UMC
*Science and Technology*
GUIDE
*Published by the University of Missouri - Columbia Extension Division*





# Adding Insulation to Your Home

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Additional insulation will reduce energy consumption in your home. Actual dollar savings will depend on present insulation levels and how much you add to them. This guide discusses alternatives and provides a method for calculating potential savings.

## Consider Ceilings First

Overhead areas are easily accessible in most homes. This means labor costs for installing added insulation will be at a minimum. You may even be able to do it yourself. The ceiling is the biggest source of heat loss in most homes—not because of its location, but because it represents the largest area exposed to outside temperatures.

If your ceiling already has 6 inches or more of insulation (R value = 24 or higher), you should look elsewhere to reduce energy costs. Ceilings with 4 inches (R = 14-16) or less are prime candidates for added insulation. Use the cost analysis technique in this guide to find out how much you can afford to add and what the pay back will be.

You will have two choices of insulation type for your ceiling—batt or fill. Batt types are usually made of either rock wool or fiberglass materials and are available in 15 and 23 inch widths and various thicknesses. Use only uncovered batts (batts without a vapor barrier covering) when adding this type insulation to an existing home.

Fill type insulation is available in a number of different materials, including rock wool, fiberglass, cellulose and vermiculite. It is a loose type of insulation that can either be poured or professionally blown in on top of existing insulation.

## When You Buy

Select insulation based on its cost per square foot for a given "R" value. "R" stands for resistance and is a measure of a given material's ability to resist the flow of heat. "R" value is an additive property—two inches will have twice the resistance of one inch, and total "R" will be the sum of existing insulation "R" and the added material's "R" value.

Different insulation materials have different "R" values. In most cases, "R" value will be printed on the package. Examples of "R" values for different types of insulation materials can be found in Table 1.

TABLE 1. "R" value per inch of thickness for commonly used insulation and building materials.

| Material | "R" Value 1" Thickness |
|---|---|
| Fiberglass or Mineral Wool Batts | 3.70 |
| Wood Fiber | 4.00 |
| Fiberglass or Mineral Wool Fill | 4.00 |
| Vermiculite | 2.27 |
| Shredded Pulp or Paper Products | 4.16 |
| Expanded Polystyrene | 4.00 |
| Expanded Polyurethane Foam | 6.25 |
| Urea-Formaldehyde Foam | 5.00 |
| Insulating Sheathing Board | 2.63 |
| Poured Concrete | .08 |
| Fir or Pine Boards | 1.30 |
| Plywood | 1.26 |
| Concrete Block | .24 |
| Light Weight Concrete Block | .36 |

## Look at Floors Next

If you do not use the basement regularly, why waste energy heating it? Uninsulated floors over unheated basements or crawl spaces lose about half as much heat as is lost through the ceiling area of the house.

Batt type insulation is recommended for floors. Use batts which have an R value of 11-13 and which are covered with a paper or foil vapor barrier. Batts can be stapled in place between the floor joists.

Pay attention to water supply lines and other plumbing when installing floor insulation. Below-ground basements rarely freeze; however, crawl spaces and walk-out basements may be subjected occasionally to freezing temperatures if the floors above are insulated. You can prevent this by insulating pipes or by providing a minimum amount of heat to keep the area above freezing. In either case, the fact that your floor is insulated will result in a net savings in your energy bill. And your floors will be more comfortable.

## Figure Walls Last

Unless you are planning to do extensive remodeling, you will find walls difficult to add insulation to. In fact, if you have any wall insulation at all, it's practically impossible to add to it without removing either the inside or outside wall covering material.

Walls which have no insulation at all can have fill type insulating materials added to the spaces between the studs. This will have to be done professionally. It involves drilling holes in exterior walls between each stud and then blowing the entire space full of insulating material. The fill holes are then capped or plugged.

In some cases it is possible to remove one or more strips of exterior siding before drilling holes. The siding can then be replaced, covering the holes.

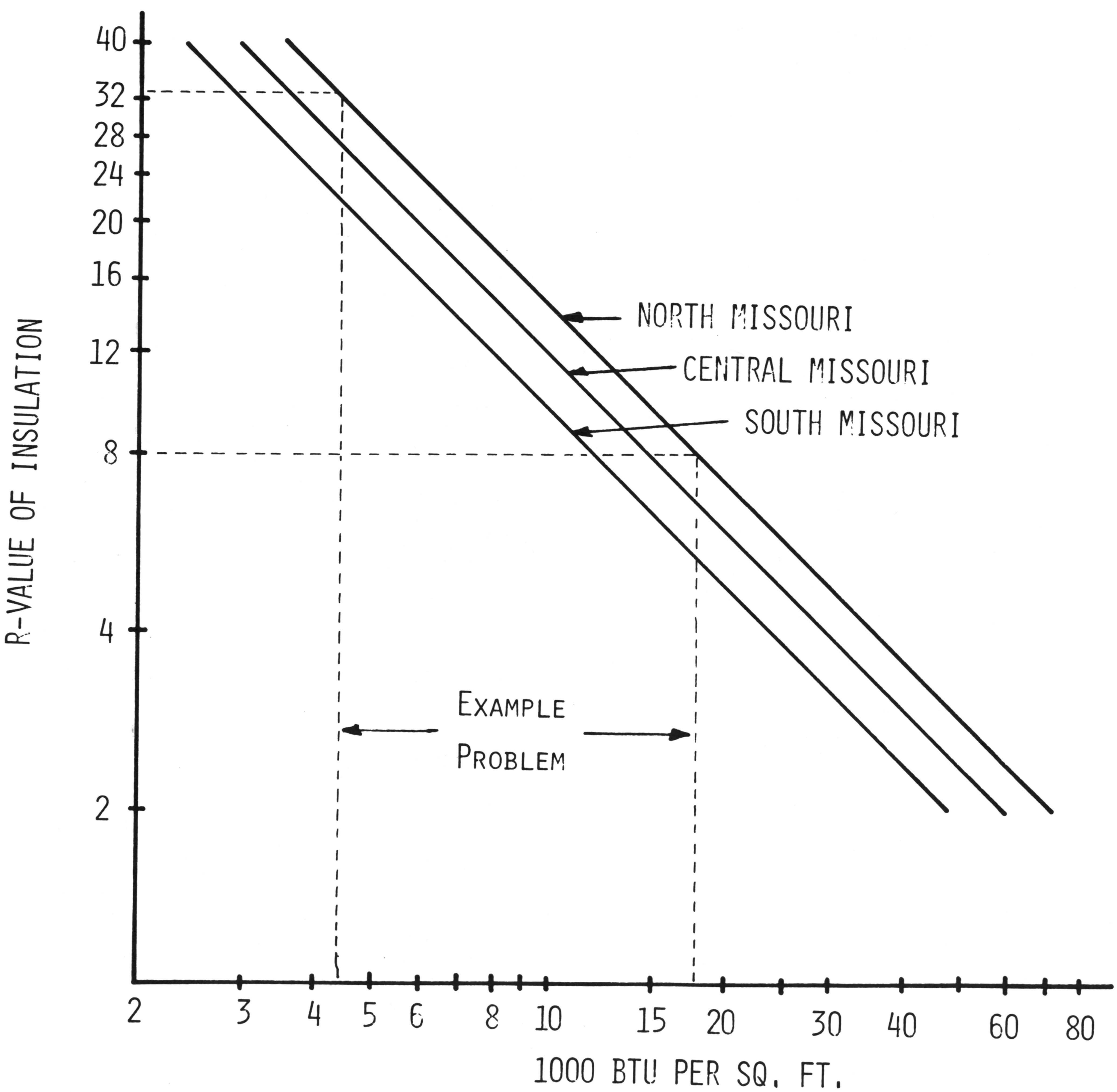
## Walls Need Vapor Barriers

A major problem with blowing insulation into walls of existing homes is moisture. Water vapor existing inside the home moves into the walls and condenses, just like it does on the outside of a glass of ice water.

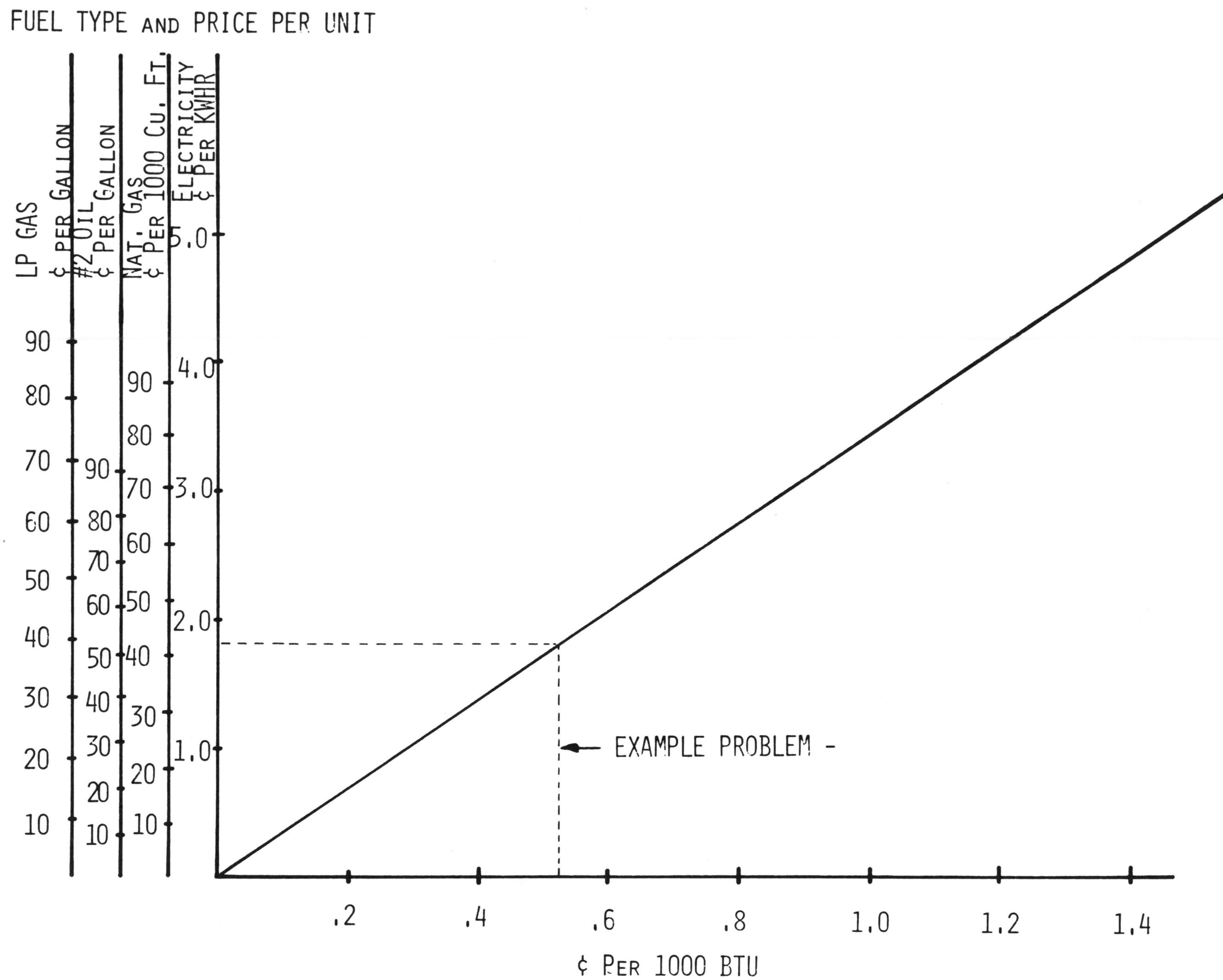
In new homes, this is prevented by installing a vapor barrier immediately under the interior surface covering of all outside walls. Most commonly used are aluminum foil and polyethylene plastic. Neither of these materials can be easily applied to an existing completed wall.

One way to achieve vapor protection is to apply two coats of aluminum paint to the interior surface of all outside walls. The aluminum paint can be covered with regular interior paint or other finish after it has dried.

*Never install wall insulation without making provision for vapor protection.*




GRAPH 1. Annual heat loss per square foot vs. level of insulation.




**GRAPH 2. Fuel cost per 1000 BTU delivered to the house; includes allowances for average heating system efficiencies.**

## Calculate Potential Savings

Whether or not you should consider adding insulation to your home is an economic decision—will the dollars invested pay off over a reasonable period of time? You can determine the potential payoff for your home by collecting some basic information and then using the following procedure.

Before you start, find out how much you are paying for energy, the size of the area being considered for additional insulation, and the present insulation level.

**Step 1.** Use Graph 1 to determine annual heat loss with present insulation. Use R = 2 if your wall or ceiling has no insulation. Enter value below.

**Step 2.** Use Graph 1 to determine annual heat loss with proposed added insulation. Table 1 can be used to find R values for different types of insulation. Enter value below.

Annual Heat Loss Before (1000 BTU) ____________

Annual Heat Loss After (1000 BTU) ____________

Savings ____________

**Step 3.** Determine potential savings by subtracting. If you are figuring for underfloor insulation over a basement or crawl space, divide the above figure by 2.

**Step 4.** Use Graph 2 to determine your energy cost per 1000 BTU.

**Step 5.** Multiply the value in step 3 by the energy cost to determine potential annual savings per square foot from added insulation.

| ____________ x | ____________ = | ____________ |
|---|---|---|
| Heat saved per square foot (1000 BTU) | Fuel cost per 1000 BTU | Annual savings per square foot |

**Step 6.** Other calculations you may want to make include the following:

- Total annual savings = annual savings per square foot x area to receive added insulation (sq. ft.)
- Years to pay for added insulation = cost of added insulation (per sq. ft.) ÷ annual savings per sq. ft.

**Sample Problem:** You live in a 1400 square foot ranch home in northeast Missouri heated with LP gas which costs 38¢ per gallon. You presently have 2 inches of fiberglass insulation in the ceiling. A contractor has offered to place an additional 6 inches of cellulose fill insulation over the fiberglass for 18¢ per square foot. Will it pay off?

### Solution:

**Step 1.** From Table 1, we find that fiberglass fill has an R value of 4.0 per inch. This means the present insulation has a total R = 8. From Graph 1, we find an annual heat loss of 18 thousand BTU per square foot.

**Step 2.** Cellulose fiber has an R value of 4.16 per inch or a total of about R = 25 for the 6-inch layer. Adding this to the present insulation gives a total R = 33. Graph 1 indicates annual heat loss of about 4.5 thousand BTU per square foot at R = 33.

**Step 3.**

| | |
|---|---|
| Before | 18 |
| After | - 4.5 |
| Potential Savings | 13.5 thousand BTU/sq. ft. |

**Step 4.** 38¢ per gallon LP gas has a cost per thousand BTU of about .5¼¢ or $.00525.

**Step 5.** Annual savings per square foot—13.5 x .00525 = $.07 per square foot

**Step 6.** Total annual fuel cost savings—$.07 x 1400 sq. ft. = $98.00
Years to Pay for added insulation—

$$\frac{\$.18}{\$.07} = 2.6 \text{ years.}$$

## What If It Doesn't Pay?

Many Missouri homes will not benefit greatly from added insulation. However, there are ways which energy consumption can be reduced even in these homes. One method is through improving weather stripping to cut air leakage into the home.

In a well insulated home, nearly half the annual fuel bill goes to heat cold air that leaks into the home. Air leakage can be reduced greatly with good weather stripping.

■ Issued in furtherance of Cooperative Extension Work Acts of May 8 and June 30, 1914 in cooperation with the United States Department of Agriculture. Carl N. Scheneman, Vice President for Extension, Cooperative Extension Service, University of Missouri and Lincoln University, Columbia, Missouri 65211. ■ An equal opportunity institution.



6/78/10M