



Cost of Cool Roofing

Overall Energy Savings Depends on the Climate

by Craig A. Tyler, architect and specification developer, Carlisle Construction Materials



The use of white reflective roofing materials as an energy-efficient solution throughout the United States and Canada has grown in popularity in recent years. This has been driven by the efforts of voluntary green building initiatives, as well as codified systems such as Cool Roof Rating Council's CRRC-1 Standard in use in California's Title 24.

This method of energy savings is expected to save air conditioning costs wherever it is used geographically, during the summer months. This may work well in warm Southern climates, but as you move North, the amount of air conditioning used is outweighed by the amount of heat needed to maintain a comfortable indoor environment. It's important for roofing contractors and design professionals to rethink their use of cool roofing in every climate, but especially those in colder Northern climates.

Energy Costs

Reflective roofing materials, when properly designed and installed, can provide a savings in building cooling costs in warm summer months by reflecting UV radiation away from

the roof thereby keeping the roofing material cooler, allowing for the roof insulation to work more efficiently at keeping the building cooler. During the winter months, the same materials, keep reflecting the UV radiation and also keep the roofing materials cooler which means the roof insulation is not as efficient in keeping the building warmer. When calculating the savings in energy, the winter heating penalty is subtracted from the summer cooling benefit, resulting in a net savings, hopefully a positive number. Using the Department of Energy (DOE) and Oak Ridge National Laboratory (ORNL) Roof Savings Calculator¹, major cities in various American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Climate Zones were selected for a cost comparison of using white reflective roof material for a one story, 50,000 sq.ft. office building, R-20 insulation above deck and low slope roof construction. The net energy savings, shown in the table above, are positive for Phoenix and Los Angeles with the remainder of the cities showing a net loss from using reflective membranes.

The use of darker colored roofs

show a net energy savings in Salem, Seattle, Albuquerque, Boulder, Billings, and Salt Lake City where they are typically heating their buildings much more than they are cooling them. The use of reflective membranes on school buildings in northern climates can be an example of "all pain and no gain" since many of them are closed during the summer and the air conditioning is not running. Warehouses and manufacturing facilities are other building use types that are frequently heated but not cooled where a reflective membrane will result in higher energy bills for their owners.

Conclusion

A roofing system should be selected based on geographic location, occupancy, service life, and level of insulation during the design process. Cool reflective roof materials are better suited for Southern climates where the bulk of a building owner's energy costs are spent on air conditioning. Darker colored non-reflective roof materials are more energy-efficient in colder Northern climates where building owners spend the bulk of their money on heating.