Rebuild America

Sarnafil is proud to have been selected

2002 Rebuild America Energy Champion
Business Partner of the Year

Energy Star® Roofing Systems

Using White Reflective Roofs to Conserve Energy Improve the Environment and Save Money

By Peter D'Antonio
Sarnafil Roofing and Waterproofing Systems

Selecting a Roof System

Important performance criteria:

- 25 year track record
- ability to withstand ponding water
- local contractor base
- ability to be repaired easily over lifetime
- low maintenance costs

Roof System Design

- Design features of a properly designed roof assembly
  - Membrane thickness
    - minimum 60 mil
    - optimum 72 mil
  - Insulation thickness
    - minimum R-30
    - optimum R-38
  - Slope
    - minimum 1/4”/foot

Building Dynamics - The Roof

➔ *The Roof functions as one of the most important features in a building:*

➔ Basic Function: ➔ Provide Weatherproofing

➔ New Impact: ➔ Energy Conservation
➔ Improve Air Quality

Building Dynamics - The Roof

- Roof System Performance has a direct effect

- Indoor Air Quality

  when it doesn't work!

  – **Development of mold**

Urban Heat Islands

- Development replaces natural vegetation with pavement, buildings, and other structures

- These surfaces absorb the sun's heat causing surface temperatures and overall ambient temperatures to rise

- Heat islands reduce livability by increasing temperatures, air pollution, and the incidence of heat related illness and death

The Smog Connection

➔ Urban heat islands are not only hotter but are also smoggier.

➔ Smog is created by photochemical reactions of pollutants in the air and intensify at higher temperatures.

➔ In Los Angeles, for every degree increase above 70F smog increases by **3%.**

1997 EPA Heat Island Reduction Initiative

- 1997 Heat Island Reduction Initiative
  - Urban Heat Island Pilot Project (UHIPP)
  - Energy Star® Roof Products Program with US DOE

Urban Heat Island Pilot Project

- EPA Objective:
- Investigate the use of HIR strategies for the reduction of cooling-energy use and for the reduction of the ambient air temperature and improving air quality

The Energy Star® Roofing Program

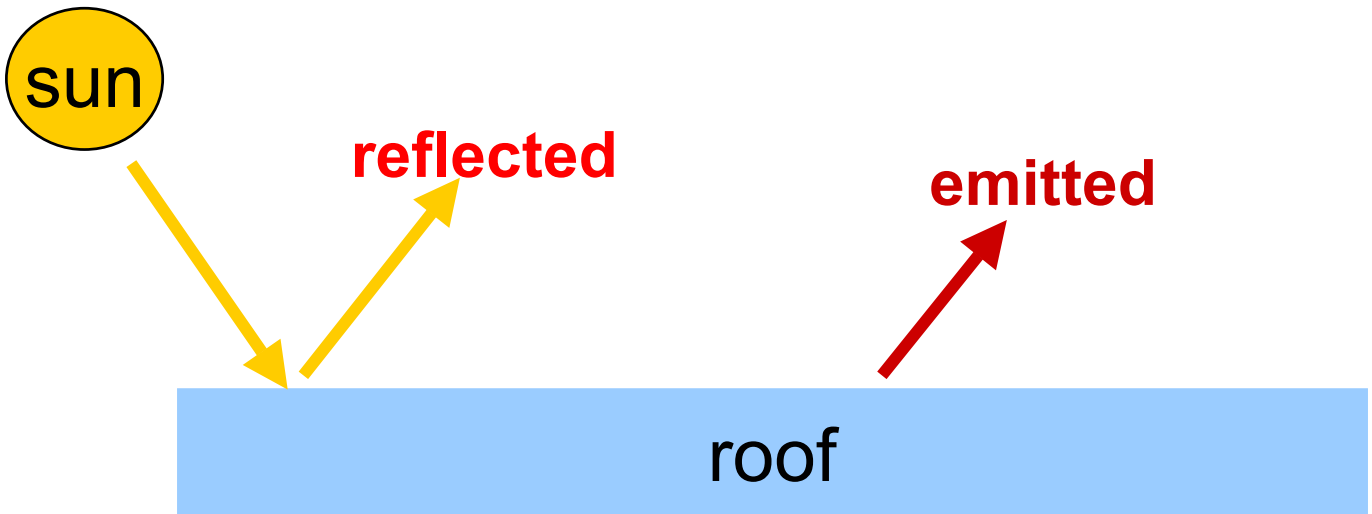
Energy Star Roofing Program Key Terms

Solar Reflectivity

Amount of incoming solar energy a material reflects, also called "albedo" (usually in %)

Emissivity

Amount of energy a material emits due to its own heat and temperature (usually in %)



EnergyStar® Roof Products Program Product Specifications

LOW-SLOPE ROOFS: Surfaces with a slope of 2:15 inches or less*	
Characteristic	**Performance**
Energy efficiency	
Initial solar reflectance	Greater than or equal to 0.65
Maintenance of solar reflectance	Greater than or equal to 0.50 three years after installation under normal conditions
Reliability	
Manufacturers warranty for defects in materials and manufacturing.	Each company's warranty for reflective roof products must be equal in all materia respects to the warranty offered by the same company for comparable non-reflective roof products. A company that sells only reflective roof products must offer a warranty for comparable non-reflective roof products.
STEEP-SLOPE ROOFS: Surfaces with a slope greater than 2:12 inches*	
Energy efficiency	
Initial solar reflectance	Greater than or equal to 0.25
Maintenance of solar reflectance	Greater than or equal to 0.15 three years after installation under normal conditions
Reliability	
Manufacturers warranty for defects in materials and manufacturing.	Each company's warranty for reflective roof products must be equal in all materia respects to the warranty offered by the same company for comparable non-reflective roof products. A company that sells only reflective roof products must offer a warranty for comparable non-reflective roof products.

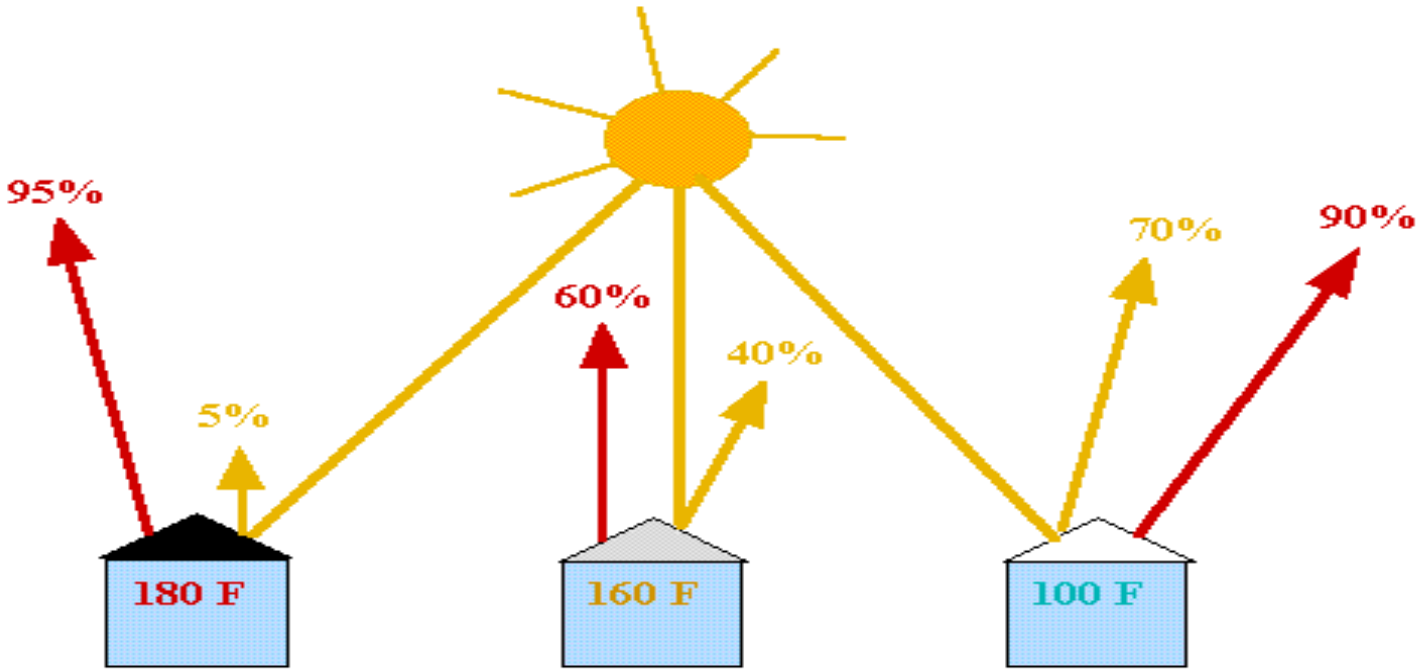
* For roof products that can be applied to either low-slope or steep-slope roofs, manufacturers should refer to the low-slope roof tables for Energy Star® specifications.

Roofing Material Comparison

- White reflective membrane 83%
- White granular surface 26%
- Smooth surface BUR 6%
- EPDM black 6%

- Source: Cool Roofing Material Database/LBNL
- http://eetd.lbl.gov/CoolRoof/membrane.htm

Effect of Reflectivity & Emissivity on Temperature

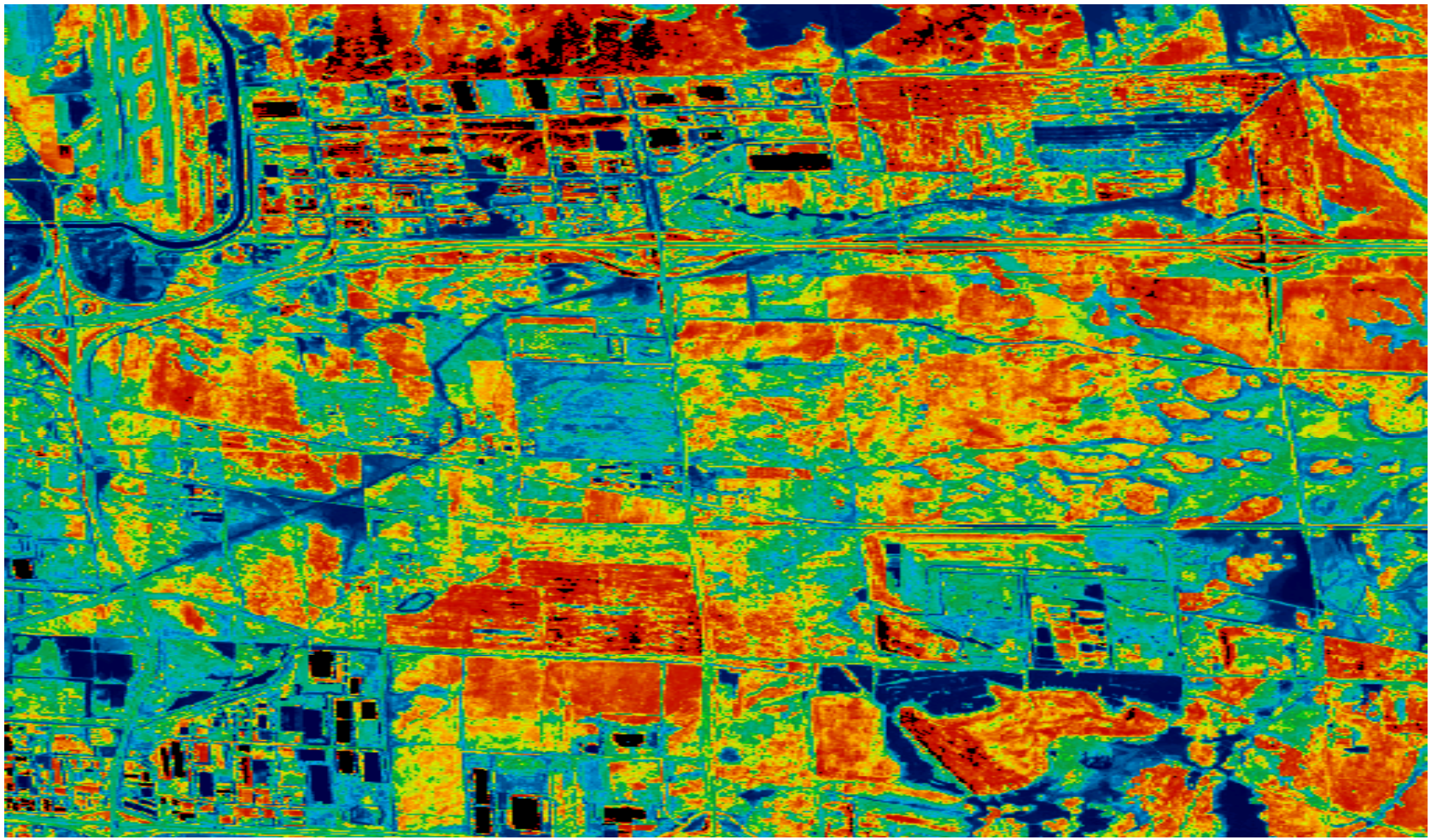


low reflectivity
high emissivity

high reflectivity
low emissivity

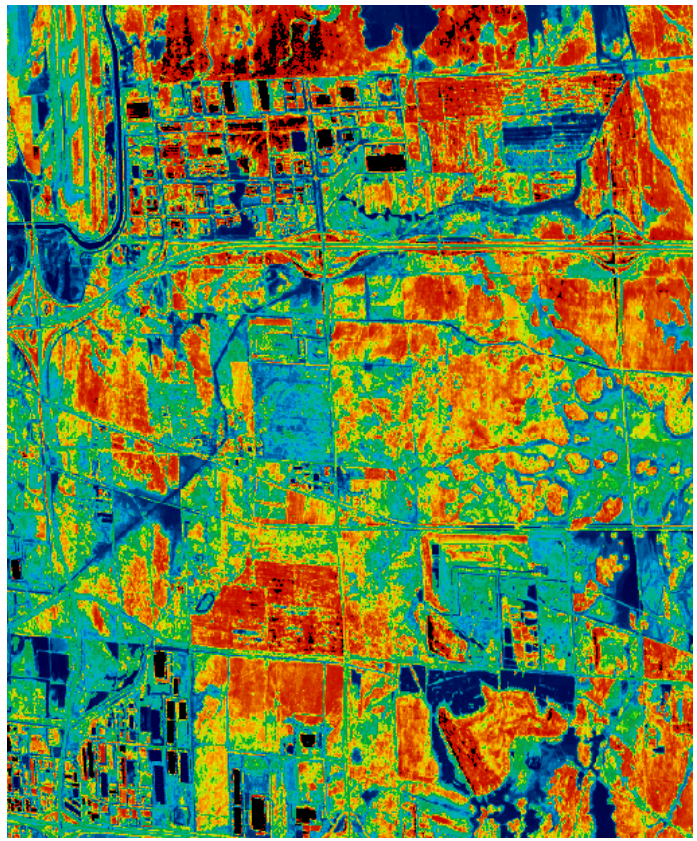
very high reflectivity
high emissivity

Salt Lake City 1999

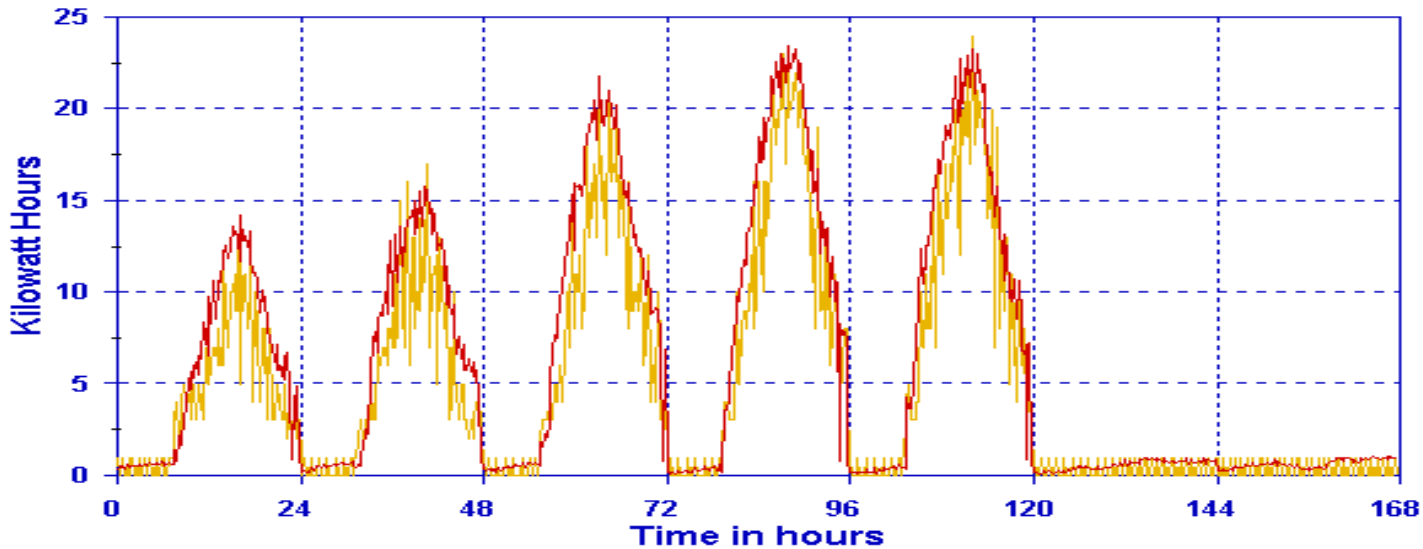


RC Willey Warehouse

Reflective Roofing Impact



One Week of Cooling Energy Use



Totals: **3242 kWh white membrane** **4102 kWh black BUR**

Savings: **860 kWh or 21%**

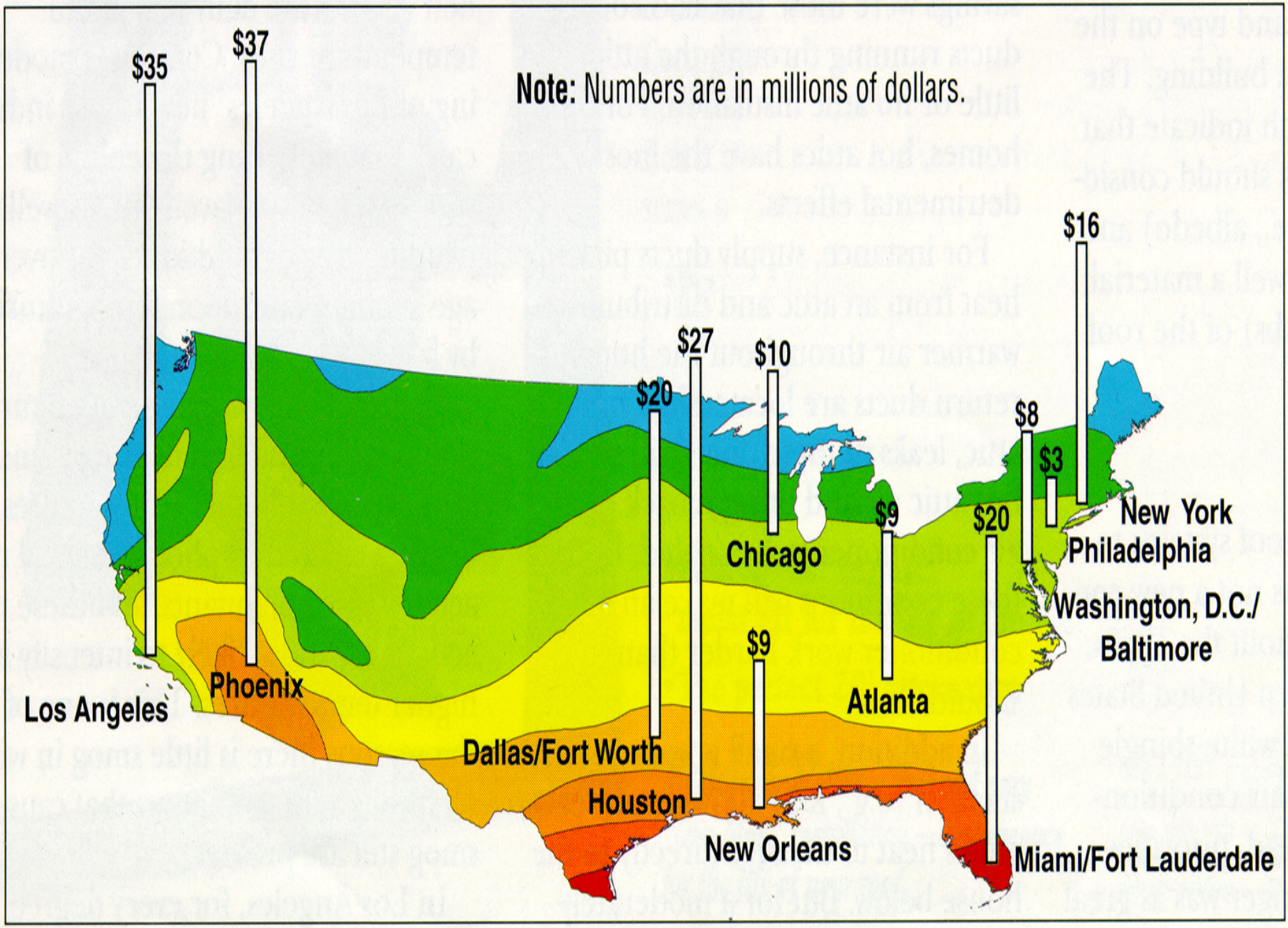


Figure courtesy of LBNL.

Figure 1: *Annual net cooling energy savings for 11 metropolitan areas.*

Smith Middle School
Energy Efficient Design Features

- Energy Star Rated Roof System
- Roof Monitors for Natural Daylighting with light detection system
- Roof Storm Water Retention System
- Roof Mounted Solar Water Panels
- Photo Voltaic Panels for lighting

Smith Middle School
Chapel Hill, N.C.

Storm Water Retention System

Daylight Roof Monitor

Solar Water Heating Panel

USGBC LEED™ Rating System

5. **LEED** - *Leadership in Energy and Environmental Design* is a standard that improves environmental and economic performance of commercial buildings using established or advanced industry principles, practices, materials, and standards.
6. Version 2.1 dated June, 2002

USGBC LEED™ Rating System

6. The LEED Rating Systems encourage the use of highly reflective roof systems with high emittance values - 90% - as a methodology to reduce the impact of urban heat islands, as well as, reduce cooling costs.

Energy Star Roofing Program

Who will benefit with the highest savings?

Buildings with the following characteristics

1. high air conditioning costs
2. a large roof surface
3. lower levels of insulation
4. location in a hot, sunny climate

Energy Star Roofing Program

Will it cost my facility more money?

The good news: an Energy Star Roof product could significantly reduce annual cooling costs by as much as 40% according to the EPA. Savings will depend on location and climate, insulation levels, the products Solar Reflectance Value, and maintenance.

Energy Star Roofing Products

- *White reflective roof systems with added insulation provide significant, cooling cost reductions*

- *Energy savings are passive - not occupant driven*

Energy Star Roofing Products

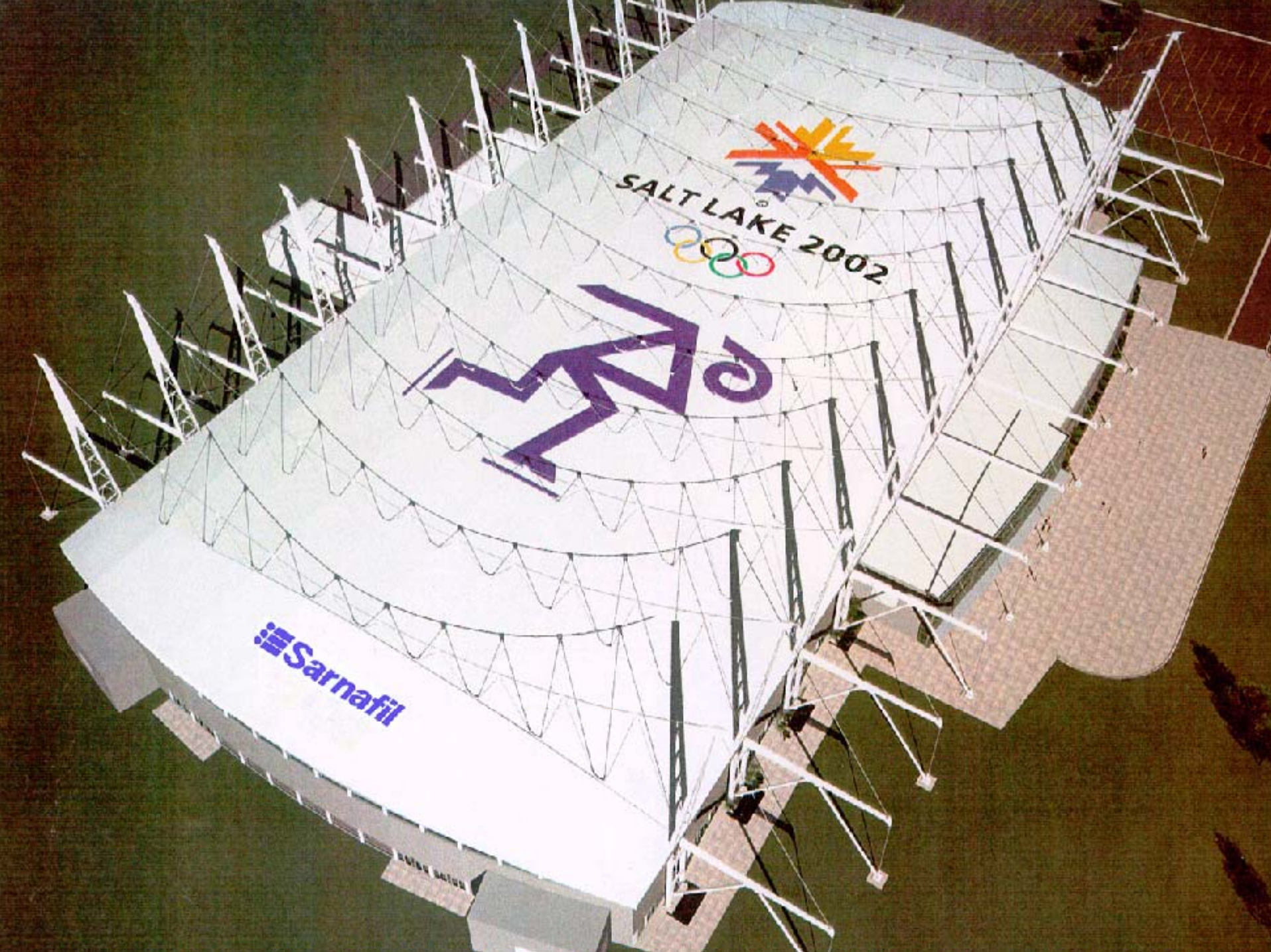
Benefits of High Performance Roof Systems

- Longer life cycle
- Lower maintenance costs
- Lower life cycle costs
- Reduce cooling costs
- Extend real time roof life
- Increased environmental benefits
- Maintain better learning environment

Donald Bren Hall

TARGET

AMERICAN AIRLINES
CENTER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More information

ICLEI - Cities for Climate Protection

www.iclei.org/us

EPA's Heat Island Website

www.epa.gov/heatisland

EPA Climate Change Impact Fact Sheets

www.epa.gov/globalwarming/impacts/stateimp/

Acknowledgements

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www.pstvnrg.com

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http://eetd.lbl.gov/heatisland