

EPA RELEASES A CALCULATOR FOR ESTIMATING SAVINGS FROM REFLECTIVE ROOFING PRODUCTS

By Steve Ryan and David Korn



Introduction

The EPA ENERGY STAR® program recently released a web-based calculator to help building managers calculate the potential savings they can achieve by installing reflective roofing. The challenge in designing a savings calculation tool is having it provide reasonably accurate results and allowing the user to provide meaningful input, while keeping it simple to use. The roofing calculator accomplishes this by using simple user inputs, such as city name or zip code to access detailed information as in climate records.

The Roofing Calculator

The calculator is based on a series of building simulations run by Lawrence Berkeley National Laboratories using the DOE2 model. A variety of building types was simulated for different climates. These simulations are converted to a set of coefficients within the model that are accessed by users' inputs, such as building type and location. The process is transparent to users.

They provide relatively simple information and the model shows savings based on DOE2 model results. The roofing calculator is available at www.energystar.gov on the products page under roofing products, or can be directly accessed at www.roofcalc.com.

Step-by-Step User Interface

Step 1. Building Details

The user supplies the construction year for the building, its type (retail, residential, or commercial), and the days of the week it operates. These simple pieces of information are used to choose the model runs on which savings are based. The days of operation are used to adjust operating costs and associated savings if the building is cooled less than seven days per week.

Step 2. Heating and Cooling Systems

A reflective roof reduces cooling costs by reflecting sunlight, but in the wintertime can cause a slight increase in heating costs because of reduced warming. To properly account for the savings and for the minor increase in heating costs, the calculator takes into account the efficiency of the building's mechanical systems. The model guides users in choosing their building system's efficiencies. Users can directly enter their furnace's efficiency and their cooling equipment's seasonal energy efficiency ratio (SEER), or they can choose the age or rough efficiency of the equipment and the calculator uses an associated value.

Step 1. Building Details	
Year of construction	Before 1980
Building type	Office
Days of operation per week	5 day(s)

Step 2. Heating and Cooling Systems	
Type of heating system	Gas Furnace
Gas furnace efficiency	Moderate (post 1980) 78%
A/C SEER	Moderate (1982-1992)

Steps 1 and 2

Step 3. Roof Details

The savings available from reflective roofing have an inverse relationship to the level of insulation separating the roof from the cooled space. Users can directly enter the R-value of the insulation in their roof or can enter low (3), medium (11), or high (38), and the calculator will use the R-value in parentheses associated with these insulation levels. The roofing products page also has a direct link to a map provided by the Department of Energy that shows recommended insulation levels by location in the country. Users choose the type of existing roof or for new construction they choose the type of roof that they would have installed. They then choose from several reflective roofs. The calculator accesses reflectivity values associated with the user's choices to calculate energy savings.

Step 3. Roof Details

Roof insulation R-Value Medium (11) ▾

? Existing dark roof solar reflectance Bitumen, Black (.05) ▾

? ENERGY STAR® labeled roof products solar reflectance Membrane, White (.75) ▾

? Conditioned flat roof area (sq. ft.) (Min: 3,000 Max: 1,000,000)

Step 4. Energy Prices

Cost of electricity (cents/kWh) (Min: 2.0 Max: 20.0)

? Cost of natural gas (cents/therm) (Min: 30 Max: 200)

Step 5. Location

? Zip Code

- OR -

City and

State -- ▾

Step 4. Energy Prices

Step 4 of the calculator's user interface asks for energy prices for electricity to value cooling savings. If the building is heated with a heat pump, this price is also used to calculate any heating penalty for the user's climate. If the building heats with gas, the gas price in cents/therm is used to calculate heating costs.

The last information required from the user is simply the building's location. Users can enter the zip code location of the building, or if they wish, the city and state. The interface has a convenient auto-complete feature that helps the user choose from more than 1,200 cities included in the calculator's database. If the user misspells the city name or asks for a city not in the database, the calculator automatically suggests cities spelled similarly to what the user has typed.

Calculated Savings

The calculator displays cooling savings, additional heating costs, and net savings per 1,000 feet of roof and for the total building. The heating and cooling degree days for the city chosen

Steps 3 through 5.

	Per 1000 sq. ft.		Total	
	Qty.	\$	Qty.	\$
Electricity	1,136.13 kWh	\$80.67	11,361.34 kWh	\$806.65
Natural Gas	-2.64 therms	\$-2.64	-26.35 therms	\$-26.35
Total		\$78.03		\$780.30

Weather Details

? Cooling degree days 3016

? Heating degree days 1688

Calculated savings and weather details.

are displayed along with all of the user's supplied information. The savings give users a rough idea of what a roofing choice could save them, with little more than several minutes needed to run the calculator.

How Should the Calculator be Used?

The roofing calculator is an easy-to-use tool to demonstrate the approximate savings available from choosing reflective roofing products. The site can be accessed from other web sites by simply adding a link pointing to www.roofcalc.com. The tool should not, however, be used as a substitute for detailed building simulation. Actual savings will vary depending on the variation between the local weather data and the site's micro-climate, any shading from trees or adjacent buildings, and from a variety of other factors.

For more information on EPA's roofing product program, contact Steve Ryan at ryan.steven@epa.gov. ■

ABOUT THE AUTHORS



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Steven Ryan joined the sales and marketing team at the ENERGY STAR® Labeling Branch in June 1999 and is currently the Program Manager for ENERGY STAR® qualified roof products. Prior

to joining the EPA, Ryan worked as an operations/financial manager for an international solar electric services company with operations in Morocco. Ryan also has a background in retail, including several years as general manager with Staples, Inc. and two years as a performance officer for Wild Bird Centers of America. Ryan

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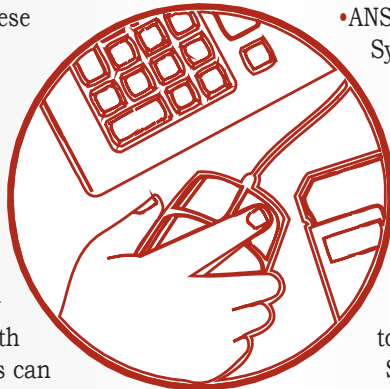
David Korn is with the Cadmus Group, Inc., a company specializing in energy efficiency consulting that is a contractor to the EPA's ENERGY STAR® programs. He has a B.S. in mechanical engineering with a concentration in energy systems from Cornell University and is a certified energy manager (CEM).

SPRI Offers its Standards Free of Charge On-line

In an effort to broaden the distribution of its useful standards, SPRI has announced that all of the SPRI/ANSI (American National Standards Institute) standards will now be available free of charge at its Internet website, www.spri.org.

SPRI, the organization representing sheet membrane and component suppliers to the commercial roofing industry, recently took this generous step to make it easier for contractors, specifiers, architects, building code officials, and other industry groups to access these valuable guidelines. Two of these ANSI/SPRI standards are themselves referenced in U.S. building codes.

Despite the considerable amount of time that SPRI members and staffers spent to develop and ballot these informative consensus standards, the association's board of directors felt that it is more important to try to reach as many people as possible with this helpful information. (Printed copies can still be ordered from the association for a nominal charge.) People can now download these standards to help make sure that roofing systems are being installed in



compliance with codes and are securely and cost-effectively applied as well.

The standards currently available, for free, at SPRI's website include:

- ANSI/SPRI RP-4, 2002, "Wind Design Standard for Ballasted Single-Ply Roofing Systems";
- ANSI/SPRI FX-1, 2001, "Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners"; and
- ANSI/SPRI ES-1, 1998, "Wind Design Guide for Edge Systems Used with Low-Slope Roofing Systems."

More ANSI/SPRI standards are under development. For example, it is expected that one on retrofit roof drains may be ready for publication this fall.

In accordance with procedures set by ANSI, SPRI re-canvasses all its standards every five years. This process keeps them as current and up to date as possible.

SPRI Technical Director Dave Roodvoets explains that ANSI/SPRI consensus standards are unique documents developed to address the industry's need for information and to help facilitate successful roofing installations.