U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Guide to Home Insulation

Insulation material, when properly used, can make your home more comfortable and energy-efficient, and can significantly reduce heating and cooling bills throughout the year.

Benefits of Insulation

On average, you can save up to 20% on your home's heating and cooling costs or up to 10% on its total energy costs by adding insulation to attics, floors, crawl spaces, and accessible basement rim joists, and by reducing unwanted air leaks all around your house.

Types of Insulation

Insulation comes in many different forms, some of which are listed below:

- **Blankets, including batts and rolls:** Whether as continuous rolls or pre-cut panels called batts, blanket insulation is perhaps the most common type used in homes in the United States.
- **Loose fill:** This adaptable type of insulation can conform to any space without disturbing any structures or finishes.
- **Sprayed or foamed-in-place:** This type allows you to fill even the smallest cavities.
- **Rigid insulation:** This insulates your home from the roof to the foundation, reducing energy losses through the house frame.
- **Reflective insulation:** This type of insulation is most effective in reducing downward heat flow.
- **Radiant barrier:** Especially useful in hot, sunny climates, this type helps keep homes cooler.

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R-Value

Insulation is important because of its ability to reduce the amount of heat that flows between the inside and outside of your home. The ability of insulation material to reduce heat flow is called its R-value. The greater the R-value, the more this heat flow is reduced.

Cost of Insulation

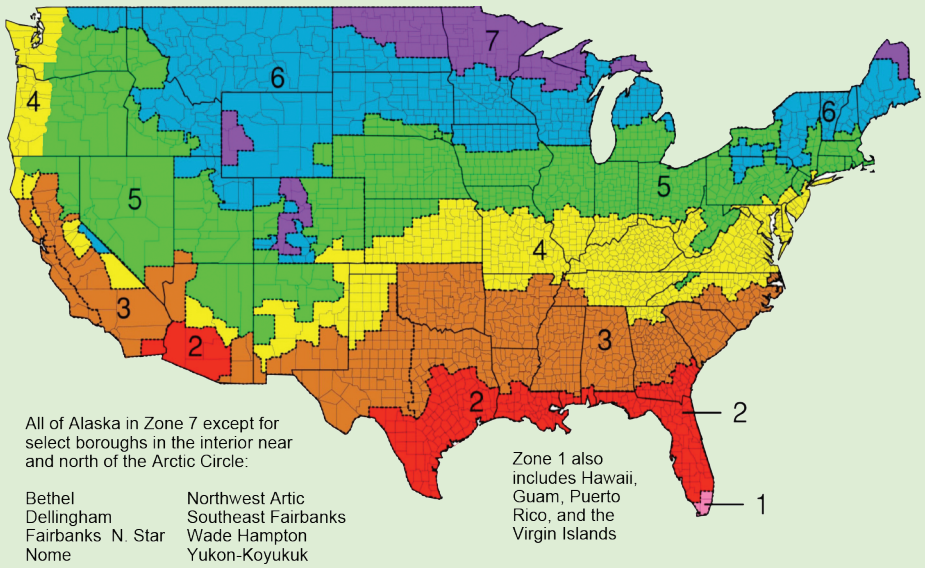
Insulation costs depend on R-value and type of material, and costs vary greatly at the retail level. The table below contains very general averages. Prices for loose-fill and spray foam are based on professional installation and reflect both material and labor costs. Check with a local supplier and/or contractor for actual costs.

Material type	R-value	Cost per square foot	Cost per square foot per R-value
Fiberglass batt (3.5 - 12 inches thick)	13	$0.20 to $0.40	$0.02
	30	$0.60 to $1.00	$0.03
Loose fill such as fiberglass, cellulose, and mineral wool (8 - 23 inches thick)	30	$0.45 to $1.35	$0.03
	50	$0.75 to $2.25	
Open cell polyurethane spray foam (3.5 inches thick)	12.6	$1.70 to $2.50	$0.17
Closed cell polyurethane spray foam (1 inch thick)	6.5	$1.30 to $2.00	$0.25
Expanded polystyrene foam board (1 inch thick)	3.8 – 4.4	$0.20 to $0.35	$0.07
Extruded polystyrene foam board (1 inch thick)	5	$0.40 to $0.55	$0.10
Polyisocyanurate foam board (1 inch thick)	6.5	$0.60 to $0.70	$0.10

continued >

R-Values by Zone

This map illustrates eight U.S. zones that determine how much insulation homes need.



Zone	Attic		Floor	Wall	
	Uninsulated Attic	Existing 3-4 Inches of Insulation	Uninsulated Floor	Uninsulated Wood-Frame Wall	Insulated Wood-Frame Wall
1	R30 to R49	R25 to R30	R13	*	N/A
2	R30 to R60	R25 to R38	R13 to R19		
3	R30 to R60	R25 to R38	R19 to R25	* and add R5 insulative wall sheathing beneath the new siding	
4	R38 to R60	R38	R25 to R30		Add R5 insulated sheathing before installing the new siding
5	R49 to R60	R38 to R49	R25 to R30	* and add R5 to R6 insulative wall sheathing beneath the new siding	
6					
7					
8					

* Whenever exterior siding is removed from an uninsulated wood-frame wall, drill holes in the sheathing and blow insulation into the empty wall cavity before installing the new siding.

Determining R-Value

New Homes

Building a new home offers more opportunities for properly installing insulation. Doing so requires you to know the places that need insulation and their recommended R-values. The R-values are based on both a region's climate and the type of heating and cooling system installed.

Oak Ridge National Laboratory offers a ZIP-Code Insulation Program, listed under *Further Reading*, to help determine your R-value and cost estimates. This program allows you to decide the types and forms of insulation that will work best for you.

Existing Homes

If your home already has insulation installed, a certified contractor can evaluate your house's current R-value and recommend whether additional R-value is needed and appropriate types of insulation.

The table opposite suggests R-values by zone as indicated in the map of the United States. It also suggests R-values when adding insulation to uninsulated or under-insulated attics, crawl spaces, and walls.

Further Reading

DOE Energy Savers: Insulation
www.energysavers.gov/insulation

Lawrence Berkeley National Laboratory Home Energy Saver Calculator
www.hes.lbl.gov/consumer

Oak Ridge National Laboratory R-Value Recommendations Calculator
www.ornl.gov/sci/roofs%2bwalls/insulation/ins_16.html

Oak Ridge National Laboratory ZIP-Code Insulation Program
www.ornl.gov/~roofs/Zip/ZipHome.html

Financial Incentives

Tax credits, incentives, and rebates may be available in your area. Please visit **www.energysavers.gov/taxcredits** for more information.

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