

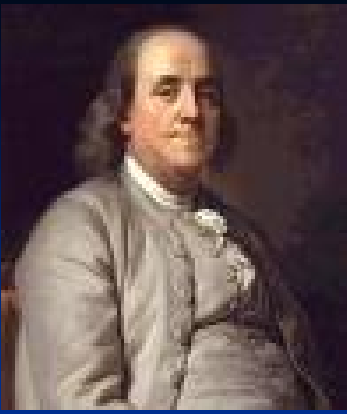
Putting the **V**
back in
HVAC



V is for Ventilation

A system or means of providing fresh air.

Webster New Collegiate Dictionary



Benjamin Franklin

“I am certain that no air is so unwholesome as air in a closed room that has been often breathed and not changed.”

“Traditional heating and cooling systems in U.S. homes have not addressed the fresh air ventilation needs for home occupants. Homes experience inadequate ventilation because they rely on infiltration and natural ventilation rather than controlled mechanical ventilation systems.”

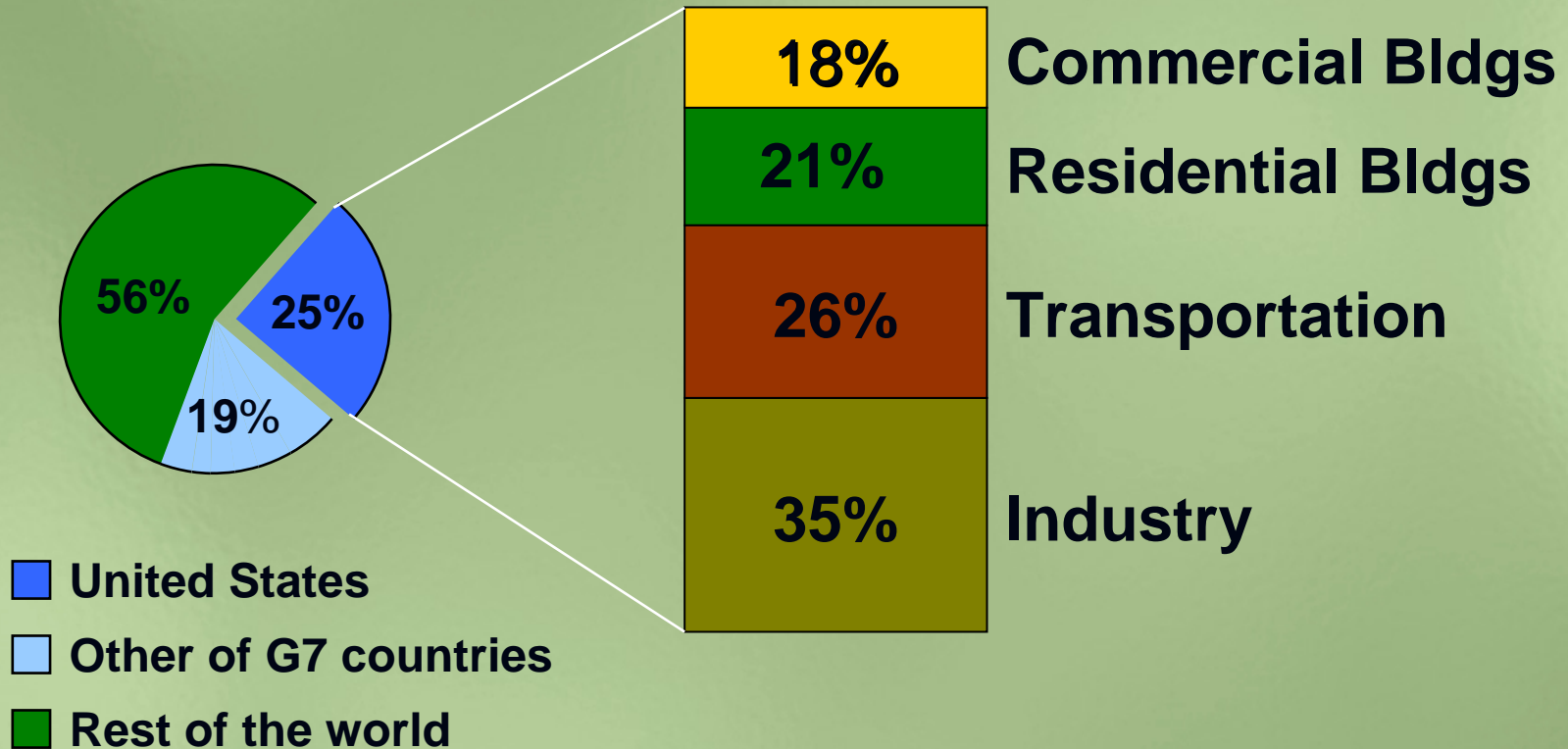
**Program Needs for Indoor Environments Research (PNIER)
US EPA Planning Document**

Common Callbacks

(Houses that work - EEBA)

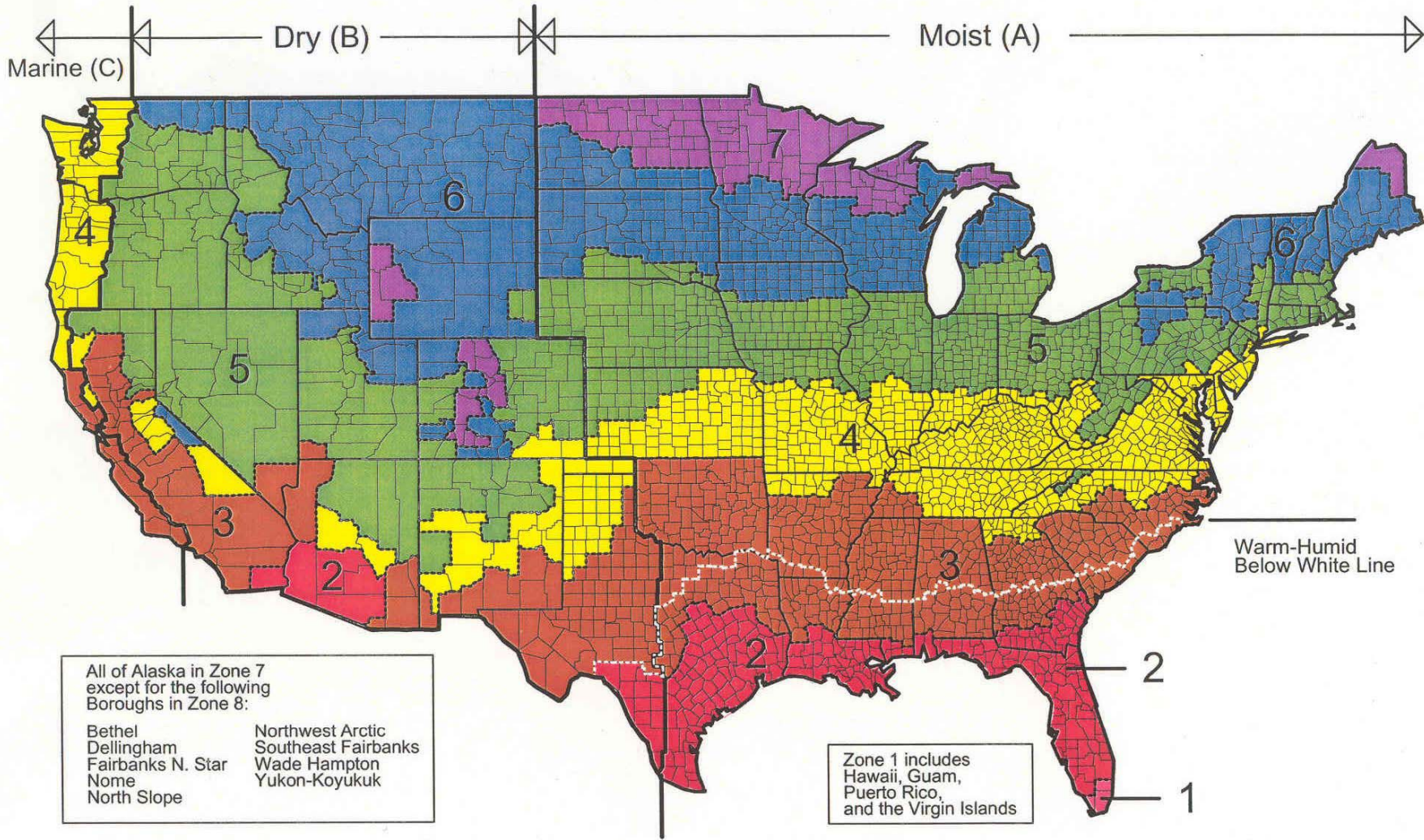
- High interior humidity
- Poor indoor air / mold problems
- Wet basements, crawlspaces or slabs
- Comfort problems / drafts
- High energy bills

US Energy Demand



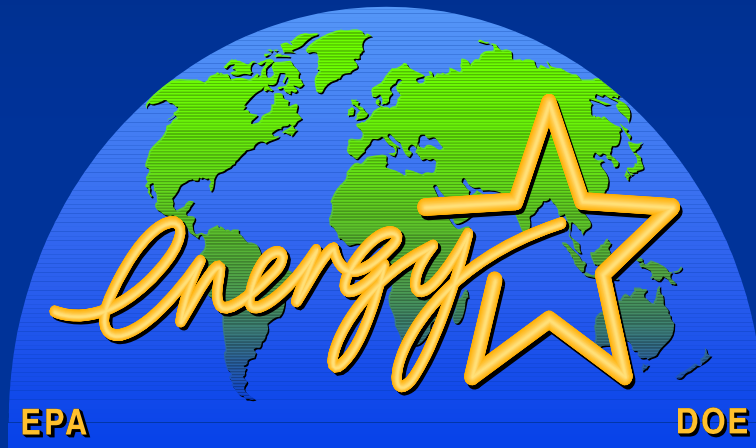
US buildings consume roughly 10% of the world's energy, every day!

Map of DOE's Proposed Climate Zones



The Better Built House

Everything you need to know but were.....



Characteristics of Better Buildings

- Very tight construction
- Carefully insulated
- Mechanical ventilation
- Point them at the sun

- Reduced moisture problems
- Good indoor air quality
- Energy efficient
- Greater comfort
- Durable / low maintenance





- Moisture control
- Radon control
- Pest barriers
- HVAC: heating, cooling, ventilation, filtration
- Combustion and garage isolation
- Healthy building materials
- Commissioning the building

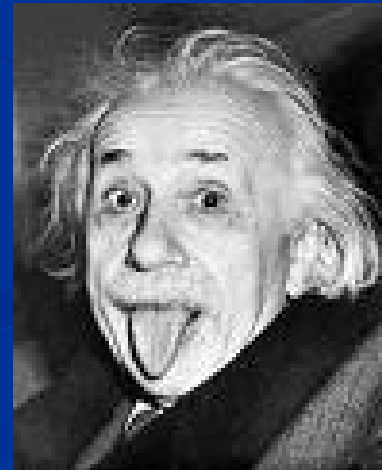
How houses work.....

House as a system

Heat, air and moisture flows

Insanity

Continuing to do things
the same, and somehow
expecting a different
outcome.



Air Flows



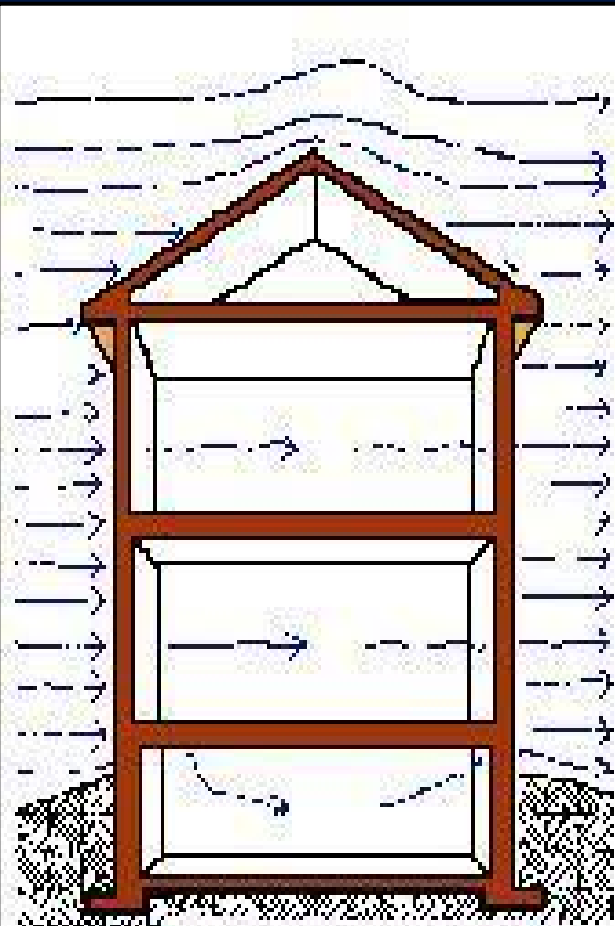
To have air flow - a pressure difference and a hole.

Pressure in houses is caused by:

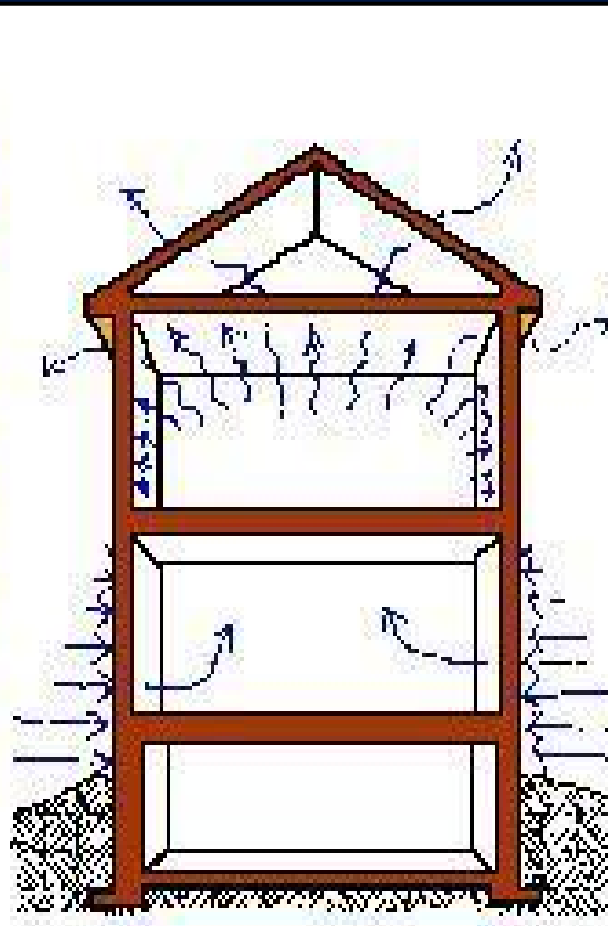
Wind Effect

Stack Effect

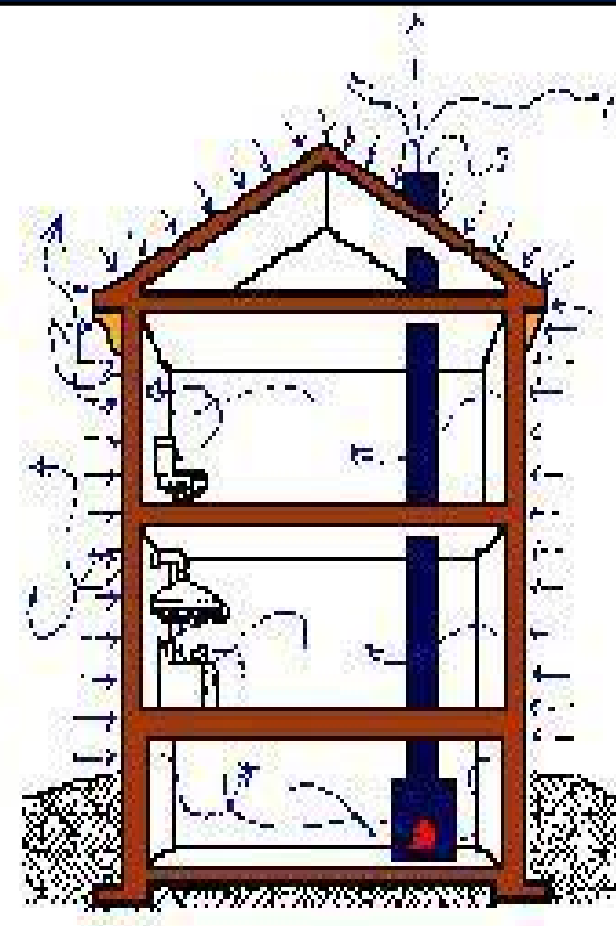
Flue or mechanical Effect



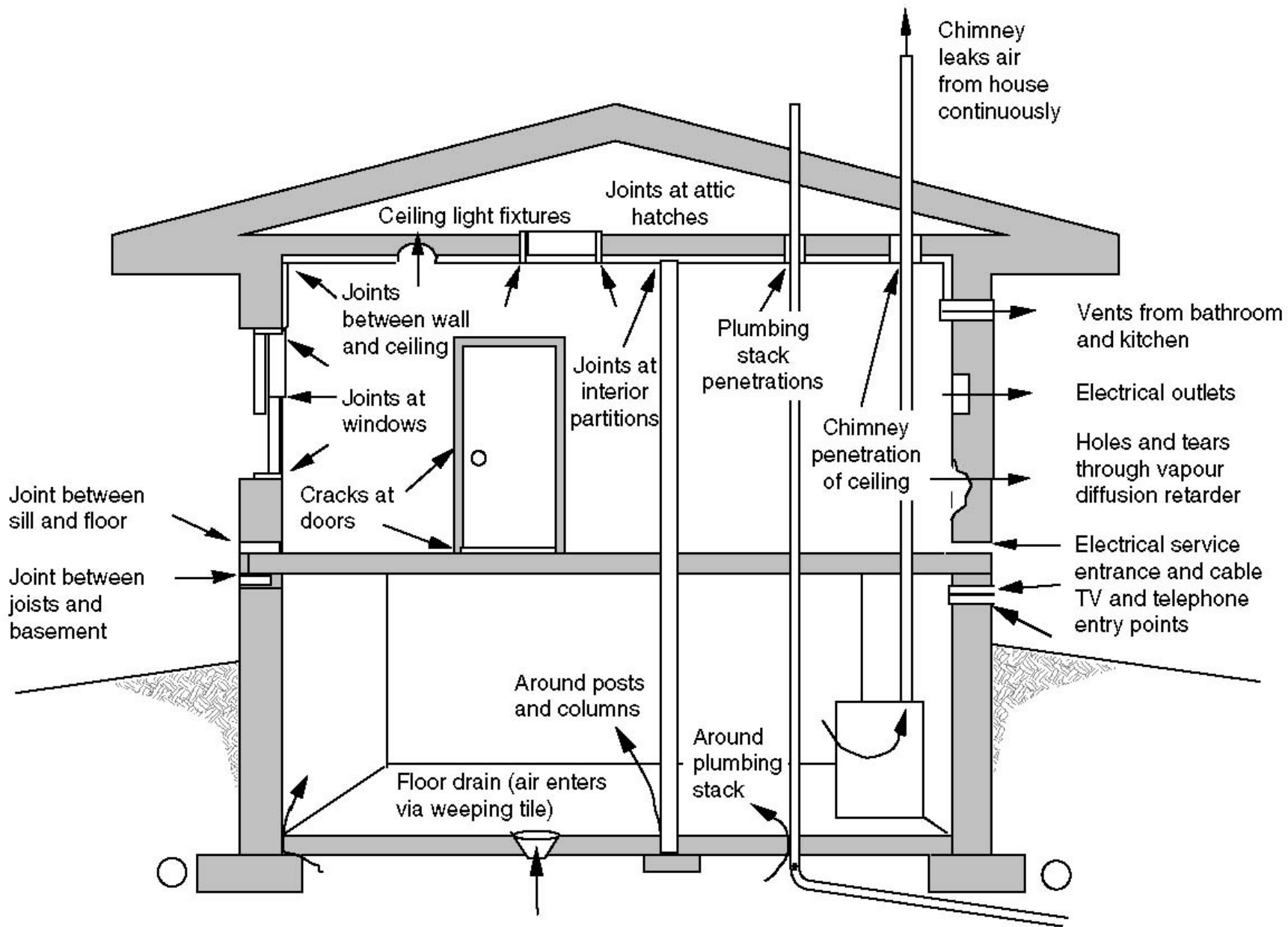
Wind Effect



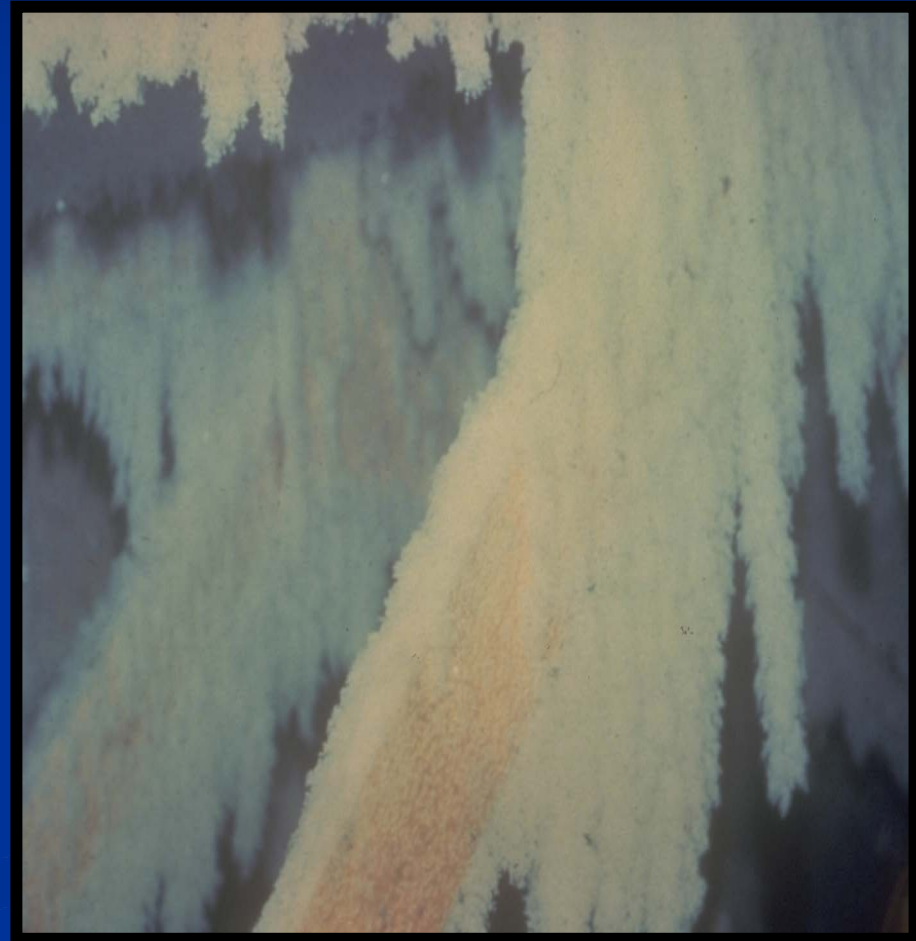
Stack Effect



Flue and Mechanical Effects



Uncontrolled air leakage exfiltrating moisture into an insulated wall or roof cavity creates rot & decay



Indoor Air Quality...

Understanding sources and solutions

- ▶ Best of the Web:
Holiday gift bargains, p. 7
- ▶ Vote on grandparents' rights, p.18
- ▶ 10 reasons to
eat your spinach, p.20



THE MOLD IN YOUR HOME MAY BE DEADLY

Is your home in danger?
 Ron Allison suffered memory loss.
 His son, Reese, has asthma and scarred lungs.
 The cause: simple exposure to household mold.
 How you can protect your family.

www.businessweek.com

BusinessWeek

JUNE 5, 2000 A PUBLICATION OF THE MCGRAW-HILL COMPANIES

China
Counterfeit goods: A losing battle

Cisco
Does it have a Microsoft problem?

Inside Story
Why 3M banned Scotchgard

Daimler-Chrysler
The fight for control — the untold story

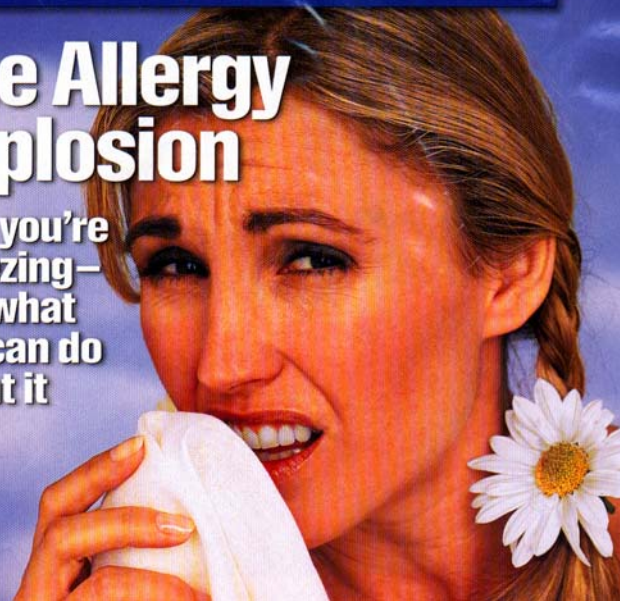
IS YOUR OFFICE KILLING YOU?

The dangers of sick buildings
 By Michelle Conlin
PAGE 114

AOL Keyword: BW

The Allergy Explosion

Why you're sneezing — what can do about it



Fact:

1 in 3 people have an allergy
severe enough to seek
medical attention on a
routine basis.

—American Lung Association

Fact:

On average, we spend more than
90% of our time in buildings,
much of it in the home.

World Health Organization

Fact:

91% of new home buyers are concerned about indoor air quality.

And are willing to pay \$5,000+ in add-ons to assure greater control of their indoor environment.

— Builder Magazine, Honeywell and Professional Builder Magazine

The Nature of IAQ & Health

Everyone is affected, some more than others

- Age – the very young and the elderly
- General health – the immune system

- Duration of exposure
- Level of pollutant concentration

Indoor air is affected by:

- Outdoor air
- Building materials
- Mechanical equipment
- The foundation (moisture, soil gases)
- Home furnishings
- Lifestyle - how people live in their home; hobbies, pets, cleaning and personal care

Pollutant Sources

External

- Outdoor air
- Attached garages
- Soil gases (radon)
- Exterior applied insecticides



Internal

- Building materials
- Combustion equipment
- Occupant Activities
 - cooking
 - cleaning
 - hobbies
- Furnishings
- Mold & other biologicals



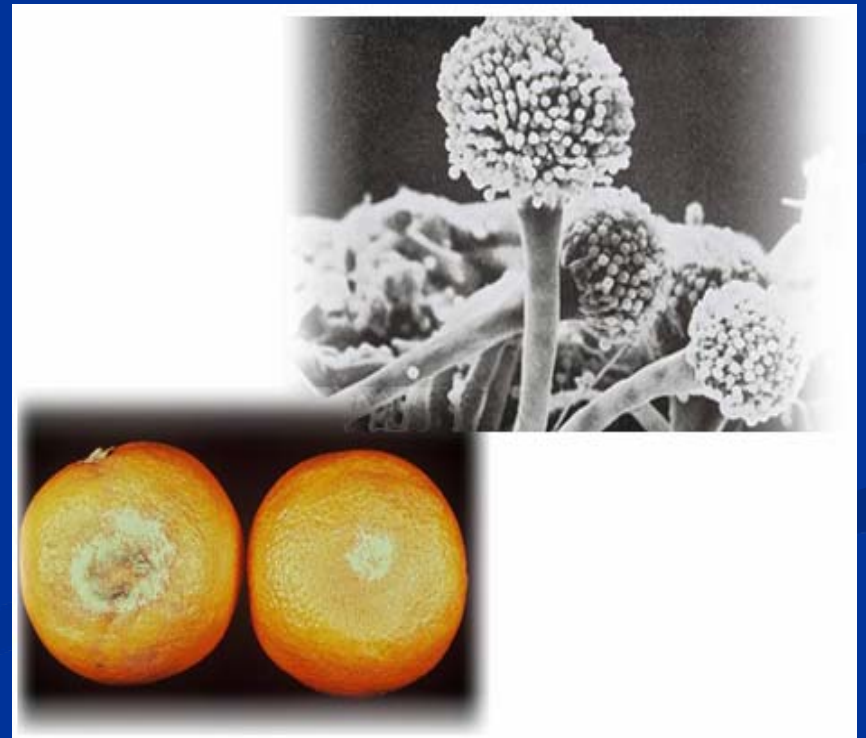
Moisture

is the key to
MOLD
GROWTH.



Molds

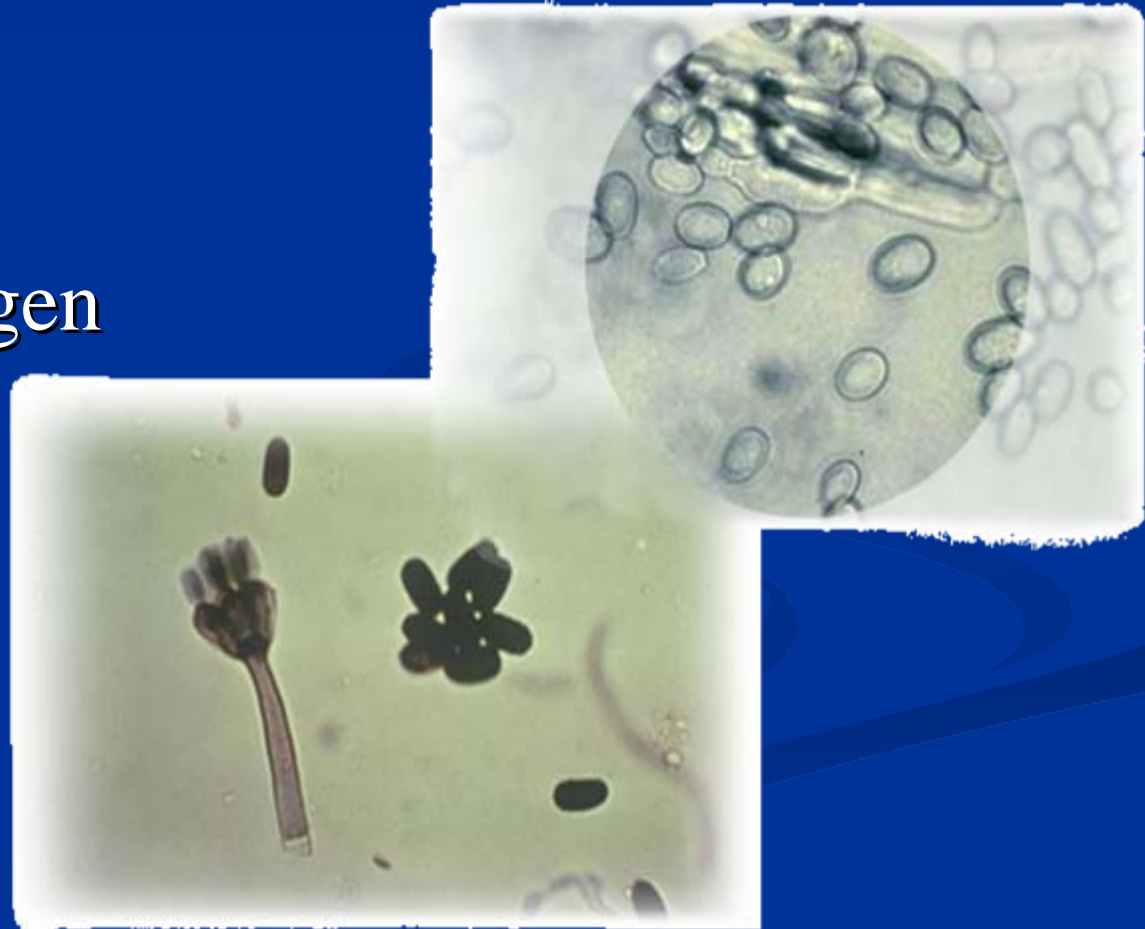
- ◆ Spores (seeds)
- ◆ Plant materials (Beta-1,3 glucans)
- ◆ Mycotoxins
- ◆ Smells (fungal volatiles)



Spores (seeds) are everywhere.....

Factors that affect the germination and growth of molds are:

- nutrients
- presence of oxygen
- temperature
- water



Strategies to Control Moisture

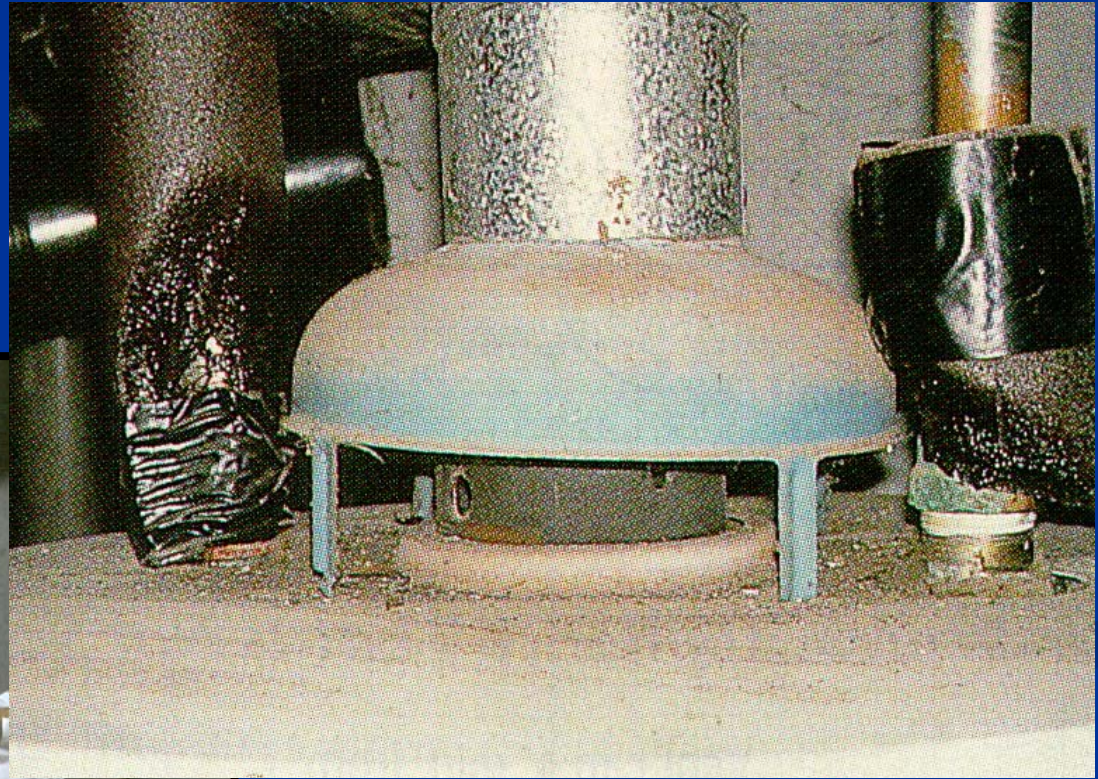
- No leaks
- Manage interior humidity levels
 - Install and operate ventilation system
 - Exhaust from kitchen and baths
 - Vent dryers
- Warm surface temperatures
 - Increase insulation
 - Avoid thermal bridges
 - Use low e, warm edge windows

Combustion Safety

Rule # 1 – don't kill your customer!

- Sealed combustion equipment
- Power vented water heater
- Direct vent fireplaces
- Vented gas cooking appliances
- Separating the house from the garage
- Install CO Detectors

Water heater safety: the good, the bad, and the ugly



The Garage to house Connection



IAQ Strategies

1. Eliminate
2. Seal
3. **Ventilate**
4. Filter



Ventilation...

Methods, amounts & strategies

More customers / more business the debate continues...

- More customers?
- More product to existing customers?
- Why not grow your business doing more \$ with your existing customers

Why Ventilate?

- Outdoor air is always cleaner than indoor air
- To control humidity
- To control pollutants
 - People - respiration (primarily CO₂), body odor, water vapor, cooking, hobbies, parties, pets
 - Buildings – materials, furnishing, combustion gases, radon, water vapor

Goals of Mechanical Ventilation

Stale air out, fresh air in

- To control moisture in buildings (source control)
- To reduce pollutants in the home (dilution)
- To filter the incoming air

- Ventilate for people (continuous)
- Supplementary ventilation (intermittent, as needed for “special events”)

- Distributed, quiet, comfortable, controlled

How Much Ventilation?

- ASHRAE: Standard 62-2
 - So much per person (bedrooms)
 - Additional ventilation based on Floor Area
- Other factors:
 - Moisture generation rates,
 - source strength of pollutant,
 - occupant sensitivity

ASHRAE 62.2

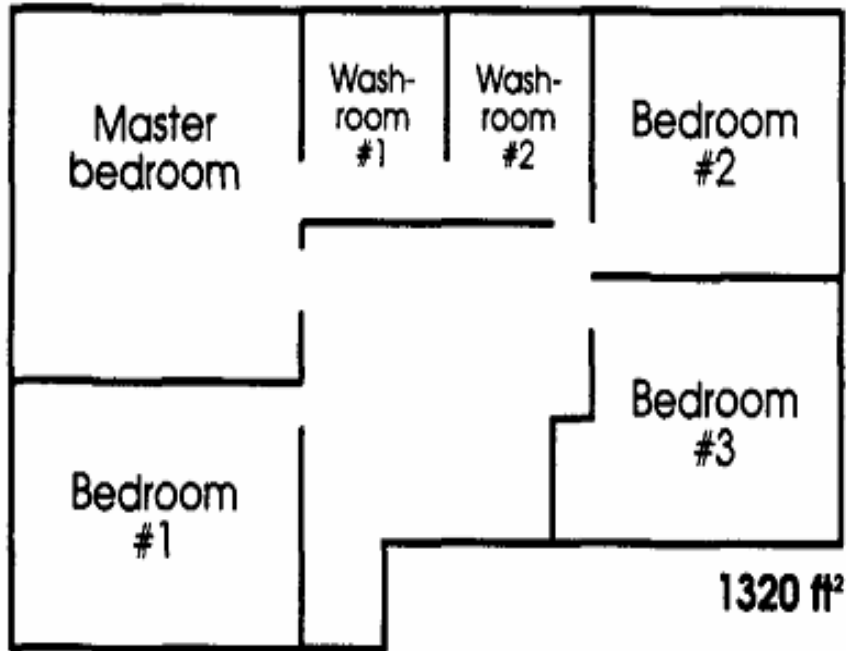
Whole house ventilation

- Every home needs the capacity for mechanical ventilation to dilute pollutants
 - over and above natural leakage and opening windows
 - There are exceptions for warmer climates where it is expected windows will be open for extended periods
- $7.5 \text{ cfm per bedroom (+1)} + 0.01 \text{ cfm/ft}^2 \text{ Floor Area}$
 - Add additional capacity if it is known there will be more people

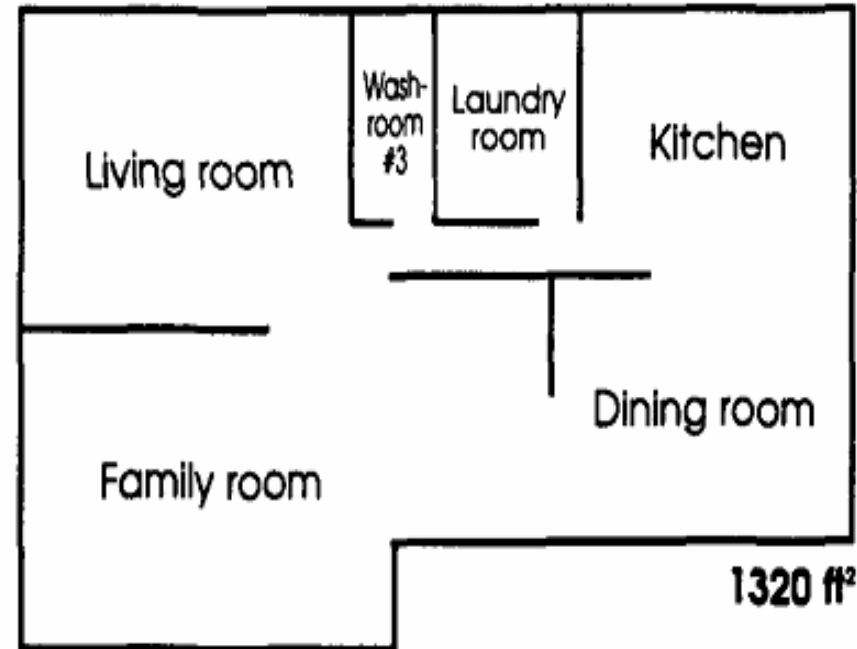
Ventilation Sizing Example

This minimal ventilation capacity controls moisture, odors and other pollutants

Second floor



Main floor



Ventilation Capacity

$$4 \text{ bedrooms} + 1 \times 7.5 \text{ cfm} + 26.4 \text{ cfm} \\ = 63.9 \text{ CFM}$$

Types of Mechanical Ventilation

- Exhaust-Only
- Supply-Only
- Balanced System

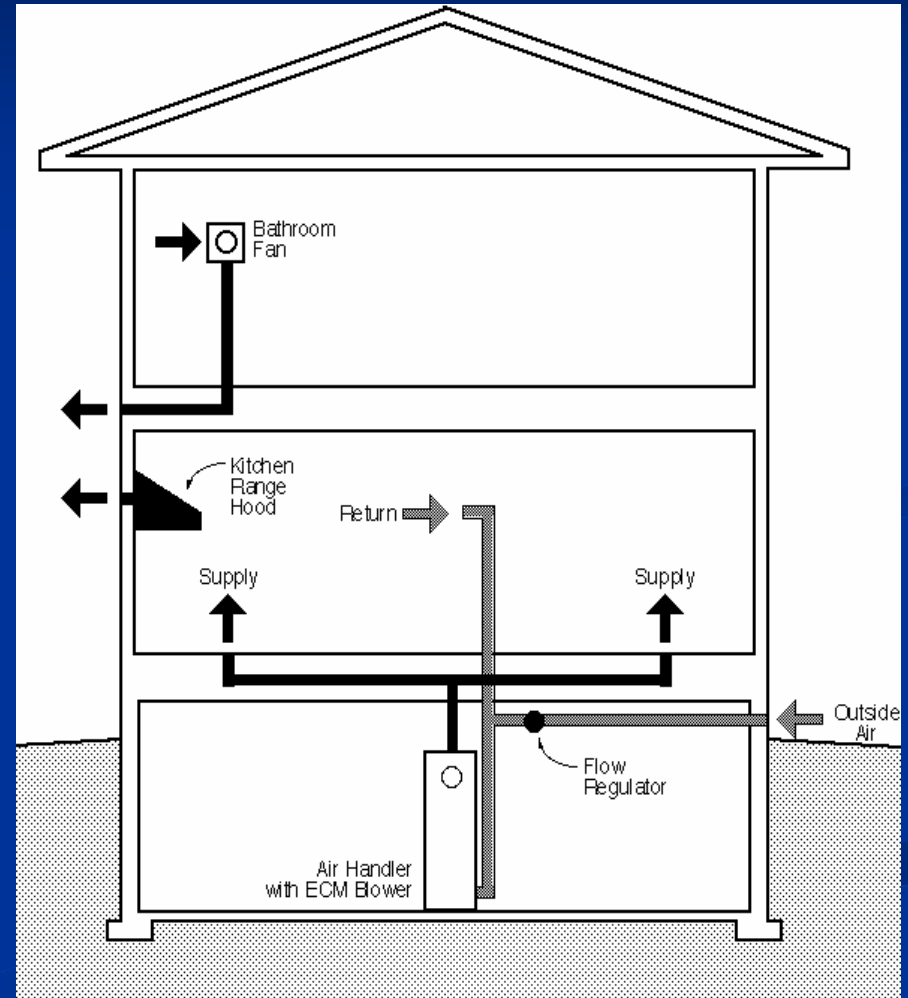
Builders want ventilation solutions for their homes.

Solutions that work in the home, not in the box - installed.

Exhaust Ventilation

Exhaust Ventilation

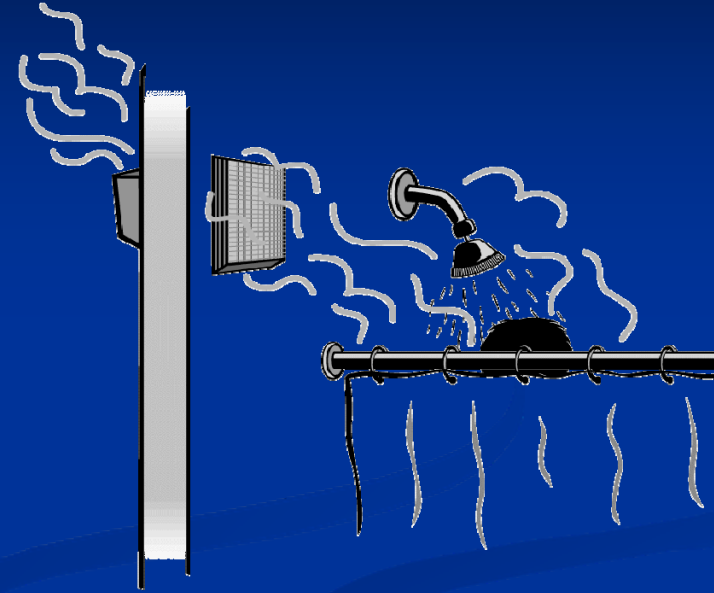
- Exhaust the moisture and pollutants at the source
- Use quiet, efficient, “tested” fans
- Be cautious about backdrafting, houses are getting tighter



Minimum bathroom fan specifications

Choose fans that are:

- HVI rated, not less than 50cfm.
- Have a sound rating not greater than 3.0 sones.
- If intended for continuous use, a sound rating of 1.0 sone is req'd.





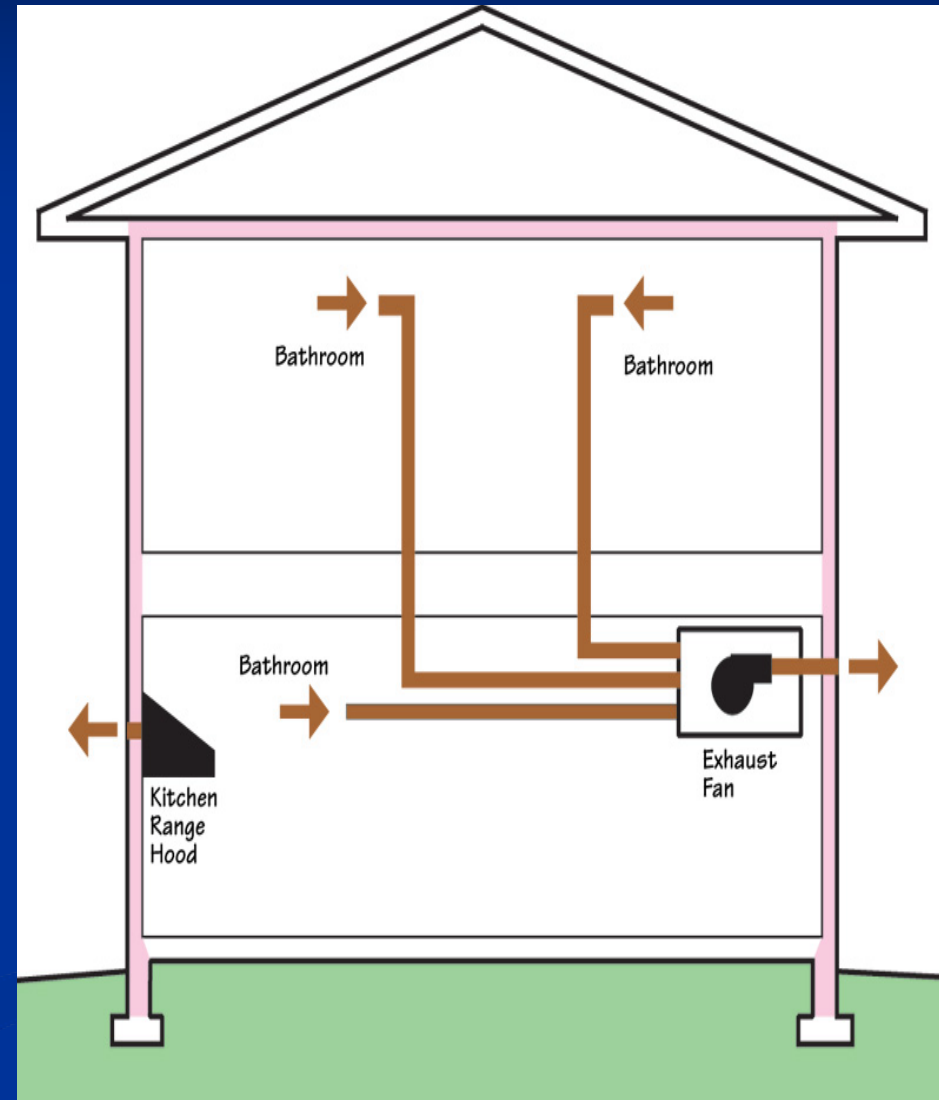
Properly sized fan and duct (5" dia.)

Insulated duct, air tight details

Exhaust Only Ventilation

Central Exhaust Fan

- A central fan can reduce noise levels and encourage extended operation times
- Locate the fan in unoccupied areas, accessible for maintenance



Central Exhaust Fan

Specify fans that are under 1.0 sones to ensure people will leave them running

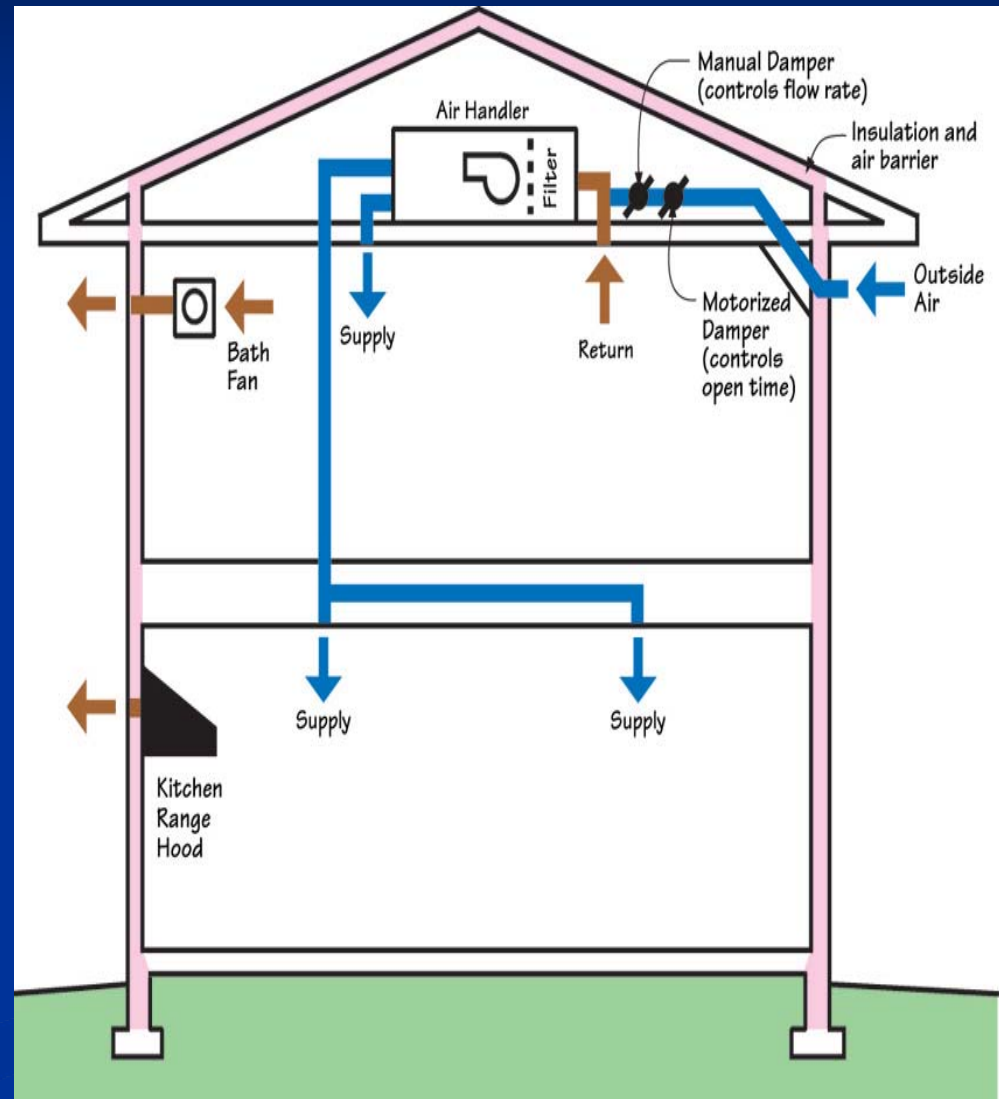




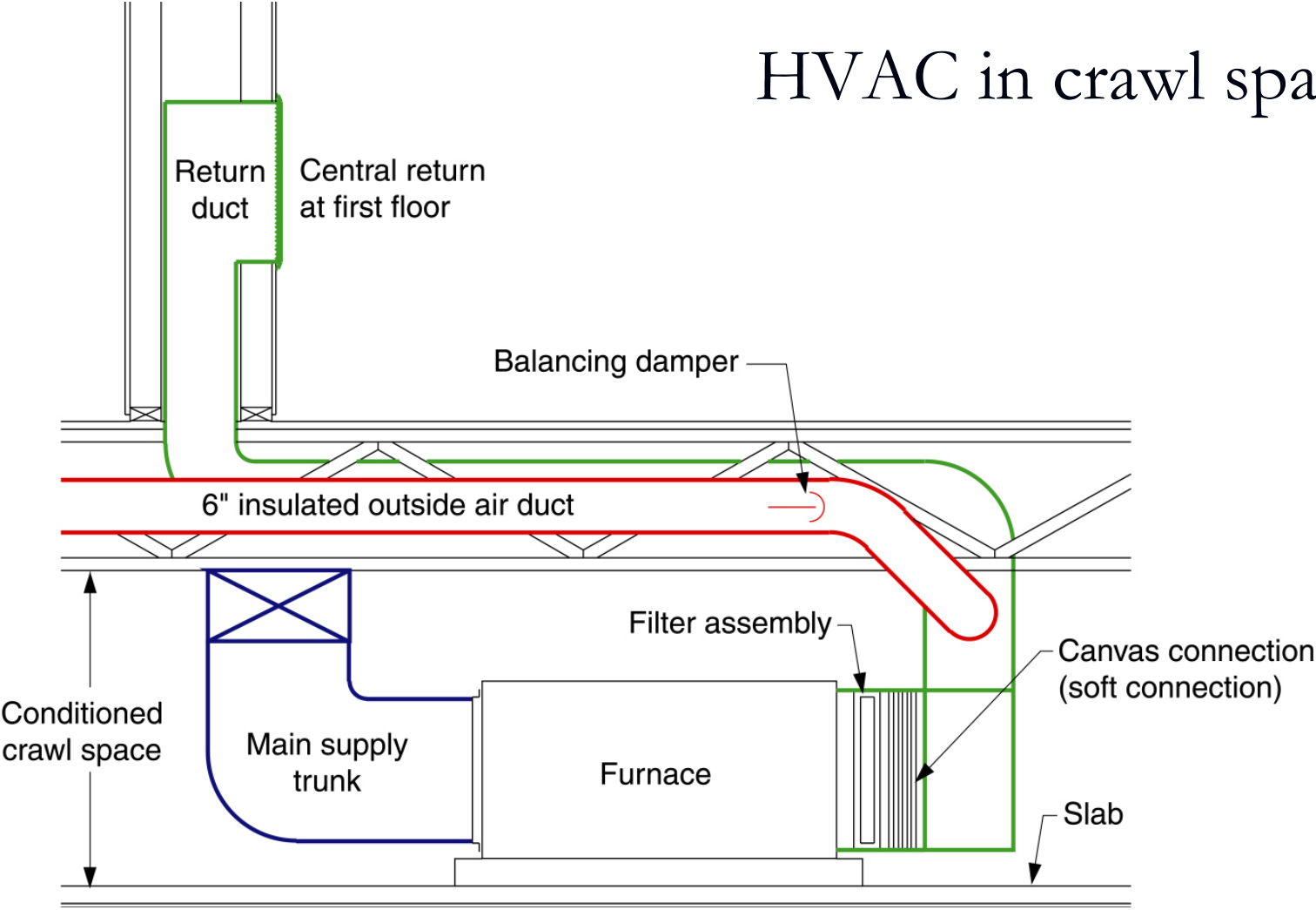
Supply Ventilation

Supply Only Ventilation

- A fresh air duct into the air handler return - typically 6"
- Use dampers & timers to control the ventilation (independent of heating & cooling cycles)
- Use ECM motors
- Supply only ventilation will tend to pressurize homes – this can be good or bad depending on climate and heating choices.



HVAC in crawl space



Distribution of fresh air is
essential for good IAQ
with all systems!



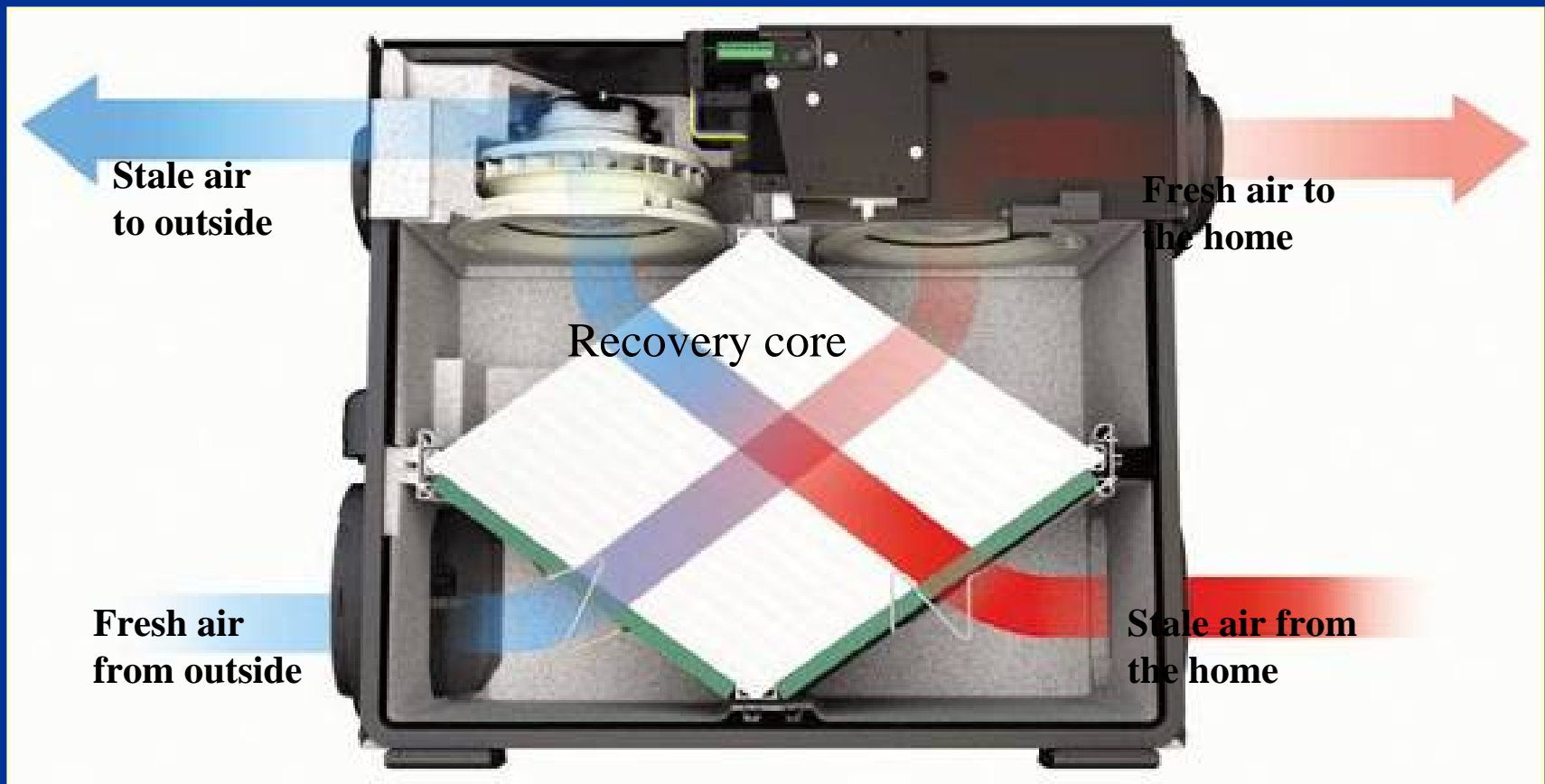
Balanced Ventilation



HRV / ERV

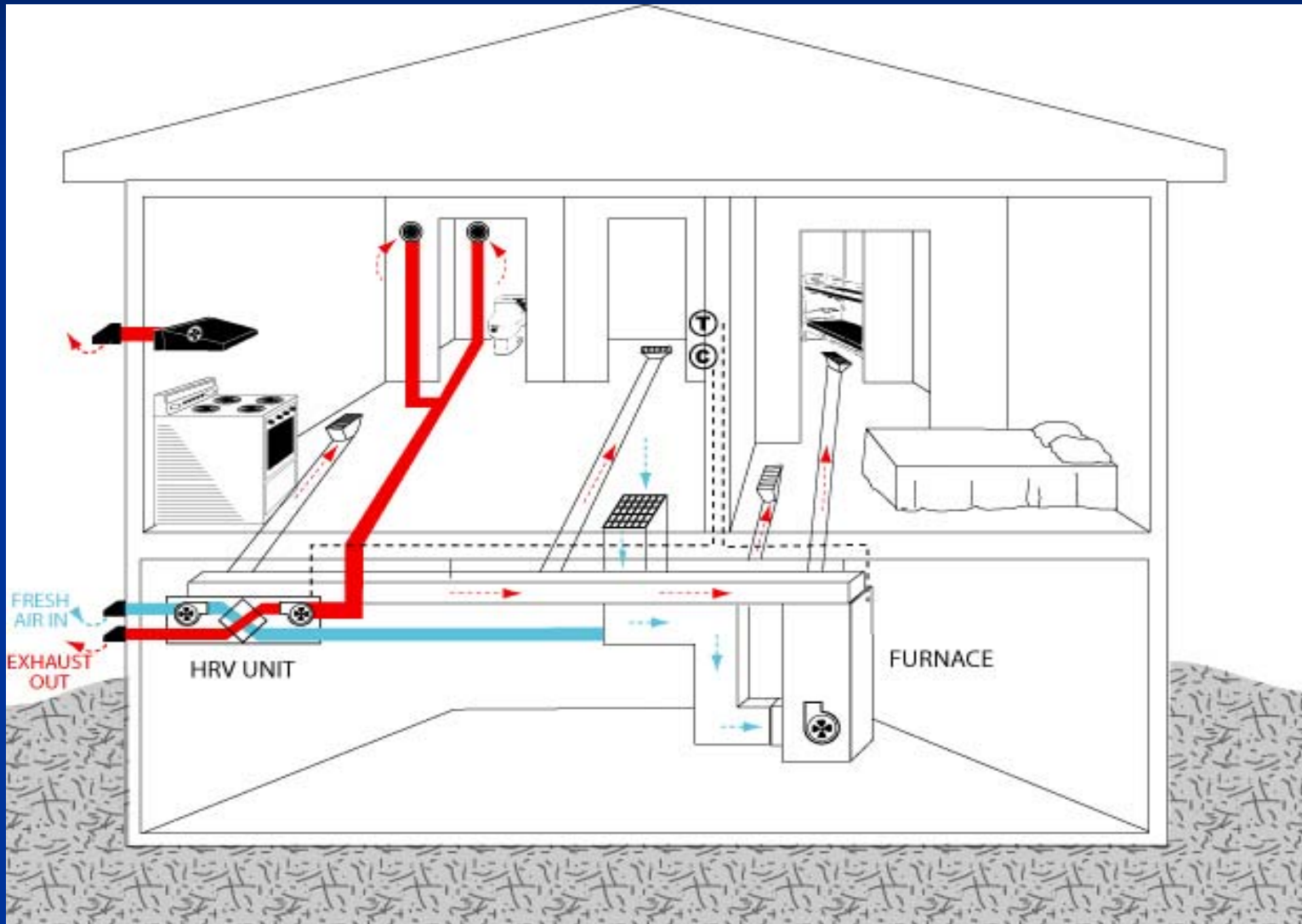
the LUNGS of the Home

Recover as much as 70% - 80% of the energy from the exhaust air stream

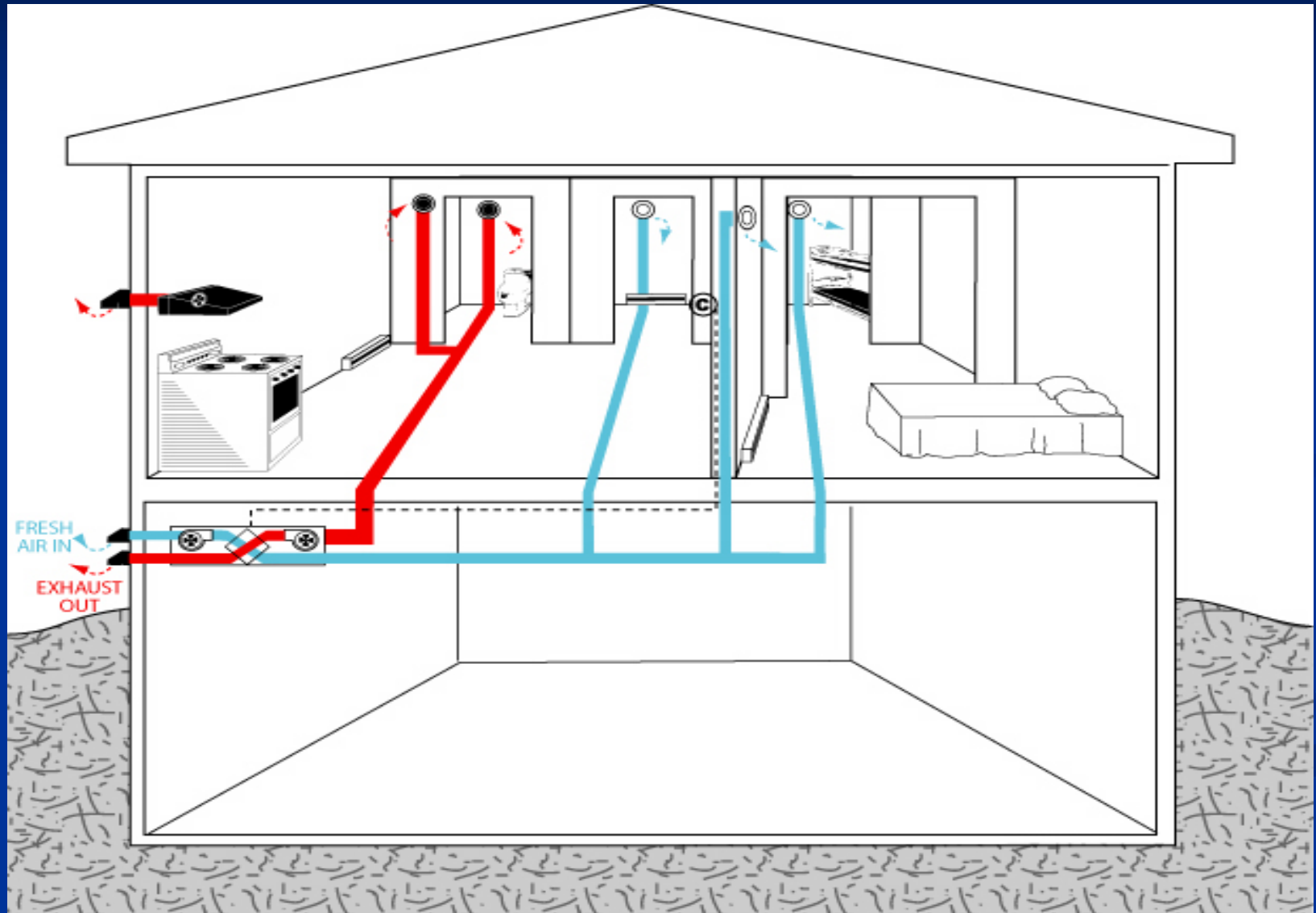




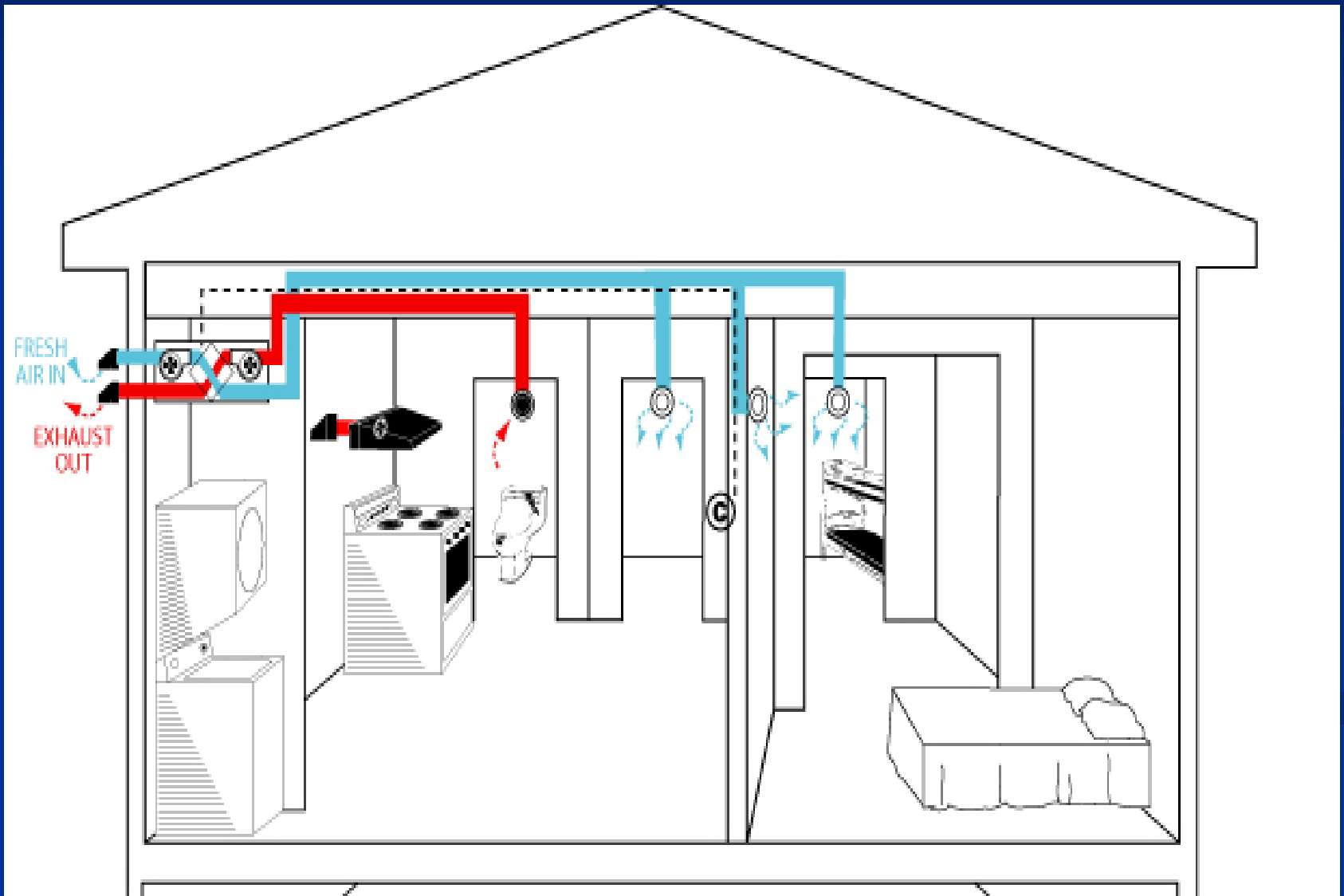
Exhaust ducted – fresh air through forced-air heating



Fully ducted system

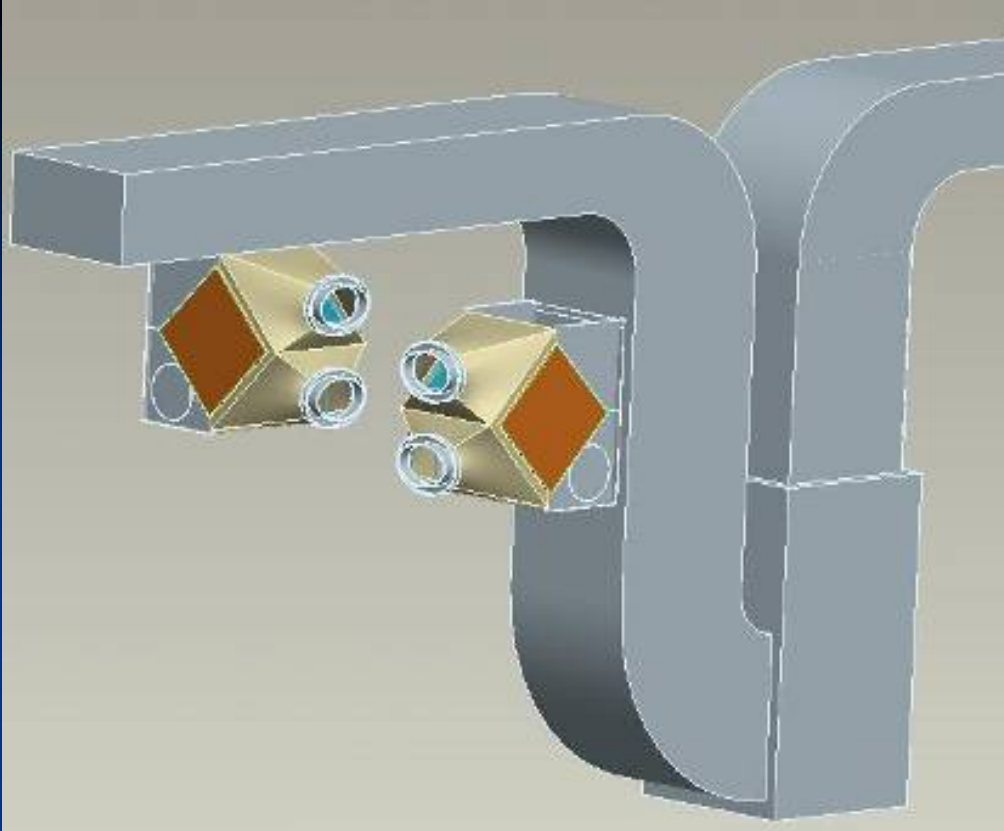


Fully ducted system – Slab on grade

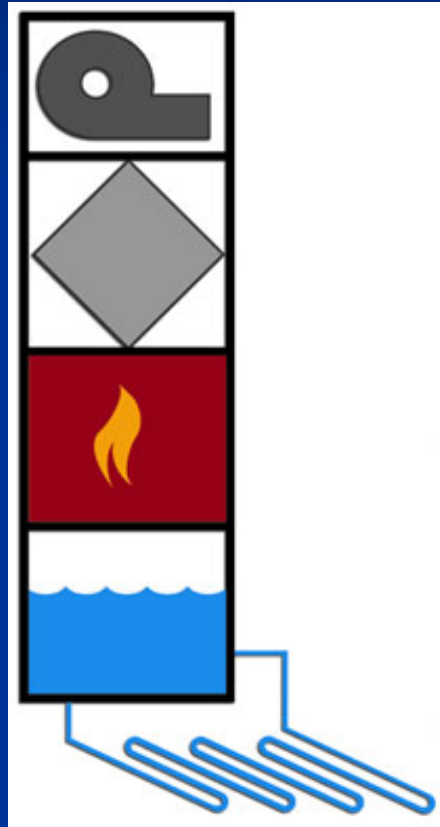




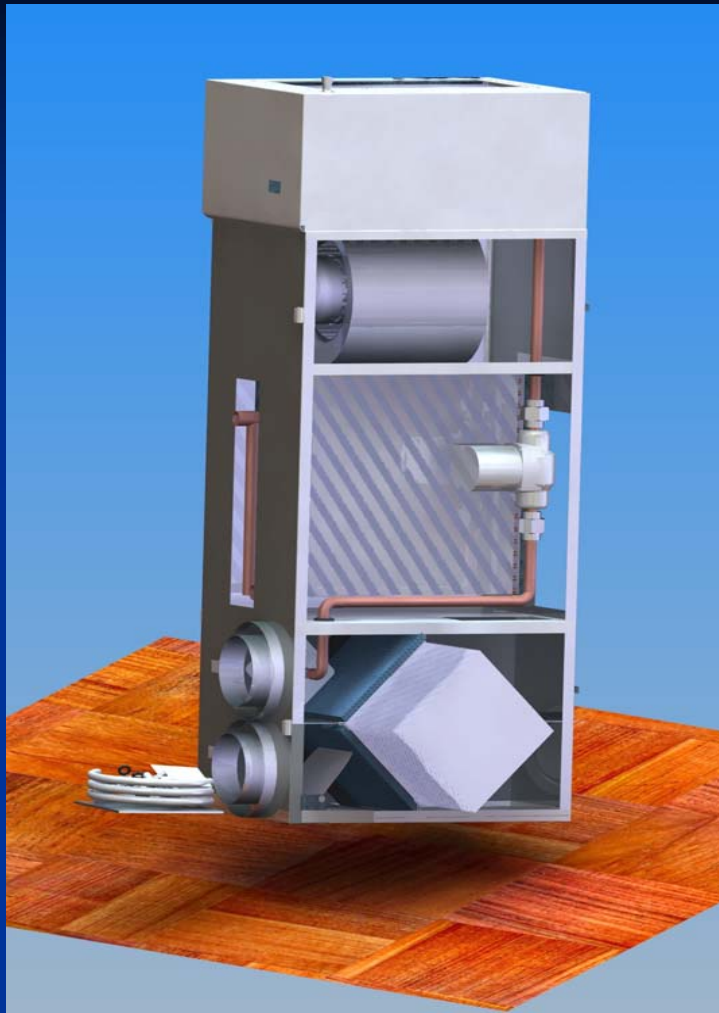




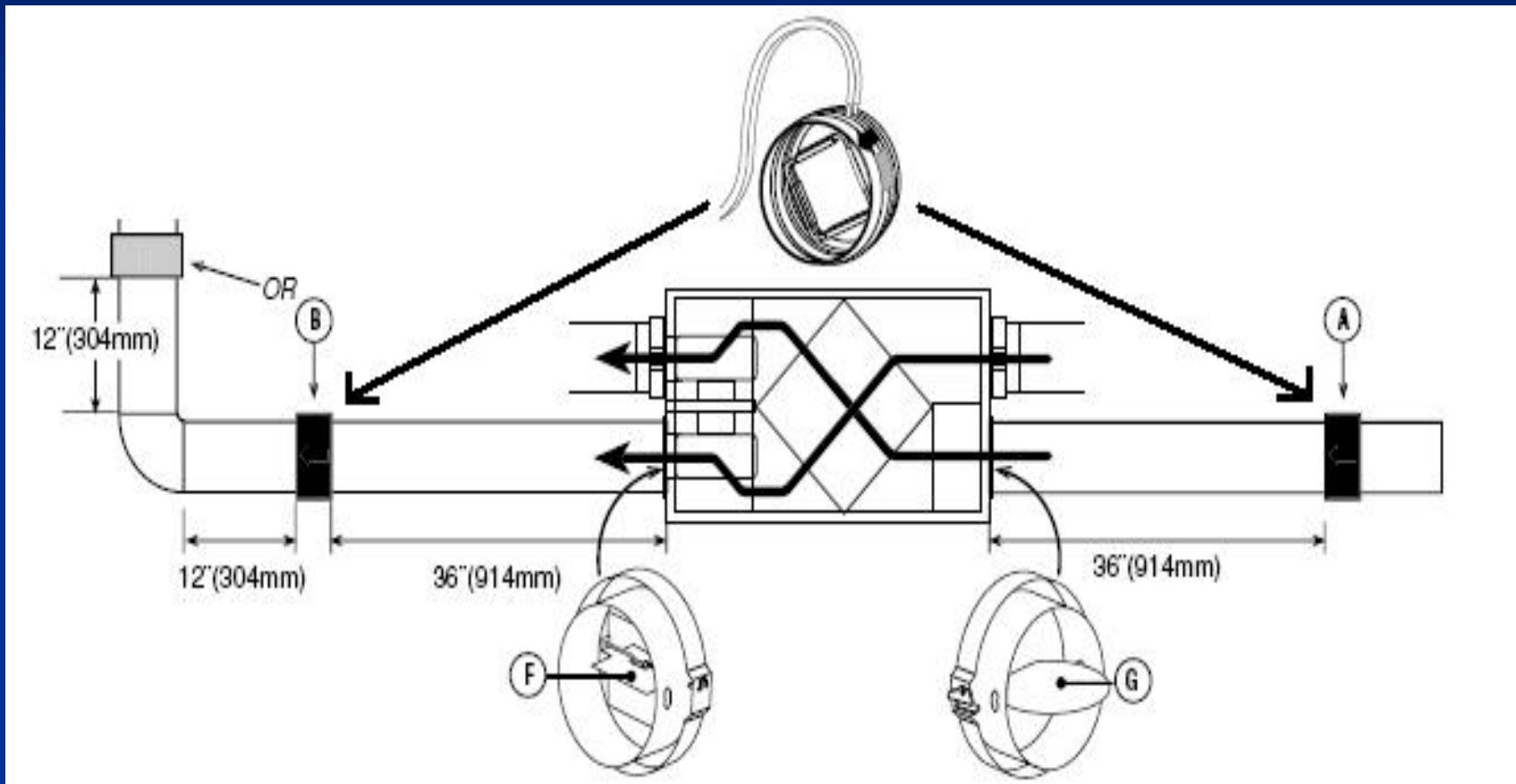
Integrated space, DHW and ventilation systems ...



- Heat distribution
forced air / Radiant floor
- Domestic hot water
- Energy recovery ventilation
- Cooling if required



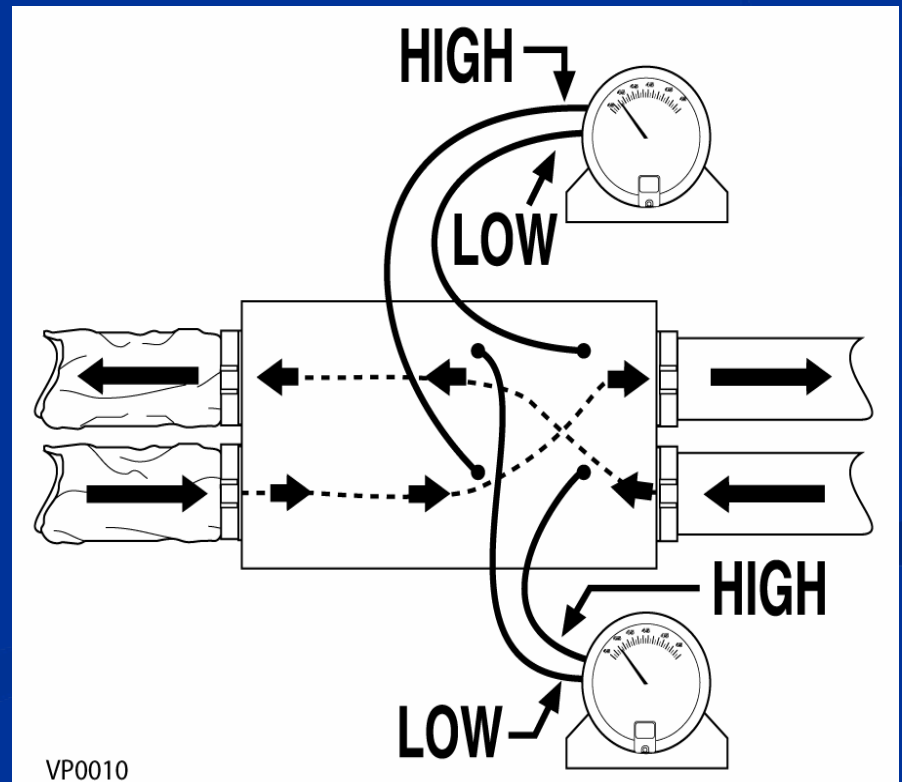
Balancing procedure with airflow stations



Balance airflows within +/-10% for proper operation

Other balancing procedures

- Individual manufacturers may have different balancing methods :
 - Some use pressure taps built into the door.
 - Some use fan speed adjustments rather than dampers.



Timer switches for the kitchen and bathrooms



Control Options

Main controls (some with dehumidistats)



Outside hoods

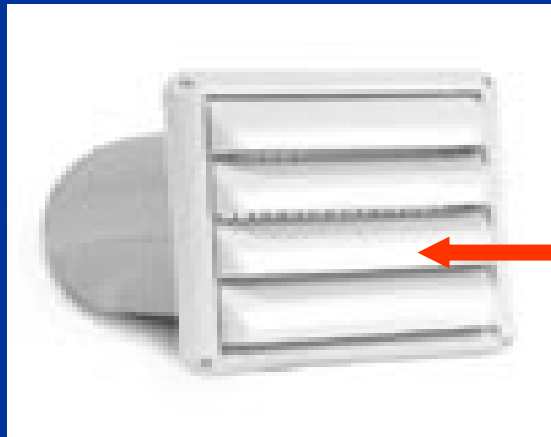


This style of hood allows excellent airflow.



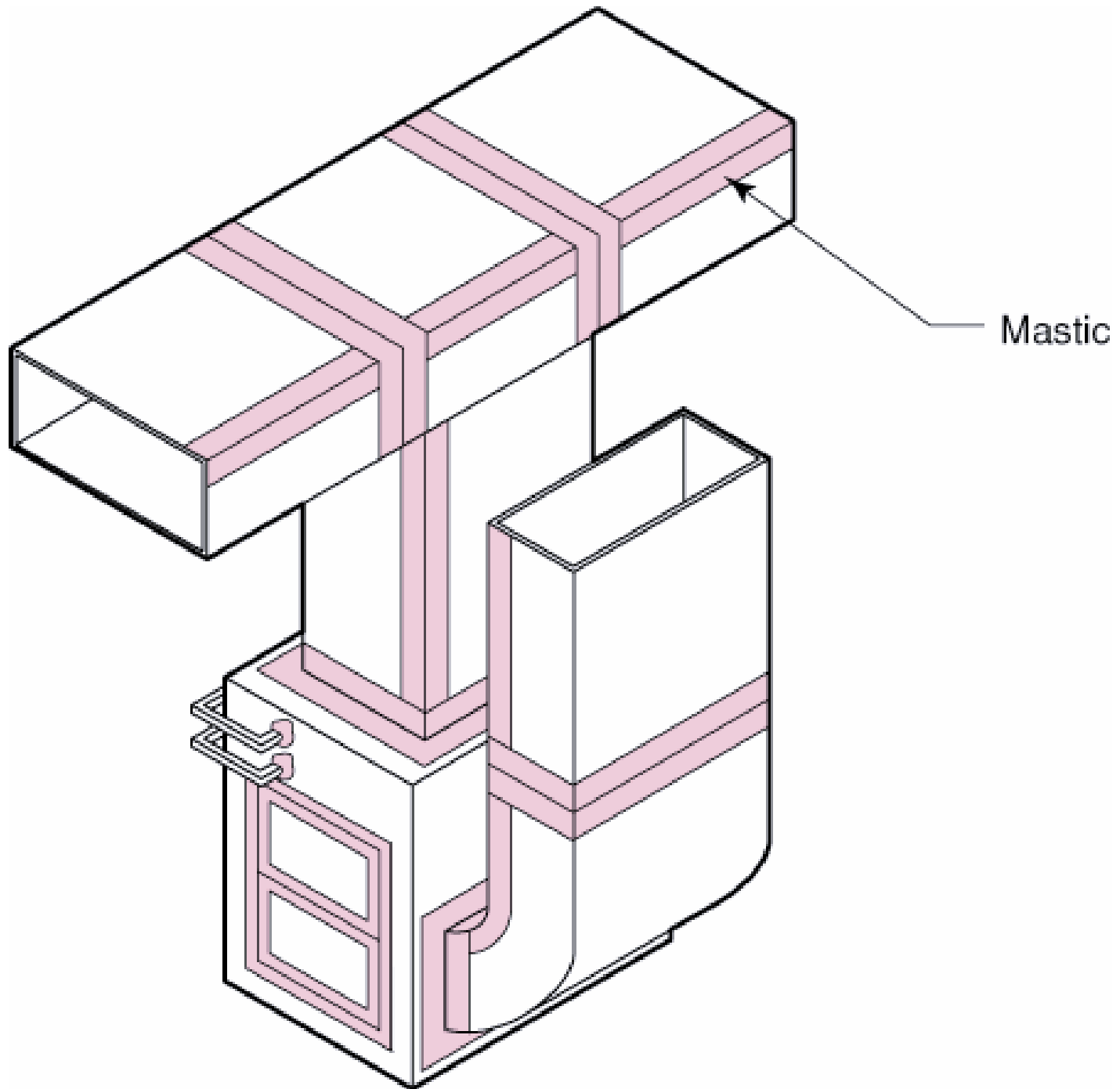
Exhaust air out

Fresh air in



This style of hood tends to be very restrictive on airflow.

A Special Hood:
Some specialized hoods don't need the 6' clearance from exhaust.



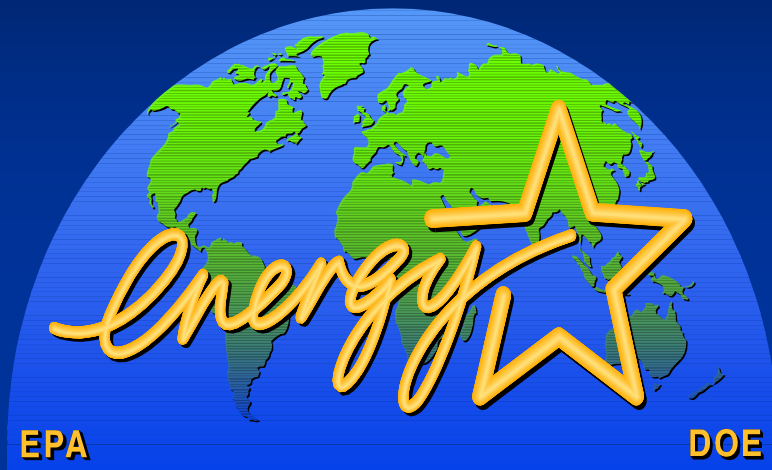


Consumer Alert for "air purifiers"

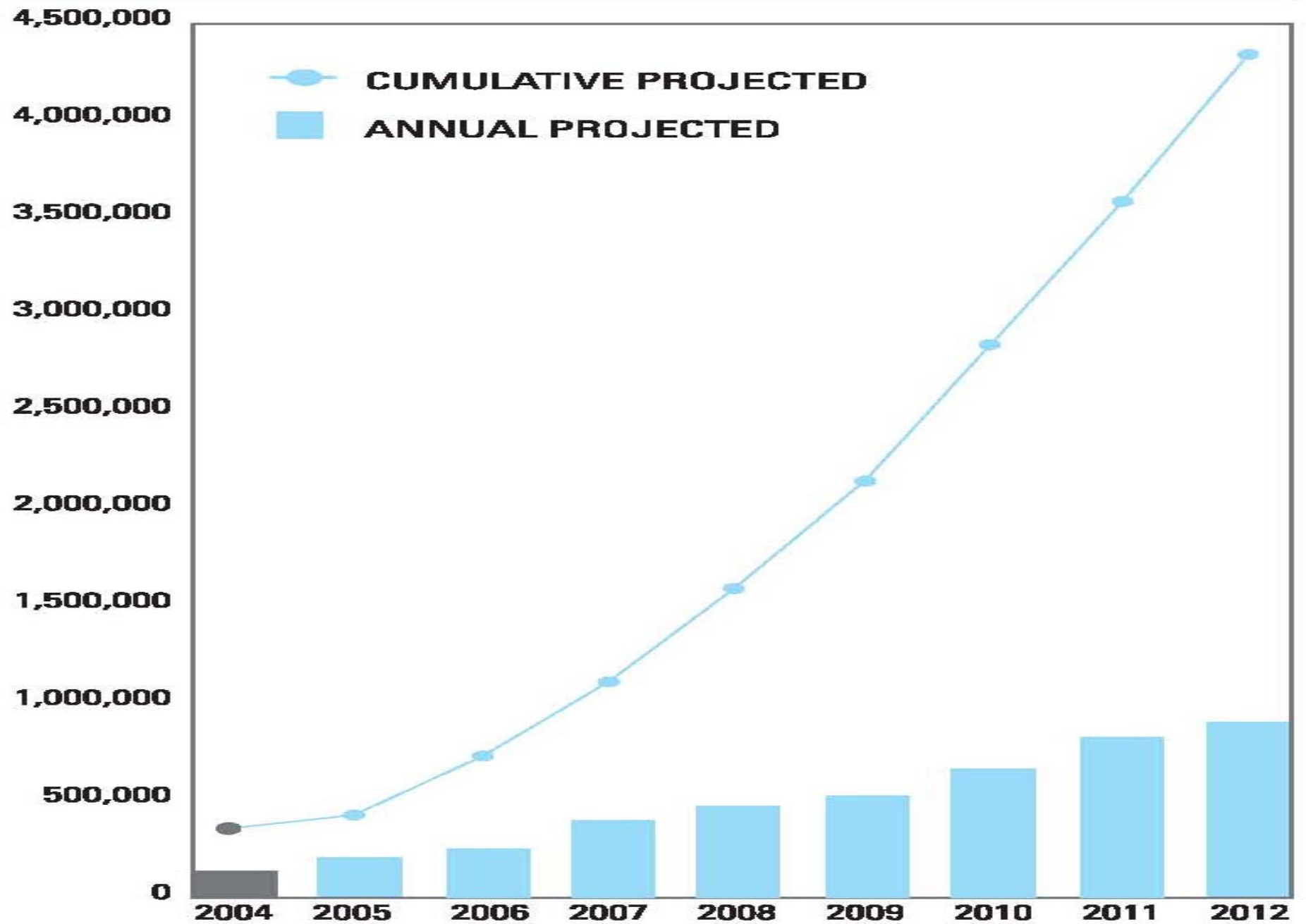
The medical staff of Consumers Union and Consumer Reports has issued warnings on Sharp's Ionic Breeze and four other leading brands of ionic air cleaners. These devices may emit harmful levels of ozone. Consumers should be aware that brief exposure to ozone aggravates asthma and decreases lung function.

Prolonged exposure can cause permanent lung damage and can deaden the sense of smell.

Changing the Course of Housing



ENERGY STAR QUALIFIED HOMES PROJECTED GROWTH



The opportunity

- America needs healthy, energy efficient houses
- Healthy homes need good ventilation
- You're in a great industry, with great products
- You are well placed to take advantage of the opportunities
- There is money to be made
- **Go get it!**

Put the **V**
back in
your **HVAC**
business



Thank You!

tex@bellnet.ca

