

# insulation

## Insulation Basics

Like clothing, insulation comes in all shapes and sizes, but each has an R-value, the measure of its resistance to heat flow. In general, lightweight, air-filled materials such as fiberglass insulation batts have high R-values per inch of thickness and are good insulators. Standard fiberglass is rated at about R-3.5 per inch. Heavy, dense materials such as brick (R-0.2) and gypsum plaster (R-0.2) have R-values so low it's difficult even to think of them as insulators. R-values are stamped on the insulation itself and displayed in all insulation advertising. It is the only reliable way to determine how effective the insulation will be, and the only way to compare one type with another.

## Comparing R-Values

Thicker is not necessarily better when it comes to insulation. That sometimes confusing subject becomes clear when you compare materials. For example, these three alternatives are rated at R-11 and offer the same thermal protection: 1½-inch-thick polyurethane board, 3½-inch-thick fiberglass batts, or 4 inches of loose-fill vermiculite. That means you can't pick one insulation over another based only on thickness. A full 5 inches of a traditional, poured-in insulation such as perlite rated at about R-13 would provide only about 60% of the thermal protection offered by an inch less (4 inches) of polyurethane board rated at about R-23. So in order to reach an insulation rating of R-11 in walls, R-19 in floors, and R-30 in ceilings, you would need different thicknesses of commonly used insulation materials.

Comparing R-values without splitting hairs should show which one of several alternatives will provide the most resistance to heat loss. But some insulation materials are better suited to certain kinds of installations. That means you must consider other insulation characteristics in addition to the R-value. (See "Choosing Insulation," p. 364.)

Also bear in mind the law of diminishing returns as it applies to insulation. This means that the first inch in an uninsulated wall offers the greatest benefit, while the second inch offers a bit less, and so on, even though the last inch costs as much as the first.

## Insulation Terms

- ◆ **Batt or blanket** insulation is usually made from fiberglass cut to fit into framing cavities. Batts are provided in sheets, while blankets come in rolls.
- ◆ **British thermal unit (Btu)** is a measurement of heat—one Btu is the heat required to raise the temperature of 1 pound of water 1 degree F.
- ◆ **Rigid board insulation** is manufactured in panels that make it easy to clad a large area. Different types provide a range of R-values, although rigid foam generally is highly rated. It also resists water and rot in locations near the ground.
- ◆ **R-value** is the standard measure of resistance to heat flow. Every type of insulation has an R-value per inch. The higher the value, the more resistance.
- ◆ **Thermal envelope** describes the sum total of a home's insulation systems: walls, ceilings, foundation, floors, windows, and doors.

## Thermal Envelope

