

Ventilation and the Green Building Opportunity

Without ventilation a Green Building would just be Moldy!

Comfortech 2007
St. Louis, MO



Heyoka Solutions

- ◆ Developer and manufacturer of ventilation equipment and controls;
- ◆ Located on Cape Cod, Massachusetts;
- ◆ Members of ASHRAE, Building America, HVI, NESEA, RESNET and US Green Building Council (USGBC);
- ◆ LEED for Homes IEQ TASC and NAHB Green Building Standard IEQ Advisory Committee, and ASHRAE 62.2 SSPC.

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www.HeyokaSolutions.com



Do homebuyers care about IEQ?

- ◆ Moisture and mold litigation – up
 - *(Approx 9,000 moisture and mold court cases – American Banker, 1/03)*
- ◆ Home moisture problem inquiries – high
 - *(30%, double the next closest subject – NAHB Research Center)*
- ◆ Asthma prevalence – high
 - *(19% of US households have at least 1 person with asthma – EPA)*
- ◆ Radon mitigation sales – up
 - *(300% increase in home radon mitigations since 1990 – EPA)*

IAQ Related Product Sales - \$1.2B/year

- ◆ Air Cleaners
- ◆ Air Fresheners
- ◆ UV Lights

Big Business!
Incomplete Solutions!





“It’s the new code, Mac. They say it’s to prevent backdrafting.”

What the heck is **GREEN** building anyway?

“**Green** building is the practice of:

- ◆ increasing the efficiency with which buildings and their sites use and harvest energy, water, and materials;
- ◆ reducing building impacts on human health and the environment;
- ◆ through better siting, design, construction, operation, maintenance, and removal during the complete building life cycle.”

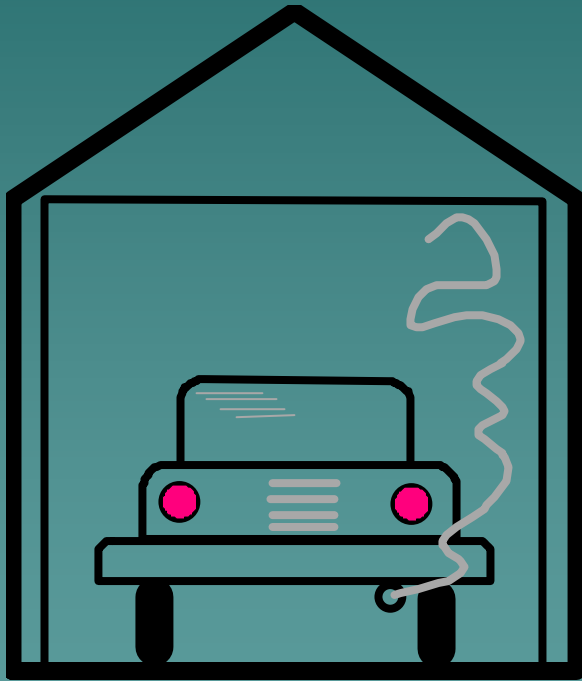
Wikipedia.org

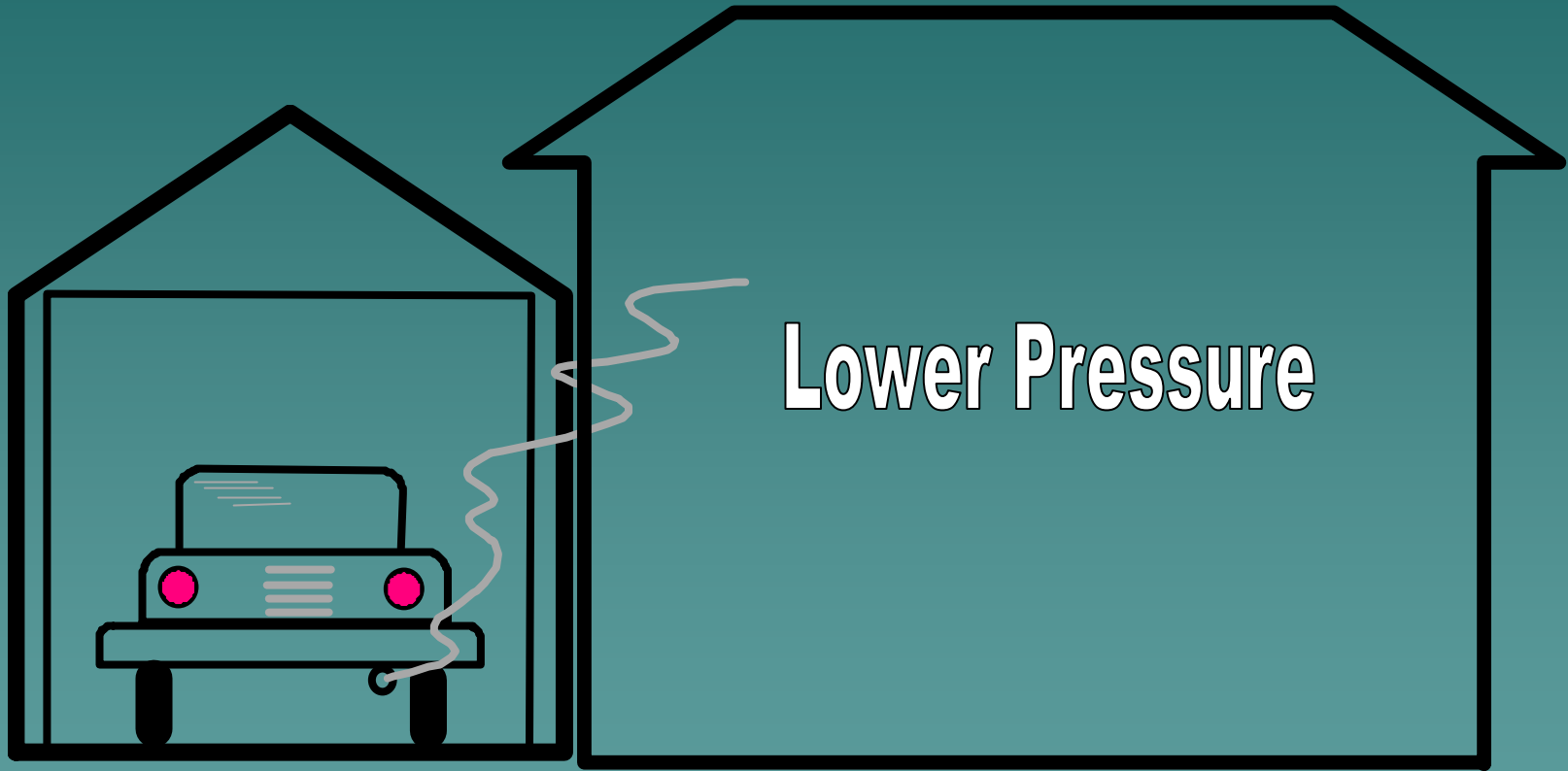
ASHRAE Greenguide

. . . a green/sustainable building design is one that achieves high performance, over the full life cycle, in the following areas:

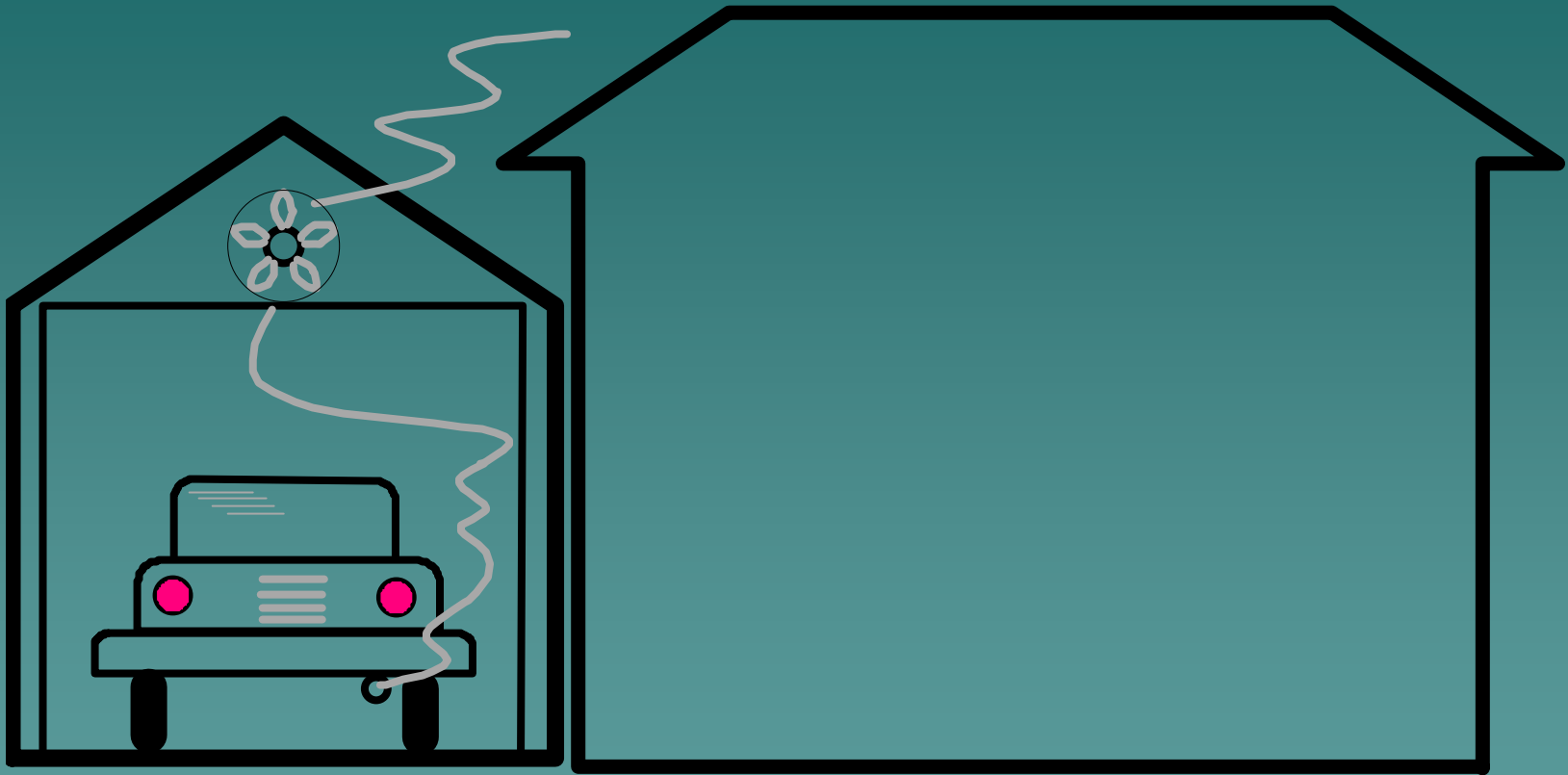
- Minimizing natural resource consumption . . .*
- Minimizing emissions . . .*
- Minimizing discharge of solid waste and liquid effluents . . .*
- Minimal negative impacts on site ecosystems.*
- Maximum quality of indoor environment, including air quality*

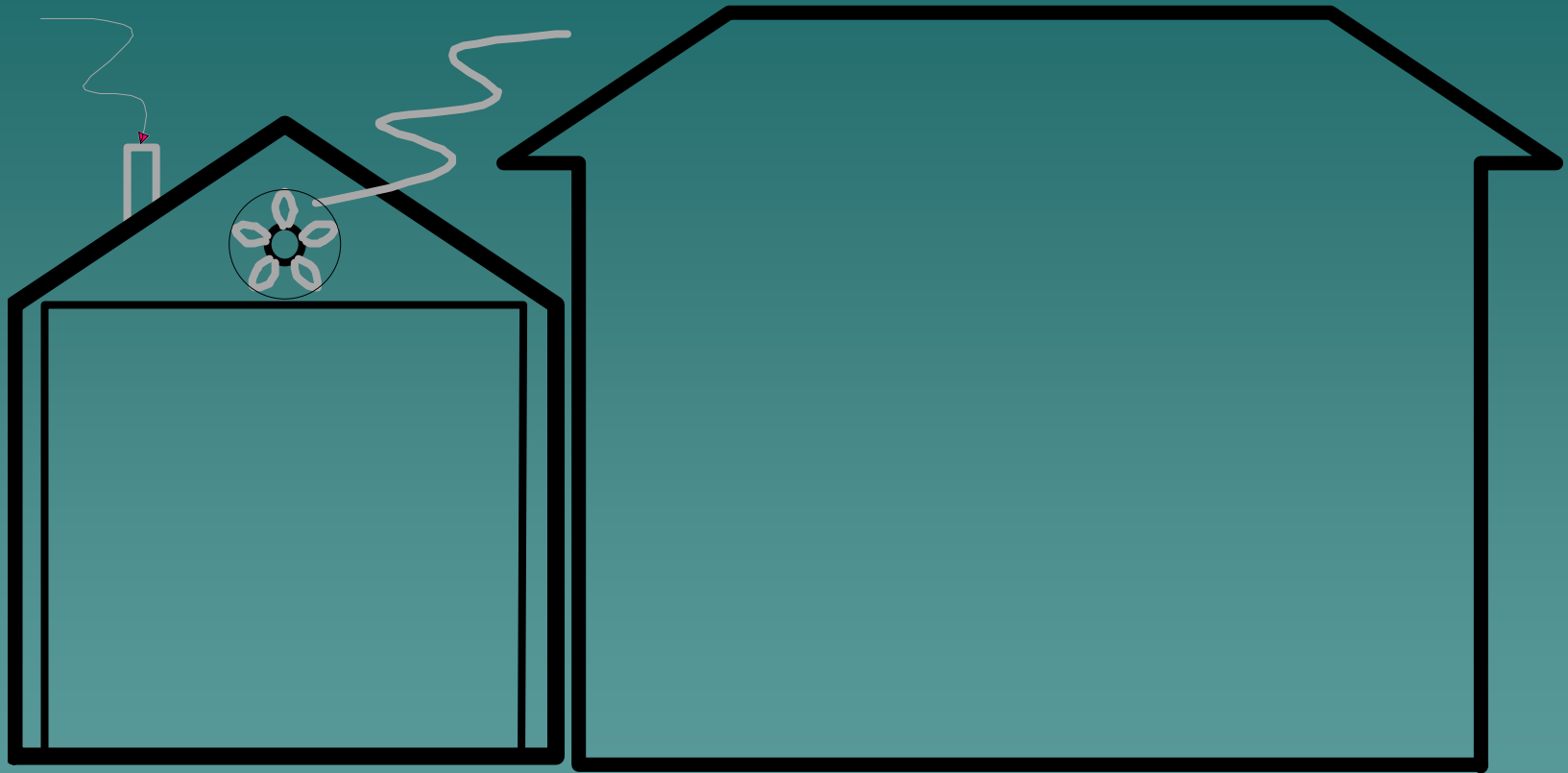
What are you trying to do and how would you like it to happen?





Lower Pressure





Green building is “holistic” building
– thinking it all the way through.

Green Building: Riding the wave with Good Ventilation

- ◆ Role of ventilation in LEED for Homes;
- ◆ Role of ventilation in Energy Star with the Indoor Air Package;
- ◆ Ventilation in NAHB Green Building Guidelines;
- ◆ Ventilation in Green Communities and Health House;
- ◆ Lot of other **GREEN** programs like: Global Green, Green Built, Inc. (Michigan), Build Green Program of Kansas City, Green Energy Ohio, EcoBuild of Memphis, Wisconsin Green Built Home, etc.



Comparing Green Building Guidelines and Healthy Homes Principles: A Preliminary Investigation

**The National Center for Healthy Housing
April 2006**

http://www.centerforhealthyhousing.org/Green_Analysis.pdf



ANSI/ASHRAE 62.2-2007

“This standard applies to spaces intended for human occupancy within **single-family houses and multifamily structures of three stories or fewer** above grade, including manufactured and modular houses. This standard does not apply to transient housing such as hotels, motels, nursing homes, dormitories or jails.”

62.2

- ◆ Sizing Table 4.1a is provided based on 7.5 cfm/person plus 1 cfm/100 ft² of conditioned space;
- ◆ 62.2-2007 assumes 2 people in the master bedroom like ASHRAE 62-1989;
- ◆ Table 4.1a reduces ventilation of larger residences compared to old 0.35 ACH method.

Whole Building Ventilation Requirements

Table 4.1a (cfm)

Number of Bedrooms	0-1	2-3	4-5	6-7	>7
<1500 ft ²	30	45	60	75	90
1501-3000	45	60	75	90	105
3001-4500	60	75	90	105	120
4501-6000	75	90	105	120	135
6001-7500	90	105	120	135	150
>7500 ft ²	105	120	135	150	165

62.2

- ◆ This level of ventilation is intended to be provided continuously whenever the building is occupiable.
- ◆ This can be supply ventilation, exhaust ventilation, or balanced ventilation.
- ◆ This level of ventilation was set including a default credit of 2 cfm/100 ft² for infiltration.

LEED for Homes

Ventilation integrated with IEQ

Must achieve 6 points in IEQ

Two paths –

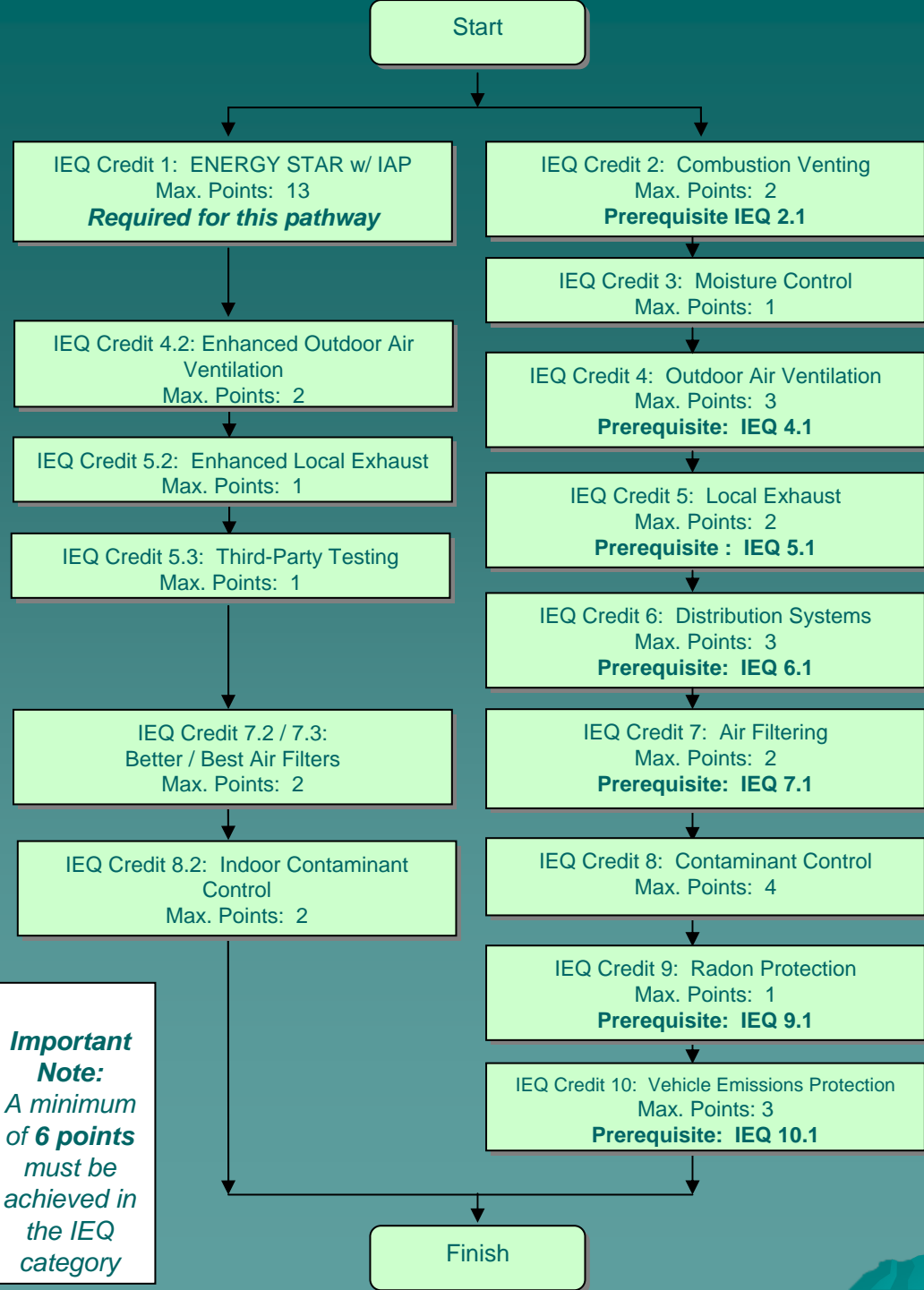
(Path 1) Energy Star with IAP (13 points)
plus additional ventilation options

- ◆ Enhanced local exhaust (2 points)
- ◆ 3rd party testing (2 points)
- ◆ Better/Best air filters (2 points)
- ◆ Indoor contaminant control (2 points)

LEED for Homes (cont)

(Path 2) Including nine credits for a max total of 21 points including:

- Combustion venting;
- Moisture control;
- Outdoor air ventilation;
- Local exhaust;
- Distribution systems;
- Air filtering;
- Contaminant control;
- Radon protection;
- Vehicle emissions protection.



Indoor Environmental Quality (IEQ) Optional Pathways through IEQ Category

Important Note:
A minimum of **6 points** must be achieved in the IEQ category





ENERGY STAR

INDOOR AIR PACKAGE

Specifications, version 2

Ventilation

4.15 Provide mechanical whole-house ventilation meeting **all ASHRAE 62.2** requirements. The following requirements shall be visually verified:

- Whole house mechanical ventilation system & controls installed to deliver prescribed outdoor air ventilation rate (62.2 section 4), including ventilation restriction in 62.2 section 4.5 (i.e. max 7.5 cfm/100 sq.ft.) for "Warm-Humid" climates as defined by IECC Figure 301.1; AND
- Transfer air (i.e. air from adjacent dwelling units or other spaces such as garages, crawlspaces, or attics) shall not be used to meet ventilation requirements (62.2 section 6.1); AND
- Air inlets shall be located a minimum of 10 ft. from contaminant sources (62.2 section 6.8), AND
- Airflow tested to meet rated fan airflow (at 0.25 in. w.c.), or duct(s) sized per requirements of 62.2 Table 7.1 and/or manufacturer's design criteria (62.2 section 7.3).

Notes:

- Outdoor air ducts connected to the return side of an air handler shall be permitted as supply ventilation only if manufacturers' requirements for return air temperature are met (e.g., "air shall be tempered to maintain minimum 60 degree F continuous air flow across furnace heat exchanger"),
- The ventilation restriction for "Warm-Humid" climates is not applicable when Energy Recovery Ventilators (ERV's) or whole-house dehumidification are installed, per manufacturer's instructions.

4.16 Provide local mechanical exhaust ventilation to outdoors in each bathroom and kitchen, meeting ASHRAE 62.2 section 5 requirements. In addition, all bathroom ventilation fans shall be ENERGY STAR qualified unless multiple bathrooms exhausted with a multi-port fan.

4.17 Clothes dryers shall be vented to outdoors.

Exception:

Electric condensing dryers, equipped with condensate drain.



ENERGY STAR, Indoor Air Package, & Green Building

Green Home Staircase

Energy Efficiency

- Envelope
- Distribution
- Equipment
- Lighting
- Appliances

IAQ and Durability

- Moisture/Mold
- Soil-gas Control
- Pest Mgt.
- HVAC
- Combust. Safety
- Materials
- Commissioning

Resource Efficiency

- Site Planning
- Water
- Materials
- Waste Mgt.
- Renewables



ENERGY STAR

w/Indoor Air Package

| Green Buildings

Making it Visible: VENTILATION messaging

Involvement Questions:

- *“Does your house ever feel stuffy?”*
- *“Did you realize that typical home HVAC systems don’t include Fresh Air Ventilation?”*

How to Demonstrate Value:

- *“All our homes are equipped with high efficiency whole-house fresh air ventilation.”*
- *“Plus we include over a dozen advanced heating and cooling system features to improve comfort and system effectiveness.”*

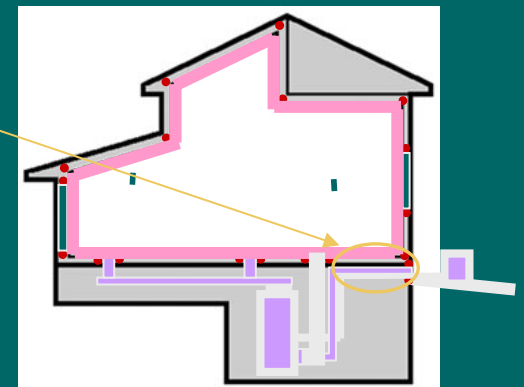
*Leave a features comparison checklist,
and/or Benefits label(s) in utility room.*

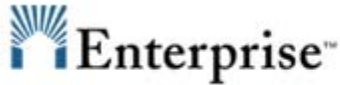


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Fresh Air Ventilation

FRESH AIR
DAMPER





CELEBRATING 25 YEARS ■ 1982-2007



*Enterprise Community Partners Green Building Program
The Green Communities Initiative is intended to help
“mainstream” green building and sustainable development in
the affordable housing industry. By 2009, Green
Communities will provide \$550 million in Green Grants,
financing, and equity investment to create 8,500 affordable
rental and for-sale homes nationwide.*



*The Green Communities criteria are aligned with the LEED
(Leadership in Energy and Environmental Design) Green
Building Rating System®. The US Green Building Council,
through LEED, strongly supports the Green Communities
initiative. In addition, the Green Communities criteria reflect
and are compatible with leading state and local green
building programs.*

www.greencommunitiesonline.org





7-6 Ventilation MANDATORY Except for Moderate Rehab

How

Install a ventilation system for the dwelling unit that provides 15 cubic feet per minute of fresh air, per occupant.

Intent

Optimal ventilation improves indoor air quality by providing fresh air to the living space on a regular basis.

Things to Consider

- Design the ventilation system to take maximum advantage of regional climate characteristics in order to help cut down on energy costs.
- Natural ventilation is acceptable in “paradise” climates defined under ASHRAE 62.2 Exceptions to 4.1.
- Specify a mechanical whole-house ventilation system per ASHRAE 62.2 and the EPA Energy Star with Indoor Air Package Specifications.





American Lung Association Health House®

The Health House program provides quality information for home builders and home owners regarding home design, construction, renovation and operation with a focus on healthy indoor air quality. Health House seeks to build a unique blend of sound medical science integrated with proven building science in a format understandable to both homebuilders and homeowners.

www.healthhouse.org



- ◆ HVAC system designed according to Manual J
- ◆ Ventilation (Final performance test): “Continuous people ventilation should be at least 1.0 cfm per 100 square feet of floor area plus at least 15 cfm for the first bedroom and 7.5 cfm for each additional bedroom.
 - The ventilation system shall be capable of providing 2 times this amount;
 - Minimum 45 cfm
 - Outdoor air shall be distributed to or exhaust air drawn from at least three locations including all bedrooms;
 - Select fans that are quiet, energy efficient, and long lasting;
 - For surface mounted fans, sound should be < 1.5 sones;
 - Power should be < 0.5 watts per cfm (1 watt/cfm for HRV);
 - Flows rated at 0.2 inches WC shall be used to meet the people ventilation rates.”



"Results

Global Green's unique approach merges innovative research, cutting-edge community based projects and targeted advocacy that:

- Educates hundreds of millions of people annually
- Leverages billions of dollars for environmental initiatives
- Implements ground-breaking environmental policy"

(Uses Building Science)



Green Built, Inc.

A project of the Home & Building Association of Greater Grand Rapids (HBAGGR), Green Built, Inc. supports home construction practices that incorporate environmentally friendly site development, water conservation, energy efficiency, waste reduction, and other green practices.

COORDINATES

Home and Building Association of Greater Grand Rapids
2021 44th St. SE
Grand Rapids, MI 49508
United States



Green Built Home Wisconsin

<http://www.greenbuilthome.org/>



Mechanical Systems

- 44. High efficiency whole house fan installed with R-38 min. insulated cover.
- 45. Two properly supported ceiling fans installed (ENERGY STAR label encouraged).
- 46. Ceiling fan pre-wires provided in habitable rooms (min. 2 prewires not including bedrooms).
- 47. **(2)** Heat Recovery Ventilator (HRV) installed.

List manufacturer _____

- 48. **(3)** Energy Recovery Ventilator (ERV) installed.

List manufacturer _____

Indoor Air Quality

- 15. **(4)** House meets **American Lung Association Health House** standards.
- 16. Automatic tub/shower room fan controls such as timers or humidistats.
- 17. Bath fans installed with smooth ducting with short, straight runs.
- 18. Spring loaded, weather stripped fan dampers installed.





National Association of Homebuilders

- ◆ 802.1 Ventilation systems to comply with ASHRAE 62.2-2007 (proposed)
- ◆ 802.1.1 Local mechanical exhaust ventilation to outdoors in each bathroom and kitchen meets ANSI/ASHRAE 62.2-2007 section 5;
- ◆ 802.1.2 Bathroom exhaust fan is provided with an automatic timer or humidistat;
- ◆ 802.1.3 Kitchen range and bathroom exhaust are verified to specification. Ventilation airflow is tested to meet the rated fan airflow (at .25 in. w.c.) or duct(s) sized per requirements of 62.2, table 7.1 and/or the manufacturer's installation instructions (ANSI/ASHRAE Standard 62.2-2007, section 7.3).
- ◆ 802.1.4 Exhaust fans are ENERGY STAR
- ◆ 802.2.1 Whole building ventilation meets the requirements of ANSI/ASHRAE Standard 62.2-2007, section 4;
 - (1) Exhaust or supply fan(s) – 7 points
 - (2) Balanced exhaust and supply fans – 9 points
 - (3) Heat-recovery ventilator – 10 points
 - (4) Energy-recovery ventilator – 10 points
- ◆ 802.2.2 Ventilation airflow is tested to meet the rated fan airflow (at 0.25 in. w.c.), or duct(s) sized per requirements of 62.2, Table 7.1 and/or the manufacturer's installation instructions (ANSI/ASHRAE Standard 62.2-2007, section 7.3).

VENTILATION AND THE GREEN BUILDING OPPORTUNITY Useful web addresses:

- ◆ www.hvi.org
- ◆ www.usgbc.org (link to LEED for homes through this)
- ◆ www.affordablecomfort.org
- ◆ www.nahb.org

National Association of State Energy Officials
State & Territory Energy Offices

- ◆ <http://www.naseo.org/members/states.htm>
- ◆ U.S. Dept. of Energy - Energy Efficiency and Renewable Energy
State Energy Office Contacts:
http://www.eere.energy.gov/state_energy_program/seo_contacts.cfm

References (cont)

- ◆ www.energystar.gov
- ◆ ASHRAE 62.2 standard:
www.ashrae.org/publications/detail/16090
- ◆ Publications referred to in Session at Comfortech:
Comparison of various programs
http://www.centerforhealthyhousing.org/Green_Analysis.pdf
- ◆ www.greencommunitiesonline.org
- ◆ www.healthhouse.org
- ◆ <http://www.greenbuilthome.org>



Save the Date:

**2008 ACI Home
Performance Conference**

**April 7-11, 2008
Pittsburgh Hilton
Pittsburgh, PA**

www.affordablecomfort.org

Summary

- ◆ All Green building programs have ventilation requirements – Get to know ANSI/ASHRAE 62.2-2007 and Energy Star with IAP;
- ◆ Bad ventilation installations can cause problems and result in expensive callbacks;
- ◆ “Snake oil” or “Band Aid” solutions will come back to bite you;

Summary

- ◆ Good ventilation and Green ventilation system installations can be profitable, are not all that hard to do, and will result in happy customers.



Thank you for listening