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Building Science

Adventures In Building Science

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Build Tight - Ventilate Right

Build Tight - Ventilate Right

How Tight?

What's Right?

Air Barrier Metrics

Material	0.02 l/(s-m2) @ 75 Pa
Assembly	0.20 l/(s-m2) @ 75 Pa
Enclosure	2.00 l/(s-m2) @ 75 Pa
	0.35 cfm/ft2 @ 50 Pa
	0.25 cfm/ft2 @ 50 Pa
	0.15 cfm/ft2 @ 50 Pa

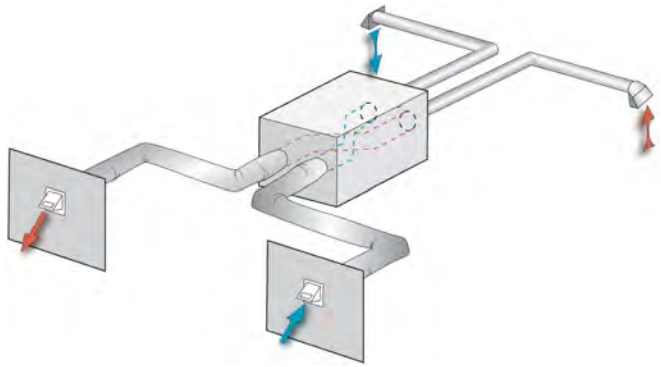
Getting rid of big holes 3 ach@50
Getting rid of smaller holes 1.5 ach@50
Getting German 0.6 ach@50

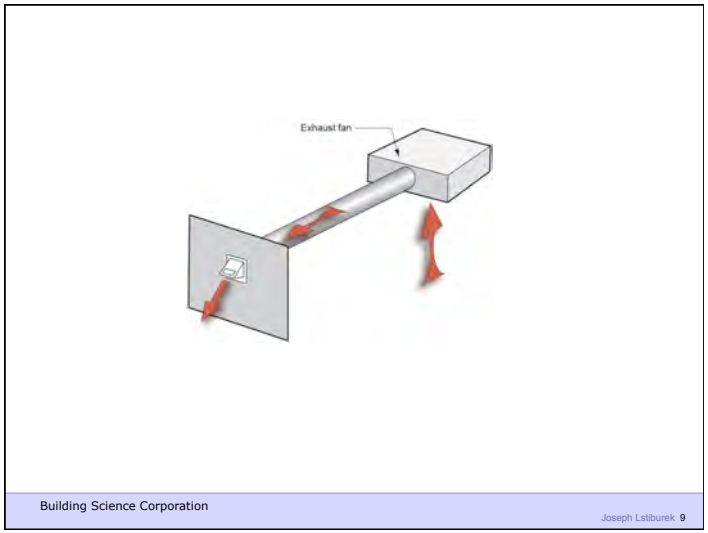
Best

As Tight as Possible - with -
Balanced Ventilation
Energy Recovery
Distribution
Source Control - Spot exhaust ventilation
Filtration
Material selection

Worst

Leaky - with – Nothing
Spot Ventilation in Bathroom/Kitchen
Exhaust Ventilation – with – No Distribution




Exhaust fan
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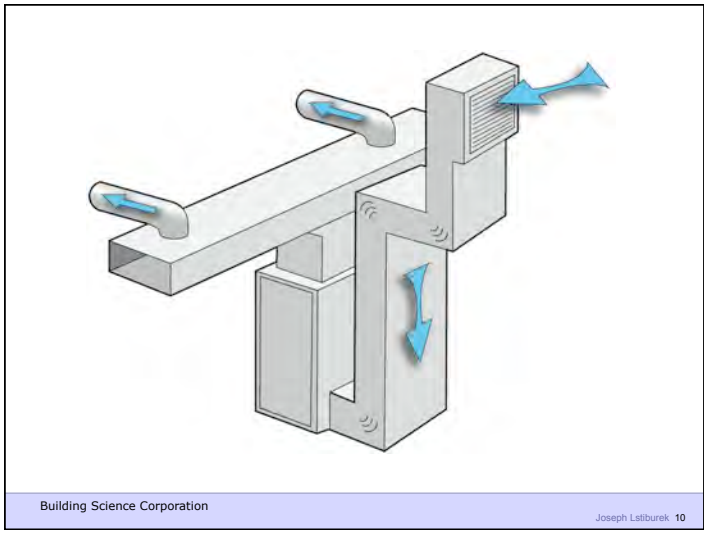
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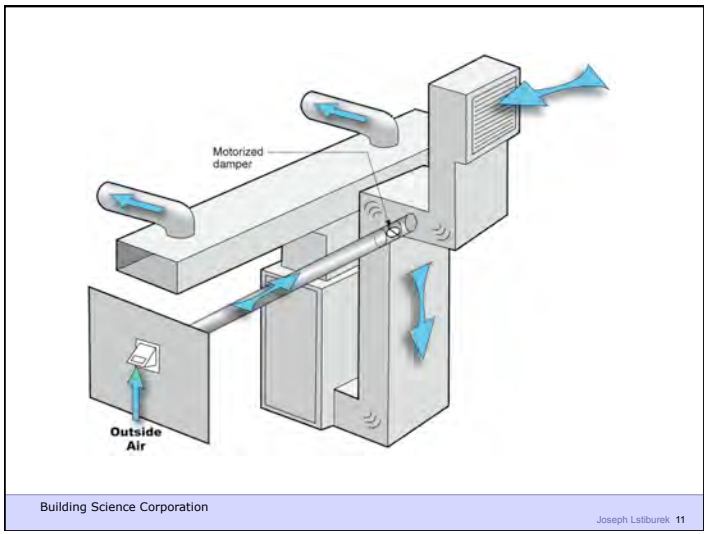
Motorized damper
Outside Air
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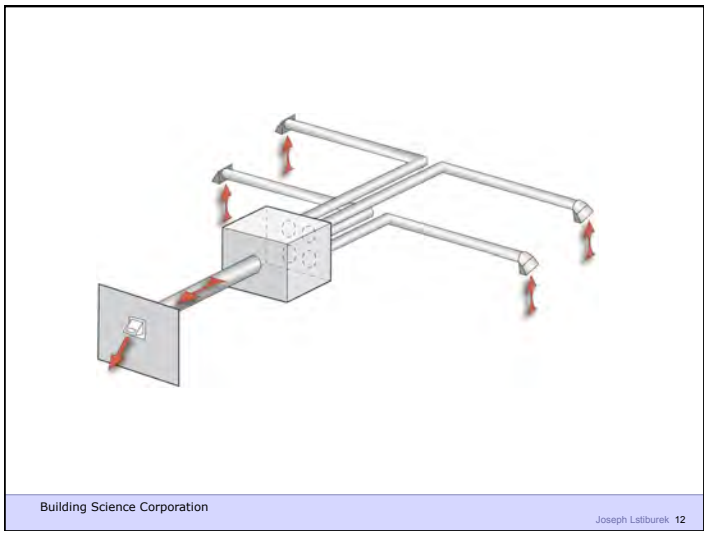
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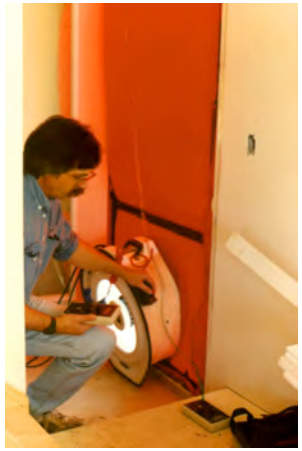
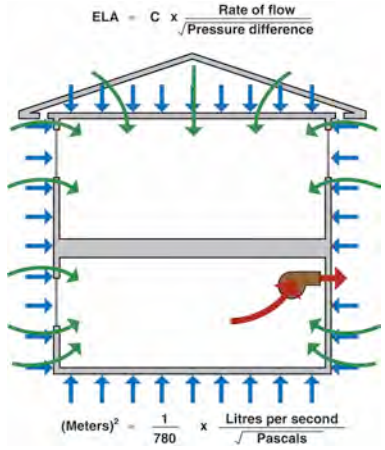
Cost	Exhaust	$150
	Exhaust + Dist	$200
	Supply + Dist	$200
	Spot + Ex/Sup + Dist	$500
	Balanced/HRV	$1,250

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

The Cult of The Blower Door





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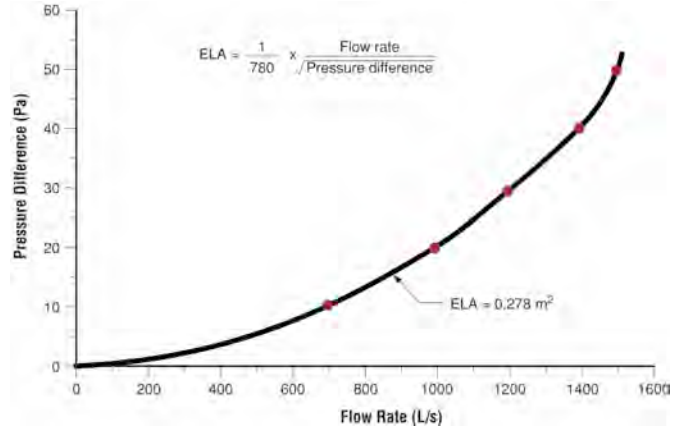

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Blower Door Can't Get You The True ACH
On A Short Term Basis – Hour, Day, Week

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Don't Know Where The Holes Are
Don't Know The Type of Holes
Don't Know The Pressure Across The Holes

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Good For Long Term Average If No Big Pressures

Good For Average Annual Energy Prediction

Good For Long Term Average If No Big Pressures

Good For Average Annual Energy Prediction

Not Good For IAQ Unless You Accept Average Annual Exposure As A Metric

Cost of Addressing the Problems Are Less Than The Cost of Testing To See If You Have Problems

Combustion Safety

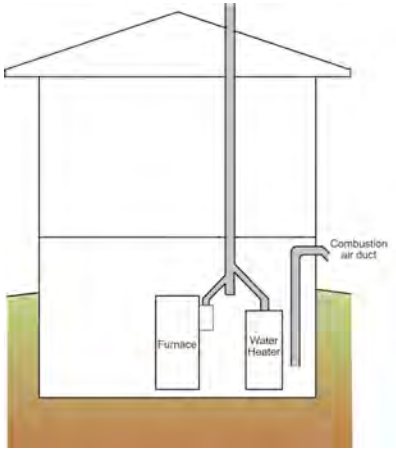
Indoor Contaminants

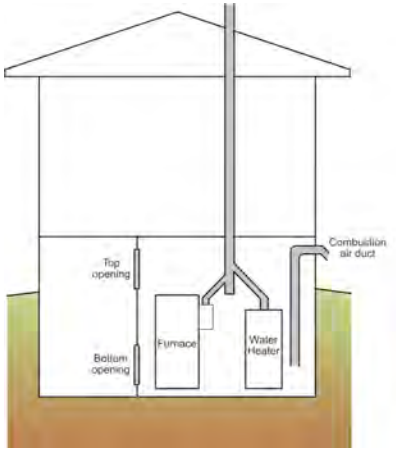
Comfort

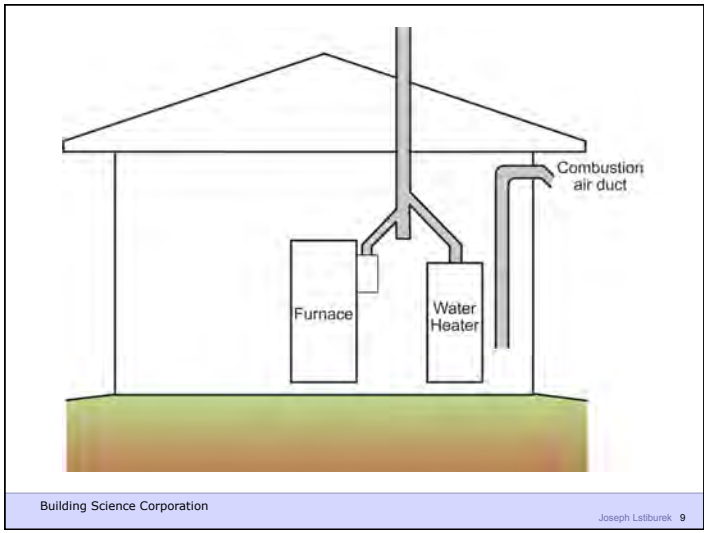
Energy

Bring Combustion Appliances Up To Code
Control Pressures
Install Controlled Ventilation
Get Rid of Big Holes
Insulate

Code Compliant Combustion Air






Combustion air duct
Furnace
Water Heater
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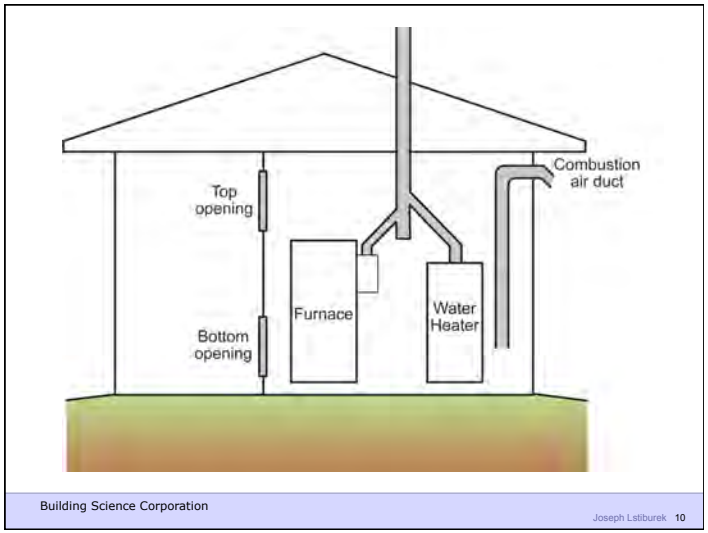
Top opening
Combustion air duct
Bottom opening
Furnace
Water Heater
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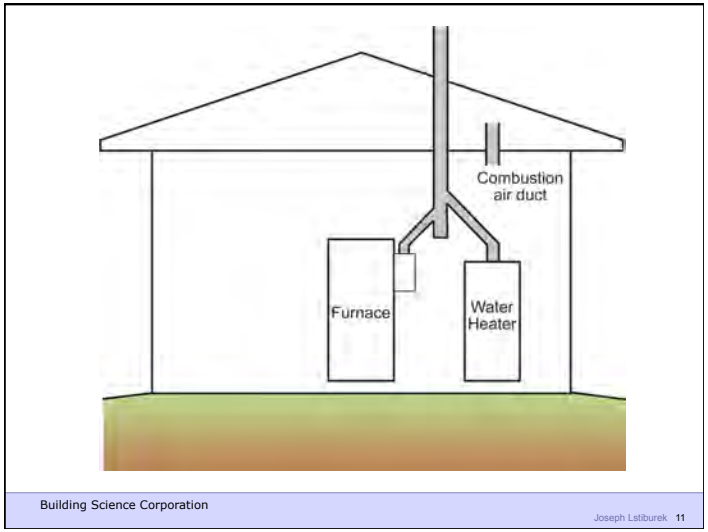
Combustion air duct
Furnace
Water Heater
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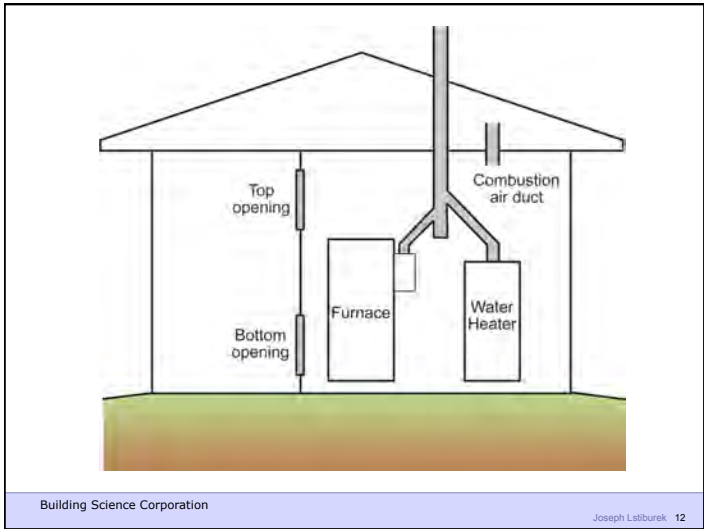
Top opening
Combustion air duct
Bottom opening
Furnace
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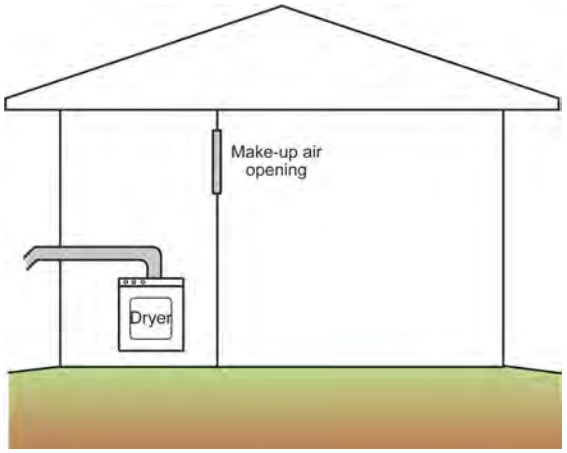

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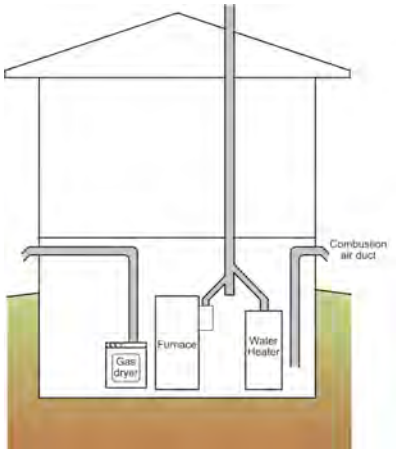

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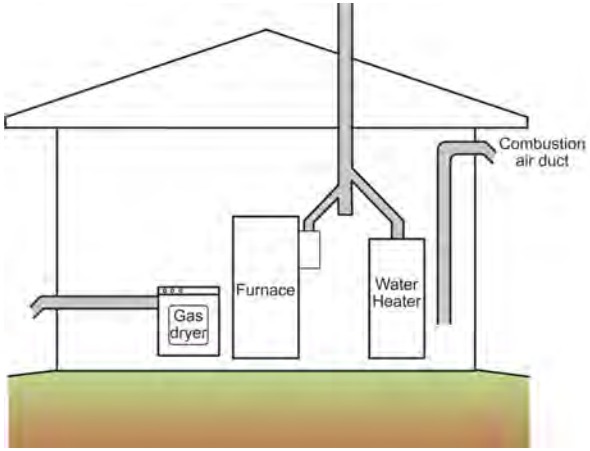

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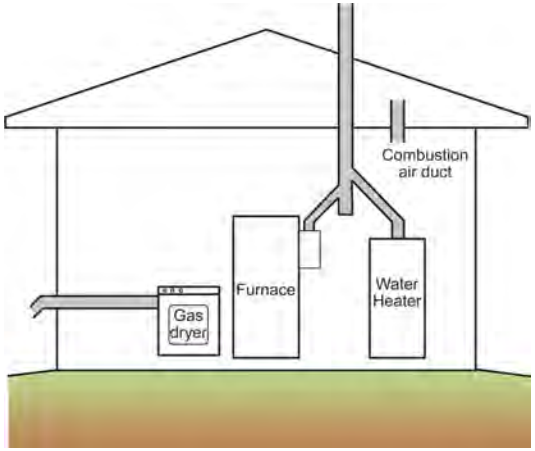

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Sealed Combustion Appliances

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Control Pressures

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Joseph Lstiburek 3

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Joseph Lstiburek 6

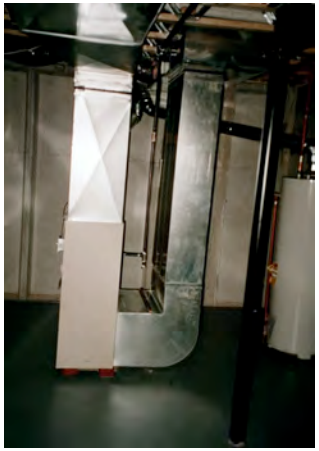

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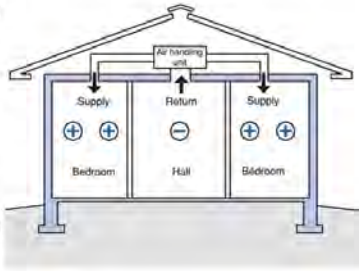
Figure 3.18
Insufficient Return Air Paths

- Pressurization of bedrooms often occurs if insufficient return pathways are provided, undercutting bedroom doors is usually insufficient; transfer grilles, jump ducts or fully ducted returns may be necessary to prevent pressurization of bedrooms
- Master bedroom suites are often the most pressurized as they typically receive the most supply air
- When bedrooms pressurized, common areas depressurize; this can have serious consequences when fireplaces are located in common areas and subsequently backdraft



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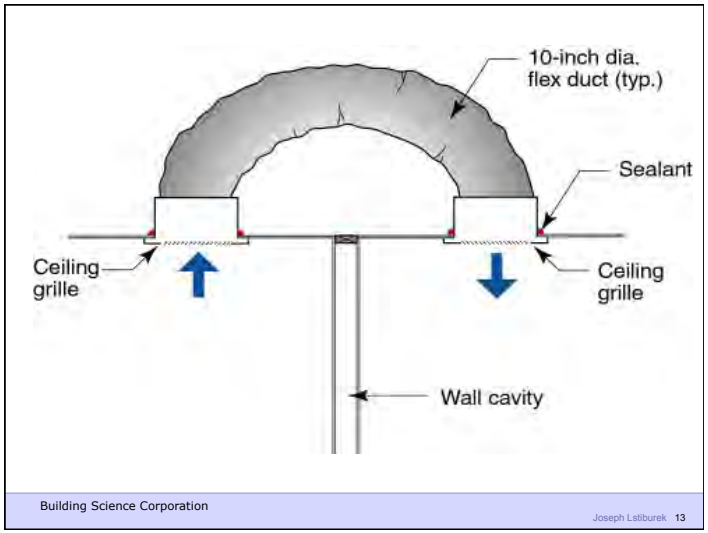
10-inch dia. flex duct (typ.)
Sealant
Ceiling grille
Ceiling grille
Wall cavity
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