

Michaels Engineering Energy Brief

COOL ROOFS IN COLD CLIMATES

SUGGESTIONS...

Do you have certain Energy Efficiency topics you'd like to know more about? Send an email with your suggestion to the author listed below and your topic might become a future Energy Brief!

DID YOU KNOW...

...Energy Star roofs are best suited for southern regions.

...Cool Roofs may only save 1/2¢ per square foot on buildings in a heating-dominated climate.

MEET THE AUTHOR



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→ IS A COOL ROOF NEEDED?

"Cool roofs" and Energy Star roofs have started to penetrate the market here in the upper Midwest. While benefits to installing cool roofs do exist, they may not save significant energy in a heating-dominated climate. The question is, "Should I install a cool roof on my building?"

→ WHAT IS A COOL ROOF?

Stated simply, a cool roof is bright and reflective. A cool roof reflects most incident solar radiation back to the atmosphere rather than allowing it to be absorbed by the surface. The solar energy that isn't reflected is absorbed and much of it can be conducted into the building. Most cool roof materials have a high emittance, which further reduces the amount of heat conducted into the building.

→ ENERGY IMPACTS OF A COOL ROOF

The purpose of cool roofs is to save energy by reducing the cooling load associated with the solar gain that makes its way through the roof structure. For heating-dominated northern climates like the upper Midwest, the required roof insulation level makes the roof reflectance nearly irrelevant with regard to heat gain. In other words, the surface temperature of the roof has a minor impact on the solar energy that gets into a building with such heavily insulated roofs.

Oak Ridge National Laboratory studies have shown that the greatest energy impacts are achieved by installing a cool roof in a cooling-dominated climate on a poorly insulated building.¹

Installing a cool roof does not decrease the heating load. In fact, a cool roof may lead to a heating penalty by reducing the heat gain to the building when it may be needed for the space.

→ SOME SECONDARY BENEFITS OF COOL ROOFS

Cool roofs have secondary benefits in addition to direct cooling-energy savings:

- Cool roofs help reduce heat island effect in urban centers by reflecting solar energy back to the atmosphere rather than absorbing it in building structures.
- Cool roofs decrease the peak roof temperature. This prolongs the life of the roof by reducing expansion and contraction caused by large temperature swings from day to night.
- Cool roofs provide an excellent barrier against water leakage, which can significantly compromise the effectiveness of the roof insulation.
- Cool roofs allow for more efficient cooling system operation when cooling equipment is located on the roof.

→ THE ENERGY BOTTOM LINE

Cool roofs will typically save 5-15% of cooling energy and require 3-7% more heating energy in heating dominated climates. Since in northern climates, heating costs per square foot are roughly three times that for cooling, the overall dollar savings are not substantial. Overall, a cool roof installation may only save 1/2¢ per square foot, out of a total heating and cooling cost that is typically 60¢ per square foot.

¹ Roof heating and cooling loads in various climates for the range of solar reflectances and infrared emittances observed for weathered coatings. Wilkes, K.E., T.W. Petrie, J.A. Atchley, and P.W. Childs. 2000.

