



## Ventilating your home

*Build tight and ventilate right* is the mantra for builders of energy-efficient, high-performance homes. In cold climates, minimizing uncontrolled air leakage is a prerequisite for enhancing a home's comfort, energy efficiency, indoor air quality, and moisture control.

### WHY VENTILATION IS IMPORTANT

Fresh air is essential to the health and well-being of our homes, new and old, as well as the people who occupy them. Properly-installed and operated ventilation systems give homeowners the ability to enhance indoor air quality by diluting indoor pollutants and odors, controlling winter moisture levels, and providing air exchange as needed.

In new homes, proper ventilation is important because the structures are sealed, trapping the various synthetic materials and cleaning products that pollute our indoor air. We also spend more time indoors than previous generations and generate more indoor moisture with the use of hot showers, washing machines, and dishwashers.

Many older homes rely on natural ventilation—that is, uncontrolled air movement through cracks and small holes in the building structure, as well as through doors and windows. While natural ventilation may seem adequate for supplying the fresh air we need, it can result in drafts and “leaky” homes that reduce comfort in extreme weather and can be expensive to heat and cool. What's more, the moisture generated by occupants exhausts through the cracks and leaks—often into the attic. This can result in moisture-related problems that can compromise the building's structure.

### TEST AND RETEST FOR PERFORMANCE AND SAFETY

Excess moisture in the home can contribute to a variety of problems: mildew, odors, frost and ice on cold surfaces, ice dams on roofs, and more. Left unchecked, these problems can lead to structural damage.



**A consultant partnering with Home Performance with ENERGY STAR® measures exhaust ventilation airflow to ensure the system performs correctly.**

That's why it's important to test your home's performance and make sure its systems are operating as they should. A consultant partnering with Home Performance with ENERGY STAR® can perform these tests to identify problems and recommend solutions.

For example, testing has shown that many exhaust fans don't draw out enough air due to improper sizing, problems with ductwork, or other reasons. Some exhaust fans draw out so much air that the home becomes depressurized (the air pressure inside the house becomes lower than the air pressure outside the house). This depressurized condition can impact the safe operation of some combustion devices such as atmospherically-vented water heaters or fireplaces. Combustion gases may spill into the home and create an unsafe environment.

**For more information,**  
call 800.762.7077 or visit [focusonenergy.com](http://focusonenergy.com).

Thorough testing by a partnering consultant can help you ensure proper ventilation and increase the comfort, safety, and durability of your home.

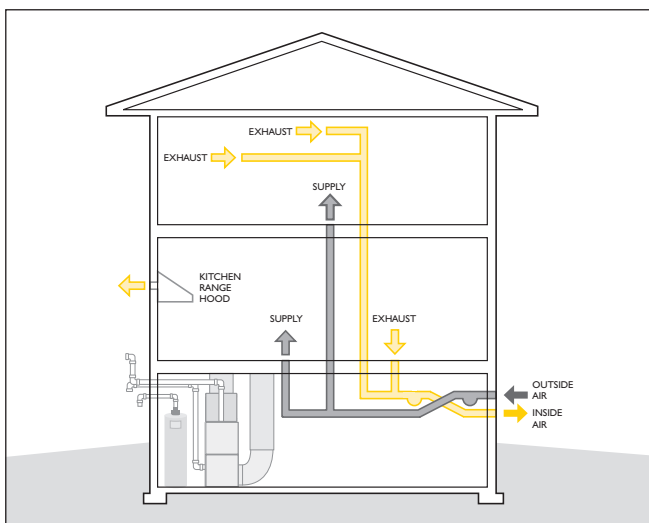
## HOW TO VENTILATE YOUR HOME

Controlled ventilation strategies include spot ventilation (using localized exhaust fans in kitchens and bathrooms) and whole-house or central ventilation systems (one or more fans and duct systems that exhaust stale air and/or supply fresh air).

### Spot ventilation

Exhaust fans quickly remove pollutants, odors, and/or moisture at their source or as they are generated. Ventilation fans in the bathroom and kitchen are critical because most moisture and odors are generated in these areas. To maximize the effectiveness of spot ventilation:

- Fans should be located as close as possible to the source of pollution and moisture. In the kitchen, use range hoods that exhaust air to the outside. Avoid ductless, recirculating units because they cannot control moisture or pollutants. In bathrooms, make sure the fan vents directly to the outside, not into an attic or crawlspace.
- Ensure all fans are ducted properly to the outside. Use rigid ductwork to avoid collapses and install ductwork in the shortest, most direct route possible. Avoid elbows and bends when possible and terminate ducts properly through the roof or walls instead of into the attic or soffitt.



**A balanced ventilation system brings in fresh outside air in equal quantities to the amount of stale inside air that is exhausted. The furnace and water heater in the diagram are vented directly to the outside and do not use indoor air in the combustion process.**

- In new homes, locate heating and cooling registers as far as is practical from exhaust vents to minimize the amount of heated or cooled air that is exhausted when the fan runs.
- Use timers and humidity sensors to run fans when they are needed.

Spot-ventilation systems should be viewed not just as fans, but as systems that include ductwork and termination fittings. They are both critical components and have the greatest impact on fan performance.

### Whole-house ventilation

Whole-house, or central ventilation systems, use one or more fans and duct systems to exhaust stale air and/or supply fresh air throughout the house. These systems come in several types:

**Balanced.** This system usually consists of two fans and two duct systems—one for supplying fresh outside air and another for exhausting stale indoor air. Fresh outside air is introduced in equal quantity to the amount of stale inside air being exhausted. This system should be tested and rebalanced after installation to ensure balanced airflow.

**Balanced with heat recovery/energy recovery.** This system adds a heat recovery ventilator (HRV) and heat recovery core, or an energy recovery ventilator (ERV) and energy recovery core to a balanced system. The HRV recovers heat from the outgoing exhaust air and uses it to warm the incoming fresh air. An ERV recovers moisture as well as heat from the outgoing air (in the heating season). These types of systems help reduce the costs of heating and cooling your home.

**Exhaust only.** This system uses fans to exhaust stale indoor air, but supplies fresh outdoor air passively through intentional or unintentional openings in the building envelope. Often, a bathroom fan controlled by a remote timer or dehumidistat is used to provide continuous ventilation in this system. Because the fan may run for long periods of time, it is important that it is quiet, with a maximum noise rating of 1.0 sone—equivalent to a new refrigerator when it is running.

**Supply only.** This system uses fans to draw in fresh outdoor air and push out stale indoor air through openings in the building envelope. This approach is generally not

recommended for cold climates without thorough design and operational considerations.

## CONTROLS FOR YOUR VENTILATION SYSTEM

Ventilation systems may be purchased with either manual or automatic controls. Manual controls require the occupant to activate the system, while automatic controls can be set to operate the system based on time of day, occupancy, humidity levels, and other parameters. All controls should be easily accessible and user friendly.

### Manual controls

The most basic manual control is an on/off switch. Other controls include:

**Delay-off timer.** This is a switch activated by the occupant that allows a fan to operate for 20 minutes or more before turning off automatically. These timers are useful in bathrooms where it is important to continue removing moisture after the occupant has finished showering.

**Timer.** A timer control allows occupants to set the time duration for which the ventilation system will operate.

### Automatic controls

These controls can be fully or semi automatic (i.e., include an override switch) and fall into the following categories:

**Automatic timers.** Programmable timers that can be used much like setback thermostats to run fans during times when there is likely to be a greater need for ventilation.

**Humidity sensors (de-humidistat).** These controls turn ventilation systems on and off when relative humidity reaches a certain level.

## OPERATING GUIDELINES

Proper operation and maintenance of your ventilation system is important to you and your home. If your home is new, you may have to run the ventilation system more often for the first year or two. This will remove the moisture and gases emitted from the construction materials, carpets, and furnishings. In general, you'll want to:

- Use a hygrometer to measure indoor humidity and adjust your ventilating strategy to keep winter humidity levels at 30 to 35 percent.
- Clean fans regularly.
- Clean intake openings regularly.

- Examine and clean exhaust vents and dampers.
- Replace filters as needed.

## WHAT ABOUT YOUR ATTACHED GARAGE?

An attached garage can be a significant source of pollutants, especially carbon monoxide. To minimize exposure to pollutants from an attached garage:

- Seal air leaks between your home and garage to minimize the amount of air from the garage that could seep into your home.
- Never idle cars in the garage. Instead, start the car and immediately back out.
- Do not operate small engines or work with high VOC compounds in your garage.
- Install carbon monoxide detectors in your home.

The best strategy is to keep garage pollutants from entering the home. Once in the home, they will have to be removed, often requiring more ventilation than currently provided. A balanced ventilation system is less likely to pull fumes and other pollutants from the garage into the house. Exhaust-only ventilation systems put more emphasis on the garage wall connection to the home.

## HOW MUCH FRESH AIR DO WE NEED?

HVAC and indoor air-quality professionals talk in terms of air changes per hour (ACH) and cubic feet per minute (cfm) when specifying ventilation systems. In their latest standard, the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) 62.2-2007 recommends ventilation rates for whole-house and spot ventilation.

Wisconsin's building code requires spot-exhaust ventilation in bathrooms, but does not stipulate an overall ventilation rate for homes. The Focus on Energy New Homes Program requires its certified new homes to comply with ASHRAE 62.2-2007. This ensures that each certified home is equipped with a ventilation system(s) that meets or exceeds the latest standards for residential construction.

### Signs of inadequate ventilation

- Do you notice lingering odors, musty smells, stale or stuffy air?
- Do you have mold or mildew in closets, or on ceilings or exterior walls?
- Is there condensation on the insides of your windows, or do you see other signs of excessive humidity?
- Do you feel better when you are outside of your home?

## Ventilating your home

If you are concerned about inadequate ventilation in your home, or if you are planning a remodeling project (which could alter the indoor air characteristics of your home), work with a consultant partnering with Home Performance with ENERGY STAR. These consultants can conduct tests to determine your home's air leakage, combustion safety, and other conditions affecting your home's air quality. Visit [focusonenergy.com](http://focusonenergy.com) to find a consultant in your area.

### VENTILATION SYSTEMS AND COMBUSTION EQUIPMENT SAFETY

Exhaust equipment, including spot ventilation fans, whole-house exhaust-only ventilation systems, clothes dryers, and other exhaust fans exhaust indoor air. If enough outside air is not brought in, to replace the exhausted air, the house becomes depressurized. In a depressurized house, combustion gases from standard combustion equipment (furnace, water heater, fireplace, etc.) can be pulled back into the house rather than exhausting out the chimney. This condition is called *backdrafting* and can cause severe injury or even death through the inhalation of deadly fumes.

#### How to avoid backdrafting

- Replace standard combustion furnaces with closed-combustion equipment, and replace atmospherically-vented water heaters with power-vented models. Closed-combustion equipment uses the ducts to push the combustion air and the flue gases directly to the outside.
- Before installing a ventilation system, have a consultant partnering with Home Performance with ENERGY STAR check to ensure your home has adequate combustion air for your combustion equipment. Have the system checked after installation and after making any structural changes to your house.
- Install carbon monoxide detectors as an added warning system—see Focus on Energy's fact sheet on carbon monoxide (downloadable from our Information Center at [focusonenergy.com/resinfo](http://focusonenergy.com/resinfo)) for more information.

### TAKE ACTION TODAY. SEE RESULTS TOMORROW.

Lower energy costs. A healthier home. Cleaner air and water. These are the results when Wisconsin residents tap into energy efficiency and renewable energy. To find out how you can reduce energy costs and improve the comfort, safety, and durability of your home, call Focus on Energy at **800.762.7077** or visit [focusonenergy.com](http://focusonenergy.com).

#### The official ENERGY STAR website

A joint effort of the U.S. Environmental Protection Agency and U.S. Department of Energy, this site offers valuable information about energy efficient products and practices. [energystar.gov](http://energystar.gov)

#### The U.S. Environmental Protection Agency

Visit this page to learn more about maintaining healthier indoor air quality at home. [epa.gov/iaq/homes/index.html](http://epa.gov/iaq/homes/index.html)

#### Home Ventilating Institute

This organization tests and certifies residential ventilation products to ensure proper ventilation and maximum indoor air quality, resulting in healthy, energy-efficient homes. [hvi.org](http://hvi.org)

#### New York State Energy Research and Development Authority

Download the free Homeowner's Guide to Ventilation for a helpful introduction to the basics of home ventilation. [nyserdera.org/publications/guide.pdf](http://nyserdera.org/publications/guide.pdf)

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Focus on Energy works with eligible Wisconsin residents and businesses to install cost-effective energy efficiency and renewable energy projects. Focus information, resources, and financial incentives help to implement projects that otherwise would not be completed, or to complete projects sooner than scheduled. Its efforts help Wisconsin residents and businesses manage rising energy costs, promote in-state economic development, protect our environment, and control the state's growing demand for electricity and natural gas. For more information, call **800.762.7077** or visit [focusonenergy.com](http://focusonenergy.com).

