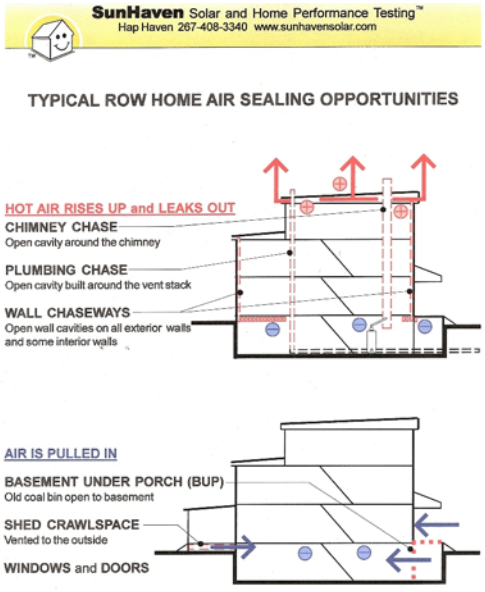
Seal before you insulate….

Do you feel a draft?

If you aren't standing in front of a door or window, that drafty feeling can be traced to what is called an air leak. The leaks typically originate in the basement or the attic.

These are the leaks that significantly raise your energy bill and make your house uncomfortable. Finding them can be difficult because your insulation may be hiding them. When the weather is cold, the heated air rises through the house to the attic and pulls in outside cold air around windows, doors, and through holes into the basement.



The sketch above, by Philadelphia-based energy expert Hap Haven, shows how and where air leaks occur. Air leaks are typically found behind knee walls, through the attic hatch, holes made for wiring, plumbing vents, open soffits, recessed lighting, a furnace flue or chase way for ducts, the point in the basement at which the foundation meets the wood framing and, of course, windows and doors.

Warm air rises to the attic, and out.

Let's start with the basement.

Air often leaks into the basement at the point in the wall where concrete or cement block comes meets the wood framing. Since the top of the wall is above ground, outside air can be drawn in through cracks and gaps where the house framing, which is called the rim or band joist, sits on top of the foundation. In the basement, the point at which the each floor joist ends at the rim joist creates a space into which air can leak.

In an unfinished basement, leaks can be sealed easily, of course. You probably won't be able to see cracks in the rim joist cavities, so seal the top and bottom of the inside of the cavity. Also, rim joist air sealing is especially important at bump-out areas such as bay windows, which hang off the foundation. These areas provide greater opportunities for air leaks and heat loss. Silicone or

acrylic latex caulk is best for sealing gaps or cracks that are 1/4 inch or less. For gaps from one-quarter of an inch to three inches, use an expanding spray-foam insulator.

Look for holes running from the ceiling of the basement through to the first floor. These holes typically were made for wiring, water supply pipes, water drain pipes, the stack for venting sewer gases and the furnace flue, which vents furnace exhaust. The flue is inside a metal sleeve, so run a bead of high-temperature caulk around the pipe sleeve and the metal frame.

The opening around a furnace or water heater flue or chimney can be a major source of warm air moving into the attic. Because the pipe gets hot, building codes usually require one inch of clearance from metal flues (two inches from masonry chimneys) to any combustible material, including insulation.

These gaps should be sealed with lightweight aluminum flashing and special high-temperature (heat-resistant) caulk. Before you push the insulation back into place, build a metal dam to keep it away from the pipe. Use the same technique for masonry chimneys.

Areas to foam or caulk include along the gap between the sill plate and the foundation; at the bottom and top of the rim joist on each end of the house, and all electrical, water, or gas penetrations and any venting ducts that pass to the outside.

After air sealing the rim joist area, it is relatively easy to insulate each cavity with rigid-foam insulation or fiberglass batts. If using batts, just cut the insulation to fit and place against the rim joist without compression, gaps or voids. If using rigid insulation, use the foam to secure the boards into place.

This could be done when you are remodeling the basement, because you would insulate the basement walls floor-to-ceiling.

Inexpensive air sealing

In houses with forced-air heating and cooling systems, ducts are used to distribute conditioned air throughout the house. In a typical house, however, about 20 percent of the air that moves through the duct system is lost because of leaks, holes and poorly connected ducts.

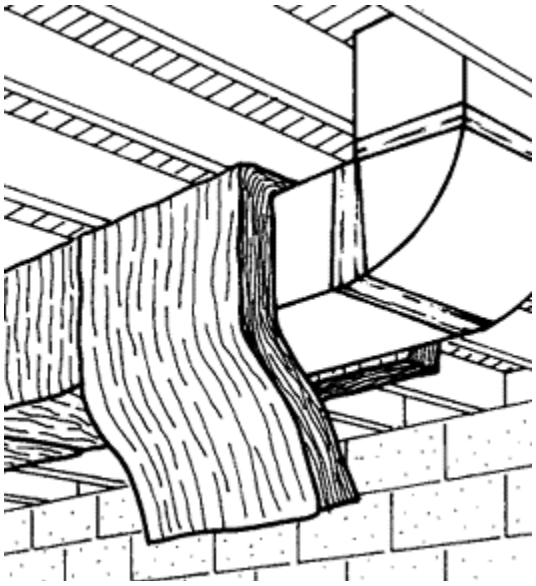
The result is higher utility bills and difficulty keeping the house comfortable, no matter how the thermostat is set.

You know that the ducts in your houses are performing poorly if you have high summer and winter utility bills; you have rooms that are difficult to heat and cool; you have stuffy rooms that never seem to feel comfortable; your ducts are in an attic, a crawlspace, or the garage, or you find tangled or kinked flexible ducts in your system.

Because ducts are often concealed in

walls, ceiling, attics, and basements, repairing them can be difficult, but there are things that you can do to improve their performance.

Some homeowners choose to take on duct sealing as a do-it-yourself project. Start by sealing air leaks using mastic sealant or metal tape and insulating all the ducts that you can access (such as those in attics, crawlspaces, unfinished basements and garages). Never use duct tape, and make sure that the connections at vents and registers are well-sealed where they meet the floors, walls, and ceiling. These are common locations to find leaks and disconnected ductwork.



Insulating ducts in unheated spaces

Outside air drawn in through basement leaks is exacerbated by the chimney effect created by leaks in the attic. As hot air generated by the furnace rises up through the house and into the attic through leaks, cold outside air gets drawn in through basement leaks to replace the displaced air. This makes a home feel drafty and contributes to higher energy bills. After sealing attic air leaks, complete the job by sealing basement leaks, to stop the “chimney effect.”

Air sealing in the attic

Attic air sealing and adding insulation are do-it-yourself projects if your attic is accessible.

Before you attempt either, make sure that the following problems have been taken care of: wet or damp insulation indicating a leaky roof; moldy or rotted attic rafters or floor joists indicating moisture problems; kitchen, bathroom, and clothes dryer vents that exhaust moist air directly into the attic space instead of outdoors; a history of ice dams in the winter; little or no attic ventilation, or knob and tube wiring that might be a fire hazard when it comes into contact with insulation.

If you have many unsealed and un-insulated recessed "can" lights, special care must be taken when putting insulating around these fixtures.

Foam insulation sprayed in attic

Don’t worry about finding and sealing all the tiny holes in the attic; you’ll save

big by plugging the large ones. The greatest amount of air leaking will be at the point where the inner and outer walls meet the attic floor, in dropped -ceiling areas), and behind or under attic knee walls.

Look for dirty insulation — this indicates that air is moving through it. Dropped soffits may be filled or covered with insulation and hard to see. Push back the insulation and scoop it out of the soffits. You will place this insulation back over the soffit once the stud cavities have been plugged and the soffits covered.

Finished rooms built into attics often have open cavities in the floor framing under the side-walls or knee walls. Even though insulation may be piled against or stuffed into these spaces, they can still leak air. Dirty insulation indicates air is moving through. These cavities need to be plugged to prevent air from moving under the floor of the finished space.

Some attics have vermiculite insulation, which may contain asbestos. Don’t disturb the insulation unless you have had it tested first.

To find evidence of gaps that let in the air, look for areas where the insulation is darkened. This is the result of filtering dusty air from the house. In cold weather, you may also see frosty areas in the insulation caused by warm, moist air condensing and then freezing as it hits the cold attic air.

In warmer weather, you'll find water staining in these same areas. Although the insulation is dirty, it is still okay to use.

There's no need to remove and replace. After sealing the areas, just push the insulation back into place. If you have blown insulation, a small rake can be helpful to level it back into place.

Use expanding foam or caulk to seal the openings around plumbing vent pipes and electrical wires. Be sure to wear gloves and be careful not to get expanding foam on your clothes, as the foam is very sticky and nearly impossible to remove once it sets. When the foam or caulk is dry, cover the area again with insulation.

Finish up by sealing the access hatch with self-sticking weather stripping. If your hatch rests directly on the moldings, add 2-1/2 inch wide stops around the opening. The stops provide a wider surface for attaching the weatherstripping and a space to mount hook-and-eye fasteners.

Pull-down stairs

Position the screw eyes so the weatherstripping is compressed slightly when the hooks are latched. Cut a piece of fiberglass or rigid foam board insulation the same size as the attic hatch and nail or glue it to the back of the hatch.

If you have pull-down attic stairs or an attic door, these should be sealed in a similar manner: weather-strip the edges and put a piece of rigid foam board insulation on the back of the door. Treat the attic door like a door to the outside.

What you need to air seal

Batt or roll of unfaced fiberglass insulation and white kitchen bags to stuff

into open stud cavities behind kneewalls and in dropped soffits …

Roll of reflective foil insulation or other blocking material such as drywall or pieces

of rigid foam insulation to cover soffits, open walls and larger holes …

Silicone or acrylic latex caulk

& caulk gun for sealing small holes (1/4 inch or less) …

Several cans of expanding spray foam insulation for filling larger gaps (1/4 inch to 3 inches) Special high-temperature (heat-resistant)

caulk to seal around flues and chimneys …

Roll of 14-inch wide aluminum flashing to keep insulation away from the flue pipe …

Retractable utility knife and sheet metal scissors …

Tape measure and staple gun (or hammer and nails) to hold covering materials in place …

Safety glasses, gloves, and dust mask …

Flashlight or portable safety light …

Source: U.S. DOE