

The US Department of Energy Concludes a New Radiant Barrier Study

Test Results as Presented by Andre Desjarlais of Oak Ridge National Laboratory

Radiant barrier is finding its way into more and more building codes, like California Title 24. As a result, the US Department of Energy has conducted elaborate tests for radiant barrier in attics at the large scale climate simulator at Oak Ridge National Laboratory. The purpose of this testing was to evaluate the performance differences in new construction and retrofit applications, as well as the performance differences between the radiant barrier sheet and the radiant barrier paint, also known as an Interior Radiant Control Coating (IRCC).

The experiment tested the performance of the following attic assemblies:

- Control (no radiant barrier)
- Radiant barrier applied directly to the OSB sheathing
- Radiant barrier applied to the underside of the rafters
- IRCC sprayed to the underside of the rafters and OSB



The attic assembly was built to code with rafter spacing, ventilation and insulation. The large scale climate simulator tested the attic at temperatures simulating both summer and winter to calculate the savings for both heating and cooling. Even the heat lamps simulating the summer sun were used to simulate the solar load on the roof assembly.

The results were similar to previous tests performed on radiant barrier:

- The attic without radiant barrier had the highest heating and cooling costs
- The OSB with radiant barrier had a 33% improved cooling and 10% improved heating
- The Rafter-applied sheet radiant barrier had a 50% improved cooling and 10% improved heating
- The IRCC spray had just 20% improved cooling and no improvement in heating from the control

The DOE was hopeful that the IRCC would offer better performance since spraying on IRCC paint is easier than installing a sheet radiant barrier once the house is built, but the thermal emissivity of the IRCCs on the market today do not perform as well as a sheet radiant barrier.

In new construction, the radiant barrier laminated to the OSB sheathing is certainly the easiest and least expensive to install, but going to the added labor in installing a radiant barrier under rafters can result in greater savings. This may be for a variety of reasons, like the higher emissivity of the OSB, a lack of space between the barrier and the sheathing to vent, and the presence of the rafters below the barrier to reduce the coverage of the low emittance surface.

The most efficient method was the radiant barrier applied to the rafters. Since this particular experiment did not have A/C ducts in the attic, homes with attic ducts could see even greater savings in the summer. Radiant barrier on the rafters is the preferred method of installing a retrofit radiant barrier by the US Department of Energy, ENERGY STAR, California Title 24, ASTM International, RIMA International, and others.

Samples of products installed are below.



Attic with no radiant barrier protection



OSB decking with radiant barrier



Rafter-applied sheet radiant barrier



IRCC spray