Radiation Insulation

MOONCRAFT TECHNOLOGY GIVES RISE TO A HIGHLY EFFECTIVE EARTH-USE INSULATION

The Apollo spacecraft represented a masterpiece of temperature control technology. It had to be, to protect astronauts from temperatures that ranged 400 degrees above and below zero Fahrenheit.

A prime element of the environmental control system that permitted astronauts to work inside the Command Module in shirtsleeves was a highly effective radiation barrier. Made of aluminized polymer film, it barred or let in heat to maintain a consistent temperature in an environment where ordinary insulative methods would not have sufficed. The key was aluminization of the material, which provided a reflective surface that kept more than 95 percent of the radiated energy from reaching the spacecraft's interior.

The radiation barrier technology has since been used on virtually all spacecraft, including unmanned spacecraft where delicate instruments need protection from extremes of temperature. It is also a key element of a sophisticated energy conservation technique for home and office building installations, plus a variety of special applications, for instance as a candy wrapping to protect the product from heat or cold during transit.

An example of companies supplying variations of the space-derived material is Buckeye Radiant Barrier, Dayton, Ohio, which markets a lightweight aluminized material known as "Super R" Radiant Barrier, manufactured by Radiant Technologies, Inc., Richmond, Virginia.

The accompanying photos

illustrate some applications of the material supplied by Buckeye. ***At top*** is a new home construction application; the radiant barrier is placed between the wall studs and the exterior facing prior to the addition of aluminum, vinyl or wood siding. In a new roof installation (***middle photo***) the barrier is placed between the roof supports and the roof sheathing. For retrofitting existing homes, the perforated Radiant Barrier tops insulation blankets on an attic floor to reflect energy (***above***). The ***upper right photo*** shows the

product applied to a commercial gas-fired boiler room in a school; prior to the installation, the room above the boiler room was uninhabitable as a classroom, but the Radiant Barrier corrected the problem. The ***bottom photo*** illustrates an industrial application in which the Radiant Barrier is used to increase the performance of a shrink wrap oven by reflecting the energy inward; the oven is used to shrink plastic protective coverings over auto seats prior to shipping.

For these and other terrestrial applications, suppliers claim the Radiant Barrier offers a decrease in utility bills of 20 percent or more. The material focuses on controlling radiant heat (as opposed to conductive heat, the direct flow of heat through solid objects, or convective heat, the upward flow of air due to its expansion as it warms). Radiant heat is the flow of invisible infrared rays from the surface of an object; all objects radiate, for example, the emittances from wood, glass, insulation and even ice.

The Radiant Barrier blocks these emittances by reflecting back 95 percent of all radiant energy, thus keeping heat in the building in the winter and blocking it out in the summer, with beneficial impact on energy bills.

"Super R" Radiant Barrier supplied by Buckeye is a three-layer material that includes two layers of 99 percent pure aluminum foil separated by a layer of polyprophylene (to act as a thermal break) and by a nylon grid that provides strength. The sheets are perforated to allow moisture to escape. •

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