10 Steps to Save Energy in Your House

Sealing and **insulating** your home is one of the most cost-effective ways to make a home more comfortable and energy efficient—and you can do it yourself.

In this chapter, you will learn how to find and seal hidden attic and basement air leaks; determine if your attic insulation is adequate and learn how to add more; make sure your improvements are done safely; and reduce energy bills and help protect the environment.

You will notice your home's air leaks in the winter more than any other time of year. Most people call these air leaks "drafts." You may feel these drafts around windows and doors and think these leaks are your major source of wasted energy. In most homes, however, the most significant air leaks are hidden in the attic and basement. These are the leaks that significantly raise your energy bill and make your house uncomfortable.

In cold weather, warm air rises in your house, just like it does in a chimney. This air, which you have paid to heat, is just wasted as it rises up into your attic and sucks cold air in all around your home—around windows, doors, and through holes into the basement. Locating these leaks can be difficult because they are often hidden under your insulation. This chapter will help you find these leaks and seal them with appropriate materials.

STEP #1 Getting started

Sealing attic air leaks will enhance the performance of your insulation and make for a much more comfortable home.

Attic air sealing and adding insulation are do-it-yourself projects if your attic is accessible and not too difficult to move around in. The projects in this chapter can usually be completed in two days and will provide rewards for years to come.

If you find any major problems in the attic space such as roof leaks, mold, unsafe working conditions, inadequate flooring, inadequate ventilation, knob-and-tube wiring, recessed “can” lights, we recommend hiring a contractor to help you and/or correct these problems before proceeding.

Look around your house for any dropped-ceiling areas, dropped soffits over kitchen cabinets, slanted ceilings over stairways, and where walls (interior and exterior) meet the ceiling. These areas may have open spaces that could be huge sources of air leaks.

STEP #2 Working in the Attic

Be sure to use a work light to make sure that your work area is lit adequately.

Use personal protective equipment. To work in an attic, you need kneepads, coveralls, gloves and a hat to keep itchy and irritating insulation off your skin. Use an OSHA-approved particulate respirator or a high-quality dust mask.

Be safe. Do not work in the attic area if you feel that it is dangerous in any way. It's not worth risking life or property. Simply hire a qualified contractor to perform the work you need to get done. If you work in a hot attic, drink plenty of water.

Watch your step. Walk on joists or truss chords. Watch your head - there will be sharp nails and things sticking out above you and all around your head.

STEP #3 What You Will Need

- Reflective foil insulation or other blocking material such as drywall or pieces of rigid foam insulation to cover soffits, open walls, and larger holes
- Unfaced fiberglass insulation and large garbage bags
- Silicone or acrylic latex caulk for sealing small holes (1/4 inch or less)
- 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 aluminum flashing to keep insulation away from the flue pipe
- Tape measure
- Utility knife and sheet metal scissors
- Staple gun (or hammer and nails) to hold covering materials in place
- Plastic garbage bag

STEP #4 Plug the Large Holes

The biggest savings will come from sealing the large holes. Locate the areas from the attic where leakage is likely to be greatest: where walls (interior and exterior) meet the attic floor; dropped soffits (dropped-ceiling areas) and; behind or under attic knee walls. **Look for dirty insulation**. Dirty insulation (black/brown stains on the underside of the insulation) indicates that air is moving through it. Push back the insulation or pull 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.

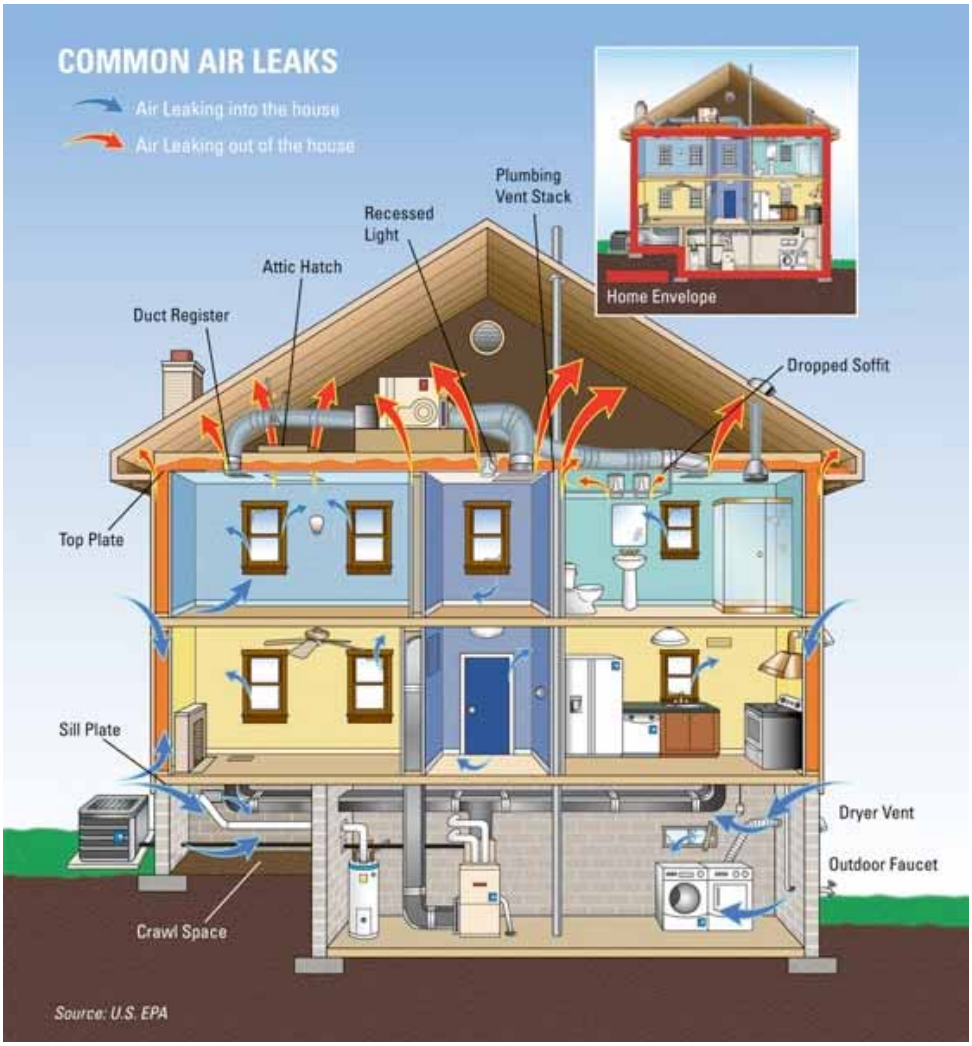
Dropped soffit. After removing insulation from a dropped soffit, cut a length of reflective foil or other blocking material (rigid foam board works well). Apply a bead of caulk or adhesive around the opening. Seal the foil to the frame with the caulk/adhesive and staple or nail it in place, if needed.

Under a wall. Cut a 24-inch long piece from a batt of fiberglass insulation and place it at the bottom of a 13-gallon plastic garbage bag. Fold the bag over and stuff it into the

open joist spaces under the wall (a piece of rigid foam board sealed with spray foam also works well for covering open joist cavities). Cover with insulation when you're done.

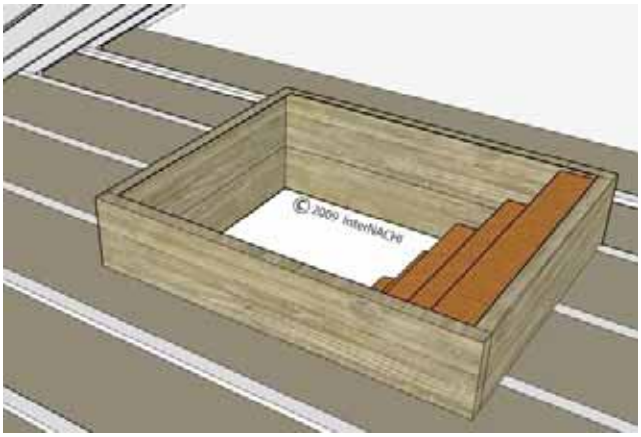
Finished rooms built into attics often have open cavities in the floor framing under the sidewalls or knee walls. Even though insulation may be piled against or stuffed into these spaces, they can still leak air. Again, look for signs of dirty insulation to indicate air is moving through. You need to plug these cavities in order to stop air from traveling under the floor of the finished space.

Flue. The opening around the flue or chimney of a furnace or water heater can be a major source of warm air moving in the attic. Because the pipe gets hot, building codes usually require 1-inch of clearance from metal flues (2 inches from masonry chimneys) to any combustible material, including insulation. This gap can be sealed with lightweight aluminum flashing and special high-temperature (heat-resistant) caulk. Before you push the insulation back into place, build a barrier out of the metal aluminum to keep the insulation away from the pipe.



STEP #5 Seal the Small Holes

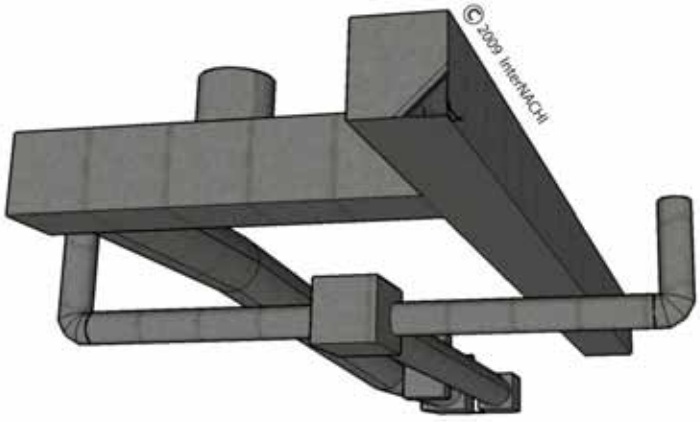
Look for areas where the insulation is darkened. This is the result of dusty air coming from the house interior, and moving into and being filtered by the insulation. In cold weather, you may also see frosty areas in the insulation caused by warm, moist air condensing and then freezing as it hits the cold attic air. In warmer weather, you'll find water staining in these same areas. Use expanding foam or caulk to seal the **openings around plumbing vent pipes and electrical wires**. When the foam or caulk is dry, cover the area again with insulation. After sealing the areas, just push the insulation back into place. If you have blown insulation, a small hand tool can be helpful to level it back into place.



STEP #6 Attic Access

Seal up the attic access panel with weather stripping. Cut a piece of fiberglass or rigid foam board insulation the same size as the attic hatch and glue it to the back of the attic access panel.

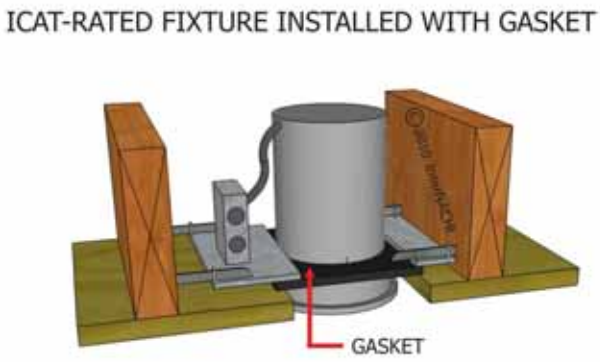
If you have pull-down attic stairs or an attic door, these should be sealed in a similar manner using weather stripping and insulating the back of the door. Treat the attic door like an exterior door to the outside.



STEP #7 Ducts

Sealing and insulating your ducts can increase the efficiency of your HVAC system. Leaky ducts waste an incredible amount of energy. Check the duct connections for leaks - seal the joints with mastic or foil tape (household duct tape should not be used). Pay special attention to all the duct penetrations going through the attic floor. Seal these with foam.

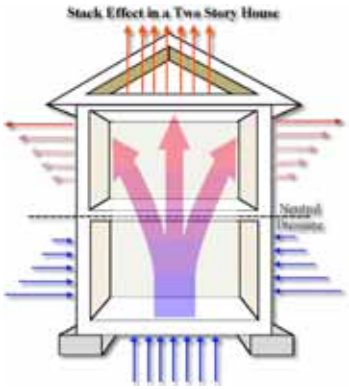
HVAC ducts should also be insulated—if your ducts are uninsulated or poorly insulated, seal them first, then add insulation. Use duct insulation material rated at least R-6. Duct sealant, also known as duct mastic, is a paste, which is more durable than foil duct tape. It is available at home improvement centers.



STEP #8 “Can” Lights

Recessed “can” lights (also called high-hats or recessed lights) can make your home less energy-efficient. These recessed lights can create open holes that allow unwanted airflow from conditioned spaces to unconditioned spaces. In cold climates, the heat from the airflow can melt snow on the roof and cause the development of ice dams. Recessed “can” lights in bathrooms also cause problems when warm, moist air leaks into the attic and causes moisture damage.

Warning: You can create a fire hazard if the “can” light is not insulated or sealed properly. It may be best to consult a professional before sealing “can” lights or coming in contact with any electrical components.



STEP #9 Stack Effect

Like a chimney. Outside air drawn in through open holes and gaps in the basement is drawn in by a chimney stack effect created by air leaks in the attic. As hot air generated by the furnace rises up through the house and into the attic through open holes, cold outside air gets drawn in through open holes in the basement 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 stack effect.

Basement air leaks. Along the top of the basement wall where floor system meets the top of the foundation wall is a good area to look for open holes and gaps. Since the top of the wall is above ground, outside air can be drawn in through cracks and gaps where the house framing sits on top of the foundation.

Sealant or caulk is best for sealing gaps or cracks that are 1/4 inch or less. Use spray foam to fill gaps from 1/4 inch to about 3 inches. We also recommend you seal penetrations that go through the basement ceiling to the floor above. These are holes for wires, water supply pipes, water drainpipes, the plumbing vent stack, and the furnace flue.

Attic and basement air sealing will go a long way to improve your comfort because your house will no longer act **like an open chimney**.

STEP #10 Attic Insulation Thickness

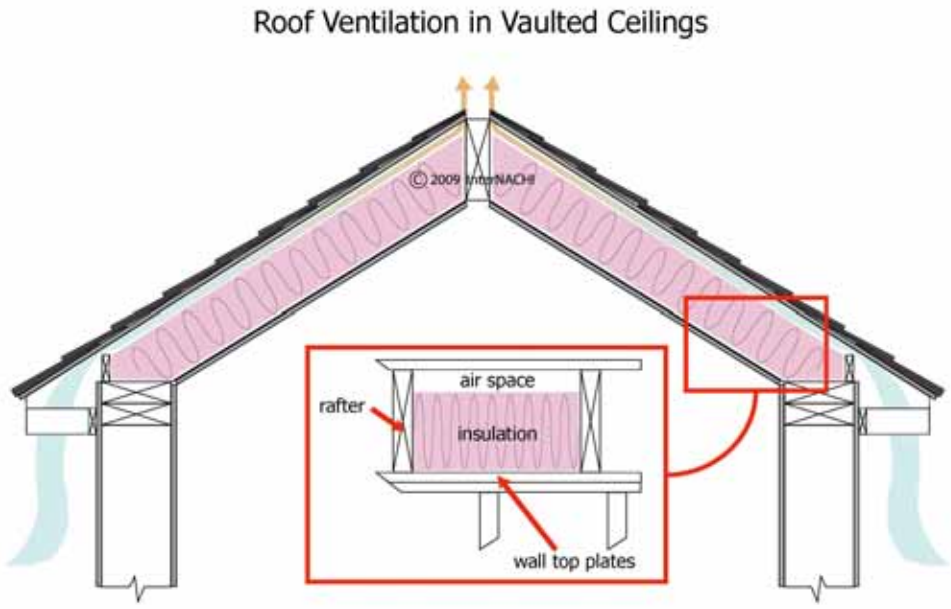
Look. One quick way to determine if you need more insulation on the floor of your attic is to simply look across the floor of your attic. If the insulation is level with or below your floor joists, more insulation is needed. If the insulation is well above the joists, you may have enough. There should be no low spots.

R-Value. Insulation levels are specified by R-Value. R-Value is a measure of insulation's ability to resist heat flow. The higher the R-Value, the better the thermal performance of the insulation. The recommended level for most attic floors is R-38 or about 10 to 14 inches (depending on the type of insulation and your climate).

When adding insulation, you do not have to use the same type of insulation that currently exists in your attic. You can add loose fill on top of fiberglass batts or blankets, and vice-versa. If you use fiberglass over loose fill, make sure the fiberglass batt has no paper or foil vapor barrier. The insulation needs to be "unfaced."

Laying out or spreading fiberglass rolls is easy. If you have any type of insulation between the rafters, install the second layer over and perpendicular to the first. This will help cover the tops of the joists and reduce heat loss or gain through the frame.

NEVER! Never lay insulation over recessed light fixtures or soffit vents. Keep all insulation at least 3 inches away from "can" lights, unless they are rated IC (Insulated Ceiling). If you are using loose fill insulation, use sheet metal to create barriers around the openings. If using fiberglass, wire mesh can be used to create a barrier.



Rafter vent trays. To completely cover your attic floor with insulation out to the eaves you need to install rafter vents or trays (also called insulation baffles). Rafter vents

ensure the soffit vents are clear and there is a clear opening for outside air to move into the attic at the soffits and out through the gable or ridge vent for proper ventilation.

Additional Information

For additional information on Indoor Air Quality (IAQ) issues related to homes such as combustion safety, indoor air contaminants, and proper ventilation, visit: http://www.epa.gov/iaq/homes/hip-front.html.

ENERGY STAR is a government-backed program helping businesses and individuals protect the environment through superior energy efficiency. To learn more about the wide variety of energy-efficient ENERGY STAR products and processes visit http://www.energystar.gov.