



## Barriers to Radiant Barriers

by Cliff Henke

*As a follow up to the article on radiant barrier research in May/June '89, here is our look at the issues of sales, pricing, and cost-effectiveness. Part 2 of two.*

The State of Minnesota stopped the sale of radiant barriers because of the extravagant claims salespeople were making in that state.

Minnesota Attorney General Hubert Humphrey III sued a home improvement company for "deceptive" radiant barrier sales practices.

Texas Attorney General Jim Mattox obtained a judgment against a radiant barrier manufacturer's energy savings claims in advertising.

The Federal Trade Commission is investigating allegations of exaggerated claims of radiant barrier performance around the country.

Increased sales activity, the pressure to translate inconclusive research results into savings estimates, increased attention from utilities trying to reduce peak load, and the little understood processes of radiant heat flux all conspire to confuse consumers.

But consumers don't need to understand mean radiant temperature and the process of heat flux through attics. All anyone considering installing a radiant barrier system really needs to know is: At what price is it worth my while to install radiant barriers?

The answer depends on three factors: total installation and purchase price, the cost of energy, and expected energy savings from the radiant barrier system itself.

The economic relationship between installation cost, utility bill savings, and payback time is relatively simple (see box). Some of the variables, such as electricity prices, are easily determined. The controversy surrounds the fair price for radiant barriers and electricity savings from their installation. Even if the electricity savings are measured in one case study, they may not apply in other houses with different levels of insulation or occupant thermostat habits, or in different climates, where the ratio of heating to cooling load may have a profound effect on annual

savings. For this reason, each research project must be carefully examined before its results are applied elsewhere.

Energy savings is one of the areas in which manufacturer's claims exaggerate research data so much that they border on outright fantasy. For example, the Minnesota lawsuit alleges that Tradesman Service and Manufacturing Inc. and Pro-Tech Energy Co. told customers that the radiant barrier "insulation" had an R-value of 19. "Customers were told they could save a whole lot of energy on their bills," said Bruce Nelson, at the Minnesota Department of Public Service Energy Division. Currently, radiant barrier benefits cannot be measured in R-value, since R-value indicates the apparent reduction in conductive heat transfer. Radiant barriers, on the other hand, are analogous to shades or awnings, which block unwanted solar heat gain through windows. Although radiant barriers and insulation have little to do with one another, especially in specific function, both conventional insulations and radiant barriers do ultimately the same thing—inhibit heat transfer.

A case in the State of Florida prompted the Federal Trade Commission (FTC) staff to define radiant barriers as a form of insulation, a step which greatly limited advertising claims. The State of Florida had assigned effective R-values to radiant barriers installed in attics, amending



It's just another space age insulation salesman, dear.

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## Radiant Barrier Economics

by Alan Meier

The primary reason to install radiant barriers is because they save money. It is important to understand the connections between the key financial variables. The only factors that truly matter in the financial calculation are the cost of the radiant barrier (including installation), the energy savings, and the price of energy. Air conditioning savings are the principal—if not the only—savings from radiant barriers, so the energy price is simply the electricity price.

The figure shows the relationship between the electricity savings, the price of the radiant barriers, and the payback period. The figure permits you to calculate the maximum amount that you can afford to pay for the radiant barriers while still having an acceptable payback period. (We assumed that electricity cost 9¢/kWh.) To use the figure, first estimate the energy savings from the radiant barrier (see chart). Next, select the desired payback time. Finally, read the vertical scale for the maximum permissible cost of the radiant barrier. Not surprisingly, greater savings will permit you to pay more for the materials while still getting the same payback period. You can create your own figure using the formula: radiant barrier cost equals (electricity savings per year) times (electricity price) times (payback time, in years).

The greatest controversy surrounds the energy savings from radiant barriers. Here are some simple rules for "homing in" on the savings. Those estimates, along with the figure, should help you select an "acceptable" price for the measure.

**Rule 1.** "A radiant barrier can't save more energy than is now used for cooling." This seemingly obvious rule is often overlooked, yet can quickly eliminate outrageously expensive bids for installation of radiant barriers. The air conditioning use for a typical house in a warm climate is shown on the figure. Even if the radiant barrier totally eliminated air conditioning electricity use, it would still need to cost less than about \$1,000 to get a 3-year payback. The simplest way to determine cooling use is to inspect utility bills. Use a "shoulder" month before the air conditioning season begins to establish a baseline.

its building construction code in a way the FTC interpreted to be a violation of its regulations. Companies then claimed R-values for their radiant barriers, based on the state's assigned values. While it is legal for a state to change its code, the companies cannot then use those assigned figures in their publicity.

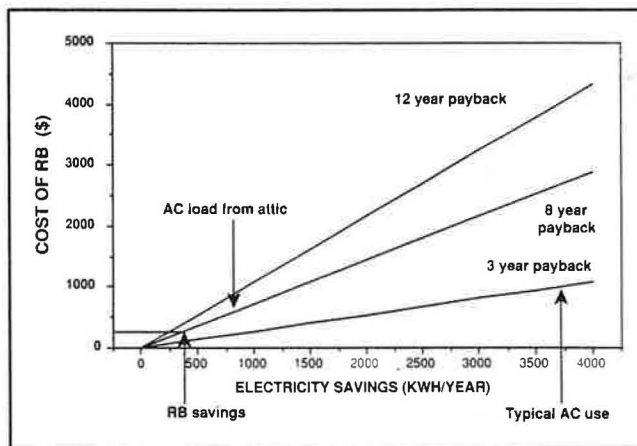
In Minnesota, the State Department of Public Service issued a regulation pursuant to an insulation standards law passed several years ago. The regulation establishes a set of criteria that all residential insulation products must meet before these products can be sold in the state. Radiant barriers are defined as insulation products under this statute. Because no radiant barrier has yet met the state's criteria for insulation products, the public service department determined they could not be sold in Minnesota.

### Case Study: Eagle Shield

Perhaps the best documented controversy over sales tactics is the story of Mattox's attempt to place an injunction forcing the radiant barrier company, Eagle Shield, to cease using false savings claims.

**Rule 2:** "A radiant barrier can't save more energy than originally went through the attic." Radiant barriers are designed only to reduce heat flow through the ceiling, so they will not affect cooling loads created by sun shining through unshaded windows or warm, infiltrating air. The cooling load caused by heat flowing through the ceiling is very difficult to measure and varies greatly with building conditions. However, a well-insulated house should not have more than 20% of the total cooling load coming through the ceiling. This is marked on the figure. In order to have a reasonably short payback period, the cost of the radiant barrier must be much lower than with Rule 1. In the physically impossible event that the radiant barrier does save all the heat formerly passing through the ceiling, then the installation must still cost less than \$700 for an 8-year payback period to be achieved.

**Rule 3:** "Radiant barriers will only save a fraction of the heat presently going through the ceiling." This is the correct number to use in the cost-effectiveness calculations. It is also the most difficult to determine. Even if the fraction saved is quite large (say, 50%), the figure shows that radiant barriers must be very cheap in order to have a short payback time, in this case less than \$400 for an 8-year payback.



Eagle Shield and Texas's Attorney General's office settled out of court in August of 1988. That agreement specifically ordered the company to issue a new marketing statement, which reduced the company's savings claims on utility bills to 3–8% for radiant barriers alone, 6–16% for comfort modules, and 8–23% for the two components combined. Other corrections in its advertising literature must also include the statement: "It is [forbidden] to claim more than 15% of heat gain or 20% of heat loss is through the ceiling in a residence until the provisions are complied with." The settlement also prevents Eagle Shield from using any payback period claims, and from implying that NASA endorsed Eagle Shield's products; the space agency has made no such claim for the record. And the order restricts the company's R-value claims in their sales presentations.

One of the advertisements by an Eagle Shield independent sales associate claimed savings of 45% on a customer's utility bills. The ad has since been condemned by the company, which added that it was the result of a misinformed sales representative.

Another misleading message came through a 1986 Eagle Shield video in which President Sam Caster assumes that

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a "typical" utility bill is \$150 per month, and a typical Eagle Shield installation costs \$695, and cites Oak Ridge National Laboratory's (ORNL) conclusions that demonstrated a 17.1% reduction in energy costs, which would produce utility bill savings of \$25-30 per month. Which, if installation costs were spread over three years, would mean that energy savings would at least pay for installation and even save money.

But the ORNL study calculated cooling savings only in summer to "shoulder" months, not annual savings. A later study, also by ORNL,<sup>1</sup> found that heating energy savings are not nearly as dramatic as cooling savings. In these tests, a house with a radiant barrier and R-30 insulation reduced its heating load by only 3 to 4% as compared to a house with the same insulation and no radiant barrier. In houses insulated only to R-11, a horizontal radiant barrier made more of a difference; it saved 8 to 10% of heating load. But among these R-11 houses, the one truss-type radiant barrier installation actually *increased* heating load by 0.8%, presumably because it effectively cut down winter solar gain. While this is a minuscule increase, it does not exactly go along with the advertising claims.

More importantly, the tape claimed that Eagle Shield saves 17.1% of *total* energy cost, which should be construed to mean the whole utility bill, including hot water heating as well as non-heating electricity use. ORNL's study found a 17.1% reduction in summer cooling load only, not in the entire summer utility bill. Eagle Shield has since revised its video.

### Buyer Beware

Because of the misinformation and lack of comprehensive data, the marketplace is "ripe for unscrupulousness," says Nisson. Dennis Creech, executive director of the Atlanta-based Southface Energy Institute, goes even further, declaring, "The false claims are the result of greed, pure and simple. And a lot of local sales personnel believe what they're told by the regional office people." Creech's opinion is based on literally "hundreds of interviews" with prospective customers investigating energy saving products, he adds.

The Sacramento Municipal Utility District (SMUD) has also been bombarded with questions from skeptical customers and salespeople who want to check out outrageous claims. Sacramento's climate, with its long, hot, dry, sunny summers, is the kind where radiant heat is a bigger problem than in most areas of the country, so it should be easier for radiant barriers to be cost-effective there than most parts of the country. Unfortunately, the area is seeing correspondingly high prices. "There are salesmen in the Sacramento area who are selling radiant barrier for over \$1.00 per square foot," says Principle Demand-Side Planner Richard Kallet.

Creech adds, "A reasonable cost is 10-15 cents per square foot. Radiant barriers are not being installed correctly and they need to be installed at a fair price." The greatest defense is to shop around. See the box for a

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**RADIANT BARRIER, INC.**

#### Some radiant barrier companies use the "spaceman motif."

Radiant barriers are in fact very effective in outer space, where virtually all heat transfer is radiant rather than conductive. Note that this ad claims that the product "reflects heat (97%)," implying that it reflects all heat, not only radiant heat.

sampling of the variety of price quotes one can get over the phone.

#### Legitimizing Radiant Barriers

Although Nelson says several manufacturers are now close to meeting Minnesota's criteria of acceptable insulation products, the most contentious remaining issue has yet to be completely resolved: equivalent R-value. That will probably be determined by some variation to the ASHRAE Handbook's tables on emissivity as a function of resistance to heat flow. "Some of the major hurdles have been overcome," reports Nelson. "Now it is a matter of public statements that are acceptable to both our office and the manufacturers. We need something for prospective consumers of these products to look at."

The Wichita, Kans.-based National Energy Specialists' Association (NESA), tries to legitimize the trade via two programs. First, NESA has introduced a warranty program to which manufacturers can subscribe. Second, the association has a "certified energy specialist" designation, for which sales personnel may apply by taking an examination.

Meanwhile, an April 26, 1989 amendment to the Texas injunction against Eagle Shield now limits what the company may say with respect to warranties. If Eagle Shield

uses a "satisfaction guarantee or warranty of any type," they must include the statement: "Notice: This conditional satisfaction guarantee is not a guarantee of any specific energy savings or of a specific payback period."

The Reflective Insulation Manufacturers Association, the radiant barrier trade group, has been active in promoting sane marketing. RIMA has also specifically recommended against horizontal installation of barriers, due to concern about dust and moisture accumulation until these concerns are proven unfounded by research. The organization is also considering a petition to ask the FTC to issue an equivalent R-value for radiant barriers, as well as similar standards to those in Minnesota.

If adopted, Howerton at the FTC explained that the commission would have to consider one of the following three choices: 1) granting radiant barriers exemption from current insulation product requirements (by showing that R-values are inappropriate for radiant barriers); 2) creating a new test designed specifically for radiant barriers; or 3) finding new procedures within the existing tests.



Some radiant barrier salesmen have been known to exaggerate savings from their product.

## Annie, Get Your Staple Gun

If you find a reasonable price, here is a short list of things to consider when installing radiant barriers in retrofit situations as well as in new construction.

1. Install in a well-ventilated attic in order to allow heated air to escape.
2. Tack the foil to the attic trusses, with the shiny side facing down, or in the horizontal method, with the

### Partial Price List

Following are prices for double-sided materials except as noted. All products are quoted for retrofit application, for a 1,000-sq. ft. attic in a roof-decking configuration, unless otherwise noted. Installation, shipping, and tax are not included unless noted. Prices were quoted without on-site visits; prices are manufacturers' estimates over the telephone.

#### Eagle Shield, Inc.

2006 North Hwy. 360  
Grand Prairie, TX 75050  
(214)641-9655  
Price: \$785/1,000 sq. ft. roll; quoted 30 cents/sq. ft. for orders of more than 10,000 sq. ft.  
Comment: Installation "ballpark estimate" of 10 cents/sq. ft. not included on purchase price.

#### Energy Saver Imports, Inc.

P.O. Box 387  
Broomfield, CO 80020  
(303)469-1787; (800)288-3645  
Price: 15 cents/sq. ft.  
Comment: Comes in single sided too (12 cents/sq. ft.); rolls are 4 ft wide by 375 ft. long. Perforated or non-perforated products are available.

#### Fi-Foil Co., Inc.

612 Bridgers Ave. W.  
Auburnbale, FL 33823  
(813)965-1846  
Price: 7 cents/sq. ft., plus tax — single-sided non-perforated products only.

#### Fortifiber Corp.

P.O. Box 959  
Attleboro, MA 02703  
(508)222-3500  
Material price: 6 cents/sq. ft.  
Comment: Material is reinforced foil. Rolls are 50" x 120'.

#### Insul-Tray Inc.

P.O. Box 3111  
Redmond, WA 98073-3111

(206)861-0525

Price: 11 cents/sq. ft.  
Comment: Insul-Tray also sells radiant barrier panels which sell for \$1.83 for the 24"x48" size and \$1.28 for 16"x48".

#### Key Solutions

7529 E. Woodshire Cove  
Scottsdale, AZ 85258  
(602)948-5150  
Price: 12 1/2 cents/sq. ft.  
Comment: For a 1,000-sq.-ft. application, two 500-sq.-ft. rolls would be needed. Mentioned "a lifetime guarantee."

#### Made in USA (formerly Energy Components and Controls)

127 South Ave.  
Marietta, GA 30060  
(404)422-4363  
Price: 9 1/2 cents/sq. ft.  
Comment: Comes in rolls 4 feet wide and either 250 or 375 ft. long, i.e. 1,000 and 1,500 sq. ft. rolls — large for residential application.

#### Parsec Inc.

P.O. Box 551477  
Dallas, TX 75355-1477  
(214)341-6700; (800)527-3454  
Price: 25.8 cents/sq. ft.  
Comment: National headquarters deferred to its California representative, which quoted \$206 per 800-sq.-ft. roll, which pro-rated works out to be 1.25 rolls that would be needed in a 1,000-sq.-ft. application. Product is single-sided.

#### Ra-Bar Products, Inc.

3815 North U.S. 1, Suite 3  
Cocoa, FL 32926  
(407)636-4104  
Price: 12 cents/sq. ft.  
Comment: Product in retrofit application is either single or double-sided and is perforated.

#### Radiant Energy Barrier Co.

5656 Isabelle Ave. 3C  
Port Orange, FL 32127  
(904)761-8840  
Price: 30 cents/sq. ft.  
Comment: Loose-laid on attic floor application is a different material and costs 20 cents/sq. ft.

#### Reflectix, Inc.

P.O. Box 108  
Markleville, IN 46056  
(800)233-3645  
Price: 49 cents/sq. ft.  
Comment: National office would not quote a price but referred to a regional rep, who quoted above price, then quoted an approximate price of 99 cents/sq. ft. for a package of attic fans with thermostats to aid attic ventilation. Later estimate also included installation and warranties.

#### R-Fax Technologies, Inc.

661 E. Monterey  
Pomona, CA 91767  
(714)622-0662  
Price: 12 1/2 cents/sq. ft.  
Comment: Price is for 1,000-sq.-ft. min-order (\$125); or \$62.50 per 500-sq.-ft. roll. Both prices include tax and shipping.

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reflective side up, so that it faces the airspace. In new construction, save time by draping the aluminum over the trusses before sheathing.

3. Truss installation minimizes dust accumulation on the shiny side.
4. Consider shingle warranties before installation. Be sure that the radiant barrier material does not void the warranty. In normal circumstances, it shouldn't because radiant barriers don't raise the roof temperature more than a few degrees and most roofing material is designed to withstand wide temperature swings. ■

### Endnote

For further reference: J.D. Ned Nisson. *Radiant Barriers: Principles, Practice, and Product Directory*. Arlington, MA: Cutter Information Corp. 1989.

1. W. Levins and M. Karnitz, 1988. "Heating Energy Measurements of Single-Family Houses with Attics Containing Radiant Barriers in Combination with R-11 and R-30 Ceiling Insulation." Oak Ridge National Laboratory, Oak Ridge, TN.



## ENERGY EXCHANGE

The Newsletter For Weatherization Professionals

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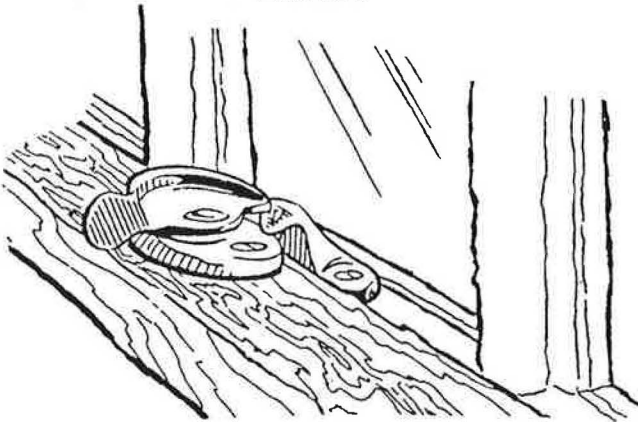
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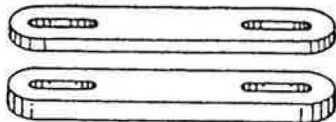
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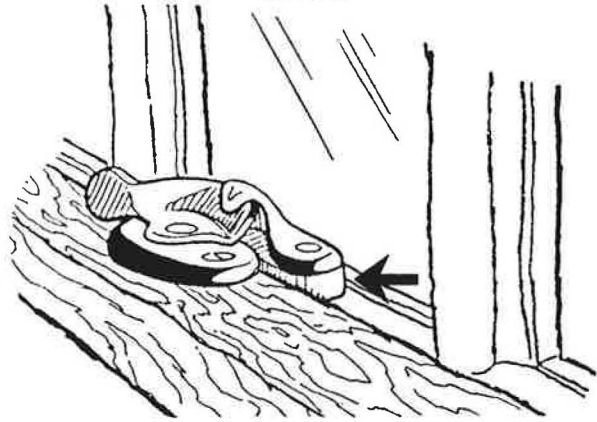
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