EFFECTS OF REFLECTIVE RADIANT BARRIER ON HEAT LOSS IN ATTIC FLOORS AND METAL BUILDING INSTALLATIONS

Charles W. Shabica
Professor of Earth Science
Northeastern Illinois University
Chicago, Illinois 60625
March 27, 1984

PROBLEM:
Can a reflective radiant barrier, installed over existing bulk insulation, decrease heat loss in homes and commercial structures?

PRODUCT TESTED:
Trilaminate structure of film sandwiched between 2 sheets of 99% pure aluminum.

TEST STRUCTURES:
Two buildings were examined using infra-red thermography. The first is a 120' x 32' commercial woodworking shop with sheet metal walls and roof on an uninsulated poured concrete foundation that is raised 12" around the perimeter. The walls and roof are insulated with 1 ½" thick fiberglass backed with sheet plastic. The condition of the fiberglass in the roof is degraded from roof leaks and old, but generally is intact. The radiant barrier product was retrofitted on 1 x 2" wood furring strips 24" o.c. below the fiberglass in the roof only. All seams were taped with foil tape.

The second structure is a ranch style frame house with an unventilated attic insulated with 8" of blow-in fiberglass. A 1 ½" thick styrofoam board was installed down the middle of the attic, partitioning it into two equal sized spaces. The radiant barrier product (perforated) was laid like a blanket on one side of the attic over the fiberglass insulation. Recording thermometers were placed in both attic spaces on top of the insulation.

CONDITIONS:
Infra-red photos were taken of both structures with an AGA Thermovision 110 infra-red camera on a partly cloudy night (temperature: +49 degrees F, time: 7 to 9 p.m. on February 15, 1984). Attic temperature measurements were taken over a three day period of generally clear skies and outside temperatures ranging from 7 to 28 degrees F. Both test buildings were located in the South Chicago Suburbs.

FINDINGS:
The commercial sheet steel building shows a surprisingly low IR emittance (heat loss) through the roof. In contract, the walls, insulated only with plastic-backed fiberglass, are seen to radiate at a relatively high level. Steel joists conducting heat to the outside wall can be seen as light vertical lines on the walls. These were not visible on the roof. Note that the uninsulated raised foundation shows a very high IR emittance.

An infra-red scan of the roof of the frame house shows a difference in IR emittance between the test and control sides of the attic (radiant barrier on the right). Recorded attic temperatures were generally considerably lower in the attic space with the radiant barrier.

CONCLUSIONS:
A radiant barrier retrofitted to fiberglass insulated sheet steel buildings is demonstrably effective in reducing heat loss. In the test case, installation of a radiant barrier on the walls would produce results similar to those shown for the roof. Installation of a radiant barrier in uninsulated buildings would show even more pronounced reduction in heat loss.

In the frame house test, IR emittance is measurably lower on the side of the house with the radiant barrier. Note: the metal roof vent on the right is closed and shows very low emittance. The IR emittance scans were taken between 7 and 9 p.m. on a relatively warm night. Scans taken later that night or with a colder outside temperature should show a greater IR emittance.

Consumer fears that radiant barrier installed in an attic will promote high roof temperatures are generally unfounded. This is evidenced by lower attic temperatures on the radiant barrier side measured in the afternoon. In addition, condensation will probably not occur as the dew point is unlikely to be reached between the radiant barrier and the underside of the roof.