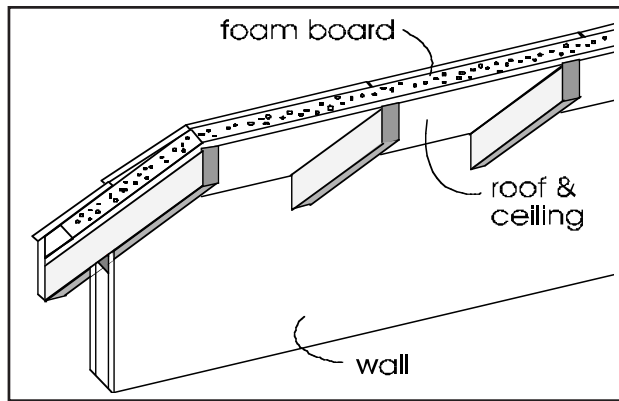


Cellulose or Fiberglass Attic Insulation

has the most cost effective performance. Blown-in cellulose or fiberglass and fiberglass batts are similar in cost and performance. Recycled cellulose insulation may be available. For R-19 performance, the insulation will be 5 to 6 inches thick (R-30 is 8.5 to 10 inches). Install in attics of new and existing homes. Typically also the best choice for framed ceilings in new homes, but can be costly to install as a retrofit in existing framed ceilings. Installed cost is about \$0.80 to \$1.00 per sq. foot. Do-it-yourselfers can cut the cost in half.

For Hawaii Model Energy Code (MEC) compliance, use R-19 under any roof color. Less insulation may be allowed if a light colored roof is installed.

	R-19	R-30	R-19 + White Roof
Cost (\$)†	\$720	\$880	\$720‡
Savings (\$/yr)†	\$450	\$480	\$490
Payback (yr)	1.6	1.8	1.5

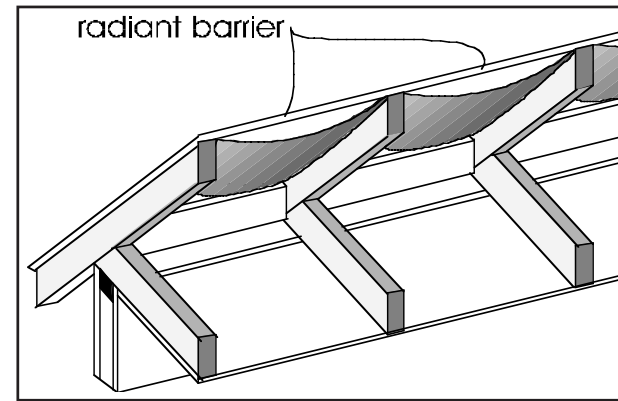


Foam Board Ceiling Insulation

provides more insulation per square inch than cellulose or fiberglass but is also more expensive. R-10 is 1.5 to 2 inches thick, and R-14 is 2 to 3 inches. Best where other insulation cannot be used, such as open-beam ceilings. Applicable for new construction or when roofing is replaced on an existing home. Two common materials are polystyrene and polyisocyanurate. Polystyrene is better in moist conditions, and polyisocyanurate has a higher R-value per inch. Installed cost is about \$1.00 to \$2.00 per sq. foot.

R-10 complies with the MEC under a medium to light colored roof; R-14 is necessary under a medium to dark roof.

	R-10	R-14	R-10 + White Roof
Cost (\$)†	\$1,360	\$1,520	\$1,360‡
Savings (\$/yr)†	\$400	\$430	\$460
Payback (yr)	3.4	3.5	3.0

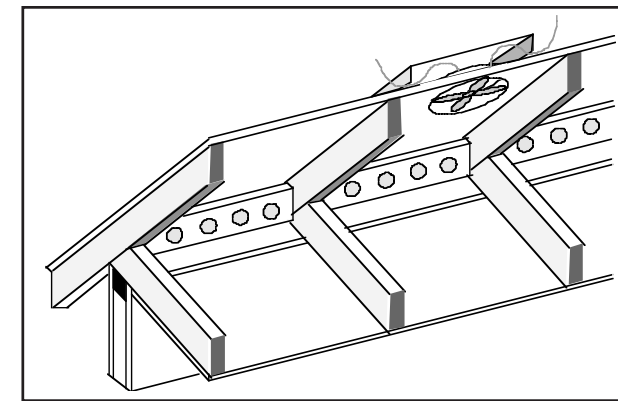


Radiant Barrier

is a reflective foil sheet that works differently than insulation but has a similar impact. The effectiveness of a radiant barrier depends on its emissivity, which should be less than 0.1. In general, the shinier the better. Installed under the roof deck, it cuts the amount of heat that is radiated from the hot roof to the ceiling below. It may be draped over the rafters before the roof is installed, or stapled to the underside of the rafters. The shiny side should face downwards for best performance because dust accumulation will decrease its effectiveness. Installed cost is about \$0.60 to \$1.00 per sq. foot.

“Plain” radiant barrier meets MEC under a light colored roof. An “insulated” radiant barrier complies under any color roof.

	Plain	Insulated	Plain + White Roof
Cost (\$)†	\$560	\$720	\$560‡
Savings (\$/yr)†	\$360	\$450	\$440
Payback (yr)	1.6	1.6	1.3



Attic Ventilators

are small fans that remove hot air and reduce attic temperature. Good inlet vent area is important, typically located under the eaves of the house. The fan should be located near the peak of the roof for best performance. Solar-powered fans currently get a 35% State tax credit. Costs are \$200 to \$400 per fan, which vent about 800 sq. feet each.

An attic ventilator meets MEC when combined with a radiant barrier or R-11 insulation.

A **white roof surface** combined with any of the measures listed here will improve performance significantly. The white surface reflects much of the sun’s heat and stays much cooler than a typical roof.

	Alone	w/Radiant Barrier	With White Roof
Cost* (\$)†	\$340	\$900	\$340‡
Savings (\$/yr)†	\$190	\$420	\$340
Payback (yr)	1.8	2.1	1.0

† Costs and savings are for a typical 1,200 ft² house with 800 ft² of roof area and with central air conditioning.

‡ No extra cost is assumed for the white roof surface.

* Attic ventilator cost assumes 35% State tax credit.

Ceiling Insulation in Hawaii?

Insulation keeps people warm in Minnesota, but does it make sense in Hawaii? Yes! Under Hawaii's hot sun, a roof can reach 150° F or more even when it's only 80° F outside. That heat conducts through the roof to the ceiling. The heated ceiling "toasts" the occupants who then turn on fans and air conditioners to cool off in the afternoon and the evening.

What does it cost?

The installed cost for roof insulation is \$0.80 to \$1.00 per square foot of roof area. For a typical home, the insulation will cost little more than the purchase and installation of a single window air conditioner.

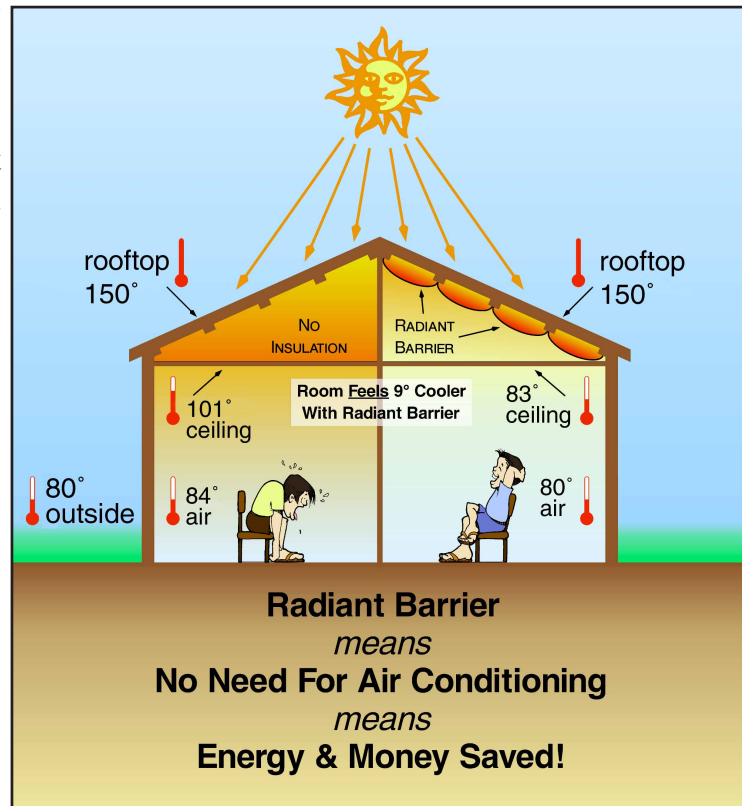
The cost to do-it-yourself is about 50¢ per square foot for fiberglass insulation.

What are the benefits?

Ceiling insulation improves comfort and cuts electricity costs. For instance, as illustrated below, R-19 insulation:

- will enable occupants to feel 9° F cooler.
- will reduce indoor air temperature by 4° in the afternoon.
- will eliminate the "toaster" effect by lowering the ceiling temperature by 18°.
- will reduce or eliminate the need for an air conditioner, saving \$550 to purchase and install a window unit or several thousand dollars for a central system.
- can eliminate the \$200 to \$400 per year needed to run a window air conditioner.
- will cut electricity bills by \$400 to \$500

per year in homes with central air conditioning. The insulation pays for itself in 1 to 2 years.



Ceiling Insulation for Your Home

*Keep Cool
Save Money*



Ceiling insulation keeps your naturally ventilated home cooler

And insulation is a cost effective way to dramatically cut your air conditioning bills

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For more information on ceiling insulation and building energy efficiency, refer to the *Hawaii Model Energy Code Application Manual*.

Or Contact:

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