Synergy™
HOME PERFORMANCE

Step 2
Fresh Air Ventilation

The 7 Steps of Building a Synergy Home

- Airtight Construction
- **Fresh Air Ventilation**
- Improved Thermal Systems
- Properly Sized, Designed, Installed, and Commissioned HVAC System
- Pressure Balanced
- Moisture Managed
- Combustion Safety

HVAC Stands For…

- (H) Heating
- (V) ???????
- (AC) Air Conditioning
- The Ventilation is missing in most homes!

Fresh Air Ventilation

- This is of tremendous importance in a Synergy Home but it is skipped by most builders.
- Indoor Air Quality (IAQ) in most homes is much worse than outdoors.
- Radon, pesticides, moisture, dust mites, mold, volatile organic materials, odors, combustion by-products from house vented fireplaces (vent-free fireplaces), candles in a jar, etc.
- We spend a lot of time worrying about attic and crawlspace ventilation and skip interior ventilation.
- A ventilation system is not a makeup-air system.

We know from testing and experience that “exhaust only” ventilation does not work in today’s homes.

In many of the homes we test, the homeowner states that they do not use exhaust fans when bathing or cooking. Where does that moisture go? Where do the combustion byproducts go?

We are yet to test a home without at least one bathroom exhaust fan improperly installed.

We use the flow hood to measure bathroom fan exhaust. We often get readings of “0” although the fan appears to be working correctly.

In homes we have tested, the record of disconnected bathroom exhaust fans in a single home is 11. The homeowner had continued to add fans due to moisture issues.

Exhaust fans vented into the attic oftentimes cause problems because hot, moist air condenses against cold decking.

This exhaust duct was completely disconnected. Without testing, how would you know?

We find that in many of the homes we test, the bathroom exhaust fans are exhausting only a fraction of its rating. Typically, you should install a 100cfm fan to get 50cfm.

We find that multiple fans that are exhausted through a single termination are not working. Notice the footprint on the ductwork.

Long runs of plastic venting increase resistance and prevent proper venting.

Install the fan with the duct port facing the right direction.

Notice that this duct outlet was directly against the ceiling joist.

Moisture attracts small animals. This is an unvented bathroom fan that a big snake liked to curl up next to.

For every cubic foot of air that exits a home through an exhaust fan or a chimney, a cubic foot of air must be pulled in to replace it. Typically, it enters from the nearest, biggest hole.

Exhaust Only Devices in Your Home

- Dryers are exhausting 250 – 400 cubic feet per minute (250 x 60 minutes = 15000 cubic feet per hour).
- Microwave exhaust – 300cfm
- Cooktops – up to 1500cfm
- Bathroom fans – 75cfm
- Vented combustion appliances
- Central Vacs – 200cfm

Many times the fresh air supply is back down the exhaust pipe of a combustion appliance or a vented fireplace.

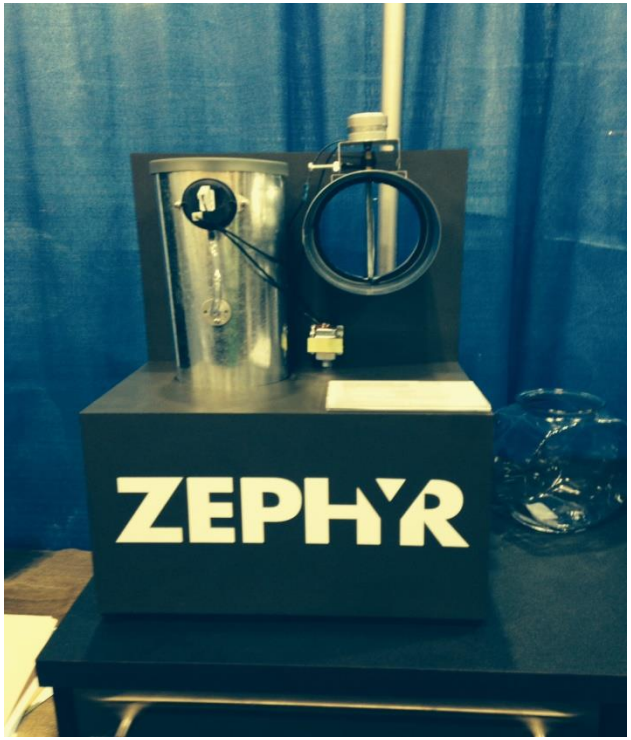
A great product to prevent "squished" ducts is the dryer box.

The 2009 IRC requires fresh air makeup on all vented fireplaces. R1006.1. A home's ventilation system cannot provide makeup air for a fireplace or range hood.

Do not install fresh air ventilation on a house-vented fireplace/vent-free fireplace. This short-circuits the oxygen depletion sensor and will kill the homeowners in a tight home.

Commercial grade cooktops can remove 1200 to 1600 cubic feet per minute of conditioned air from the home. **The 2009 International Residential Codes now address the situation in Section M1503.4** "Exhaust hood systems capable of exhausting in excess of 400 cfm shall be provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with a means of closure and shall be automatically controlled to start and operate simultaneously with the exhaust system."

These are fresh air ventilation kits for kitchen exhausts. A pressure switch wired to the exhaust fan opens when the appliance is turned on. Makeup air on your HVAC system is also required.



This can be a difficult task but it is mandatory especially with a masonry fireplace nearby.

Makeup air for a very powerful exhaust system.

There are some great videos on Youtube.

- Alpine Fresh Air Ventilation System
- Makeup Air Kit for Commercial Cooktop Exhaust
- Makeup Air Kit for Wolf Cooktop
- Broan Kitchen Makeup Air Kit
- Residential Kitchen Makeup Air Webinar
- Carrier ERV Video

Air is a carrier. It carries hitch-hikers from hell!

- Odors.
- Dust.
- Pesticides from your crawlspace.
- Radon.
- Mold.
- Pollen.
- Moisture.
- Insulation.

Is your home unusually dusty? What about the contaminants you can’t see?

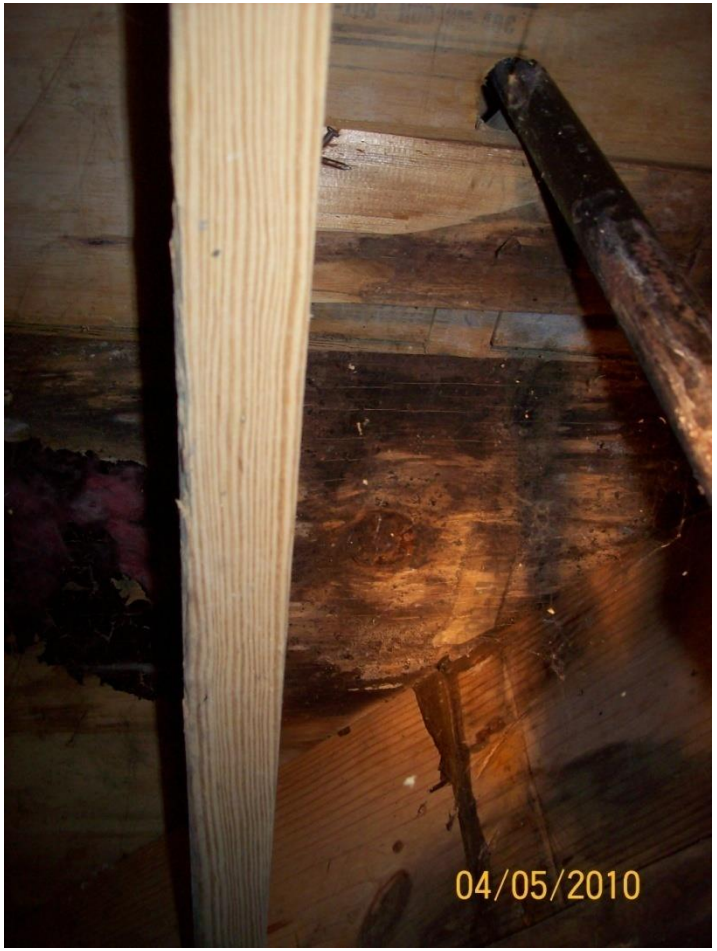
Keep in mind that pressure issues become magnified as homes become tighter.

Driving forces include:

- Wind – Step 1 Airtight Construction addresses.
- The stack effect – hot air rises.
- Out of control fans such as motorized attic fans, dryer vents, bathroom fans, and kitchen exhausts.
- Pressure induced forces due to duct leakage and the lack of returns or jumper ducts.
- Why not eliminate these driving forces?

Many of the problems we find in the homes we test originate in the crawlspace.

Unsealed holes between the home and the crawlspace.



Studies show that as much as 50% of a home's air comes from the crawlspace.

Leaking supply ducts and rooms without return duct/jumper ducts cause the house to become negatively depressurized, and as a result, air is pulled into the home.

Leaking return ducts pull unconditioned air carrying humidity and contaminants directly into the home and often results in a dirty interior coil that reduces airflow and comfort and eventually leads to premature compressor and fan motor failure.

A disconnected clothes dryer vent combined with return duct leaks. Notice that the homeowner attempted to patch the leak with painter's tape.

To prevent your home from drawing in bad air from unintended places, simply provide a fresh air intake to the return side of your HVAC system to provide makeup-air.

Keep in mind that we load this additional air into the HVAC system design. Also keep in mind that the unconditioned outside air is being pulled in anyway.

We need a control to time the ventilation and to prevent over-ventilating the home.

- During the early Spring and late Fall our temperatures are very mild.
- The HVAC system operates very little and moisture levels are elevated.
- Fresh Air Ventilation is especially important during these periods.

During the hottest times of the year when the AC is running almost continuously and during the coldest times of the year when the heat is running, an Air-Cycler / April-aire or an Energy Recovery ventilator will help prevent over-ventilating.

Air-Cyclers/Aprilaire Model 8126

- Must be used on ECM fans only! Not PSC's.
- The length and size of duct must be considered.
- Filtration must be considered.
- The termination must be considered.
- Available negative pressure where the outside air duct connects to the backbox of the return.
- It must be designed and commissioned so the total recovery efficiency (ability to transfer moisture) isn't compromised.

Running your air handler in the “on” position is not a solution because it oftentimes pulls in contaminants through duct leaks and creates pressure differentials. In the summertime, it redistributes moisture from the coil back into the home as well as heat.

An Energy Recovery Ventilator (ERV) is the best solution but it costs money.

Energy Recovery Ventilators (ERV)

- Use an ERV not HRV in the south.
- It is designed to deliver fresh air to a home's interior.
- It will almost always increase the humidity of a home in the summertime
- It is not designed to provide makeup air for combustion appliances or kitchen exhausts.
- The more it operates the more energy it uses.
- Fresh air should be delivered to bedrooms and living rooms and stale air removed from bathrooms, laundry rooms, and sometimes the kitchen.
- Older, leaky homes rarely need an ERV.

ASHRAE 62.2

- Requires fresh air ventilation in new construction.
- Will soon become part of the “Code”.
- Fresh air ventilation is required in commercial buildings.
- Why not be the fresh air ventilation leader in the market?
- We can help you develop an inexpensive fresh air ventilation strategy.

Common ventilation strategies we witness in new construction….that allows a house to “breathe”

Use a shoddy insulator with an insulation that is essentially an air filter.

Expect house-wrap to provide air-sealing. It is similar to wrapping a present on the sides and not the top and bottom.

Don’t air seal around the windows and doors!

Just cut a hole directly into the attic and filter the air with a sheet of fabric softener.

Our homes need to breathe in much of the same way we need to breathe. We need to breathe through our lungs which were designed for the purpose. We don’t need to breathe through our feet (crawlspaces and attics) or our bottoms (unsealed holes) which is essentially what we are doing when we do not provide fresh air ventilation!

Reasons to ventilate

- Reduce warranty calls and liabilities.
- Give your customer clean, fresh, and healthy air.
- Don’t kill your customer!

Fresh Air Ventilation is the signature of excellence in new home construction!

Good Ventilation video links on Youtube.

- http://www.youtube.com/watch?v=NsSvMB9bJeE
- http://www.youtube.com/watch?v=GGVS7UalLiY
- http://ccbinnovations.com/
- http://www.youtube.com/watch?v=yR6YBXAeQ7k
- http://www.youtube.com/watch?v=7M-kl1_tKDQ
- http://www.youtube.com/watch?v=P5b_3BqCsOg