RADIANT BARRIERS: PROVEN TO WORK

Energy efficiency in home construction is important to home owners and prospective home buyers. Monthly utility bills are balanced against the number of years it takes for an energy saving method to pay for itself. This combined with the fact that the number one challenge in the Sunbelt is to control heat gain, make radiant barriers an integral part of building to improve the overall comfort level in a home and reducing utility bills.

As much as 93% of the total heat gain from the roof decking to the top of the insulation is via radiation, and a radiant barrier will stop as much as 97% of radiant heat transfer. Bulk insulation can only slow heat transfer, and more is not better. Studies have shown that a radiant barrier combined with mass insulation is an effective way to reduce the cost of air conditioning and heating.

In most construction, the roof or ceiling area is the largest contributor to heat gain due to the large surface area exposed to the sun and the extreme temperatures of roof surfaces. Roof temperatures reach upwards of 165 degrees F and attic temperatures can reach 130 degrees F on a typical August day in the Sunbelt. At peak times, more than 40% of the energy which enters the conditioned space through the ceiling is the direct result of radiant energy from the attic deck being transferred to the top of the insulation. While radiant barrier systems have been around for over twenty-five years they have now emerged as one of the most efficient methods of minimizing heat gain.

It is important to understand the simplicity of how radiant barriers work and their applications in residential construction. Heat always travels hot to cold and its method of travel is via radiation, convection and conduction. In an attic space, radiation accounts for as much as 93% of the heat flow. The roof temperature's increase as the sun strikes the roof surface. Roofing materials (shingles & decking) are often poor reflectors, emitting or re-radiating 90% of incoming solar energy. Dark shingles absorb as much as 95% of the incoming solar energy heat gain. The hot roof materials begin transferring this heat to the cooler insulation below, heating the insulation's surface in the same manner. The insulation becomes saturated and begins transferring to all surfaces within the interior of the home. The radiant surface temperatures of the walls and ceilings have a direct influence on the comfort level of the occupants and increased energy costs. Even today, most energy conservation programs, while recognizing radiant barriers, continue to overemphasize insulation in controlling heat flow from the attic to a home's interior.

A polished film of aluminum is the primary component of a radiant barrier system. Compared to a dark surface, aluminum only emits 3% to 5% of as much radiant energy from its surface. Thus, radiant barriers can block 95% to 97% of radiant heat flow.

There are several types of radiant barrier systems: stapled to the underside of roof rafters, draped over the roof trusses and laminated or stapled directly to the underside of the roof decking. A radiant barrier that is stapled to the bottom of the rafters or trusses is the highest performing application. This application, and has the advantage of reducing the radiant heat gain that comes through the truss and rafter surfaces (which can be as much as 10-20% of the total roof area). Deck applied radiant barrier systems consist of aluminum directly applied either by gluing or stapling to the 4' x 8' sheets of roof decking. The decking is applied in the normal fashion but with the radiant barrier facing the attic space. For draped radiant barrier systems, either a single or double sided aluminum radiant barrier material is draped over the roof trusses before the roof sheathing is applied. Some spray- applied coatings are paints are not technically radiant barriers. For a product to be a radiant barrier it must meet the requirements of ASTM C1313, the standard specification for radiant barriers. The aluminum surface must have an emittance of 0.10 or less and a reflectivity of 90% or greater. Low-e paints and coatings have an emittance of 0.22 to 0.50 which is far greater than that of a radiant barrier. The lower the emittance values the better in terms of thermal radiation.

On hot summer days, the roof of a residence absorbs solar radiation at a higher than is dissipated through conduction (to the attic interior) and convection (t0 the outside air), thus creating a rise in roof temperature. During a typical summer afternoon in the Sunbelt, a properly installed attic radiant barrier system will:

- Reduce attic temperatures as much as 30 degrees.
- Reduce heat transfer from attic to living space up to 50%
- Reduce heat loads on attic ducts and equipment up to 50%.
- Extend the life of the air-conditioning unit.
- Increase the comfort level of the home.

It is common to think that radiant barriers will be less efficient if attic ventilation is increased. The fact is that after small ventilation rate is achieved (0.25 CFM/per square foot of attic floor), increasing attic ventilation does not lower the efficiency of radiant barriers. Radiative heat transfer from the roof to the ceiling insulation essentially bypasses attic air; the attic air absorbs only a small percentage of radiant energy. Ventilation is certainly an important component in the construction of a house, but is by no means the cure all for the hot summers of Sunbelt.

In today's market, with rising energy costs and increased consumer awareness in all areas of industry, it is more important than ever to produce a product that is not only smart economics for the builder but also for the consumer. The builders that have adapted radiant barriers into their programs are clearly becoming the benchmark in the industry for energy efficient and environmentally conscious construction and thus are creating a competitive advantage.