Ask Jon Eakes

WILL REFLECTIVE FOILS HELP TO INSULATE MY WALLS?

Last Updated: Wednesday, November 30th, 2016, Created: Thursday, October 14th, 1999

Yes but no. (I thought you'd like that one.)
Aluminum reflectors will turn back RADIATION heat losses into the house, and in fact help to limit heat losses. However, they will only work if there is at least a half-inch air space in front of the reflective surface and the surface remains clean and shiny. In addition, in cold northern climates, the reflective heat losses that they turn back are almost negligible as most northern heat losses are due to conduction and convection. Also, our strong conductive heat losses tend to carry dirt to the reflective surface. To the extent that they do work to reflect heat, they also reflect solar gains back outside.
In theory, reflective foils help stop some heat losses but in the reality of cold northern climates they do very little and their necessary air space is better used by filling it with insulation. A good rule of thumb is to consider their reflective value as just about useless in regions colder than 4,500 Degree Days Celsius. Click here for the Canadian Degree Day Map.
Aluminum foil skins on some foam insulation panels are there to prevent the escape of insulating gasses; such as neon. Although these are excellent (and expensive) insulation panels, claims about their reflective properties come from these company's advertising departments, not their engineering departments.
In the US, there exist whole insulating systems based entirely on aluminum that create single and double channels made of aluminum foil inside the stud walls. They come rolled up in neat packages and, when stretched, pop up like fancy Christmas cards and fill the wall cavities like fiberglass batts. In warmer regions of the US this system seems to work for Air Conditioning loads, but in Canada they were refused building code acceptance years ago. The difference in temperature between the inside and the outside of a Canadian house is so great, combined with the fact that it is impossible to seal these channels at the top and bottom of each wall, that they act as cold pumps inside the walls due to the convection currents inside the foil channels. They actually reduce the insulating value of the empty wall. The National Research Council recorded negative R values when they tested aluminum foil channels in Canada.
More recently Canadian companies have begun to promote bubble packs with aluminum facings as insulating materials, even claiming great insulation value under concrete floor slabs. These companies even ignore the requirement for the foil to remain clean and to have an air space facing the reflective surface. Canadian government testing has shown these bubble wraps to have no insulating value at all under a concrete slab.
WHERE REFLECTIVE FOILS DO WORK
Now, the other side of the picture and a different part of the continent -- reflective foil and foil faced insulation systems, even reflective paints are very effective in the South, in an Air Conditioning climate. Here they are reflecting the very high temperatures of the sun to help keep the house cool. In Florida it is common to find simple sheets of aluminum foil stapled to the underside of the roof rafters and that serves as effective attic insulation.
The important difference between a heating and an air conditioning climate is that in a heating climate we are trying to keep heat in that is being radiated at relatively low temperatures, like the temperature of the human body, while in an air conditioning climate we are trying to keep heat out that has an extremely high temperature source, the sun. Reflective foils work better with higher temperature sources. Generally speaking, radiant barriers are part of good building science in a climate where air conditioning is far more important than heating. They are placed shiny side to the outdoors with at least a half inch air space in front of that reflective surface. Foil covered wall insulation would have

strapping between the foil and the siding. In a heating climate we want all the solar warming we can get; although reflecting the suns heat away from the house could be useful in the summer it just doesn't make sense to reflect winter solar energy away from the house. Conductive thermal insulation works well in both climates and is the best bet where air conditioning does not dominate the annual fuel costs.

Keywords:
R-Value, Heat Loss, Radiant, Reflective, Walls, Insulation