

## **Radiant Barriers**

Radiant barriers are materials that are installed in buildings to reduce summer heat gain and winter heat loss, and hence to reduce building heating and cooling energy usage. The potential benefit of attic radiant barriers is primarily in reducing air-conditioning cooling loads in warm or hot climates. Radiant barriers usually consist of a thin sheet or coating of a highly reflective material, usually aluminum, applied to one or both sides of a number of substrate materials.

### **How do radiant barriers work?**

Radiant barriers work by reducing heat transfer by thermal radiation across the air space between the roof deck and the attic floor, where conventional insulation is usually 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" (also called the "emittance"). The emissivity is a number between zero (0) and one (1). The higher the emissivity, the greater the emitted radiation.

A closely related material property is the "reflectivity" (also called the "reflectance"). This is a measure of how much radiant heat is reflected by a material. The reflectivity is also a number between 0 and 1 (sometimes, it is given as a percentage, and then it is between 0 and 100%). For a material that is opaque (that is, it does not allow radiation to pass directly through it), when the emissivity and reflectivity are added together, the sum is one (1). Hence, a material with a high reflectivity has a low emissivity, and vice versa. Radiant barrier materials must have high reflectivity (usually 0.9, or 90%, or more) and low emissivity (usually 0.1 or less), and must face an open air space to perform properly.

On a sunny 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 placed on the underside of the roof sheathing, much of the heat radiated from the hot roof is reflected back toward the roof. 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 into the rooms below the ceiling.