ORNL roof and attic design proves efficient in summer and winter

EurekAlert!

A new kind of roof-and-attic system field-tested at the Department of Energy's Oak Ridge National Laboratory keeps homes cool in summer and prevents heat loss in winter, a multi-seasonal efficiency uncommon in roof and attic design.

The system improves efficiency using controls for radiation, convection and insulation, including a passive ventilation system that pulls air from the underbelly of the attic into an inclined air space above the roof.

"Heat that would have gone into the house is carried up and out," says Bill Miller of ORNL's Building Envelope Group. "And with a passive ventilation scheme, there are no moving parts, so it's guaranteed to work."

The new roof system design can be retrofitted with almost all roofing products. The heart of the design is a foiled covered polystyrene insulation that fits over and between rafters in new construction or can be attached on top of an existing shingle roof system. Homeowners don't have to remove old shingles, which saves money.

Poorly sealed HVAC ducts leak conditioned air into an attic, which typically costs homeowners $100 to $300 per year based on ORNL computer simulations.

To address the problem, some homeowners pay $8,000 to seal the attic with spray foam, which can save upwards of $460 a year. For less initial cost and the same number of payback years, homeowners can retrofit the attic with the new design for about $2,000 and save $100 a year.

Looking to the future, Miller and colleagues are working on designs with lower initial installation costs, and greater cost-effectiveness overall.

The paper, "Prototype Roof Deck Designed to Self-Regulate Deck Temperature and Reduce Heat Transfer," was published by the National Roofing Contractors Association. Authors on the paper are W. Miller, Stan Atherton and Russell Graves of the University of Tennessee, Knoxville, and Billy Ellis of Billy Ellis Roofing.

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