



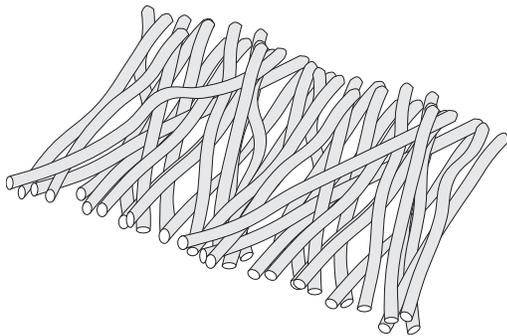
# Energy Conservation Tip Sheet

## IMPROVING YOUR HOME'S INSULATION

Insulation is the key element in making a home comfortable and energy-efficient during both cold and hot weather. In many homes, retrofit attic and wall insulation improvements are the best energy investments of all.

Insulation is rated by R-value, which measures resistance to heat flow. Each type of insulation has a different R-value for each inch of thickness, hence 3 inches of fiberglass will have a value of about R-10 while 3 inches of foamboard has a value of about R-15.

### Trapped Air Slows Heat Flow



*Fiberglass, like all types of insulation, traps air between loosely packed rows of fibers. The trapped air provides the insulating value, not the fiberglass itself.*

### INSULATION TYPES AND CHOICES

Fiberglass batts are the most common insulation found in existing homes. Many homes have batts installed in both wall cavities and in the attic.

Loose-fill insulation, either fiberglass and cellulose, is also used as both attic and wall insulation. This type of blown blanket has no voids or edge gaps, if installed properly, loose-fill usually has more resistance to heat flow than fiberglass batts.

Plastic foam insulation, like polystyrene and polyurethane, is available in 4-foot by 8-foot or 2-foot by 8-foot sheets of various thicknesses. Plastic foam insulation is

a moisture and air barrier, unlike fibrous insulation. Foam sheets can be used to insulate masonry walls or as insulated sheathing on frame walls.

Sprayed polyurethane is sometimes used to insulate walls, foundations, or roofs. It is costly to install, but worth its higher price when adhesion, moisture-resistance, air-sealing ability, and structural strength are important. Sprayed polyurethane insulation is usually applied by professional crews with truck-mounted equipment.

### Retrofit Attic Insulation



*Either loose-fill fiberglass or loose-fill cellulose insulation are good choices for attic insulation because they form a seamless blanket. Insulation dams are installed to maintain clearance around the attic hatch and chimney.*

### RETROFIT ATTIC INSULATION

Loose-fill insulation is blown into attics using an insulation-blowing machine. It is inexpensive and easy to install. If your ceiling has less than 5 inches of insulation (about R-19), adding insulation to a total of 12-16" (about R-49) is an excellent investment. Attic insulation provides a better return than most energy investments since it increases comfort and lowers consumption in both summer and winter.

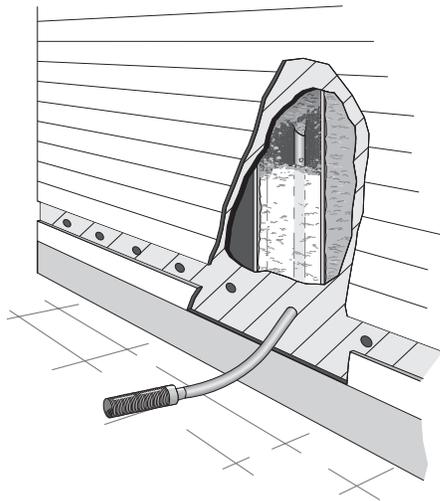
## RETROFIT WALL INSULATION

Many older homes were built with little or no wall insulation. Since your home's wall cavities are out of sight, it's hard to know how much insulation is installed in them. But if your home is more than 30 years old, it's worth the time to find. One of the best ways is to remove the cover plate of an electrical outlet (be sure to turn the power off first). Use a flashlight to peer around the electrical box into the wall cavity. Another trick is to drill a small inspection hole in an inconspicuous place such as a closet. The wall cavity should be full.

Wall insulation is usually blown into the wall cavities of existing homes through a series of holes in the interior or exterior wall surfaces. This type of loose-fill insulation should be installed at sufficient density to avoid settling.

If you plan to install new siding on your house, or to paint the interior or exterior, you'll have a good opportunity to blow insulation into uninsulated or partially insulated wall cavities. During these major jobs, you can reduce or eliminate the cost of patching the holes need to install cavity insulation. Insulating foam sheets can also be attached to walls after existing siding is removed and before a home is re-sided, adding valuable extra thermal resistance.

### Dense-Packed Wall Insulation



*Exterior walls of older homes are best insulated using a fill tube inserted into the wall cavity. The tube helps achieve the high density needed to prevent settling by packing the insulation throughout the height of the wall.*

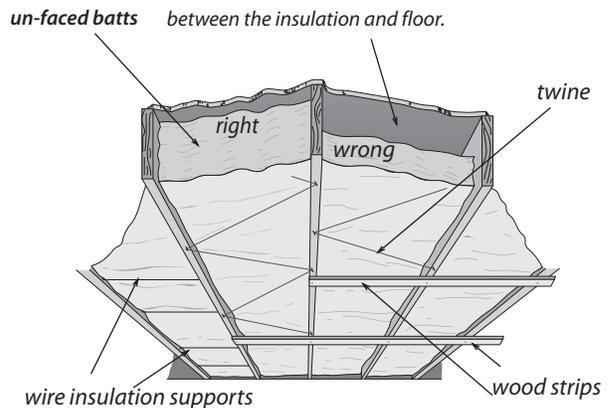
## RETROFIT CRAWL-SPACE INSULATION

If your home is built over a crawl space, it should be insulated at either 1) the floor above the crawl space, or 2) at the foundation walls around the crawl space.

If you choose to insulate the floor above the crawl space, it should be brought up to at least R-11. This can be achieved with a 3<sup>1</sup>/<sub>2</sub>-inch un-faced fiberglass batt. Better yet, install a 5<sup>1</sup>/<sub>2</sub>-inch batt to achieve R-19. Provide permanent support such as wood strips or wires for this type of overhead installation. Avoid the use of faced batts since they tend to trap moisture.

### Insulating the Floor Above Your Crawl Space

*Either buy insulation deep enough to fill the cavity, or push the insulation up to avoid leaving a space between the insulation and floor.*



*There are a number of effective ways to attach and support floor insulation, including twine, wire insulation supports, and wood strips.*

In many cases, a better approach to crawl space insulation is to insulate the foundation wall with sheet foam insulation and thereby include the crawl space within the conditioned boundary of the home. Foam insulation can tolerate crawl space moisture better than fiberglass batts, and so is often the best choice where moisture is present. One-inch extruded polystyrene foam provides about R-5. Spray foam insulation, installed from a truck-mounted machine, is also a good choice for foundation walls, and it has the added benefit of creating an excellent air seal. If you decide to insulate the foundation walls of your crawl space, you should close off the foundation vents—at least during the winter—to avoid heat loss.

For more energy-saving tips, visit the NCC website at [www.savemobile.org](http://www.savemobile.org)

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The choice of wall vs. floor insulation in a crawl space will often be driven by practical considerations such as the type of foundation (avoid trying to attach insulation to stone walls), the presence of ground water (don't insulate the foundation wall if water drains through it), and the presence of heating and cooling ducts (insulate the foundation wall, not the floor, so the ducts remain within the heated and cooled boundary of the home).

In either case, take steps to control moisture in the crawl space by installing a ground moisture barrier such as polyethylene sheeting over the bare soil, and by sealing the edges and seams with urethane sealant. If moisture is allowed to accumulate in the crawl space or elsewhere in the home, it will encourage the growth of mold, mildew, or rot.

### FOUNDATION INSULATION

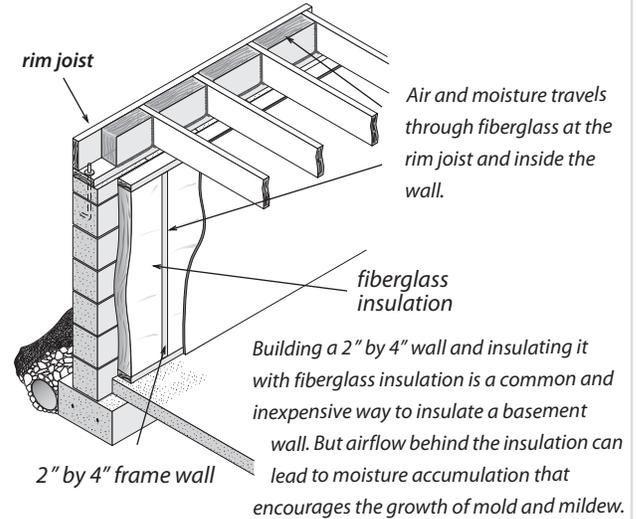
When a house has a heated basement, the basement walls are usually insulated and the floor above the basement isn't insulated. The most common way to insulate basement walls is to build a framed wall against the foundation and fill it with fiberglass batts. The frame is then covered with drywall. This installation creates a moisture trap, however, as moisture can usually find some path into the wall where it can condense into liquid water. This can encourage the growth of mold and mildew.

A better choice for basement wall insulation is polystyrene foam, installed in sheets that are either 1 or 2 inches thick. If installed at the exterior, as during new construction, use durable water-resistant insulation, such as blue or pink extruded polystyrene. You'll also need to provide protection from damage for portions that are exposed above ground level. Sheet metal, fiberglass panels, or troweled-on stucco are usually used to protect this type of installation. If foam board is installed at the interior, as is typical for retrofit applications, the foam is often covered with drywall to provide a finished surface and a fire barrier.

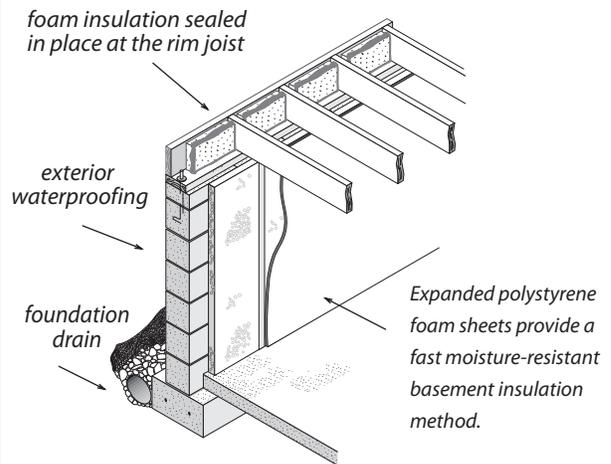
Whether you insulate the floor or foundation wall, you should insulate the rim joist at the same time. Although fiberglass is most commonly used, foam insulation, or a combination of foam insulation and fiberglass, is better because moisture sometimes migrates behind the fiberglass and condenses on the cold rim joist, causing damage from mold or rot. Spraying polyurethane foam in the rim-joist area is now a common practice.

## Crawl Space and Basement Insulation

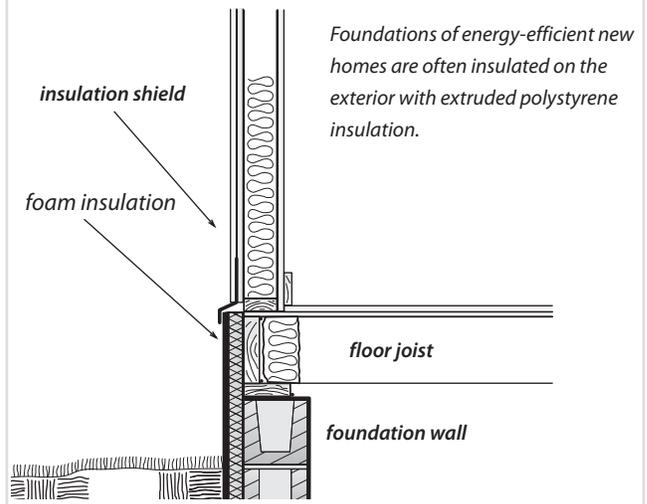
### Standard Basement Insulation



### Improved Interior Insulation



### Exterior Basement Insulation



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## Insulating Values of Construction Materials

Material	Average R-Value
Concrete	0.1 or less
Wood	1.0 to 1.5
Fiberglass batts, standard	3.0
Fiberglass batts, high density	4.0
Fiberglass insulation, blown into open cavity such as an attic	2.3
Fiberglass insulation, blown into closed cavity such as a wall	4.0
Cellulose insulation	3.4
Expanded polystyrene foamboard (white, known as beadboard)	4.1
Extruded polystyrene foamboard (usually blue, yellow, or pink)	5.0
Polyurethane or polyisocyanurate foam (spray application)	4.0 to 7.0

1. Varies according to density.  
 2. Varies according to density and quality.  
 3. Varies according to age and formulation.

### SEALING YOUR HOME'S AIR LEAKS

Air leaks in the ceilings, walls, and floors of your home can waste up to 30 percent of the energy consumed by your heating and cooling equipment. Holes and gaps in your home's shell also allow moisture, insects, dust, and pollutants to enter your home. Sealing air leaks reduces this energy loss and also keeps airborne moisture from entering building cavities, where it could encourage the growth of mold and mildew.

The air leakage sites that result in the greatest energy loss often include these locations.

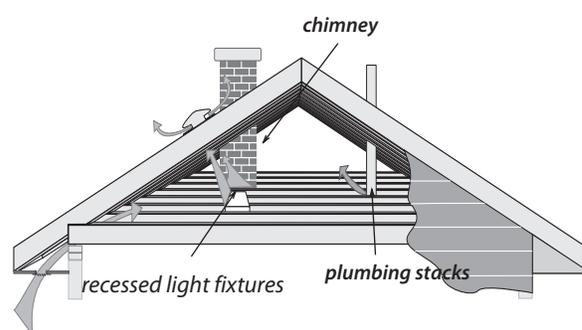
- Recessed light fixtures.
- Penetrations from chimneys, pipes, wires, and electrical boxes through floors and ceilings.
- The perimeter of the floor framing -- rim joist.
- Junctions of exterior walls and floors.

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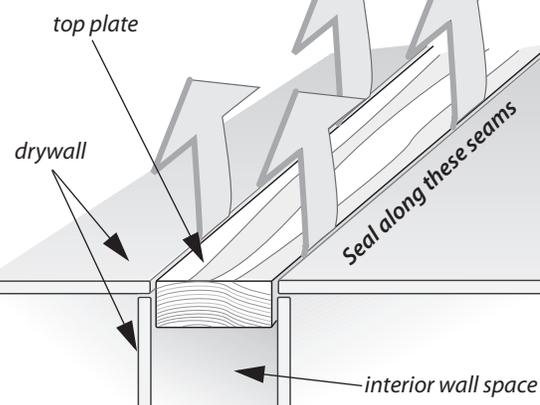
- Gaps between structural framing and door or window frames.
- Leaks into attic through top plates of interior walls.
- Outlets and switches in exterior walls.

You can seal the smallest air leaks with caulking. Moderate size openings are best sealed with one-part canned foam sealants that expand in place. Two-part foams, that are packed in a pair of canisters and furnished with an applicator nozzle, can fill larger gaps. Seal the largest openings, as around plumbing chases in the attic or crawl space, with plywood or rigid-foam insulation.

### Sealing Air Leaks in the Attic



### Tops of interior walls



Attics harbor a variety of air leaks that draw conditioned air out of your home. The air then passes easily through the fibrous attic insulation. These should be sealed before installing attic insulation to slow heat loss and prevent moisture damage.