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Home insulation choices

Heating costs are high in poorly insulated homes because heat escapes easily in winter. Warm air produced by a heating system is naturally drawn to cold areas or surfaces. As a result, heat travels directly through walls, floors and the roof. This is called heat loss, and the furnace will work to compensate for heat loss, which costs you money. Insulation materials in walls, floors and the roof slow the flow of heat. Insulation keeps the heat in during the winter, and in the summer works to keep your house cooler by preventing cool air from escaping and hot air from entering.

Resistance is key

The capacity of an insulation material to reduce heat flow is measured in terms of resistance or R-value. The higher the R-value, the better the insulation properties of the material (per inch of material). In Missouri, an existing home's attic should be insulated to at least R-49, floors to R-19 and exterior walls to R-19. Achieving these R-values depends on the type and the thickness of insulation installed. For example, fiberglass batt insulation has an R-value of around 3.2, so one 3.5-inch batt will insulate a wall cavity to about R-11. The R-value of extruded polystyrene board insulation is R-5 per inch, so just 2 inches of that material have about the same insulation effectiveness as the fiberglass.

Insulation types

Different types of insulation have different uses. Select the right type of insulation for the job and install it according to manufacturer's instructions to ensure it is most effective.

Installing insulation is easiest when a house is under construction, but you can also add insulation to most existing houses. Insulation can be purchased in four basic forms:

- Batts, blankets or rolls
- Loose-fill
- Rigid-board
- Foamed-in-place

Batts, blankets or rolls

Insulation batts or blankets consist of fibers made from spun rock, slag or glass. Fiberglass, the most common insulation, is made from glass and has an R-value of 2.2 to 3.2 per inch. The R-value of an inch of rock or mineral wool made from rock or slag is 3.1. Batts are cut to specific lengths, while blankets come in long "cut-it-yourself" rolls. Both types are available in thicknesses ranging from 1 to 12 inches and wide enough to fit either a 16- or 24-inch cavity opening. Batts and blankets work well when the space to be insulated is an unfinished, framed-in area. Common applications include insulating unfinished walls, open attics, basements or crawl space ceilings.

You can buy batt and roll insulation with a built-in vapor barrier made of kraft paper or foil. You can also buy it unfaced, without a vapor barrier, and install a plastic barrier separately. A vapor barrier is necessary to prevent moisture absorption, which lessens the effectiveness of the insulation. Both fiberglass and mineral wool are nonflammable, but their vapor barriers aren't, so they must be covered



with a fireproof material such as a half-inch of drywall.

Finally, do not compress batt or blanket insulation into a tight space. The insulation relies on tiny air pockets to slow heat flow, and crushing these pockets decreases the insulation's effectiveness.

Loose-fill

This type of insulation comes in bags and can be made from cellulose (mulched newsprint or wood fibers), fiberglass and mineral wool. Its R-values range from a low of 2.2 per inch for fiberglass to 3.7 per inch for cellulose fiber. For maximum R-value effectiveness, install loose-fill insulation to the proper density. Cellulose, fiberglass and mineral wool loose-fill insulations are most commonly installed by a professional who blows it into finished walls or finished attic spaces. By applying special adhesives to loose-fill insulation, you can insulate unfinished wall cavities. The adhesives assure that the insulation will not settle in the wall cavity.

Rigid-board

The most common rigid-board insulations are made from a wide range of plastic materials, including expanded polystyrene (R-value of 4.0 to 4.5 per inch), extruded polystyrene (5.0 to 5.5 per inch), polyurethane (6 to 7.5 per inch), and polyisocyanurate (6 to 7.5 per inch). Because of their ability to resist moisture damage, polystyrene rigid-board insulations are commonly used in basement and crawl space walls and around slab foundations. However, only extruded polystyrene products are recommended for exterior below-ground installation. All rigid-board products can be used to insulate cathedral ceilings and insulation sheathing under exterior siding.

Plastic rigid-board insulations are flammable and must be covered with a fire-resistant material such as a half-inch of drywall.

Foamed-in-place

Some plastic insulation is also available in a foam form that can be sprayed by professionals into walls or roof cavities during construction. The most common are polyurethane and icynene, which when foamed in place have an R-value of 3.5 to 6 per inch. Foamed-in-place insulations have excellent air-sealing, vapor barrier control and have excellent insulation qualities.

General guidelines

Seal first, then insulate. Adding insulation to your home's attic, walls or floors will not be effective if heat can easily travel through cracks and holes between framing members and around windows and doors. Seal all major cracks and openings before insulating.

Install a vapor barrier between living spaces and insulation. Installing a vapor barrier is necessary to keep moisture out of your insulation and other building materials. The air in your house contains large quantities of moisture due to showers, cooking and washing clothes. This moisture can pass right through your walls, roof and floor. It condenses when it hits a cold surface, which causes blistering paint, wet insulation and possibly structural damage. For existing homes, vapor barrier paints can be used.

Ensure adequate ventilation. Adding insulation increases the need for ventilation in attics and crawl spaces. Pay close attention to ventilation requirements for these areas.

Additional information

See University of Missouri Extension publication GH4881, *Insulating and Weatherizing Your Home*, to learn more about how to make your home more energy-efficient.

Insulation type	R-value per inch
Fiberglass — loose-fill	2.2
Fiberglass — batts or rolls	3.2
Cellulose fiber	3.7
Mineral wool or fiber	3.1
Expanded polystyrene board	4.0 – 4.5
Extruded polystyrene	5.0 – 5.5
Polyurethane board or spray	6.0 – 7.5
Icynene spray foam	3.7

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