



# Energy Facts

## Home Insulation

Lower your energy costs and  
provide creature comfort

E-2809

Heating and cooling your American home accounts for 50 – 70% of your home energy use. Unless your home was constructed with special attention to energy efficiency, adding insulation will probably reduce your utility bills. Much of the existing housing stock in the U.S. is not insulated to the optimal level. Older homes are likely to use more energy than newer homes, usually due to inadequate insulation and air leakage. Insulation saves money. It also makes your home more comfortable by helping to maintain a uniform temperature through the house.

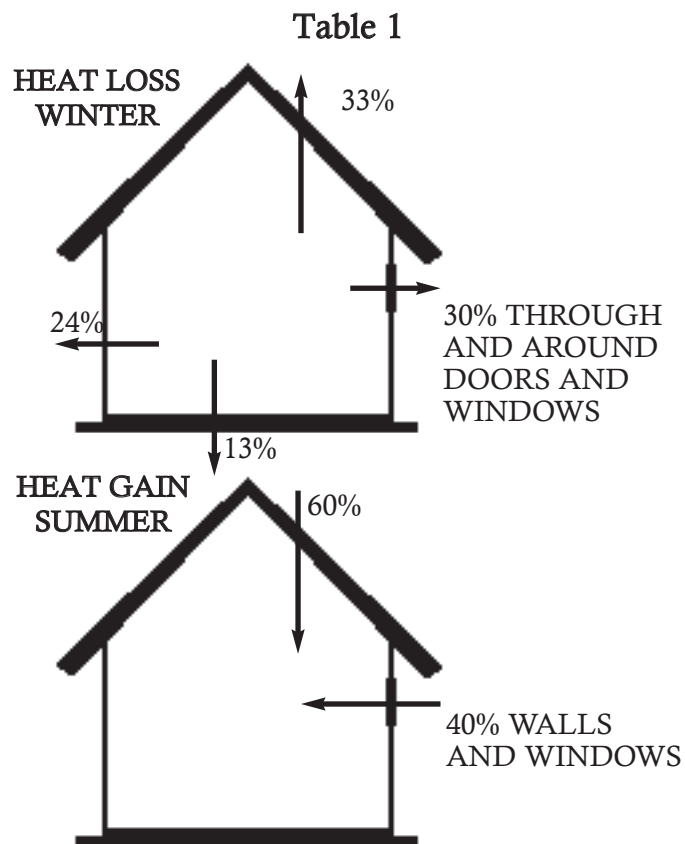
### Insulation Priorities

It is important to:

- Insulate your attic to recommended levels, including the attic door or hatch cover
- Provide the recommended level of insulation under the floor, above unheated spaces, around walls in a heated basement or unventilated crawl space, and on the edges of slabs-on-grade.
- Use the recommended levels of insulation for exterior walls for new home construction. When remodeling or residing your house, consider using the levels recommended for new construction in your existing walls.

### How Insulation Works

Heat flows naturally from a warmer to a cooler space. In the winter, this heat flow moves directly from all heated living spaces to adjacent unheated attics, garages, and basements, or to the outdoors through ceilings, walls, and floors – wherever there is a difference in temperature. During the cooling season, heat flows from outdoors into the house. See Table 1.



Insulation decreases this heat flow by providing effective resistance to the flow of heat. Insulation is rated in terms of thermal resistance called R-values that indicate the resistance to heat flow. The higher the R-value, the greater the degree of insulating effectiveness. The R-value of thermal insulation depends on the type of material, its thickness, and its density. In calculating the R-value of a multi-layered installation, the R-values of the individual layers are added. Installing more insulation in your home increases R-value and the resistance to heat flow.

The effectiveness of an insulated wall or ceiling also depends on how and where the insulation is installed. For example, insulation that is compressed will not give its fullest rated R-value. Also, the overall R-value of a wall or ceiling will be somewhat different from the R-value of the insulation itself because some heat flows around the insulation through the studs and joints. Therefore, the overall R-value of a wall with insulation between wood studs is less than the R-value of the insulation itself because the wood provides thermal short-circuits around the insulation. The short-circuiting through metal framing is much greater than through wood framed walls.

## Does Your Home Need More Insulation?

To begin you must answer this question: find out how much insulation you already have and then determine how much more would be cost effective. 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.

If you don't have someone else to inspect your home, you'll need to look for insulation in the attic, then check walls and floor adjacent to an unheated space like garage or basement. In those places, the structural frame elements (the ceiling joists or wall framing boards) are often exposed, making it easier to examine the insulation and to measure depth and thickness of insulation.

It is more difficult to inspect your exterior walls. One method is to examine an electrical outlet on an exterior wall, but first 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. In older homes, you may want to check more than one outlet because wall insulation on one wall doesn't necessarily mean that it is everywhere in the house.

Next, inspect and measure the thickness of any insulation in unfinished basement ceilings and walls or above crawl spaces.

## Types of Insulation

Although insulation can be made from a variety of materials, it usually comes in four types: batts, rolls, loose-fill, and rigid foam boards. Each type is made to fit in a different part of your house. Batts are made to fit between the studs in your walls or between the joists of your ceilings or floors. Batts are usually made of fiberglass or rock wool. Also, rolls or blankets are usually made of fiberglass and can be placed over the floor in the attic.

Loose-fill insulation (made of fiberglass, rock wool, or cellulose) is blown into the attic or walls. Cellulose is usually made from recycled newsprint treated with fire-retardant chemicals.

Rigid foam boards are made of polyisocyanurate extruded polystyrene (XPS or blueboard) expanded polystyrene (EPS or bead board) or other materials. These boards are lightweight, provide structural support, and generally have an R-value of 4 to 7 per inch. Rigid board insulation is made for use in confined spaces such as exterior walls, concrete slabs, and cathedral ceilings. See Table 2.

## Attics and Crawl Spaces

The easiest and most cost-effective way to insulate your home is to add insulation to the attic. To find out if you have enough attic insulation, measure the thickness of insulation. If there is less than R-value 22 (7 inches of cellulose) you could probably benefit by adding more. Michigan Energy Code for new homes requires R-30 for attics/ceilings and R-13 for walls.

If your attic has ample insulation and your home still feels drafty and cold in the winter or too warm in the summer, chances are you need to add insulation to the exterior walls as well. This is a more expensive measure that usually requires a contractor, but it may be worth the cost if you live in a very hot or cold climate and it will increase the comfort level.

You may also need to add insulation to your crawl space. Either the walls or the floor above the crawl space should be insulated.

## Insulation Tips

Consider factors such as climate, building design, and budget when selecting insulation R-values for your home.

Recessed light fixtures can be a major source of heat loss, but you need to be careful how close you place insulation next to a fixture unless it is marked "I.C." and is designed for direct insulation contact. Check your local building codes for recommendations.

As specified on the product packaging, follow the product instructions and wear the proper protective gear when installing insulation.

## Sources of information:

Agriculture Fact Sheet 2-3-8, USDA Office of Governmental Affairs, D.C. 20250

Energy Savers, U.S. Department of Energy

Insulation Fact Sheets, U.S. Department of Energy  
Web Site HYPERLINK "<http://www.ornl.gov/>"  
[www.ornl.gov/](http://www.ornl.gov/)

Building Codes Department, Eaton County MI

### Commonly Used Insulations Table 2

| Insulation Type                          | R-value per inch | Made From               | Comments  |
|--|------------------|-------------------------|---|
| Cellulose                                | 3.5-3.7          | Ground wood or paper    | <ul style="list-style-type: none"> <li>• Often blown in attics and walls</li> <li>• Additives provide resistance to fire and mold/fungus growth</li> </ul>  |
| Fiberglass batt                          | 3.0-3.8          | Strands of molten glass | <ul style="list-style-type: none"> <li>• Fits best in standard joist widths</li> <li>• Fire and mold resistant</li> </ul>   |
| Fiberglass loose-fit                     | 2.2-3.0          | Strands of molten glass | <ul style="list-style-type: none"> <li>• Eye, sun, and throat irritant at time of installation</li> <li>• Lightest loosefill insulation</li> </ul>  |
| Rockwool or mineral wool                 | 2.7-3.0          | Molten rock or slag     | <ul style="list-style-type: none"> <li>• Fire and mold resistant</li> <li>• Can irritate sun, eyes, and throat-high fire resistance</li> <li>• Available in blankets or batts</li> </ul>  |
| Rigid Board expanded polystyrene         | 4.0              | Petrochemical           | <ul style="list-style-type: none"> <li>• Can irritate skin, eyes, and throat</li> <li>• Often white "beadboard" material</li> <li>• Can absorb water, best used inside</li> <li>• Burns with toxic smoke</li> <li>• Needs fire barrier if used inside the home</li> </ul> |
| Rigid Board extruded polystyrene         | 4.0-5.0          | Petrochemical           | <ul style="list-style-type: none"> <li>• Water resistant Good for exterior use and below grade</li> <li>• Needs fire barrier if used inside</li> <li>• Serves as a vapor barrier</li> </ul>   |
| Rigid Board polyurethane or isocyanurate | 6.0-8.7          | Petrochemical           | <ul style="list-style-type: none"> <li>• Often used as exterior sheathing, but not below grade</li> <li>• Absorbs water</li> <li>• Generally foil faced on both sides</li> </ul>  |

#### Energy Team Acknowledgments

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