What standards are used to evaluate radiant barriers?
—R.K. Washington, D.C.

For the moment, the only standards I could find anywhere regarding radiant barriers are ASTM Cl 158-97 “Standard Practice for Installation and Use of Radiant Barrier Systems (RBS) in Building Construction” and ASTM C1313-97 “Standard Specification for Sheet Radiant Barriers for Building Construction Applications.”

ASTM C1158 suggests that improper installation of a radiant barrier could result in a variety of bad things ranging from poor ventilation and unwanted moisture accumulation, to causing a fire resulting either from being too close to hot lighting or from an electrical short circuit. (It doesn’t mention what might happen if the installer became part of the circuit; perhaps that’s the purview of another committee.)

ASTM C1313 specifies minimum thickness, purity and a few attributes of the aluminum foil used in the sheet type of barriers. It also advises that these barriers should be checked for tear, mildew and corrosion resistance, but leaves much latitude for such evaluations.

What I did uncover about radiant barriers from the product literature of several manufacturers made for some interesting reading, however. Though there are several variations on the theme, these barriers essentially resemble a sandwich of a couple layers of aluminum on either side of a number of strong flexible substrates. Manufacturers claim that using a radiant barrier can prevent 97 percent of the radiant heat transfer in a building. Since more than 70 percent of the heat gain or loss in a building is radiant heat, the use of such a barrier can mean significant energy savings in either heating or cooling costs.

Heat is transferred in three different forms: conduction, convection and radiation. Conduction is heat moving through a solid object. Convection is heat moving through a gas or liquid. Radiation is potential heat in the form of infrared waves that cause the molecules in either a solid, liquid or gas to get excited and give off heat.

Heat moves from hot to cold, and the more available mass, the higher the potential heat transfer. Surfaces that have high reflectivity and reflect infrared don’t get as hot as duller surfaces, which absorb radiation. Since an aluminum film has a high reflectivity and a very low mass, it does a good job of reflecting away infrared radiation, preventing it from heating up more massive and absorptive building materials like wood, steel and plaster when placed between them and the radiation. Though conventional insulation reduces conduction and convection, without a reflective surface, radiation passes right through it.

Since the radiation is reflected by the barrier regardless of where it is placed, it can go under the roof sheathing, under or over the exterior sheathing, or under the flooring and still keep the wanted heat in and the unwanted heat out. However, aluminum films are also very good moisture barriers, so it is important that the non-permeable variety of radiant barrier not be placed between potential moisture and its escape route. When this cannot be avoided, there is the permeable (for example, perforated) variety of radiant barrier. Otherwise moisture may accumulate where it is not wanted and cause all kinds of damage.

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