

LEED V4 and the Benefits of Roof Coatings



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Today's Moderator



Dan Hounsell

Editor-in-Chief,

Facility Maintenance Decisions

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Today's Presenters

James R. Kirby



Executive Director,
Roof Coatings Manufacturers
Association (RCMA)

James is Director of Codes and Regulatory Compliance for Kellen Company. He is a licensed architect in Illinois; he has a master's degree in architecture from the University of Illinois at Urbana-Champaign; and he has a Graduate Certificate in Sustainable Building Design and Construction from Boston Architectural College. Kirby has expertise in roof system design and construction, weatherproofing and energy-efficiency of the building envelope, and rooftop PV systems. He also is an accredited Green Roofing Professional.

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Learning Objectives:

- Analyze the role of roof coatings in energy savings and occupant comfort
- Discuss updates to LEED under V4
- Learn how roof coatings apply to LEED V4 certification
- Review case studies of roof coating applications

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To ask questions:

Please use the question and answer panel on the right-hand side of the screen, and send to all panelists.

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Presentation Handouts

All participants will receive an e-mail by the end of the day with a link to download a PDF copy of today's presentation slides.

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Roof Coatings Manufacturers Association: LEED V4 and the Benefits of Roof Coatings

Presented by:

James R. Kirby, AIA

RCMA Executive Director



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Roof Coatings Manufacturers Association (RCMA)

- National **trade association** representing manufacturers of asphaltic and reflective roof coatings and industry suppliers
- RCMA has **more than 70 members** who manufacture in almost every state in the country as well as suppliers to the industry
- A leading industry voice **promoting the benefits of roof coatings**
- RCMA provides its membership with up-to-date information on **legislative** and **regulatory** developments, building **codes and standards**, **technical advancements**, and other industry topics of interest



Key Benefits of Roof Coatings

- Most **effective, least costly option** to save energy in low slope roofing in residential, commercial, and industrial buildings
- **Extend the life of the roof** by preventing water, chemical, or physical damage
- Prolong roof system life cycle by **reducing “thermal shock”** stress of large temperature changes
- Certain roof coatings even provide an extra level of **waterproofing protection** to help shed water to keep building interiors dry

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Importance of “Cool”

- **Global Warming** - 83% of American adults who say global warming is occurring believe the US should be a leader in addressing it (Yale School of Forestry & Environmental Studies & the AP-NORC Center for Public Affairs Research).
- **Heat Islands** - The annual mean air temperature of a city of 1 million people or more can be 1.8–5.4°F (1–3°C) warmer than its surroundings. Black roof surfaces can become hotter than reflective roof surfaces (EPA).
- **Economic Impact** - Nationwide implementation of cool roofs could mean an annual savings of \$1 billion in cooling costs (LBNL Heat Island Group).



Key Benefits of Reflective Roof Coatings

- **Help Reduce Cooling Costs.** Reflective coatings reflect visible light and infrared and ultraviolet radiation, leading to lower roof temperatures.
- **Energy Savings Potential with Retrofits.** 2.5 billion square feet of roofs are replaced or re-coated annually, compared to only 0.5 billion square feet of roofs on new buildings.
- **Waste Reduction.** Roofing materials are the 3rd greatest contributor to waste in landfills. Roof coatings prolong the roof life and prevent tear-off and waste.
- **Air Quality Improvement.** Reflective roof coatings reduce smog and improve air quality by lowering ambient temperatures.

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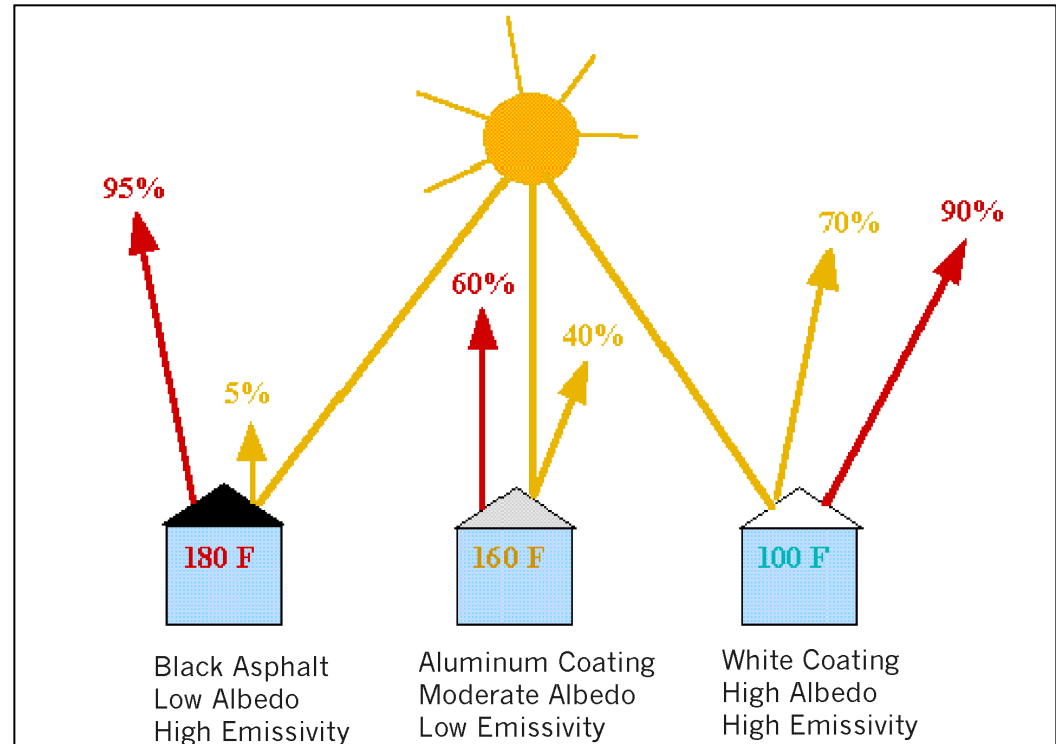
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Reflective Coatings: How do they Do It?

On a hot day (ambient temperature of about 90°F):

- Dark roofs absorb solar energy, get hot, transfer heat into the building.
- White roofs reflect solar energy back into space so roof surface stays cooler.



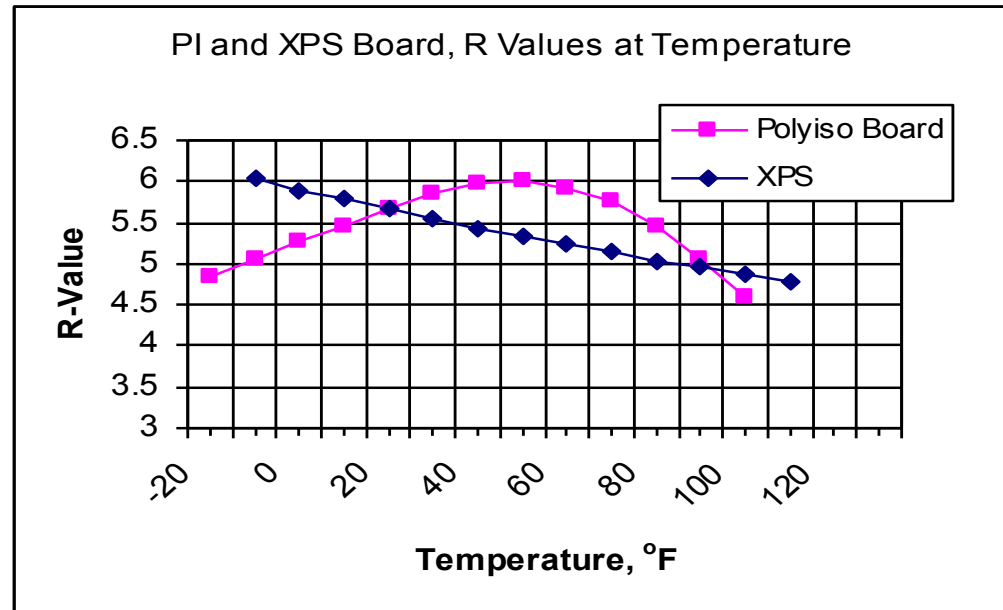
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Reflective Coatings: How do they Do It?

- Insulation resists the flow of heat from the warm to the cool.
- A cool roof surface increases insulation effectiveness.



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Why does USGBC includes roof coatings in LEED?

For all the benefits + reasons just provided.



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RCMA and LEED V4

- RCMA produced a White Paper in 2015 about coatings and LEED v4 titled *Reflective Roof Coatings and LEED v4*.
- The emphasis is on the structure of *LEED v4 for New Construction* and *LEED v4 for Existing Building Operation and Maintenance*, and how reflective roof coatings can fulfill LEED v4 Prerequisites and Credit Requirements.



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LEED V4 – OVERVIEW

- LEED impacts high performance green buildings and their design, construction, operation and maintenance. The effort must be cost-effective and timely.
- LEED v4 is developed and maintained by USGBC, a 501(c)(3) non-profit based in Washington, DC, which was founded in 1993.
- LEED v4 was launched in November 2013. After Oct 31 2016, only LEED v4 can be used to *register* projects. LEED v3 project registered prior to Oct 2016 have until June 2012 to be *certified*.



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LEED V4

- There are 5 categories where reflective roof coatings are in play. They are:
 - New Building Design and Construction
 - Interior Design Construction
 - Existing Building Operation and Maintenance
 - LEED for Homes
 - LEED for Neighborhood Development
- LEED is comprised of *Credit Categories*, each include *Prerequisites*, *Credits*, and *Bonus Credits*.
- Reflective Roof Coatings contribute to the *Energy and Atmosphere Prerequisite: Minimum Energy Performance* and play an important role in several *Credits*.



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LEED V4

- Reflective Roof Coatings are recognized in LEED rating systems for several reasons:
 - Reduction of Urban Heat Island Effect
 - Energy Conservation with the benefit of carbon emission reduction
 - Extension of service life of roofing systems for new construction and existing buildings



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LEED V4 CREDIT CATEGORIES

- There are 7 LEED Credit Categories where reflective roof coatings are relevant:
 - Innovation
 - Integrative Process
 - Sustainable Sites
 - Energy and Atmosphere
 - Materials and Resources
 - Indoor Environmental Quality
 - Regional Priority



LEED V4 CREDIT CATEGORIES

- Innovation

- Innovation points are earned by exceeding the base requirements for eligible CREDITS...or by developing a quantifiable design or construction idea that gets included in the project

- Integrative Process

- Integrative design is the process by what a number of project conditions and variables are investigated and evaluated comprehensively to determine the most cost effective and environmentally benign project possible.

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LEED V4 CREDIT CATEGORIES

• Sustainable Sites

- Intent: To minimize the effects on microclimates and human and wildlife habitats by reducing heat islands
- Includes roof reflectivity, reduction of hardscape (e.g., parking lots) and use of high SRI or high SR materials.
- Use one of the following options:

TABLE ONE

Standard Non-roof or Roof Calculation

$$\frac{\text{Area of Non-roof Measures}}{.5} + \frac{\text{Area of High Reflective Roof}}{.75} + \frac{\text{Area of Vegetative Roof}}{.75} \geq \frac{\text{Total Site Paving Area}}{\text{Total Roof Area}}$$

TABLE TWO

Weighed Non-roof or Roof Calculation

$$\left(\frac{\text{Area of High Reflectance Non-roof A}}{.5} \times \frac{\text{SR of High Reflectance Non-roof A}}{\text{Required SR}} \right)^1 + \frac{\text{Area of Other Non-roof Measures}}{.5} + \left(\frac{\text{Area of High Reflectance Non-roof A}}{.75} \times \frac{\text{SR of High Reflectance Non-roof A}}{\text{Required SR}} \right)^2 + \frac{\text{Area of Vegetative Roof}}{.75} \geq \frac{\text{Total Site Paving Area}}{\text{Total Roof Area}}$$

1 Summed for all high-reflectance non-roof areas

2 Summed for all high-reflectance roof areas

TABLE THREE

Minimum Solar Reflectance Index Value, by Roof Slope

Slope		Initial SRI	OR	3-Year Aged SRI
Low Sloped Roof	</=2:12	82		OR
Steep Sloped Roof	< 2:12	39	32	



LEED V4 CREDIT CATEGORIES

• Energy and Atmosphere

- *Fundamental Commissioning and Verification* is a prerequisite, and *Enhanced Commissioning*, which is a credit, occurs after FC+V (includes the roof system).
- *Minimum Energy Performance* is a prerequisite. It can be achieved by:
 - Whole-building energy simulation: Improve 2% - 5% over baseline building
 - Prescriptive compliance: ASHRAE Advanced Energy Design Guide
 - Prescriptive compliance: Advanced Buildings Core Performance Guide
 - ...All use ASHRAE 90.1-2010 standard.
- *Optimize Energy Performance*, which is a credit, occurs after OEP. It can be achieved by:
 - Whole-building energy simulation
 - Prescriptive approach: ASHRAE Advanced Energy Design Guide.

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LEED V4 CREDIT CATEGORIES

• Materials and Resources

- Six new or revised Credits
 - Construction and demolition waste management planning
 - Building life cycle impact reduction
 - Building product disclosure and optimization – EPDs
 - Building product disclosure and optimization – sourcing raw materials
 - Building product disclosure and optimization – material ingredients
 - Construction and demolition waste management
- Material re-use and diverting materials from landfill are rewarded efforts in LEED
- Intent is to extend service life of existing buildings, conserve material use, retain resources, reduce waste, reduce environmental impacts of new buildings related to manufacturing and transport



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LEED V4 CREDIT CATEGORIES

• Materials and Resources

- Construction and demolition waste management (credit) planning (prerequisite)
 - Use of coatings over existing roofs (e.g., material re-use, reduction of waste)
 - Include proper disposal of packaging and containers (e.g., recycle plastic/metal, re-use pallets, return policy of unused materials)
- Building life cycle impact reduction (credit). Use of 'whole building life cycle analysis' is likely how coatings will be included.
 - Any use of reflective coatings that contributes to saving/renovating historic, abandoned, or blighted buildings and/or
 - Maintains existing roof structure and profile
- Building product disclosure (credit)
 - Use products with EPDs that have "preferred" impacts, or demonstrate impact reduction below industry average.
 - Use products that have raw material supplier reports showing environmental benefits/stewardship
 - Use products and materials that report chemical ingredients and verified to minimize the use and generation of harmful substances



LEED V4 CREDIT CATEGORIES

- Indoor Environmental Quality

- *Indoor Environmental Quality—Daylight Credit:* For example, the use of reflective coatings can enhance the reflected light into rooftop monitors that direct sunlight to indoor spaces, reducing the need for electricity.
- *Optimize Energy Performance:* For example, the use of reflective coatings can contribute to an energy efficient building envelope, allowing the “right sizing” of space conditioning systems.

- Regional Priority Credit

- Identified by local USGBC chapters as important issues in an area/zip code. This incentivizes the use/non-use of specific products that contribute positively to the local issue. This can be used with other credits, if identified locally.

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Case Study #1



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CASE STUDY – Plastics Manufacturer

- 1M sq ft facility with numerous, persistent leaks resulting from UV degradation and thermal shock, aggravated by prevailing winds, tropical storms and salt air. Leaks interrupted work and shut down operations occasionally.
- Reflective roof coating installed; did not require tear-off and disposal. Halted leaks, increased interior comfort, and saved energy.
- Roof temps dropped 30F - 35F, resulting in increased productivity and decreased maintenance.
- Meets all roofing related LEED v4 prerequisites; and *Integrative Design, Sustainable Sites, Energy and Atmosphere, Materials and Resources, Innovation, and Regional Priority credits*.



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Case Study #2



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CASE STUDY – Plastics Manufacturer

- The roof leaked shortly after purchasing the building. A quick, effective, cost-appropriate solution was necessary to protect the inventory and keep the business running.
- No substrate repairs were needed. A coating could be applied to the existing roof.
- Application directly to the existing roof eliminated existing roof materials from the waste stream.
- The interior became more comfortable, and the building became more energy efficient.
- The warranties and service life will contribute to simplifying future *LEED v4 for Existing Building Operation and Maintenance* applications.
- The reflective roof coating contributes to the *Energy and Atmosphere* and *Materials and Resources* credits.



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Case Study #3



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Cool Story – Smooth Asphalt BUR

- 60 year old factory, 65,000 sf, air conditioned space
- 4-ply smooth asphalt BUR, 13 yr old with aluminized asphalt coating, 5 yrs old
- No leaks, dry by IR thermography, incidental standing water, ¼" slope
- R-value of 16 (when newly installed)
- Objective - cool, protect & extend roof life



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Smooth Asphalt BUR - Action

- Power wash off dirt and most of asphalt coating
- Prime / Base of ½-3/4 gal/Sq asphalt compatible acrylic coating
- Fabric reinforcement at penetrations/curbs
- Finish coat of 1.5-2.0 gal/Sq of D-6083 acrylic white finish coating



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Smooth Asphalt BUR – Cool Roof Application Results

- 8/4/06 Ambient T= 82°F
SR=0.35 Surface T= 141°F
- 8/27/07 Ambient T= 83°F
SR=0.81 Surface T= 98°F
- Comparing August '06 to August '07:
 - KWH/day reduction of 7.3%
 - Energy \$/day reduction of 9.4% (difference due to demand charge reduction)



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Roof Coatings and LEED v4

- Roof coatings have a role in the high performance green building movement generally and the LEED certification process specifically.
- Roof Coatings:
 - Reduce energy consumption
 - Extend service life
 - Achieve LEED Prerequisites and Credits
- Advancements in building energy modeling will only reinforce the desirability of reflective roof coatings in high performance buildings, LEED v4, and other green rating systems in the future.
- Coatings are ever-expanding their role in the construction industry.



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QUESTIONS?



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