

## Energy Savings with White Roofs

A white elastomeric roof coating reduced air conditioning energy consumption by 25% in one home and 43% in a second home during a five-week field study performed by the Florida Solar Energy Center (FSEC). The FSEC project is one of the few studies to document actual impact of white roofs on energy use. The final report, released last month, concludes that elastomeric white roof coatings, though expensive, are a cost-effective retrofit in some situations, and that white roofs in general should be cost effective for new construction.

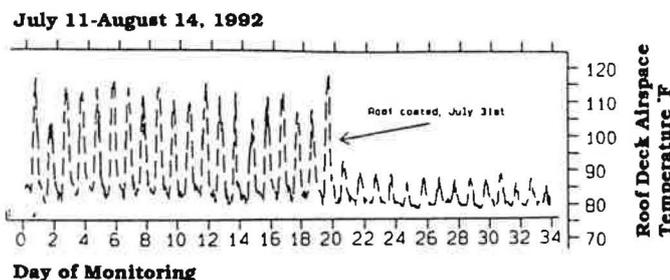
### Worst-case test

The impressive results from the FSEC tests are largely explained by the poor condition of the two homes prior to retrofit with white coating. One had only R-11 attic insulation; the other had no attic insulation. In both homes, the air handler and distribution ducts for the air conditioning system were located in the attic.

Before the retrofit, attic air temperature peaked around 110°F during the test period; after the roof coating was applied, peak temperatures dropped to about 85°F (Figure 2). The cooler



Figure 1 — Danny Parker, principal investigator for the FSEC study, applying elastomeric coating over existing roof.



SITE #2: EFFECT OF REFLECTIVE ROOF COATING

Figure 2 — Attic air space temperature before and after application of white roof coating.

attic temperature not only reduces conduction through the ceiling, but also reduces heat gain into the duct distribution system.

### Painting the roof versus adding attic insulation

For southern homes with only R-11 attic insulation, might it be more cost effective to paint the roofs white rather than add more attic insulation? Maybe, said Danny Parker, principal investigator in the FSEC study. One advantage to roof coating, he said, is that it reduces heat gain to the ducts as well as heat gain through the ceiling. On the other hand, the coatings are much more expensive (materials cost from \$.30 to \$.70 per square foot) than blow-in insulation. Even with the impressive savings, the simple payback period is almost 20 years, Parker said. But he believes that reflective roof systems will become more cost effective as new products, such as reflective shingles, are developed.

### New construction — white shingles no good

There are few data on the energy efficiency benefits of reflective roof surfaces on new homes with high R-value attic insulation. One FSEC test on a home with R-25 cellulose attic insulation showed 10% energy savings from roof-coating retrofit.

The good news is that there are several types of reflective roofing materials on the market, including metal roofing, concrete tiles, single-ply roofing, and aluminum shingles. For new home building, the extra cost of reflective over non-reflective products is essentially zero.

The bad news is that there are no reflective asphalt shingles. Even "white" asphalt shingles, despite their appearance, are not very reflective. A recent report from Lawrence Berkeley Laboratory, written by Haider Taha, states that "snow white" asphalt shingles have a reflectivity of only 24% and will absorb five times as much solar heat as white paint.

In fact, white shingles are not much better than grey shingles for reflecting solar heat. This is illustrated by the graph in Figure 3, which shows the measured deck temperatures of roofs with three different coatings, including white shingles, grey shingles, and white paint. Notice that the white shingles are only about 13°F cooler than the grey shingles, compared to the white elastomeric coating, which is 50°F cooler.

FSEC's Parker told **EDU** that the technology exists to produce reflective white shingles. For example, 3M has a white quartz product with high reflectivity. But manufacturers do not yet perceive a demand for the product. One practical problem may be that asphalt shingles, as currently designed, depend on high temperature for heat sealing.

For more information, contact Danny Parker, Florida Solar Energy Center, 300 State Road 401, Cape Canaveral, FL 32902; (407) 783-0300. The project report, *Measured Air Conditioning Electricity Savings from Reflective Roof Coatings Applied to Florida Residences* (FSEC-CR-596-93) is available for \$25 from FSEC. ♦

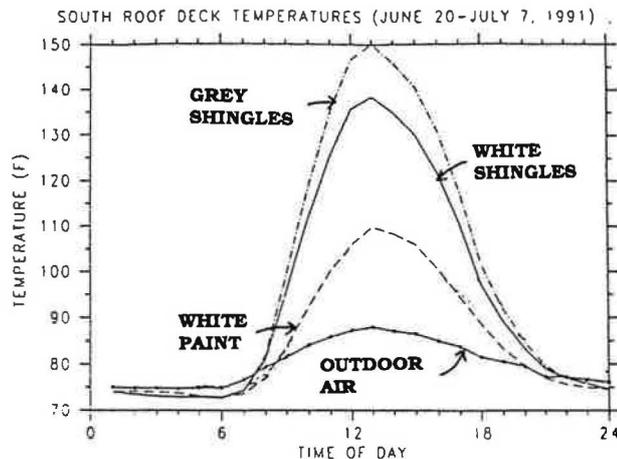


Figure 3 — Daily deck temperature variation for roofs with various types of coatings. Source: FSEC.

## “Foamless” Energy-Efficient Foundation System from Oak Ridge Lab

As part of a comprehensive research project on foundation energy efficiency, scientists at Oak Ridge National Laboratory have developed a unique new R-12 foundation system. According to visiting Polish scientist Jan Kosny, the new system should be as practical as anything currently on the market, and, because it does not include plastic foam, should eliminate problems of termite penetration in and around foundation insulation.

Kosny's system consists of interlocking inner and outer concrete panels that are dry stacked without mortar. The outer panels are structural, and the inner panels, made of lightweight concrete, provide thermal resistance. The lightweight concrete should have high enough R-value so that no foam or other insulation is necessary to attain an R-value of R-12.

### Better than Sparfil?

Sparfil blocks, developed by Sparfil International, Inc., of Concord, Ontario, Canada, are also made of insulating concrete and dry stacked without mortar. But Sparfil walls require surface bonding with reinforced stucco or another surface bonding agent for structural strength. Not so with Kosny's system. Except for aesthetic reasons, no coating is required on either side.

Oak Ridge is currently seeking patent protection and working with the National Concrete and Masonry Association to test prototypes of the new system.

For more information, contact Jan Kosny, Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, TN 37831; (615) 576-5454. ♦

## This Month's “Believe It or Not” — Shiny Versus White Surfaces for Solar Control

### Quiz question:

What would be more effective for reflecting solar heat from a building roof: Shiny aluminum foil or flat white paint?

### Answer:

The white painted surface. Even though aluminum foil appears much more reflective, the white paint will actually reject more solar heat.

### The explanation:

The explanation for this surprising phenomenon is included in a report on air conditioning savings from the use of roof coatings, published last month by the Florida Solar Energy Center (see summary, page 6). FSEC's Danny Parker, principal author of the report, explained why it is true and described a simple demonstration for nonbelievers.

Although aluminum foil appears much shinier than white paint, its actual reflectivity for visible