

Guide to Home Ventilation

Ventilation refers to the exchange of indoor and outdoor air. Without proper ventilation, an otherwise insulated and airtight house will seal in harmful pollutants, such as carbon monoxide, and moisture that can damage a house.

Why Ventilate?

Gases from combustion appliances, like stoves and fireplaces, can accumulate in a poorly ventilated home and threaten your health and safety. Excessive moisture in the home can also threaten your health, and can lead to mold growth, ruin insulation, and even cause structural damage. Additionally, elevated levels of humidity can make cooling equipment work harder, leading to more costly energy bills.

Ventilating a home combines the physical aspects of the house with techniques you can complete after the construction phase. Ductwork and exhaust fans can remove combustion gases from a home. Additionally, there are many ways you can prevent moisture from entering and accumulating in your home.

There are three types of home ventilation:

1. **Natural ventilation** is uncontrolled air movement from windows, doors, or cracks in the home. This used to be the most common ventilation method of allowing fresh outdoor air to replace indoor air in a home, and still is found in most older homes.



Proper ventilation helps keep a home energy-efficient, safe, and healthy.

2. **Spot ventilation** controls air movement by using localized exhaust fans to quickly remove pollutants and moisture at the source. Common household examples include range hoods over stoves and bathroom exhaust fans. Spot ventilation is typically used in conjunction with one of the other strategies, and can be used to improve the effectiveness of natural ventilation. If both spot and natural ventilation together do not meet your home's ventilation needs, then you should consider a whole-house ventilation strategy.
3. **Whole-house ventilation** entails using one or more fans and duct systems to exhaust stale air and/or supply fresh air into the house. Whole-house ventilation systems provide controlled, uniform ventilation throughout the house. They may be exhaust-only (relying on leakage into the building for fresh air), supply-only (relying on air leakage from the building to exhaust stale air), or balanced systems that include both exhaust and fresh air intake components.

Carbon monoxide (CO) detectors

Carbon monoxide is a colorless, odorless, deadly gas produced as a byproduct of the combustion of natural gas, propane, and even wood. CO detectors are highly recommended for homes with any fuel-burning appliances because they sound alarms when CO levels reach potentially dangerous levels. Detectors should be installed in bedrooms and in rooms with a direct connection to combustion appliances, such as kitchens, basements, and rooms with space heaters. Typical battery-operated CO detectors cost between \$20 and \$50.

Combustion Appliances

Combustion appliances – appliances that burn natural gas, propane, oil, kerosene, or wood – are used in millions of homes and are often more efficient and cost-effective than electric appliances.

Remember to carefully install and maintain combustion appliances for safe and efficient operation. Their exhaust gases must be directly vented outside. Otherwise they can leak or release combustion products, including deadly carbon monoxide, inside the house.

Avoiding Moisture Problems Means Good Ventilation

When moist air encounters a colder surface, some of the moisture will condense and become a liquid. This happens on the surface of an iced tea glass, which is why you need a coaster to avoid water damage to a wooden table. In a similar way, moisture condensing inside a wall or in the attic can lead to wood rot and permit the growth of mold. To avoid moisture problems and ensure good ventilation, follow these steps:

Stop air leaks

Home moisture issues often directly relate to uncontrolled air flow where warm, moist air comes into contact with cold surfaces, causing condensation. Seal all air-leakage paths between living spaces and other unconditioned parts of the house, such as attics, basements, and crawl spaces. Insulation alone cannot prevent moisture problems. See the *DOE Guide to Air Sealing* at www.energysavers.gov/publications to learn more.

Control water

Minimize the chance of water entering your house by keeping the roof in good condition. Check caulking and flashing around windows, doors, tubs, and showers. Clear roof gutters of debris and drain moisture away from the house.

Ventilate indoor moisture

The materials used in building a new 2,000-square-foot home contain about six tons of water that must escape during the first year. Inhabitants of a home also generate moisture when they cook, shower, and do laundry. Just by breathing and perspiring, a typical family adds about three gallons of water per day to their indoor air. If a clothes dryer is not vented outside, or if the outdoor vent is closed off or clogged, all that moisture will enter the living space, too.

- Kitchen and bathroom vents should lead directly outside and should never be vented into the attic, where moisture can cause serious problems and pose potential health problems.
- Consider adding controlled ventilation after you air seal. It may be necessary to provide fresh air to avoid buildup of stale air and indoor air pollutants. Special air-to-air heat exchangers, or heat-recovery ventilators, can do this. See the *Whole House Fan Technology Fact Sheet* in *Further Reading* at the end of this fact sheet.
- Replace unused, noisy vent fans with quiet ENERGY STAR® models.

Have a moisture escape path

- A dehumidifier can effectively reduce moisture levels (though it will increase your energy use).
- A humidifier can provide comfort during the winter months, but use it only in rooms that have sufficient air flow to ventilate the room properly and prevent moisture issues.
- Ventilate attics appropriately. See the *DOE Guide to Durable Attics* at www.energysavers.gov/publications to learn more.

Further Reading

DOE Energy Savers: Air Sealing
www.energysavers.gov/air_sealing

ENERGY STAR on Duct Sealing
www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_ducts

Homeowner's Guide to Ventilation (for cold climates)
www.nyserda.org/publications/guide.pdf

Home Ventilating Institute
www.hvi.org

Whole House Fan Technology Fact Sheet
www.nrel.gov/docs/fy99osti/26291.pdf

Financial Incentives

Tax credits, incentives, and rebates may be available in your area. Please visit www.energysavers.gov/taxcredits for more information.