



Energy Efficiency and Renewable Energy
Federal Energy Management Program

How to Buy “Cool” Roof Products

Why Agencies Should Buy Efficient Products

- Executive Order 13123 and FAR section 23.704 direct agencies to purchase products in the upper 25% of energy efficiency, including all models that qualify for the EPA/DOE ENERGY STAR® product labeling program.
- Agencies that use these guidelines to buy efficient products can realize substantial operating cost savings and help prevent pollution.
- As the world's largest consumer, the federal government can help “pull” the entire U.S. market towards greater energy efficiency, while saving taxpayer dollars.

Federal Supply Source:

- General Services Administration (GSA)
Phone: (817) 978-8640

For More Information:

- DOE’s Federal Energy Management Program (FEMP) Help Desk and World Wide Web site have up-to-date information on energy-efficient federal procurement, including the latest versions of these recommendations.
Phone: (800) 363-3732
www.eren.doe.gov/femp/procurement
- EPA lists vendors of ENERGY STAR® roofing products and offers other information to help select energy-efficient roofing.
Phone: (800) 782-7937
www.energystar.gov
- Lawrence Berkeley National Laboratory provides valuable information on energy-efficient roofing, including the solar reflectance and emittance of various roof materials.
eetd.lbl.gov/coolroof
- National Roofing Contractors Association (NRCA) provides a number of helpful guides on roofing products and installation.
Phone: (847) 299-9070
nrca.net
- Lawrence Berkeley National Laboratory provided supporting analysis for this recommendation.
Phone: (202) 646-7950

Efficiency Recommendation^a

Roof Slope	Recommended Solar Reflectance		Best Available Solar Reflectance ^b	
	Initial	3 years after Installation	Initial	3 years after Installation
Low-slope (< 2:12)	65% or greater	50% or greater	87%	85%
High-slope ^c (≥ 2:12)	25% or greater	15% or greater	77%	60%

- a) Following this recommendation will provide the greatest benefit where cooling energy costs exceed heating costs.
- b) To receive these solar reflectance ratings, roof products must be tested when new and after three years of exposure, according to ASTM E-903 and the Energy Star Roof Products Memorandum of Understanding (see “For More Information”). Initial reflectance may decrease over time, depending on the product, due to aging, dirt, and microbial accumulation.
- c) For products that can be installed on both low- and high-slope roofs, “Low-slope” guidelines should be followed.

The federal supply source for roofing products is the General Services Administration (GSA), which offers them through Federal Supply Schedule 56-IV(A), “Construction and Building Materials.” In order to reduce cooling costs, be sure to specify roof products that meet the recommended levels, whether buying from GSA or through a contractor. All products with the EPA/DOE ENERGY STAR® label meet this Efficiency Recommendation.

There are three properties to look for when selecting a roof material to reduce building cooling load: 1) high solar reflectance, 2) endurance of high reflectance over time, and 3) high emittance. The ENERGY STAR program presently considers reflectance only, not emittance. High emittance lowers roof temperature by increasing the release of heat by thermal radiation. To ensure a high-

Definitions

Roof products include single-ply membranes, built-up roof surfaces, asphalt shingles, metal roof tiles, and roof coatings.

Solar reflectance, or albedo, is the fraction of incoming direct and diffuse solar radiation reflected by a surface. Materials with high solar reflectance values absorb less of the sun’s energy and therefore stay cooler, reducing daytime air conditioning requirements.

Where to Find “Cool” Roof Products



Buyer Tips

emittance roof, avoid unpainted metal roofs and aluminum coatings. If installing a metal roof, make sure it is painted a light color (not with a clear coating).

Choose an installer carefully to ensure proper installation of the roof product or roof coating that will maximize durability and solar reflectance. The National Roofing Contractors Association (NRCA) provides some helpful advice in its “Guidelines for Selecting a Roofing Contractor” (available on the NRCA Web site, see “For More Information”). Roofs should be properly examined at regular intervals and maintained or cleaned when necessary and appropriate to assure the maximum solar reflectance.

Installation and Usage Tips

Roof Product Cost-Effectiveness Example				
4,900 sq. ft. Office Building – Washington, DC and Phoenix, AZ				
<i>Performance</i>	<i>Base Model</i>		<i>Recommended Level</i>	
<i>Roof Product Description</i>	Black EPDM ^a		White EPDM ^a	
<i>Initial Solar Reflectance</i>	6%		69%	
<i>3-year Solar Reflectance</i>	8%		58%	
<i>Geographic Location</i>	<i>Wash., DC</i>	<i>Phoenix</i>	<i>Wash., DC</i>	<i>Phoenix</i>
<i>Annual Heating Energy Use (therms)</i>	870	46	930	60
<i>Annual Cooling Energy Use (kWh)</i>	20,700	40,400	19,300	37,300
<i>Annual Energy Cost</i>	\$1,590	\$2,440	\$1,530	\$2,260
<i>Lifetime Energy Cost</i>	\$17,100	\$25,600	\$16,500	\$23,800
<i>Lifetime Energy Cost Savings</i>	-	-	\$600	\$1,800

Definition

Lifetime Energy Cost Savings is the sum of the discounted value of annual energy cost savings, based on average usage and an assumed roof life of 15 years. The assumed gas and electricity prices are 40¢/therm and 6¢/kWh, the federal average gas and electricity prices in the U.S. Future energy price trends and a real discount rate of 3.4% are based on federal guidelines (effective from April, 2000 to March, 2001).

a) EPDM, Ethylene-Propylene-Diene Monomer, is a thermoset elastomer single-ply roofing membrane. All three examples assume that membrane is fully adhered or mechanically attached.

Cost-Effectiveness Assumptions

The examples shown above are from simulations using a modeling program called DOE2. Calculations are based on a prototype existing building: 4,900 sq. ft., one story, flat roof, R-11 attic insulation, R-7 wall insulation, with an average existing efficiency gas furnace and central air conditioner.

Using the Cost-Effectiveness Table

In the example above, new or replacement roofing at the recommended level is cost-effective if the purchase price does not exceed the price of the Base Model roof by more than \$600 in Washington, DC, or \$1,800 in Phoenix. There is generally little or no added cost for high-reflectance roofing.

Metric Conversions

1,000 sq. ft. = 93 sq. meters
 1 therm = 100,000 Btu
 = 29.3 kWh
 = 105.5 MJ

How do I assess the energy savings potential for my situation?

Energy savings from the installation of a high solar reflectance roof product are climate-specific (notice the difference in savings from Washington, DC to Phoenix in the “Cost-Effectiveness Example.”) The greatest savings will occur in buildings located in hot and sunny climates that have a high roof-surface to building-volume ratio (i.e., low-rise buildings), poorly insulated roofs and attic ductwork. Cool roof systems can cause heating costs to rise slightly in winter. In areas with cold climates (e.g., Detroit, Minneapolis) or with cloudy, cool summers (e.g., Seattle or San Francisco), summer cooling savings may be less than increased winter heating costs. The ENERGY STAR[®] Roof Products program is a good source for helping determine the potential for savings on different building types in different climates (see “For More Information”).

