COLD CLIMATE HOUSING RESEARCH CENTER
CCHRC

Promoting and advancing the development of healthy, durable and sustainable shelter for Alaskans and other circumpolar people.

Can Paint Help Insulate Your Home?

A Product Test

Robbin Garber-Slaght and Colin Craven, CCHRC
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Introduction
Can lowering your home heating bill be as simple as applying a fresh coat of paint? There are paint products on the market that claim to cut 20%, 40% or even 70% off your heating bill. It's an appealing idea that sounds too good to be true. Because it is critical in Alaska's extreme environment that home construction methods are effective at ensuring that the home is energy efficient and comfortable, CCHRC designed a study at the request of the Alaska Housing Finance Corporation to test such claims. The CCHRC Product Testing Lab (PTL) chose two products sold as insulating paint and evaluated their effectiveness in reducing heat loss. Results from our tests did not identify any thermal improvements attributable to the products in tests designed for cold climate applications.

Objectives
We had two main objectives for this study. One was to determine the paints thermal resistance properties by using standard test methods. If they reduced heat loss through conduction or infrared radiation (two of the three forms of heat transfer), this would be reflected in test results on samples. We did not address air permeance or other measures of heat transfer by convection on the assumption that paint would not be relied on as an air barrier. The second study objective was to simulate a real-world application to determine if the paints would save energy when applied to the walls and ceiling of a test box subjected to temperatures below freezing.

The Testing Process
To determine the paints resistance to heat loss by infrared radiation we had the emittance of each coating tested by Air-Ins, an accredited test laboratory in Montreal, Canada.

Construction of the test boxes in progress

Air-Ins determined the emittance of the applied products using ASTM Test Method C1371. Both products had an emittance of about 0.9, which is the same as most building supplies such as nonmetallic paint, wood and masonry. Low emittance materials, such as aluminum foil or sheets, have an emittance of approximately 0.05 to 0.1. Therefore the test findings indicate that neither product is an effective inhibitor of heat loss by radiation.

To determine the paints resistance to heat loss by conduction, CCHRC determined the thermal conductivity of the paints using a modified version of ASTM Test Method C518. Untreated gypsum boards were tested in the PTL thermal conductivity analyzer, and then the boards were re-tested after being treated with one of the paints. The thermal conductivity of the coating was determined from the difference in thermal conductivity between the untreated and treated specimens. Using the thermal conductivity and thickness of the specimens, we calculated their R-value attributable to conduction. The higher the R-value, the better the material is at reducing heat loss. Figure 1 shows that there was al-

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Cold Climate Housing and Research Center, P.O. 82489, Fairbanks, AK 99708.
Phone: (907) 457-3454, Fax: (907) 457-3456, Email: info@cchrc.org

most no change in the R-value of the gypsum board coated with the one paint, and that there was a decrease in the R-value with the other. Examples of conventional thermal insulation are provided in Figure 1 for comparison.

To demonstrate how these paints perform in a home we built three insulated boxes that simulate typical home construction techniques. The boxes were three feet long on all sides. They were constructed of 2x4 framing with fiberglass insulation, vapor barrier and gypsum board on the inside and OSB sheathing on the outside. The floor and the lid were insulated with four inches of extruded polystyrene insulation. Electric heaters were added to the boxes, along with power monitoring equipment and temperature sensors. The boxes were first tested outside without any coatings to determine if the energy needed to maintain 70°F in the box interiors was the same. Once we determined that this was the case, two of the boxes were painted with the test products on the inside, the third was left plain. They were tested outside overnight several times to see if there were any differences in the energy input due to the coatings. Figure 2 illustrates that there is very little difference between the control box and the boxes with interior coatings of the tested paints.

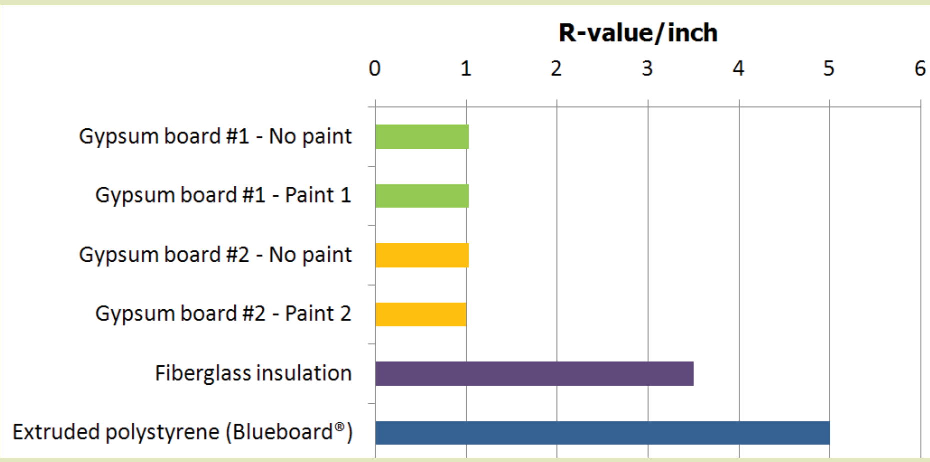

Figure 1. R-values per inch of the samples relative to common insulation materials

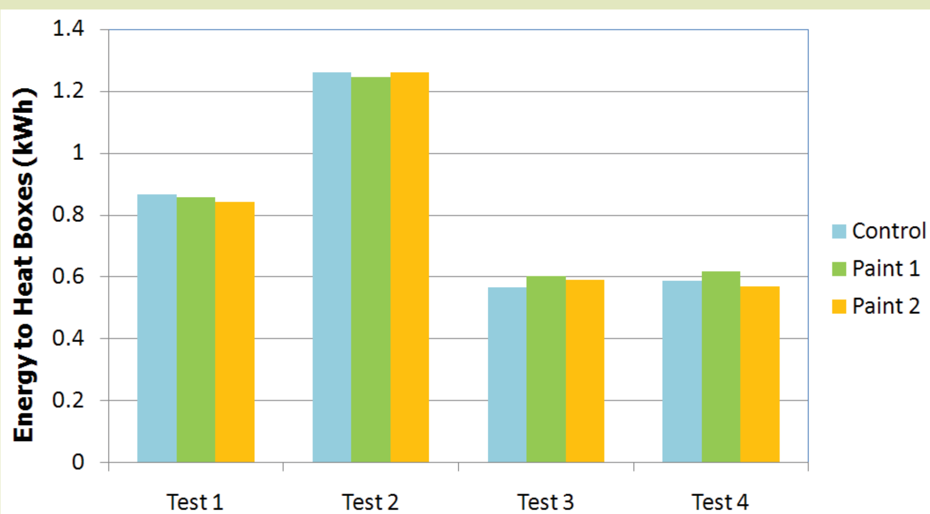

Figure 2. Similarities in energy performance

Results and Conclusions

Saving 20% to 70% on your heating bill isn't easy. Experience shows that energy efficiency retrofits of homes in Alaska require a strategy that is tailored to the needs of the home. It would be simpler if we could reduce this burden to only applying a fresh coat of paint, however, based on our tests of two products sold as insulating paint, this is not an effective approach for homes in cold climates. It is possible that there are other scenarios where these products could be effective in reducing energy costs for residential homes. One of the paints we tested is currently an Energy Star-qualified product for roof coatings, where the primary goal is reducing solar absorption to decrease air conditioning loads. Such considerations were not included in our tests, as they are not considered of primary importance for Alaska's climate.

There are many more insulating paints sold on the market than CCHRC can evaluate, and certainly new products will appear in the future. When evaluating such products, we advise that you place the burden of proof for establishing thermal performance on the manufacturer. Most insulation available on the market provides relevant technical information, such as R-values, derived from standard test methods, similar to what CCHRC has done in this report.