RRCI Reflective Roof Coatings & LEED
Webinar Presentation

Speakers
Bill Kirn & Robert Kobet
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Speakers

Robert Kobet
The Kobet Collaborative
President

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Quest Construction Products
Market Manager – New Innovations
A Special Thank You

Penny Gift
A Special Thank You
to RRCI’s Past President
This webinar discusses the role of reflective roof coatings in the US Green Building Council’s Leadership in Energy and Environmental Design (LEED™) Building rating system. The purpose is to provide stakeholders with an understanding of how reflective roof coatings contribute to cost effective, environmentally sound new building and renovation projects that use the LEED building rating system. Emphasis is on the structure of LEED and how reflective roof coatings (RRC) contribute to fulfilling LEED prerequisites and credit requirements. The paper focuses on white elastomeric coatings, but the findings apply to any RRC that are LEED compliant.
Purpose of the Webinar

- Raise the awareness of the qualities and attributes of reflective roof coatings (RRC) in the green building movement and the LEED rating systems
- Encourage stakeholders to value RRC in the integrative design process when resolving price, cost, value design and constructive budget issues
- Enable LEED project teams to fully evaluate RRC when compiling LEED credit requirements
Disclaimer

This publication is written for and provided by the Reflective Roof Coatings Institute for the purpose of assisting its membership and industry stakeholders in the use of reflective roof coatings in achieving USGBC LEED certification. LEED certification is the domain of the US Green Building Council and the Green Building Certification Institute, which retain all rights and jurisdiction to the LEED submission and evaluation processes. Nothing in this document is intended to replace or supersede the authority of the USGBC or GBCI.
The Reflective Roof Coatings Institute (RRCI) members are coatings manufacturers, raw materials suppliers, applicators, and industry consultants. We welcome members who are interested in supporting the growth of reflective roof coatings.
Reflective Roof Coating Types

- **Asphaltic**
  - Silver colored
  - Grey colored

- **Non-Asphaltic**
  - White colored
  - Light pastel colored
Reflective Roof Coating Distinctives

- **Solar reflectance**
  - The whiter the color, the higher the solar reflectance and the better heat reflectance.

- **Thermal emittance**
  - Non-metallic is better than metallic
  - The “Baked Potato in Aluminum Foil” problem
    - The foil keeps the potato hot, by holding the heat in!
    - This is bad for roofs and causes premature weathering
    - Heat accelerates degradation.
Headquarters for Financial Advice & Investment Services
Details

- 60,000 sq. ft.
- 18-year old black EPDM
- Leaks / open seams and flashings
- Saw tooth design – sections abut vertical window walls
- Each section is approx. 20 ft. deep by 80 ft. long, with a 30-45 degree slope
- Renovated 19th century mill
- Roof repaired and coated with white reflective coating
Benefits

- No tear-off / Reduced noise
- 1/3 the cost of replacement
- Extended roof life
- Unexpected bonus – Saw tooth design; white reflective surface reflects light inside building, reducing electric bills to light building interior
Owner said the coating system was bouncing so much light through the clerestory windows that workers on the top floor no longer needed artificial illumination on sunny and partly cloudy days.

Owner installed sensors that automatically switch off the top-tier bulbs when reflected sunlight reaches sufficient intensity. Per the owner, it's a lot of heat load reduction in the interior - and it's several hundred lights they're talking about.
RRC Provides

- Later peak electricity demand
- Protective coating (membrane) over roof
- Extend roof life
- Lower life cycle costs
- Roof sustainability
- Proven to reduce the “Urban Heat Island” effect
Life Cycle Cost Effects of Roof Maintenance Coatings

- Prevents further roof surface degradation
- Reflective will cool dark roof reducing the rate of “degradation chemistry”
  - Heat accelerates chemical reactions (hotter roofs wear out faster!)
- Less dead load than recover
  - No need to tear off 2\textsuperscript{nd} roof as required by Building Codes
- Lower cost than recover
- Reflective roof coating will reduce heat load on roof
- Cooler ambient air around air handling inlets has been proven to increase HVAC compressor life!
Benefits of RRC

- Create “Cool Communities”
- Reduce “Urban Heat Islands”
- Reduce Ambient Air Temperature
  - Proven in the Phila. “Cool Block” Project
- Reduce Energy Costs
- Improve Air Quality
- Extend Roof Life
Summary Benefits (con’t)

- Quick Installation
  - Make spot repairs, clean, coat.
- Cost Effective
  - RRC’s have excellent cost/performance
- Sustainable
  - Restores original performance
- Renewable
  - Can be recoated as needed
- Watertight
  - Provides additional waterproof layer
The U.S. Green Building Council (USGBC) is a 501c3 nonprofit organization committed to a prosperous and sustainable future through cost-efficient and energy-saving green buildings. USGBC works toward its mission of market transformation through its LEED green building certification program, robust educational offerings, a nationwide network of chapters and affiliates, the annual Greenbuild International Conference & Expo, professional credentials and advocacy in support of public policy that encourages and enables green buildings and communities.

The LEED® green building program is a voluntary, consensus-based global rating system for buildings, homes and communities that are designed, constructed, maintained and operated for improved environmental and human health performance. LEED addresses all building types emphasizing state-of-the-art strategies in: sustainable site development, water savings, energy efficiency, materials and resources selection, locations & linkages, awareness & education, indoor environmental quality, innovation & education and regional priorities.

The Green Building Certification Institute (GBCI) recognizes excellence in green building practice and performance globally through its third-party certification services and professional credentials supporting market transformation.

USGBC + GBCI = LEED Administration
The Family of LEED Rating Systems

<table>
<thead>
<tr>
<th>GREEN BUILDING DESIGN &amp; CONSTRUCTION</th>
<th>LEED FOR NEW CONSTRUCTION</th>
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<tbody>
<tr>
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<td>LEED FOR CORE &amp; SHELL</td>
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<td>LEED FOR SCHOOLS</td>
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<td>LEED FOR HEALTHCARE</td>
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<td>LEED FOR RETAIL</td>
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<td>GREEN INTERIOR DESIGN &amp; CONSTRUCTION</td>
<td>LEED FOR COMMERCIAL INTERIORS</td>
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<td>LEED FOR RETAIL INTERIORS</td>
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<tr>
<td>GREEN BUILDING OPERATIONS &amp; MAINTENANCE</td>
<td>LEED FOR EXISTING BUILDINGS: OPERATIONS AND MAINTENANCE</td>
</tr>
<tr>
<td>GREEN HOMES DESIGN &amp; CONSTRUCTION</td>
<td>LEED FOR HOMES</td>
</tr>
<tr>
<td>GREEN NEIGHBORHOOD DEVELOPMENT</td>
<td>LEED FOR NEIGHBORHOOD DEVELOPMENT</td>
</tr>
</tbody>
</table>
LEED Rating System Structure

Minimum Program Requirements

• Must comply with environmental laws
• Must be a building
• Must have a reasonable site boundary
• Must be a minimum size – 1000 sq. ft.
• Must comply with minimum occupancy rates – 1 person
• Must allow USGBC to whole building energy and water usage data
• Must comply with a minimum building to site ratio of 2%

Eligibility + Opportunity
LEED Credit Categories

- Sustainable Sites
- Water Efficiency
- Energy & Atmosphere
- Materials & Resources
- Regional Priority
- Innovation in Design
- Indoor Environmental Quality

LEED Scores
- 40-49
- 50-59
- 60-79
- 80+
SS Credit 7.2: Heat Island Effect—Roof

1 Point

Intent
To reduce heat islands to minimize impacts on microclimates and human and wildlife habitats.

Requirements

OPTION 1

Use roofing materials with a solar reflectance index (SRI) equal to or greater than the values in the table below for a minimum of 75% of the roof surface.

Roofing materials having a lower SRI value than those listed below may be used if the weighted rooftop SRI average meets the following criteria:

\[
\frac{\text{Area of Roof Meeting Minimum SRI}}{\text{Total Roof Area}} \times \frac{\text{SRI of Installed Roof}}{\text{Required SRI}} \geq 75\%
\]

Alternatively, the following equation may be used to calculate compliance:

\[
\left[ \frac{\text{Area of Roof A}}{\text{Required SRI}} \times \frac{\text{SRI of Roof A}}{\text{Required SRI}} \right] + \left[ \frac{\text{Area of Roof B}}{\text{Required SRI}} \times \frac{\text{SRI of Roof B}}{\text{Required SRI}} \right] + \ldots = \text{Total Roof Area}
\]

0.75

<table>
<thead>
<tr>
<th>Roof Type</th>
<th>Slope</th>
<th>SRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-sloped roof</td>
<td>\leq 2:12  (15%)</td>
<td>78</td>
</tr>
<tr>
<td>Steep-sloped roof</td>
<td>&gt; 2:12 (15%)</td>
<td>29</td>
</tr>
</tbody>
</table>
Reflective roof coatings contribute significantly to building energy performance.
EA Credit 1: Optimize Energy Performance

1–19 Points

Intent
To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic impacts associated with excessive energy use.

Requirements
Select 1 of the 3 compliance path options described below. Project teams documenting achievement using any of the 3 options are assumed to be in compliance with EA Prerequisite 2: Minimum Energy Performance.

OPTION 1. Whole Building Energy Simulation (1–19 points)
Demonstrate a percentage improvement in the proposed building performance rating compared with the baseline building performance rating. Calculate the baseline building performance according to Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda1) using a computer simulation model for the whole building project. Projects outside the U.S. may use a USGBC approved equivalent standard2. The minimum energy cost savings percentage for each point threshold is as follows:

<table>
<thead>
<tr>
<th>New Buildings</th>
<th>Existing Building Renovations</th>
<th>Points</th>
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<tbody>
<tr>
<td>12%</td>
<td>8%</td>
<td>1</td>
</tr>
<tr>
<td>14%</td>
<td>10%</td>
<td>2</td>
</tr>
<tr>
<td>16%</td>
<td>12%</td>
<td>3</td>
</tr>
<tr>
<td>18%</td>
<td>14%</td>
<td>4</td>
</tr>
<tr>
<td>46%</td>
<td>42%</td>
<td>18</td>
</tr>
<tr>
<td>48%</td>
<td>44%</td>
<td>19</td>
</tr>
</tbody>
</table>

Reflective roof coatings contribute significantly to building energy performance
Commissioning the building envelope is becoming more important as an Enhanced Commissioning opportunity to insure energy performance and resistance to weather intrusion. Thermal imaging, building pressurization, and gas degeneration testing are some of the methods being used to optimize the envelope and insure the roof assembly is installed and performing as intended.
MR Credit 1.1: Building Reuse – Maintain Existing Walls, Floors and Roof
1-3 Points

Intent
To extend the lifecycle of existing building stock, conserve resources, retain cultural resources, reduce waste and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirements
Maintain the existing building structure (including structural floor and roof decking) and envelope (the exterior skin and framing, excluding window assemblies and non-structural roofing material). The minimum percentage building reuse for each point threshold is as follows:

<table>
<thead>
<tr>
<th>Building Reuse</th>
<th>Points</th>
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<tbody>
<tr>
<td>55%</td>
<td>1</td>
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<tr>
<td>75%</td>
<td>2</td>
</tr>
<tr>
<td>95%</td>
<td>3</td>
</tr>
</tbody>
</table>

Hazardous materials that are remediated as a part of the project must be excluded from the calculation of the percentage maintained. If the project includes an addition that is more than 2 times the floor area of the existing building, this credit is not applicable.

Maintaining existing roof assemblies in whole or in part contributes to this Credit. Upgrading existing roof systems using reflective roof coatings is a viable strategy for salvaging existing roofs while increasing energy performance.
Careful planning and application of reflective roof coatings contribute to minimizing construction waste. Large surface areas can be installed with relatively little construction waste, especially if material containers and packaging are recycled.
Given the Credit requirements and complexity of the calculations relative to the LEED Point opportunity, RRCs are usually not included in this credit attempt.

MR Credit 5: Regional Materials
1–2 Points

Intent
To increase demand for building materials and products that are extracted and manufactured within the region, thereby supporting the use of indigenous resources and reducing the environmental impacts resulting from transportation.

Requirements
Use building materials or products that have been extracted, harvested or recovered, as well as manufactured, within a specified distance of the project site for a minimum of 10% or 20%, based on cost, of the total materials value. If only a fraction of a product or material is extracted, harvested, or recovered and manufactured locally, then only that percentage (by weight) can contribute to the regional value. The minimum percentage regional materials for each point threshold is as follows:

<table>
<thead>
<tr>
<th>Regional Materials</th>
<th>Points</th>
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<tbody>
<tr>
<td>10%</td>
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</tr>
<tr>
<td>20%</td>
<td>2</td>
</tr>
</tbody>
</table>

OPTION 1
All building materials or products have been extracted, harvested or recovered, as well as manufactured within a 500 mile (800 kilometer) radius of the project site.

OR

OPTION 2
Building materials or products shipped by rail or water have been extracted, harvested or recovered, as well as manufactured within a 500 mile (800 kilometer) total travel distance of the project site using a weighted average determined through the following formula:

\[
\text{Distance by rail/3} + \text{Distance by inland waterway/2} + \text{Distance by sea/15} + \text{Distance by all other means} \leq 500 \text{ miles [800 kilometers]}
\]
RRCs can be utilized to bounce additional daylight into roof monitors and other day lighting apertures, as well as onto sloped renewable energy system assemblies such as photovoltaic and solar thermal collector arrays.

IEQ Credit 8.1: Daylight and Views - Daylight

**Intent**
To provide building occupants with a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas of the building.

**Requirements**
Through 1 of the 4 options, achieve daylighting in at least the following spaces¹:

<table>
<thead>
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<th>Regularly Occupied Spaces</th>
<th>Points</th>
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</thead>
<tbody>
<tr>
<td>75%</td>
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</table>

**OPTION 1. Simulation**
Demonstrate through computer simulation that the applicable spaces achieve daylight illuminance levels of a minimum of 10 footcandles (fc) (110 lux) and a maximum of 500 fc (5,400 lux) in a clear sky condition on September 21 at 9 a.m. and 3 p.m.

Provide glare control devices to avoid high-contrast situations that could impede visual tasks. However, designs that incorporate view-preserving automated shades for glare control may demonstrate compliance for only the minimum 10 fc (110 lux) illuminance level.
• Sustainable Sites Credit 7.2 – Urban Heat Island, Roof

Which relates

• Energy and Atmosphere Credit 1 – Optimize Energy Performance

Relates to

Think about the synergies!

• Interior Environmental Quality Credit 8.1 - Daylighting

Etc.
• MR Credit 1.1 – Building Reuse, Roof

which relates to

• Energy and Atmosphere Credit 1 – Optimize Energy Performance

which relates to

• EA Credit 3 – Enhanced Commissioning

Think about the synergies!
LEED Certification Process

**Start**
- Identify partners
- Register project in LEED Online
- Build project team
- Apply for incentives
- Begin LEED documentation and design process

**Design**
- Complete design
- Assemble documentation
- GBCI conducts design review
- “Anticipated, pending, denied”

**Construction**
- Complete construction
- Assemble documentation
- GBCI conducts construction review
- “Awarded, pending or denied”

**Certification**
- Secure LEED plaque
- Conduct occupant survey
- Consider LEED for Existing Buildings: Operations & Maintenance
Certification Tool: LEED Online

### Project Information Forms

<table>
<thead>
<tr>
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<th>#</th>
<th>d/c</th>
<th>Credit Name</th>
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<th>Denied</th>
<th>Status</th>
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### Sustainable Sites

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To get your copy of the RRCI White Paper, please visit www.therrci.org or call 816.221.1297.