



Getting Residential Ventilation Right

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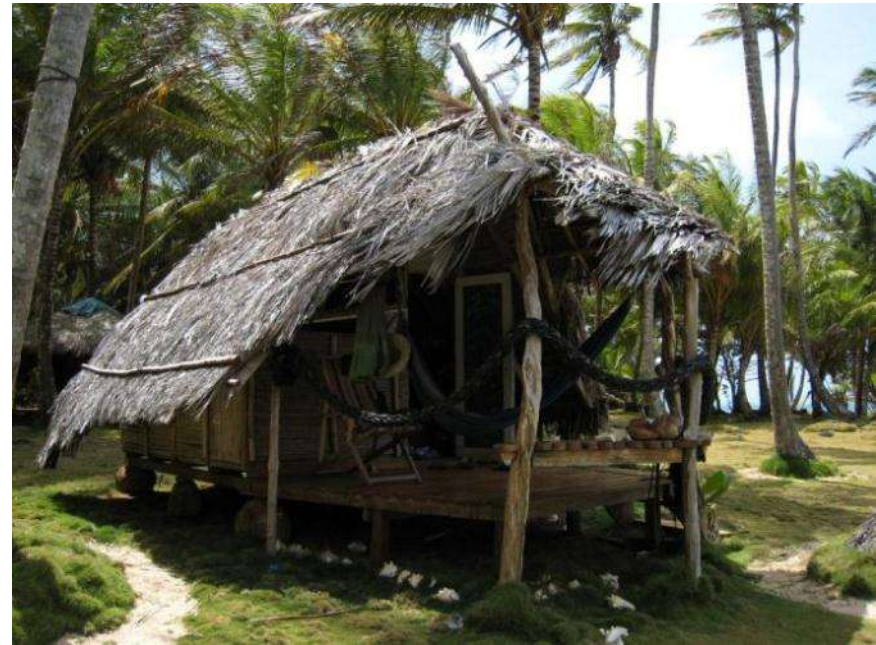
Today's Discussion

- Ventilation Requirements
- Three Whole-House Ventilation Strategies
- Two Local Exhaust Strategies
- Multifamily Options
- Build Tight, Ventilate Right
- More on Ventilating Right
- Improving Air Quality and Saving Energy
- Checking Your Work



Why Ventilate?

- Materials have changed
- Siting has changed
- Tightness has changed
- Codes and standards



Build-tight-ventilate-right saves more energy than building naturally leaky buildings, and air quality is better, too



ASHRAE 62.2

- Whole-house (Section 4)
 $Q = .01 * S.F. + 7.5 * (\#BR + 1)$
- Local exhaust (Section 5)
 $K = 100 \text{ cfm int} / 5 \text{ ACH cont}$
 $B = 50 \text{ cfm int} / 20 \text{ cfm cont}$
- Windows do not count
- Single family homes
- Multifamily in-unit spaces



Whole-House Ventilation

Three Major Strategies:

- Exhaust Only
- Supply Only
- Balanced Heat or Energy Recovery

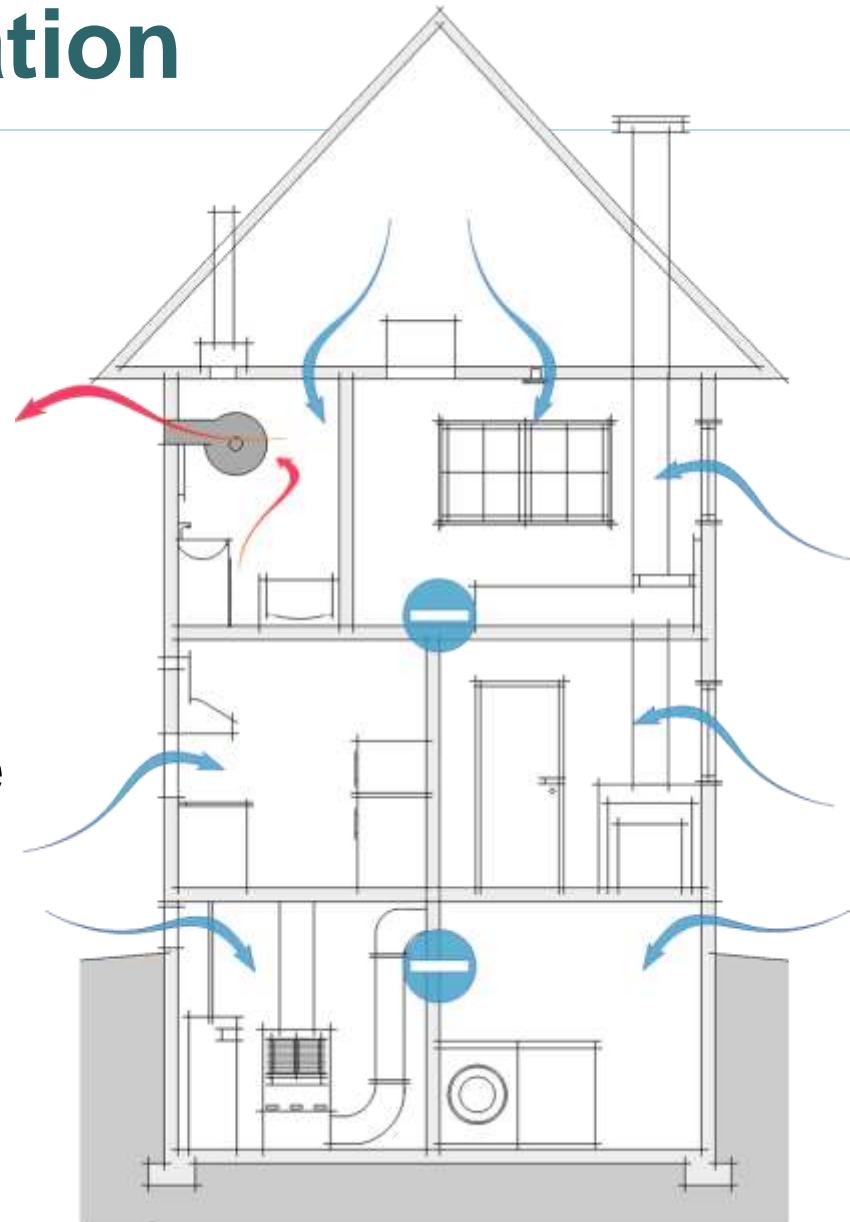


Veridian Homes



Exhaust Only Ventilation

- Continuous OR timer
- Depressurizes
- Outside air through leaks, cracks, or planned inlets (trickle vent, not undercut)
- Fans rated continuous use
- Quiet fans ≤ 1 sone
- 40-60 cfm, 6-10 watts



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Supply Only Ventilation

- Fresh air duct to return ductwork
- Supplies fresh air when air handler runs
- Pressurizes
- Stale air out through leaks and cracks
- Use VFD to minimize energy impacts

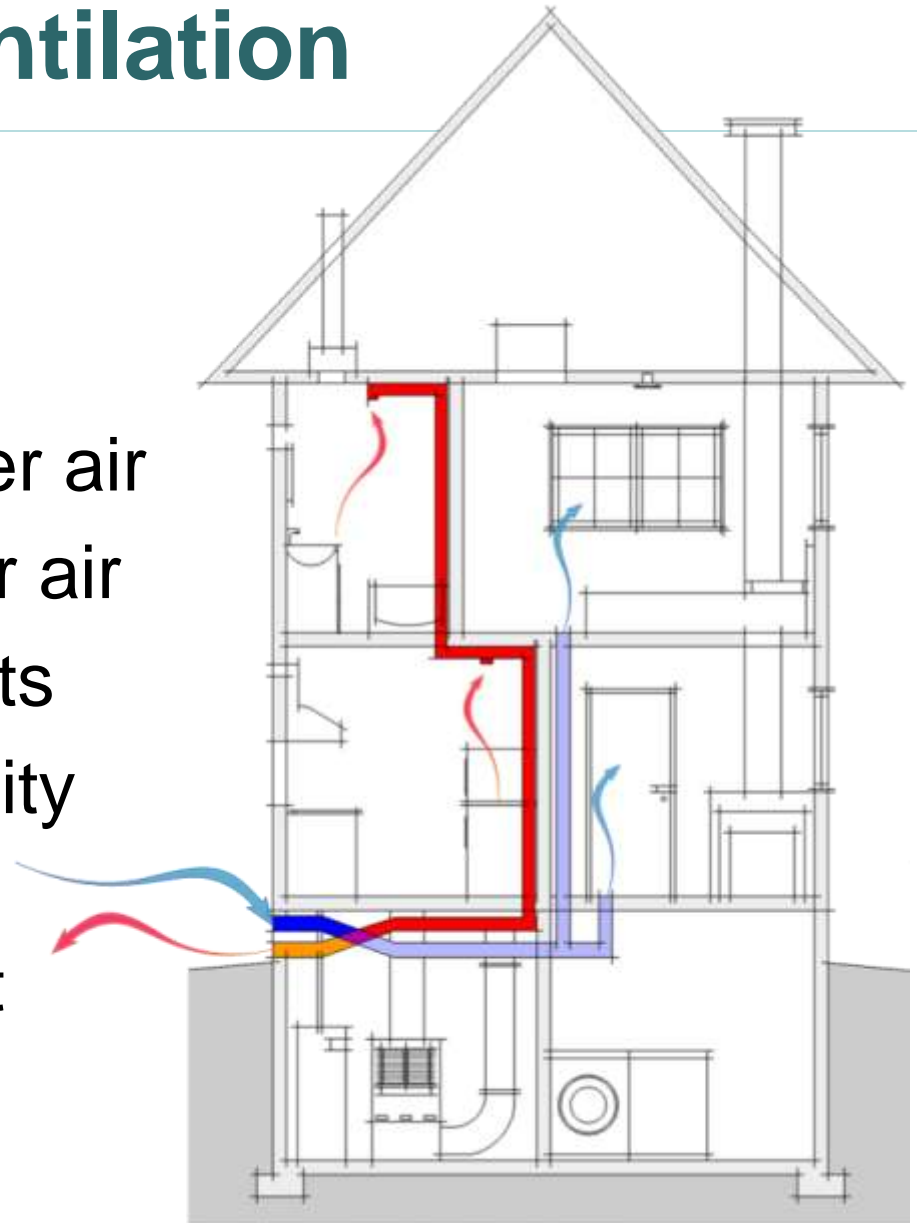


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Heat Recovery Ventilation

- Transfer heat between indoor and outdoor air
- Cools incoming summer air
- Warms incoming winter air
- Best with separate ducts
- Good to remove humidity
- Good for favorable humidity levels in & out



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Energy Recovery Ventilation

- Transfers heat and moisture between indoor and outdoor air
- Cools incoming air in summer and heats it during winter
- Moisture moves from more moist air to less moist air
- Used in hot humid conditions to remove humidity from incoming air
- Used in cold dry conditions to return some or all of the humidity to the indoor space

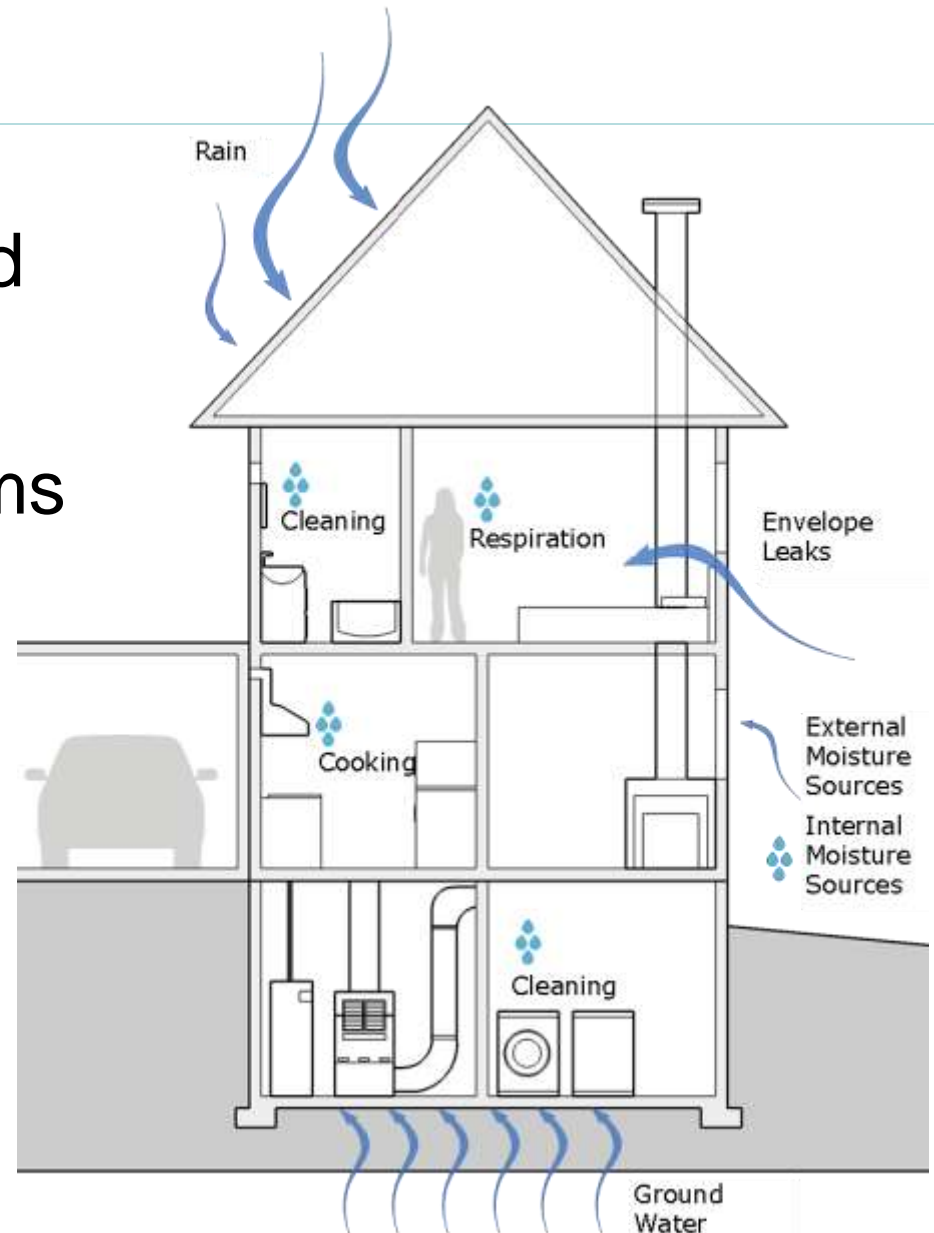


Types of Ventilation – Pros & Cons

	Exhaust Only	Supply Only	HRV	ERV
Pros	<ul style="list-style-type: none"> • Low first cost • Easy retrofit • Low maintenance • Low energy fan 	<ul style="list-style-type: none"> • Low first cost • Easy retrofit • Low maintenance • Filtered air 	<ul style="list-style-type: none"> • High energy savings • Low maintenance • Air is filtered • Balanced pressures 	<ul style="list-style-type: none"> • High energy savings • Air is filtered • Humidity control • Balanced pressures
Cons	<ul style="list-style-type: none"> • No heat recovery • May pull air into cavities 	<ul style="list-style-type: none"> • Furnace fan = high energy • No heat recovery • May push air into cavities 	<ul style="list-style-type: none"> • High first cost • Difficult retrofit • Higher energy use fan • Condensate drain needed 	<ul style="list-style-type: none"> • High first cost • Difficult retrofit • High maintenance • Higher energy fan use • Bathroom tie-in • Condensate drain needed
Best Use	<ul style="list-style-type: none"> • No outdoor pollutants • Moderate outdoor humidity 	<ul style="list-style-type: none"> • High outdoor pollutants 	<ul style="list-style-type: none"> • High indoor humidity • No humidity concerns • Separate ductwork 	<ul style="list-style-type: none"> • High outdoor humidity • Low indoor humidity • Separate ductwork

Local Exhaust

- Remove pollutants and moisture
- Kitchens and bathrooms vented to outdoors
- Continuous exhaust
- Intermittent exhaust
- MF Central Systems
- MF Unitized Approach



Continuous Local Exhaust

- Bathrooms 20-30 cfm
- Kitchens 5 ACH
- Match whole-house flow rates for Exhaust Only
- Boost flow for localized humidity or pollutants
- Kitchen room fan + recirc hood
- Timed options acceptable



Intermittent Local Exhaust

- User demand controlled
- Bathrooms 50-80 cfm
- Kitchens 100cfm
- Vented range hood removes pollutants closer to source
- Distinct from whole-house

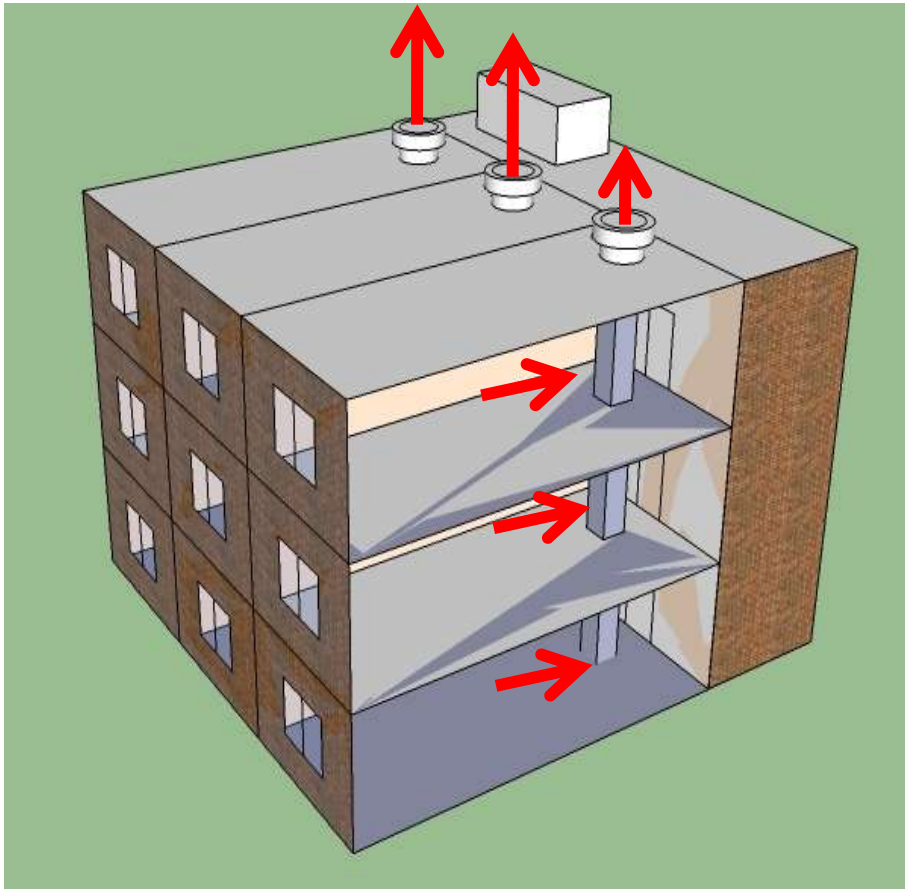


Overlook at Clipper Mill

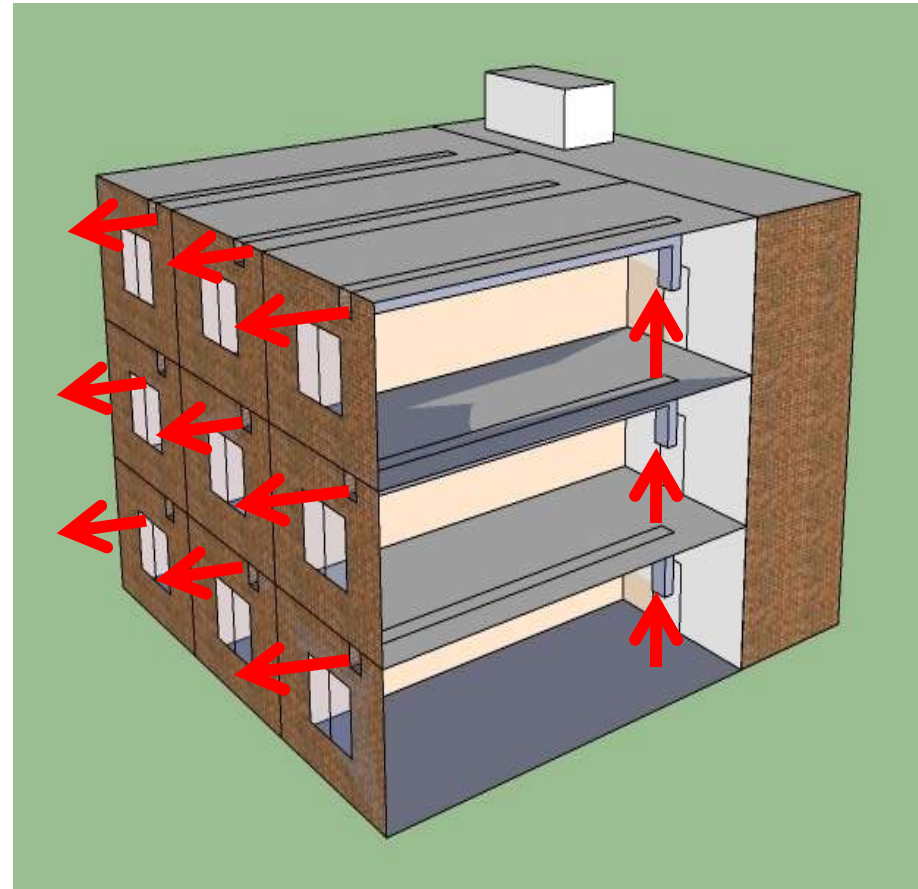


Multifamily: Central or Unitized?

Central Exhaust

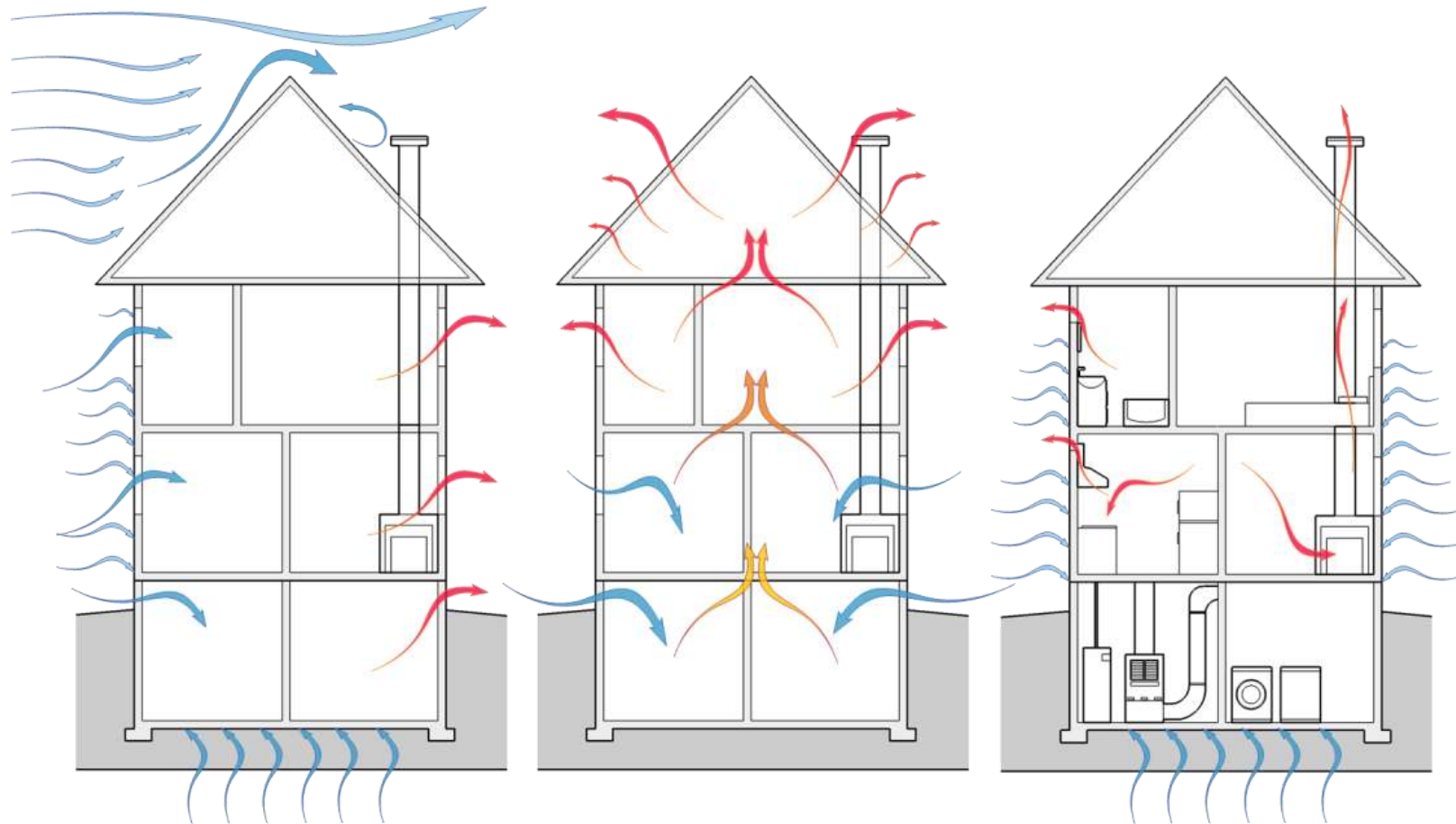


Unitized Exhaust



To Ventilate Right, First Build Tight!

Air Flow in Buildings



Wind Driven Air Flow

Stack Effect

Mechanical Equipment

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Ventilation Works As Installed

- Design \neq Performance
- Typical leakage in newly installed ducts is 30%
- SF fans typically pull 30-80% of rated flows
- ERV's are valuable, but are often mis-used



Rooftop Fan "Art"



Tips for Successful Venting

- Use short straight runs
- Seal ducts & shafts
- Seal rooftop fan curbs
- Seal registers/grilles to drywall
- Install CAR Dampers
- Test performance!



*University Village Apartments
on Colvin Street*



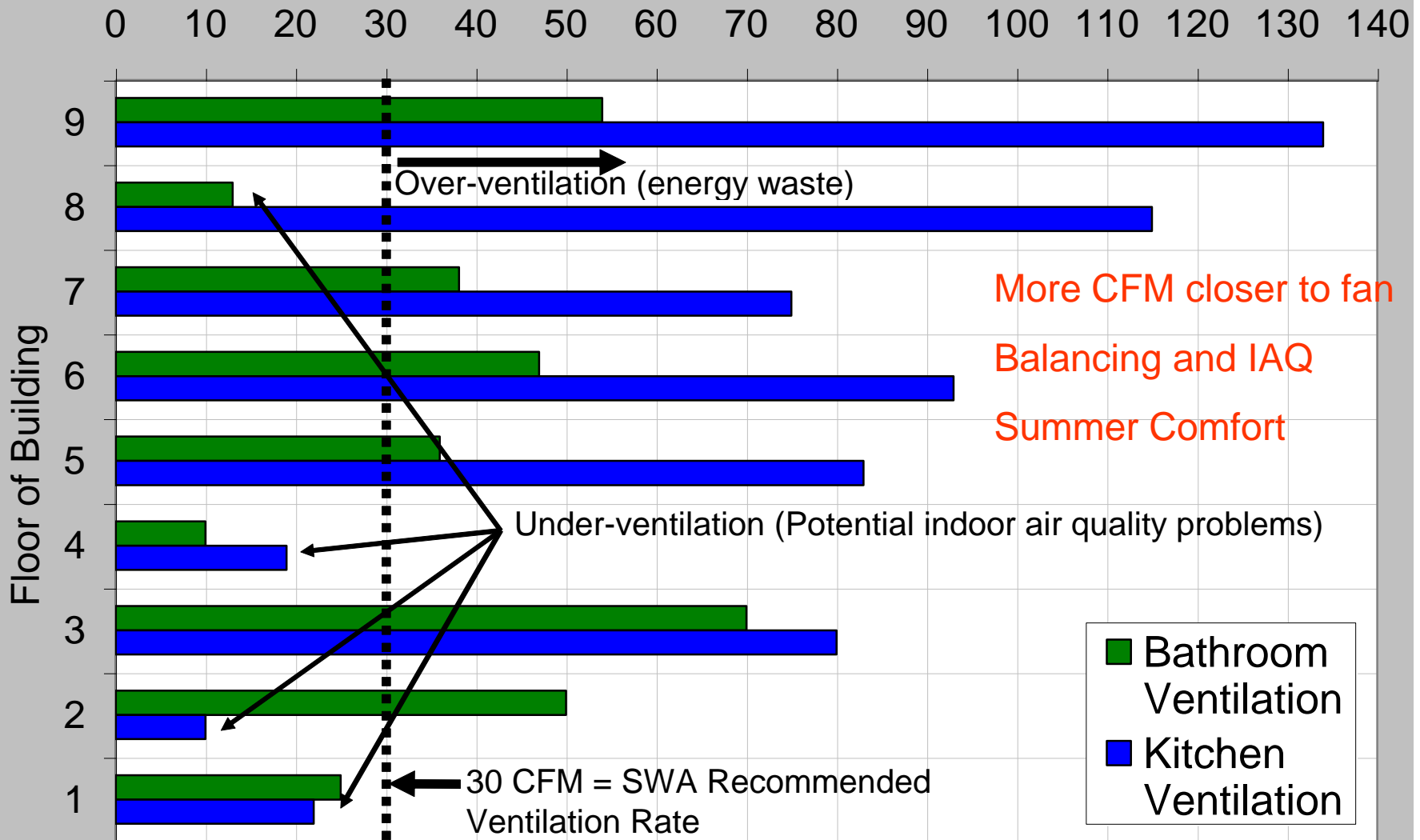
HRV/ERV's are Worth Getting Right

- HRV/ERVs that share ducts with central systems need extra fanpower to move air
- Duct separately, or use VFD air handlers
- Supply fresh air where it is needed most: bedrooms are first priority
- Although common practice, SWA does not recommend tying ERVs to bath exhaust
- Instead, provide local exhaust fan to deal with variable humidity buildup and draw stale air from central areas



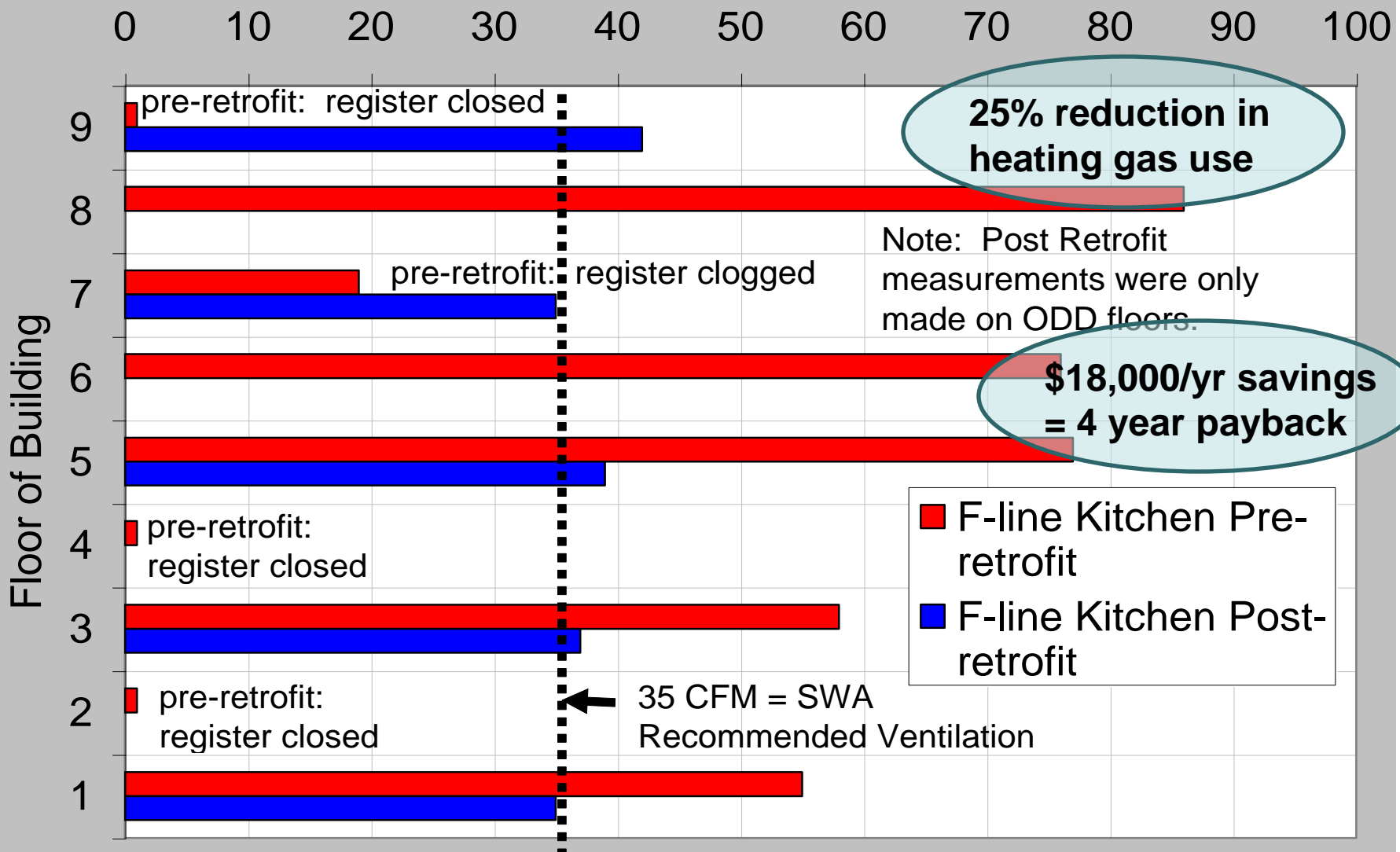
Case Study 1: MF Overventilation

Exhaust CFM at Each Floor of a 9-story Building



Retrofit Results

Exhaust CFM by Floor: Before and After Retrofit



Summary

- Step 1: Understand ventilation requirements
- Step 2: Select the simplest design that can achieve both air quality and energy objectives
- Step 2: Build a tight building
- Step 3: Pay attention to installation quality
- Step 4: Check to make sure ventilation works
- Step 5: Educate users





Thank You

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