



# Home Insulation

Insulating ceilings, walls, and floors adds resistance to the flow of heat and decreases the heating or cooling needed to keep your home at a comfortable temperature.



## WHY INSULATE YOUR HOME?

Insulating your home is an investment which keeps paying dividends long after installation. The California Energy Commission's Consumer Energy Center states, "Properly insulated homes can use 30 to 50 percent less energy than homes without insulation".

### Insulating Your Home

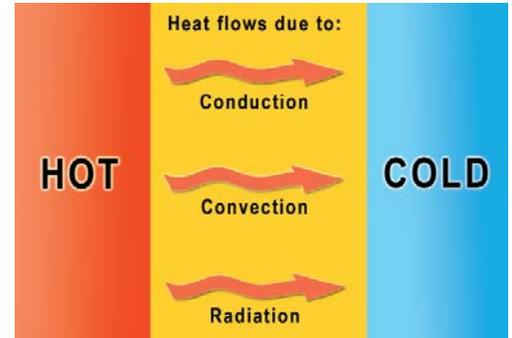
- saves you money on heating and cooling
- provides year-round comfort for your home
- conserves energy
- protects the environment by reducing greenhouse gas emissions

### How Does Insulation Work?

Heat flows from warmer to cooler spaces. In winter, your heating system uses energy to replace escaped heat. In summer, your air conditioner uses energy to remove entering heat. Insulating ceilings, walls, and floors adds resistance to the flow of heat and decreases the heating or cooling needed to keep your home at a comfortable temperature.

### Heat Flows Due To:

- **Conduction** which is movement through solids. When you warm up your hands on a cup of hot chocolate, heat travels into your palms and fingers through conduction.
- **Convection** which transfers on the currents of a moving fluid. When you boil water, convection moves heat through the water to the surface, and then through the air as steam.
- **Radiation** which is the transfer of solar or infrared energy through space. Radiant solar energy travels in a straight line. This is why you move to the shade to avoid direct sunlight.



Insulation materials with low conductivity help prevent the flow of heat through walls, doors, and pipes. Some materials slow down heat flow by creating tiny pockets of air or other gases through convection. Air sealing minimizes the flow of air and prevents heat loss from convection. Reflective insulation materials serve as a physical barrier, radiating heat back toward the heat source.

Insulating effectiveness is expressed as an R-Value (Resistance Value) – the higher the R-Value, the greater the effectiveness. Use the R-Value to compare individual products, evaluate the value a contractor proposes in your estimate, and help calculate estimated energy savings. The R-Values are determined by material type, thickness, and installed weight per square foot, not by thickness alone.

The Federal Trade Commission requires that the labels on insulation packaging state the R-value and certain specific health, safety, and fire-hazard information. Use only insulation materials approved by the State of California Bureau of Home Furnishings. Your contractor should provide you with proof of acceptance of the products' performance ratings.



## HOW THICK SHOULD YOUR INSULATION BE?

R-value	BATTS (blankets)	LOOSE FILL (Blown-in)	LOOSE FILL (Blown-in)
	Fiberglass/Rock Wool	Fiberglass/Rock Wool	Cellulose
11	3.5 – 4"	4 – 5"	3 – 4"
19	5.5 – 6.5"	6.5 – 9"	5 – 6"
22	6 – 7.5"	7.5 – 10"	6 – 7"
30	8.5 – 10"	10.25 – 13.75"	8 – 9.25"
38	12 – 13"	15 – 16.5"	10.25 – 12"

*This chart represents the average R-value of different kinds of insulation. The actual value may vary between manufacturers. The R-value of foam insulation varies from 3.4 to 8.6 per inch. Be sure to check the R-value for the specific type of foam insulation you're considering.*

## WHICH KIND OF INSULATION IS BEST?

The insulation your home needs depends on the climate; whether or not you have an air conditioner and a heater, and whether you use natural gas, propane, oil, or electricity for heat.

Some relevant variables are:

- how much insulation you need
- how easy it is to get to the location where the insulation will be installed
- the space available for the insulation material
- local availability and price of the insulation
- whether you will install the insulation yourself or have it professionally installed

## INSULATION PRODUCT TYPES

**Blankets**, (in the form of batts or rolls) are flexible products made from mineral fibers, including fiberglass, recycled cotton/polyester or rock wool.

**Blown-in loose-fill insulation** includes cellulose, fiberglass, or rock wool in the form of loose fibers or fiber pellets that are blown into spaces by using pneumatic equipment. These product types may be used in combination, usually with lower density (weight per unit volume) material placed on top of higher-density product.

**Foam insulation** comes in two types:

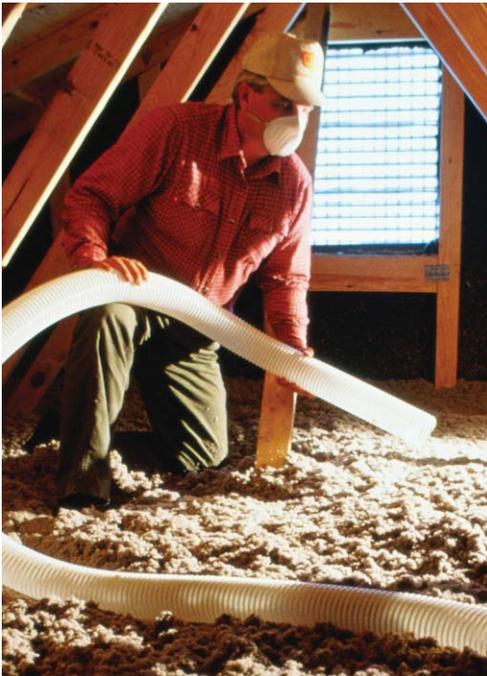
Open-celled foams, (such as polyisocyanurate) and closed-cell foams, (such as polyisocyanurate and polyurethane). Closed-celled foams provide a greater R-value for a given thickness.

**Rigid insulation** is made from fibrous materials or plastic foams and is produced in board-like shapes and molded pipe coverings that leave few heat loss paths. The boards may be faced with a reflective foil.

**Reflective insulation or radiant barriers** are made from aluminum foils with a backing such as kraft paper, plastic film, polyethylene bubbles, or cardboard. This type of insulation is most effective in reducing radiant heat flow and is less effective at reducing conductive heat flow.

## INSULATING A NEW HOME

Installing recommended levels of insulation during initial construction is a better value than adding it later. The Federal Trade Commission (FTC) requires the seller of a new home to include in the sales contract information about the type, thickness, and R-value of the insulation to be installed on every part of the home. If your builder participates in the ENERGY STAR® program, third-party inspectors will ensure that the insulation has been installed properly.





### ADDING INSULATION TO YOUR EXISTING HOME

The first step is finding out how much insulation you already have. To evaluate your home's current insulation:

1. *Check your attic, inside the walls, and under the floors.* If you are not comfortable performing these checks, a licensed insulation contractor can verify your home's insulation R-value levels for you.

Measure the thickness of the insulation and try to determine what type it is:

IF YOU SEE:	IT IS PROBABLY:
<b>Loose fibers</b>	Fiberglass (light yellow, pink, white); Rock wool (dense gray or near white, may have black specks); or Cellulose (small flat pieces or fibers, grey if made from newsprint or brown if made from cardboard)
<b>Granules (light-weight)</b>	Vermiculite (golden color) or Perlite (white)
<b>Batts (light-weight)</b>	Fiberglass (yellow, pink, or white)

2. *Estimate the R-Value by type of insulation*

<b>Loose fiber fiberglass</b>	2.5 x depth in inches = total existing R-value
<b>Rock wool</b>	2.8 x depth in inches = total existing R-value
<b>Cellulose</b>	3.7 x depth in inches = total existing R-value
<b>Vermiculite or Perlite</b>	2.7 x depth in inches = total existing R-value
<b>Fiberglass batts</b>	3.2 x depth in inches = total existing R-value

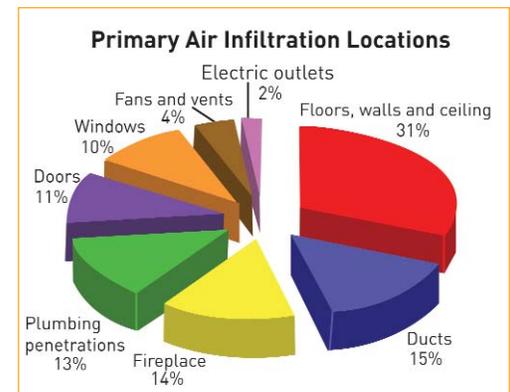


3. *Look at the ductwork of your heating and air conditioning system.* They should be insulated if they run through unconditioned spaces in your home, such as attics and crawl spaces. Repair leaking joints and seal remaining leaks. Where sections of insulation meet, overlap the facings and seal with fiberglass tape without compressing the insulation.

### AIR SEALING

Air sealing makes your home more comfortable as well as saving energy. It minimizes drafts in the winter, keeps hot air from entering in the summer, and prevents bathroom shower steam from moving to the attic. Hot air tends to rise and cold air to fall, so leakage patterns usually lead toward the attic. Therefore, it is important to stop leaks before adding insulation. Insulation does not stop or plug air leaks, nor does it hide them after the process is complete.

The following chart illustrates the proportion of air that flows in and out of various areas of a typical home.



Source: California Energy Commission's Consumer Energy Center.



## MOISTURE CONTROL AND VENTILATION

Water or moisture that gets trapped inside your walls can cause damage to the building and health problems, such as allergies, to its residents. In today's tight homes, lack of ventilation can leave air stale and create pollutants. To supply fresh air, you may want to use a special air-to-air heat exchanger, or heat-recovery ventilator.

## INSULATION INSTALLATION, THE RETROFIT CHALLENGES

Whether you install the insulation on your own or have it done by a contractor, educate yourself about proper installation methods. For safety purposes please have an electrician evaluate your wiring.

If you choose to have the installation done professionally, obtain cost estimates from several contractors.

If you install your own insulation, always observe the following precautions:

- Wear adequate clothing to protect your skin and eyes - a long-sleeved shirt with collar and cuffs buttoned, gloves, hat, glasses, and disposable dust respirator rated for the type of insulation your attic contains or you are installing.
- Read all labels and follow the manufacturers' directions.
- Do not cover or hand-pack insulation around heat-producing locations such as bare stove pipes, furnace flues and chimneys, motors, and electrical and lighting fixtures.
- Observe all fire safety codes.
- Do not cover attic vents with insulation.

## Buyer's Tips

Be sure to consult several contractors and get proposals for different energy-efficient solutions. A smart practice would be to call the Contractors State License Board at **1-800-321-CSLB** or visit [www.cslb.ca.gov](http://www.cslb.ca.gov) to confirm your contractor's license status or to find a licensed contractor in your area. And remember, it's always a good idea to request references.

For more information about energy efficiency and other Pacific Gas and Electric Company's energy management solutions visit our web site at [www.pge.com](http://www.pge.com) or call our **Smarter Energy Line** at **1-800-933-9555**.

## References

**Home Insulation Fact Sheet,**  
[www.ornl.gov/sci/roofs+walls/insulation/ins\\_01.html](http://www.ornl.gov/sci/roofs+walls/insulation/ins_01.html)

**CA Energy Commission's Consumer Energy Center,**  
[www.consumerenergycenter.org/home/tightenup/insulate.html](http://www.consumerenergycenter.org/home/tightenup/insulate.html)

**Weatherization Fact Sheet,**  
[www.pge.com/includes/docs/pdfs/shared/saveenergymoney/rebates/weatherization.pdf](http://www.pge.com/includes/docs/pdfs/shared/saveenergymoney/rebates/weatherization.pdf)

**The Old House**  
[www.oldhouseweb.com/how-to-advice/insulation-precautions.shtml](http://www.oldhouseweb.com/how-to-advice/insulation-precautions.shtml)

