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Determining Insulation Needs

The cost for heating and cooling an average home for a year climbed drastically from $600 in 1974 to $1,090 in 1977. You can help control those costs in existing or new homes by adding insulation. The cost of adding insulation ranges from $300 to $1,500, depending on the size and needs of the house. However, you should be able to recover your insulation costs through fuel savings in a few years.

Several programs are available through your local power or gas distributor or the Farmers Home Administration to assist you in financing your insulation costs at comparatively low interest rates.

How Much Insulation?

Insulation needs are usually measured in inches of thickness. R value, however, is a better indicator of effectiveness. R stands for Resistance and indicates the capacity of insulation to resist heat flow.

The higher the R value, the better the insulation.

You can find which insulation is the best buy by comparing dollar costs per R value, just as you might compare dollars per ounce of food at the grocery market.

The amount of insulation to use depends on climatic conditions that relate to elevation, proximity to mountains, bodies of water and other local factors. Local costs for insulation and local utility costs will also enter into the decision.

Idaho's varying climatic conditions and elevations cause a great variation in desired R values, even between locations relatively close together. For this reason the Idaho Office of Energy suggests the following values for the entire state:

Ceilings	R-38
Floors	R-19
Walls	R-19

It normally is not cost effective to go above R-12 in existing walls due to the size limitations of the standard 4-inch wall cavity. New homes should be constructed with 6-inch wall cavities to allow R-19 insulating values.

Do not put R-19 insulating batts into a 4-inch wall cavity. Compressing the thick batt into the narrower opening compresses the insulation so that air voids are closed, and much of the insulating value is lost.

In determining how much insulation you should add, remember that the cost effectiveness of more insulation decreases as more is added. Starting with an uninsulated attic for example, the first layer of insulation batts could pay for itself within 2 to 4 years. A second layer of similar batts might take 6 to 8 years to pay for itself, and a third layer could take 10 years or more.

Example: Let's say that your home was constructed several years ago and you want to upgrade the insulation in your ceiling to meet recommended state standards. This means you will need to add enough additional insulation to achieve a value of R-38. Do the following:

Step 1. Measure the thickness and note the type of insulation already in the home. Use a ruler or yardstick. To determine the type of insulation, compare it with the description given in Table 1. If you are still not sure, ask a local building supplier to identify a sample. Let's say you find that between 3½ to 4 inches of fiberglass batt is already used for insulation.

Step 2. Determine the R value of existing insulation. From Table 2, which compares total insulation thickness, types and R values, you can see that 3½ to 4 inches of fiberglass batt has an R value of R-11.

Step 3. Now determine how much more insulation is needed by subtracting what is already there (R-11) from the recommended amount (R-38 for the ceiling).

Step 4. Finally, determine from Table 3 the amount of insulation you must add for an additional R-27 (R-38 minus R-11). Several of the choices that you have are:

- 7½ to 8 inches of loose fill mineral wool or cellulose.
- 10½ to 11 inches of expanded vermiculite or perlite.

Any one of these choices or of one of the others in appropriate thickness would provide the total recommended insulation that needs to be added to the existing insulation. Your final decision may be based on which material is most economical, most readily available or other individual requirements.

Fix Loss Leaders First

In the winter, about 24 percent of the heat loss in a home occurs through or around the doors and windows. Another 33 percent goes through the ceiling. The remaining 13 percent goes through the floor if there is a vented crawlspace or no basement.

In the summer, 60 percent of heat enters through the ceiling and 40 percent through the side walls and the windows. Therefore, for maximum year-round comfort, the side walls, floors and ceiling need to be insulated. Remember, windows and doors should be insulated in the form of weather stripping, double glazing or storm windows and doors. In northern

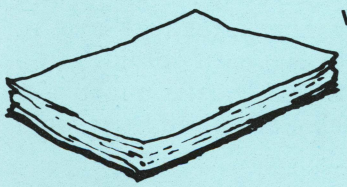
Table 2. Insulating R value equivalents.

	Batts or blankets		Loose fill**		
	glass fiber	rock wool	glass fiber	rock wool	cellulosic fiber
	(in inches)				
R-11	3½-4	3	5	4	3
R-19	6-6½	5¼	8-9	6-7	5
R-22	6½	6	10	7-8	6
R-30	9½-10½*	9*	13-14	10-11	8
R-38	12-13*	10½*	17-18	13-14	10-11

*Two batts or blankets required.
**Must be poured or blown to manufacturer's specification for correct density.

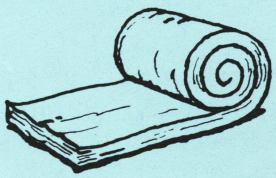
Table 1. Major types of insulation.

BATTS — glass fiber, rock wool



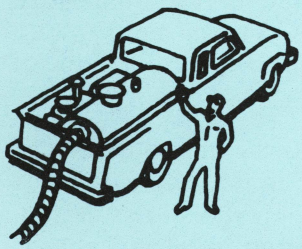
Where they're used to insulate:
unfinished attic floor
unfinished attic rafters
underside of floors
open sidewalls

BLANKETS — glass fiber, rock wool



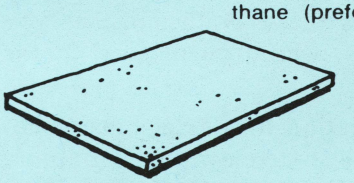
Where they're used to insulate:
unfinished attic floor
unfinished attic rafters
underside of floors
open sidewalls

FOAMED-IN-PLACE — EXPANDED URETHANE



Where it's used to insulate:
finished frame walls

RIGID BOARD — polystyrene (extruded), expanded urethane (preformed), glass fiber, polystyrene (molded beads)



Where it's used to insulate:
exterior wall sheathing
floor slab perimeter

NOTE: Care should be taken with these products to assure fire safety.

LOOSE FILL (blown-in) — glass fiber, rock wool, cellulose

Where it's used to insulate:
unfinished attic floor
finished attic floor
finished frame walls
underside of floors

LOOSE FILL (poured-in) - glass fiber, rock wool cellulose, vermiculite, perlite

Where it's used to insulate:
unfinished attic floor

Table 3. Insulating values of several insulating and building materials.

Material	Insulation value	
	"R" per inch thickness	"R" for thickness indicated
Batt or blanket insulation		
Wood or cellulose fiber with vapor barrier and paper facing	3.20-4.00	
Glass wool or mineral wool	3.00-3.80	
Loose fill insulation		
Mineral wool (rock, glass or slag)	2.80-3.70	
Vermiculite (expanded) Perlite (expanded)	2.13-2.70	
Cellulose	3.50-3.70	
Rigid insulation		
Polystyrene foam, extruded or expanded	4.00-5.40	
Polystyrene, molded beads	3.57	
Expanded urethane, sprayed or preformed	5.80-8.00	
Polyurethane, expanded	6.25-8.00+	
Glass fiber	4.00	
Insulating sheeting board (½-inch reg. density)	1.32	
(25/32-inch reg. density)	2.06	
Construction materials		
Concrete, sand and stone aggregate	0.08	
Concrete block, three hole, 8-inch		0.95-1.11
Concrete block, lightweight aggregate, 8-inch		1.72-2.18
Concrete block, lightweight aggregate, 8-inch (cores filled with vermiculite)		4.00-5.03
Face brick, 4-inch		.44
Hardwoods, maple, oak, etc.	0.91	
Softwoods, fir, pine	1.25	
⅜-inch plywood		0.47
½-inch plywood		0.62
Hardboard, ¼-inch tempered		0.25
Wood siding, ½-inch thick clapboard		0.81
Asphalt shingles		.44
Aluminum or steel over flat sheathing		0.5-0.65
Gypsum or plaster board, ⅜-inch		0.32
Gypsum or plaster board, ½-inch		0.45
Plaster, brick or stucco	0.11-0.20	
Steel or aluminum	0.0007	
Glass	0.003	
Doors		
Solid wood, 1 inch	1.25	
Solid wood, 2 inch		2.50
Solid wood, 2 inch plus metal and glass storm door		3.45
Windows (glass only)		
Single glazing		0.88
Double glazing (¼ to ½-inch air space)		1.60-1.75
Single glazing with storm windows		1.75-1.89
Air space		
Bounded by ordinary materials (vertical space)	¾-inch or more	.97
Horizontal-heat flow down	¾-inch or more	1.25
Horizontal-heat flow up	¾-inch or more	.85

climates, storm windows over existing double glazing may pay off in fuel saved.

In existing homes, first caulk and weather strip around windows and doors to eliminate air leaks. Next, insulate in the attic. Then insulate doors and windows by adding storm sashes of glass or plastic. Finally, if your home has a crawlspace, add underfloor insulation, or insulate the walls of the crawlspace or basement.

Adding insulation to existing exterior walls usually costs too much for the insulation to pay for itself within a reasonable length of time. It can, however, increase the comfort level.

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*Adapted from U.S.D.A. Fact Sheet 2-3-8. Recommended to Idaho residents by Shirley Nilsson, Extension housing and equipment specialist, and Roy Taylor, Extension agricultural engineer, both at the University of Idaho, Moscow.

Titles in the Current Information Series dealing with energy conservation for the home are:

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