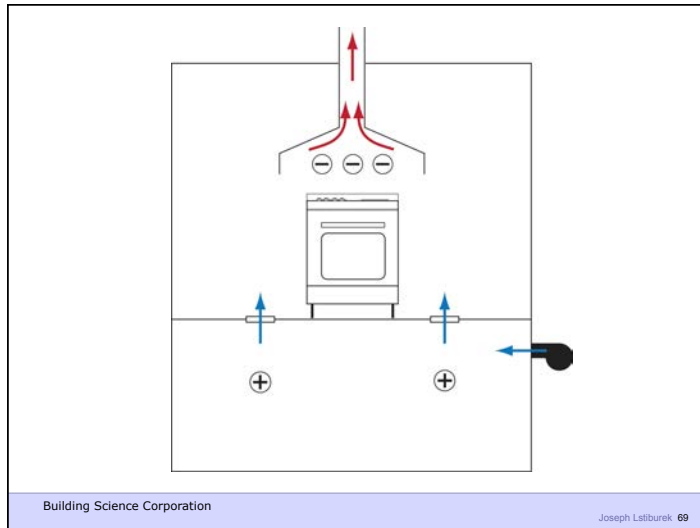
Recommended Range of Relative Humidity
 Above 25 percent during winter
 Below 70 percent during summer



Kitchen Exhaust Hoods

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Clothes Dryers


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Approaches

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