

Consider a Radiant Barrier

by Geoff Hartman

Although not required as part of the EPA's ENERGY STAR® Home qualification guidelines, radiant barriers at the roof can significantly improve the HERS Index and help a home qualify for the ENERGY STAR label. When considering the hot, sunny Houston weather, radiant barriers have steadily gained in popularity among the local homebuilders. This article examines radiant barriers and why you should consider installing them.

Radiant barriers are materials designed to reduce summer heat gain and winter heat loss caused by the transmission of long-wave radiant energy. This helps to reduce summer cooling energy usage, and can sometimes help reduce winter losses as well. The primary benefit of radiant barriers in the attic is to reduce air-conditioning loads in warm or hot climates. Radiant barriers usually consist of a thin sheet or coating of a highly reflective material, which is often aluminum. One of the best applications is to adhere the barrier directly to the underside of the roof decking (sheathing) material. Primarily in new home construction, radiant barriers are installed before the roof deck is installed or applied directly to the underside of this decking material.

Radiant barriers work by reducing heat transfer from thermal radiation across the air space between the roof deck and the attic floor where conventional insulation is placed. All materials give off, or emit, energy by thermal radiation as a result of their temperature. The amount of energy emitted depends on the surface temperature and a property called the "emissivity". The emissivity is a number between zero (0) and one (1), and for radiant barriers, the higher the emissivity, the greater amount of emitted radiation.

Another related material property is the "reflectivity", which is a measure of how much radiant heat is reflected by a material. The reflectivity is also a number between 0 and 1. Radiant barriers must have a high reflectivity (usually .9 or higher) and low emissivity (usually 0.1 or less), and must face an open air space to perform properly.

On a hot summer day, solar energy is absorbed by the roof, heating the roof sheathing and causing the underside of the sheathing and the roof framing to radiate heat downward toward the attic floor. When a radiant barrier is installed under the sheathing, much of the heat radiated from the hot roof is reflected back through the sheathing and roof shingles. This makes the top surface of the insulation cooler than it would have been without a radiant barrier and thus reduces the amount of heat that moves through the insulation and ultimately into the rooms below the ceiling. In some cases the use of a radiant barrier is reported to lower attic temperatures by 30 degrees during peak sunshine periods.

In the winter, radiant barriers can reduce indoor heat losses through the ceiling. Radiant barriers reduce the amount of energy radiated from the top surface of the insulation, but can also reduce beneficial heat gains provided by solar heating of the roof.

Radiant barriers offer several benefits to homeowners. If functioning properly, radiant barriers can account for up to a 20% reduction in energy usage, which translates to lower utility bills. The heating and cooling equipment can last longer with less maintenance over time due to it not having to work as hard. Ultimately, with a cooler attic, all equipment installed above the ceiling will operate under less stress. With the equipment operating under less stress, warranty callbacks to homebuilders could then be reduced.

Homebuilders should consider installing radiant barriers as a cost effective method to lower their rated HERS Index, and to provide home buyers with lower energy bills and improved comfort.

Building Code:

Today's building codes allow significant flexibility to encourage innovative and cost-effective construction practices. Technologies and construction techniques that achieve equivalent thermal performance for the building envelope and systems are not only allowed, but encouraged. Several states specifically reference radiant barriers in their trade-off or software calculations.

Because of the reduced heat gains in summer, radiant barriers may also allow builders to reduce some attic insulation or duct insulation levels, which will offset at least a portion of the incremental cost of installing the radiant barrier.

The City of Houston has proposed the following option for the residential building code.

Draft Proposal Only: Code Enforcement Team, June 2007:

If a roof radiant barrier with an emittance of 0.05 or less as tested in accordance with ASTM C-1371 or ASTM E-408 is used, then the roof/ceiling minimum insulation value shall be R-19.

Green Building:

The energy savings provided by proper application of radiant barriers can help to reduce the amount of greenhouse gas emissions contributed by our homes. This in turn helps a home to meet a variety of criteria used for evaluating and qualifying homes for Green Building designation.

How a Radiant barrier Works:



In the **Summer**, solar energy against the roof is converted to heat and radiated into your attic, where it warms insulation, ceilings and HVAC ductwork.

A radiant barrier blocks that radiant heat from entering the home.



In the **Winter**, heat from indoors radiates from the ceiling, escaping through the attic and roof. Work ducts also radiate heat into the attic spaces.

A radiant barrier blocks some of that heat from escaping.

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