ENERGY EFFICIENCY AND RENEWABLE ENERGY CLEARINGHOUSE

Does Your Home Need More Insulation?

To begin to answer this question, you must first find out how much insulation you already have and then determine how much more would be cost-effective. Many older homes have less insulation than homes built today. A qualified home energy auditor will include an insulation check as a routine part of an energy audit. For information about home energy audits, call your local utility company. State energy offices are another valuable resource for information. An energy audit of your house will identify the amount of insulation you have and need, and will likely recommend other improvements as well.

If you don't have someone else inspect your home, you'll need to look for insulation in several places. Figure 1 shows the places in a typical house where insulation should be installed. These are the areas you should check. In each you'll need to measure the thickness of the insulation and identify which type of insulation was used (see "Types of Insulation – Basic Forms" in Table 1).

Your home may have one or more of several different insulation materials. Mineral fiber insulation, including fiber glass and rock wool, is produced from either molten glass, slag, or rock. Fiber glass insulation is usually very light-weight, and yellow, pink, or white in color. Fiber glass can be found in loose-fill and blanket, either batt or roll, forms. Rock wool loose-fill is usually more dense than fiber glass, and is most commonly gray with black specks. Some rock wool products, however, are near-white. Loose-fill cellulose insulation is commonly manufactured from recycled newsprint, cardboard, or other forms of waste paper. Most cellulose is in the form of small flat pieces rather than fibers. However, some cellulose products are so finely divided they look fibrous as well. Vermiculite- and perlite-loose-fill products are no longer commonly used as home insulation, but you may find them in an older home. They are produced by expanding naturally occurring minerals in a furnace. The resulting granules are non-combustible and are commonly poured-in-place.

First, check the attic; then check walls and floors adjacent to an unheated space like a garage or basement. In these places, the structural frame elements (the ceiling joists or wall framing boards) are often exposed, making it easy to examine the insulation (if any) and

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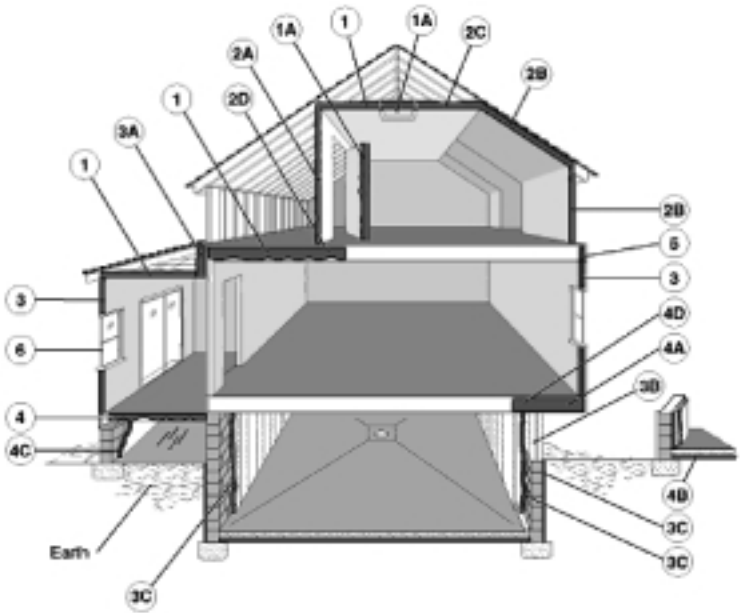
to measure the depth or thickness of the insulation. It is more difficult to inspect finished exterior walls. One method is to use an electrical outlet on the wall, but first be sure to turn off the power to the outlet. Then remove the cover plate and shine a flashlight into the crack around the outlet box. You should be able to see whether or not insulation is in the wall. You may need to pull a small amount out to determine which type of material was used. Also, you should check separate outlets on the first and second floor, and in old and new parts of the house, because wall insulation in one wall doesn't necessarily mean that it's everywhere in the house. An alternative to checking through electrical outlets is to remove and then replace a small section of the exterior siding.

Next, inspect and measure the thickness of any insulation in unfinished basement ceilings and walls, or above crawl spaces. If the crawl space is not ventilated, it may have insulation on the perimeter wall. If your house is relatively new, it may have been built with insulation outside the basement or foundation wall. However, this insulation would not be visible because it would be covered by a protective layer of stucco, plastic, fiber glass, metal flashing, or a rigid protection board. The builder or the original homeowner may be able to tell you if such exterior insulation was used.

Fig 1. Examples of Where to Insulate



1. In unfinished attic spaces, insulate between and over the floor joists to seal off living spaces below.*
   1A attic access door
2. In finished attic rooms with or without dormer, insulate …
   2A between the studs of "knee" walls;
   2B between the studs and rafters of exterior walls and roof;
   2C ceilings with cold spaces above;
   2D extend insulation into joist space to reduce air flows.
3. All exterior walls, including …
   3A walls between living spaces and unheated garages, shed roofs, or storage areas;
   3B foundation walls above ground level; 3C foundation walls in heated basements, full wall either interior or exterior.
4. Floors above cold spaces, such as vented craw spaces and unheated garages. Also insulate …
   4A any portion of the floor in a room that is cantilevered beyond the exterior wall below;
   4B slab floors built directly on the ground;**
   4C as an alternative to floor insulation, foundation walls of unvented crawl spaces;
   4D extend insulation into joist space to reduce air flows.
5. Band joists.
6. Replacement or storm windows and caulk and seal around all windows and doors.

*Well-insulated attics, crawl spaces, storage areas, and other enclosed cavities should be ventilated to prevent excess moisture build-up.

**For new construction, slab on grade insulation should be installed to the extent required by building codes, or greater.

Table 1. Types of Insulation--Basic Forms

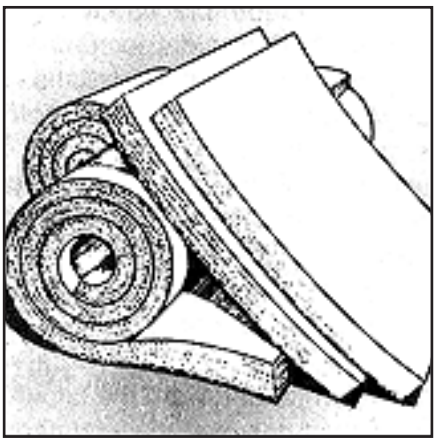
Form	Method of Installation	Where Applicable	Advantages
Blankets: Batts or Rolls • Fiber glass • Rock wool	Fitted between studs, joists and beams	All unfinished walls, floors and ceilings	Do-it-yourself Suited for standard stud and joist spacing, which is relatively free from obstructions
Loose-Fill (blown-in) or Spray-applied • Rock wool • Fiber glass • Cellulose • Polyurethane foam	Blown into place or spray applied by special equipment	Enclosed existing wall cavities or open new wall cavities Unfinished attic floors and hard to reach places	Commonly used insulation for retrofits (adding insulation to existing finished areas) Good for irregularly shaped areas and around obstructions
Rigid Insulation • Extruded polystyrene foam (XPS) • Expanded polystyrene foam (EPS or beadboard) • Polyurethane foam • Polyisocyanurate foam	Interior applications: Must be covered with 1/2-inch gypsum board or other building-code approved material for fire safety Exterior applications: Must be covered with weather-proof facing	Basement walls Exterior walls under finishing (Some foam boards include a foil facing which will act as a vapor retarder. Please read the discussion about where to place, or not to place, a vapor retarder) Unvented low slope roofs	High insulating value for relatively little thickness Can block thermal short circuits when installed continuously over frames or joists.
Reflective Systems • Foil-faced paper • Foil-faced polyethylene bubbles • Foil-faced plastic film • Foil-faced cardboard	Foils, films, or papers: Fitted between wood-frame studs joists, and beams	Unfinished ceilings, walls, and floors	Do-it-yourself All suitable for framing at standard spacing. Bubble-form suitable if framing is irregular or if obstructions are present Effectiveness depends on spacing and heat flow direction
Loose-Fill (poured in) Vermiculite or Perlite	not currently used for home insulation, but may be found in older homes		

What Kind of Insulation Should You Buy?

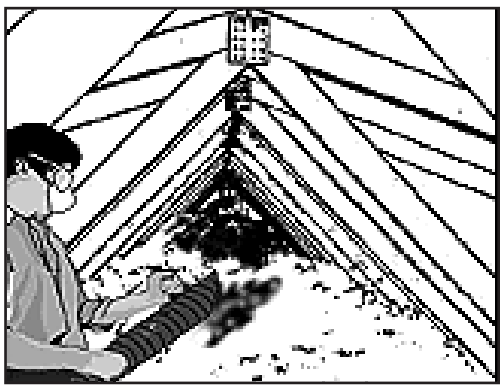
Once you have located the areas in your house requiring insulation, and have determined what R-value is needed, you will need to decide what type to buy. Some types of insulation require professional installation, and others you can install. You should consider the several forms of insulation available, their R-values, and the thickness needed. Remember, for a given type and weight of insulation, the thicker it is, the higher its R-value. The basic forms of thermal insulation are summarized in Table 1. Here is some additional information.

The blown-in material can provide additional resistance to air infiltration if the insulation is sufficiently dense.

Basic Forms of Thermal Insulation

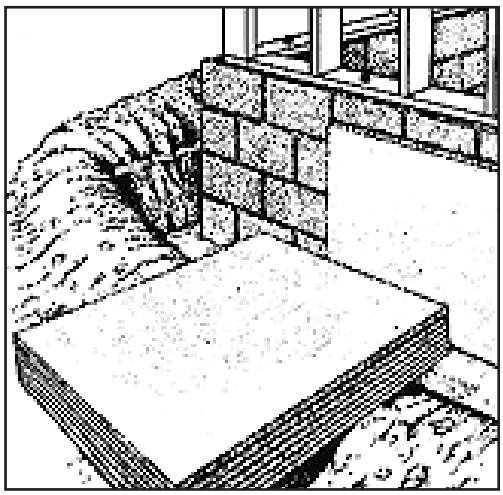


BLANKETS, in the form of batts or rolls, are flexible products made from mineral fibers. They are available in widths suited to standard spacings of wall studs and attic or floor joists. Continuous rolls can be hand-cut and trimmed to fit. They are available with or without vapor retarder facings. Batts with a special flame-resistant facing are available in various widths for basement walls where the insulation will be left exposed.



BLOWN-IN loose-fill insulation includes loose fibers or fiber pellets that are blown into building cavities or attics using special pneumatic equipment. Another form includes fibers that are co-sprayed with an adhesive to make them resistant to settling. The blown-in material can provide additional resistance to air infiltration if the insulation is sufficiently dense.

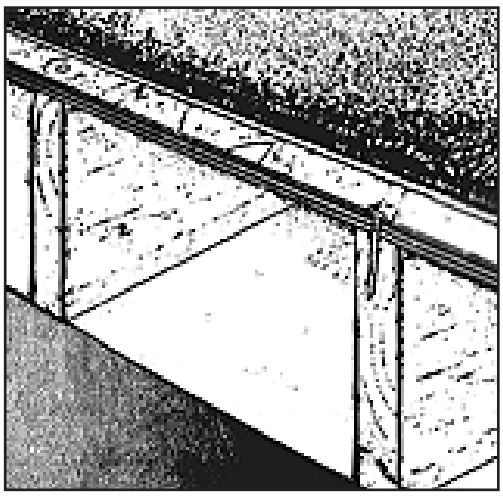
FOAMED-IN-PLACE polyurethane foam insulation can be applied by a professional applicator using special equipment to meter, mix, and spray into place. Polyurethane foam can also help to reduce air leaks.



RIGID INSULATION is made from fibrous materials or plastic

A good insulation label should have a clearly stated R-value, and information about health and safety issues.

foams and is pressed or extruded into board-like forms and molded pipe-coverings. These provide thermal and acoustical insulation, strength with low weight, and coverage with few heat loss paths. Such boards may be faced with a reflective foil that reduces heat flow when next to an air space.



REFLECTIVE INSULATION SYSTEMS are fabricated from aluminum foils with a variety of backings such as kraft paper, plastic film, polyethylene bubbles, or cardboard. The resistance to heat flow depends on the heat flow direction, and this type of insulation is most effective in reducing downward heat flow. Reflective systems are typically located between roof rafters, floor joists, or wall studs. If a single reflective surface is used alone and faces an open space, such as an attic, it is called a RADIANT BARRIER. Radiant barrriers are sometimes used in buildings to reduce summer heat gain and winter heat loss. They are more effective in hot climates than in cool climates. All radiant barriers must have a low emittance (0.1 or less) and high reflectance (0.9 or more).

Check the Label Before You Buy

No matter what kind of insulation you buy, check the information on the product label to make sure that the product is suitable for the intended application. A good insulation label should have a clearly stated R-value, and information about health and safety issues. An informative label should state:

- The type of insulation material;
- The R-value (measured at 75F);
- The types of spaces that can be insulated;
- Safety precautions in application and use, including any fire-hazard related restrictions;
- The quantity in the package;
- The name and address of the manufacturer or distributor.

For more information concerning insulation, visit:
http://www.ornl.gov/sci/roofs+walls/insulation/ins_01.html

This publication was adapted from:
Insulation Fact Sheet
DOE/CE-180
Building Envelope Research, Oak Ridge National Laboratory

January 2004