



E³A: Energy Management for Home

Steps in the Home Energy Series

Air Sealing

Cooling Your Home

Gas Appliances

Home Insulation Choices

Indoor Air Quality

Insulating Side Walls

Mobile Homes

Saving Energy

Storm Windows

Top Ten Tips

Water Heater

Condensation

Carbon Monoxide

Lighting

Attic Insulation

Air sealing

To keep heating and cooling costs down, it helps to seal cracks and unwanted openings in your house to prevent air infiltration. Warm air naturally flows to a cooler space, so heated air will escape to the cold outdoors if your house is not well sealed. As warm air escapes, cold outside air is simultaneously pulled in through cracks around the foundation, doors, windows and other openings to replace the lost heated air. The reverse happens in summer when hot air enters a cooled house.

Because warm air rises, cracks and openings in the ceiling are a major concern. This air movement pattern is called the stack effect. Poorly sealed houses act like giant chimneys. The greater the temperature difference between outside and inside, the faster heat moves up and out. Minimize heat loss by tightening up your house. Before beginning this process, correct any moisture or indoor air quality problems in your house because air-sealing could make them worse. Make sure all combustion appliances, such as furnaces and water heaters, are working correctly and are properly vented. Read the guides in this module on condensation, indoor air quality, gas appliances and carbon monoxide for more information.

Blower door tests

If you're eligible for weatherization assistance, you might be able to arrange to have your house air-sealed and insulated. Testing to determine the tightness of your house will probably start with a blower door test to help find the air leaks. The blower door is primarily a large fan that pulls air out of a house. As it draws air out, a technician can accurately measure air tightness and locate air leaks throughout the house.

You can conduct your own air leak test on a windy day using your hand. Dampen your hand and hold it around closed windows, doors and other suspect places. A leak will make your hand feel cool.



Basic air-sealing materials

The effectiveness of sealing air leaks depends on the size and location of the openings and choosing the right material for the job. For a quick and cheap fix, plug larger holes with drywall, cardboard or plastic bags filled with fiberglass insulation scraps. For small holes, cracks and openings, caulking and sealants are the most common solution.

Caulk is a semi-solid, toothpaste-like substance used to fill gaps of up to $\frac{3}{8}$ inch where different building materials meet, such as along a wall and the foundation. Hardware and building supply stores carry many varieties of caulk, the most common being tubes squeezed by hand or applied using a caulking gun. Caulk is also available in rope form, which is applied with your fingers. For sealing cracks and holes in a climate like Missouri's, select a quality product that seals well in temperatures below 0 degrees F and in the heat of summer, which can get up to 110 degrees F.



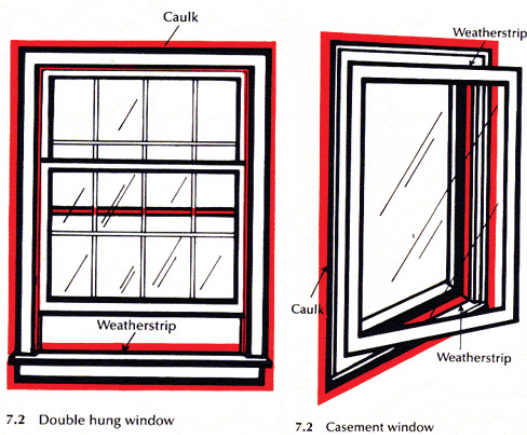
Photo credits: Colorado State University

Ask a store salesperson for help choosing the right caulk for the job, and follow the product directions carefully. You need different types of caulk for different

surfaces on the inside and outside of your house. Some caulk is waterproof, some is not; some can be painted, some cannot. Higher-end caulk seals better, lasts longer and isn't much more expensive than bargain varieties. Air-sealing is one area in which you don't want to scrimp on materials because a poorly sealed crack is still a crack.

Foam sealants are commonly used to fill larger gaps of up to 1 inch. Once applied, they expand to fill and seal the space and, like caulk, harden as they dry. The two most common types are urethane and latex foam, both available at hardware and building supply stores. Latex foam cleans up easier and often comes with a reusable applicator, so you don't have to finish a whole can at once. Urethane foam can be difficult to remove from hands and clothes, and most applicators are not reusable.

Weatherstripping eliminates gaps between movable parts, such as around the perimeters of exterior doors and operable windows, when they are closed. Weatherstripping can be made of metal, foam, rubber, vinyl or felt and is often sold by the foot or in prepackaged window or door kits. Try to match the product that originally came with the door or windows so the finished result will look good and likely be most effective. Again, ask a store salesperson for help in selecting the right product for your situation. Some materials are nailed or tacked on while others are applied with self-adhesive tape. Well-installed weatherstripping will be slightly compressed when doors and windows are closed.



7.2 Double hung window

7.2 Casement window

Properly seal and weatherstrip windows to save energy.

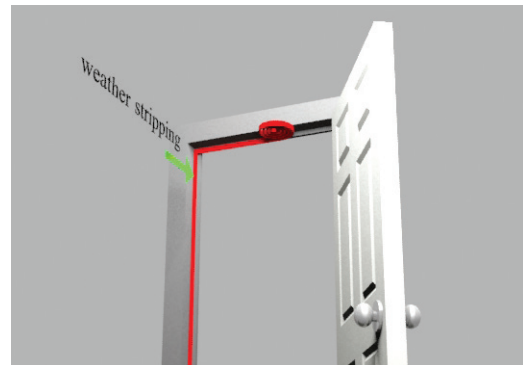
Start at the top

Start by closing gaps between your roof or attic and the living space below. Properly air-sealing this area will help save on your heating bill. Every opening in the attic floor is a potential escape route for heat. Check around electrical wires, light fixtures, chimneys, stove flues, ductwork and plumbing vent pipes, as well as along the tops of walls. To walk around in this area, lay boards on top of the joists because the ceiling won't support your weight. Wear a dust mask and gloves if you have to roll insulation back to look for leaks. Dirty spots on insulation will generally indicate an air leak.

In some old homes, partition walls from below open into the attic space. Seal these large openings by stuffing them with plastic bags filled with fiberglass insulation. Chimneys and stove flues require special attention. Use heat-resistant caulk for small gaps, and add a sheet-metal collar to seal larger openings. Treat the attic hatch as an outside door and apply weatherstripping around it.

Examine, seal and insulate ductwork

If you have a forced air heating and cooling system, it pays to seek out leaks in both the supply and return ducts in attics or crawl spaces. To make sure all the pieces are properly connected, turn on the furnace fan and run your hand over the duct seams and joints to feel for air leaks. Holes in supply ducts will blow air out, and gaps in return



Illustrations by Robert Work

Weatherstripping options for windows and doors.

ducts will suck air in (tissue will stick to the hole). Plug any leaks you find with foil tape (not duct tape), or better yet, apply water-based mastic (waterproof, putty-like paste used as a joint-sealer or filler) to the duct seam.

Once the leaks are fixed, you can save even more by insulating ducts in unheated areas with foil-faced fiberglass duct insulation. Wrap the insulation around the duct and tie or tape it in place.

Tackle the low spots

Seal places where cold air can get in, including areas around window and door frames and between your living space and an unheated basement or crawl space. You can use the same methods and materials from the attic; weatherstripping around doors and operable windows and plugging gaps with caulk, foam or drywall. Again, use heat-resistant products around chimneys and stove flues.

You can also buy inexpensive foam gaskets that fit behind electrical outlet and light switch cover plates. If you have a fireplace, close the damper when you're not using it, and ensure the seal is tight if you don't use it much.

Provide combustion air

All combustion appliances — gas furnaces, water heaters and ranges — need fresh air to operate properly, and cutting off that air supply could cause carbon monoxide and other dangerous gases to build up. Combustion air should be sized properly and be drawn from outside the house. Contact a heating contractor for assistance in determining whether your appliances are receiving adequate outside combustion air.

Air-sealing brings many benefits

Regardless of whether you or a contractor does the work, the time and money spent on air-sealing will provide many returns, especially when coupled with attic, wall and floor insulation. Making your home more energy-efficient will not only lower heating bills, but also keep your home cooler in the summer.



Photo credit: Colorado State University



