Pathways to Professionalism

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LEED™ Accreditation and Certification as it Applies to the Roof Consultant

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ABSTRACT

The US Green Building Council (USGBC) LEED™ initiative is gaining significant momentum in the construction industry, and with the forthcoming "LEED for Existing Buildings (LEED EB)," it will have a direct impact on our industry, whether we agree or disagree with the concept.

Understanding the LEED™ initiative, its requirements, and effects on our industry is important. Even more critical is understanding how green roofs, cool roofs, sustainable roofs, and life-cycle cost issues correlate to these LEED™ requirements.

SPEAKER

RICK COOK has authored numerous papers on the subject of roofing systems and wind-related damages. He has presented several papers at national symposiums and conferences, including the American Society of Civil Engineers, the Construction Specifications Institute, the Roof Consultants Institute at Factory Mutual, Roof Consultants Institute International Convention, and the Federal Construction Committee in Washington, DC. Mr. Cook has also presented dozens of papers at local and regional meetings and conferences related to roofing and waterproofing in the construction industry.

THOMAS W. "HUTCH" HUTCHINSON has made numerous presentations in Europe, South America, North America, and Asia. Hutchinson believes in the complete integration of all building components into a roof system design, and his work is noted for its comprehensiveness in design, detailing, and specification. Hutchinson is currently a principal in Hutchinson Design Group, Ltd., first vice president of RCI, a Certified Energy Professional in the city of Chicago, and secretary of CIB/RILEM International Joint Committee on Roof Materials and Systems. He is a member of AIA, CSI, RCI, NRCA, and ASTM Committee D-08 on Roofing, Waterproofing, and Bituminous Materials.

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LEED™ Accreditation and Certification as it Applies to the Roof Consultant

The U.S. Green Building Council (USGBC) LEED™ initiative, as well as the forthcoming LEED™ for Existing Buildings (LEED™ EB) and the LEED™ for Core and Shell (LEED™ CS) are gaining significant momentum in the construction industry. LEED initiatives will have a direct impact on our industry, whether we agree or disagree with the concept. The mighty dollar drives many aspects of our industry. And as the environmental initiative continues to be supported by numerous government agencies, and increases in regulatory incentives (including available tax credits) and industry marketing efforts continue to grow, so will the LEED™ initiative.

Where does sustainability fall into this discussion? Can a sustainable roof be cool, green, and LEED™ certified? "Sustainable construction generally means to design using materials that can be re-used after the service life of the original design has been satisfied. This concept has some merit if you are going to select one of two materials that have equal performance and one can be re-used and the other discarded." [1]

Who's in charge, what is required, and when and how does it affect our clients, our projects, the roofing industry, and us?

Understanding the LEED™ initiative, its requirements, and its effects on our industry is important. Even more critical is understanding how green roofs, cool roofs, sustainable roofs, and life-cycle cost issues correlate to these LEED™ requirements.

As has always been the case, it is the roof consultant's responsibility to advise the owner of the advantages and disadvantages, cost implications, and projected service life of "environmentally" friendly systems as compared to conventional systems. Significant changes have not occurred with the system types available. The changes are occurring with the parameters that are being considered, and, based on these parameters, which systems are being considered.

A significant element of this process is the life-cycle cost evaluation – that a system has a realistic construction cost, service life, and maintenance costs with others with which it is being compared. Previously, we have analyzed life-cycle cost issues based on ASTM E 917-02 or the principles we learned in Engineering Economics 101. The latest "sophisticated methodology" is Life-cycle Assessment (LCA), used to identify and quantify potential environmental and economic impacts of a product or service by analyzing whole life-cycle cost relationships. Programs using the available warranty period to establish life expectancy of a system, using models that do not address the known "thermal short circuits" within our assemblies or are based on unattainable maintenance programs, provide incomplete information. This adds a new dimension to the various issues we have typically considered in the past.

We must also remember that a roof system is expected to do many things (keep us dry, provide wind and fire resistance, save energy through insulation R values, deal with cool roof issues, adhere to or contribute to attaining a LEED™-certified project LEED™, be durable, impact resistant, provide aesthetics, low maintenance, and reasonable initial costs.) When we put a greater emphasis or need on one performance characteristic, we often sacrifice others. These choices will also affect the cost and service life of the assembly. This same "balance" concern exists within the LEED™ process itself, between environmental responsibility, healthy places (buildings) and profitability.

OBJECTIVES:

Roof consultants should:

1. Obtain a working knowledge of the environmental definitions, criteria, and standards and their implications to our industry.
2. Understand the requirements and process to become a LEED™ Accredited Professional. Those involved in the design phase of the industry, and especially new construction, can provide a valuable asset to the owner and design team, and it won't hurt from a marketing perspective.
3. Understand LEED™ for Existing Buildings (LEED™ EB) is part of the "family" of LEED™ rating systems and is currently being finalized. Also, realize upcoming LEED™ CS is for the Core and Shell projects, which will likely

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include the roofing system as well.

4. Be aware of and under stand the new, sophisticated, Life-cycle Assessment tool for green building procurement. Comparing the proposed systems from a realistic life cycle cost perspective will provide a valuable perspective for the owner in weighing the advantages and disadvantages.

5. Stay abreast of the constant and ever changing initiatives, guidelines, and criteria.

6. Understand sustainability is about taking the long-term view.

Definitions

USGBC defines a green design as "design and construction practices that significantly reduce or eliminate the negative impact of the buildings on the environment and occupants" in five broad areas:

1. Sustainable site planning,
2. Safeguarding water and water efficiency,
3. Energy efficiency and renewable energy,
4. Consideration of materials and resources, and
5. Indoor environmental quality.

EPA's Green Building Design goal was initiated in 1995 to have structures that incorporate sustainable designs. This is defined as a design in which the impact of the building on the environment will be minimal over the lifetime of that building. This statement included ten specific design objectives to achieve the above goal, including "design of the building envelope for energy efficiency."

Oak Ridge National Laboratory defines sustainable low-sloped roofing as "a roofing system that addresses the issues of energy efficiency, use of materials with lower environmental impact and embodied energy, durability with less maintenance and reduced waste generation throughout the life cycle from design through construction and reroofing, to reuse and final disposal."

The City of Seattle defines a sustainable building as one using the integration of building materials and methods that promote environmental quality, economic vitality, and social benefit through design, construction, and operation of the built environment.

Realizing the importance of defining sustainable terminology, ASTM International issued ASTM E 2114-01, "Standard Terminology for Sustainability Relative to the Performance of Building." This standard, released in 2001, defined 45 terms associated with sustainability. The proposed revisions to this standard are ASTM WK 1240, WK 4305, and WK 5560.

ASTM International Green Roof Task Group, a division of subcommittee E06.71 on building sustainability, has a series of new standards being developed for green roof systems, including, but not limited to the following:

ASTM WK 575: "Practice for Assessment of Green Roofs," to establish a procedure for assessment of green roofs that includes both technical requirements and considerations for sustainable development.

ASTM WK 4235: "Standard Guide for the Selection Installation and Maintenance of Plants for Green Roofs."

ASTM WK 4236: "Standard Practice for Determination of Dead Loads and Live Loads for Green Roof Systems."

Perhaps the best working definition was developed at the 1996 ORNL "Proceedings of the Sustainable Low Sloped Roofing Workshop." At the workshop, a sustainable roof was defined as "a roof system that is designed, constructed, maintained, rehabilitated, and demolished with an emphasis throughout its life cycle on using natural resources efficiently and preserving the global environment."

As difficult as "sustainability" is to define, it is even more difficult to understand and implement.

USGBC LEED™

In *Professional Roofing* magazine, in September 2003, Thomas. L. Smith wrote:

"I anticipate LEED certification will be commonplace within a few years for major corporate buildings and many public buildings. Although roof systems are a small part of the integrated whole building approach LEED takes, the roof system part of the LEED initiative is significant.

"It is therefore incumbent on...roofing professional(s) to be aware of LEED and position themselves to be important team players in the certificate process by performing the tasks already mentioned in this article."

The LEED™ Initiative has two basic elements: Project Certification and Professional Accreditation. Currently, of the over 1450 projects with have applied, over 121 projects are registered for Project Certification. The number of projects that are "following" these principles is unknown. As of September 2004, 19,057 professionals had been trained through LEED™ workshops and 10,249 had become LEED™ Accredited Professionals.

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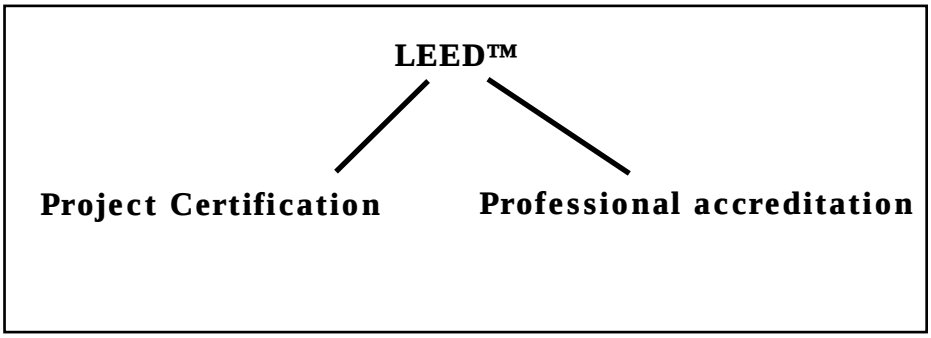

Based on this author's research, Tom Smith's prediction is coming true, and then some.

Project Certification

The Leadership in Energy and Environmental Design (LEED™) Green Building Rating System represents the USGBC's effort to provide a national standard for what constitutes a "green building." Through its use as a design guideline and third party certification tool, it aims to improve occupant well being, environmental performance, and economic returns from buildings using established and innovative practices, standards, and technologies.

The USGBC was formed in 1993 and has evolved with its gain in momentum and support. The initial LEED™ Version 1.0 was established in August 1998, and LEED™ Version 2.0 in March 2000. This initial effort is now referred to as LEED™ NC for New Construction and Major Renovations. The LEED™ Version 2.1, 2nd Edition, was released in May 2003.

The LEED™ Green Building Rating System is a voluntary, consensus-based, national standard for developing high performance, sustainable buildings. USGBC LEED™ certifies buildings, not the materials or products that are used to construct the building. Only a few LEED™ credits are dependent on third-party certification or proving equivalence to a given standard.

Project Categories

LEED™ standards are currently available or under development for the following categories:

LEED™ NC: New commercial **C**onstruction and major renovation projects less than 50% of occupants remain during work. Addresses the whole building and building site.

LEED™ EB: Existing **B**uilding (pilot version) operating performance and building upgrades more than 50% remain during work.

Currently under review are:

LEED™ CI: Commercial **I**nteriors (pilot version) projects concurrently or in addition to NC, CS, & EB.

LEED™ CS: Core and **S**hell projects (pilot version) is being developed for the developer who is not responsible for the interior space.

Currently under development are the additional standards for:

LEED™ H: Home will address single-family homes, both detached and attached, and multi-family residential buildings up to three stories, but developed on a single lot.

LEED™ ND: Neighborhood **D**evelopment will address the design and location of new, multi-family lots for residential, commercial, or mixed-use developments. This category is site oriented, and not related to the individual home.

Project Evaluation

The rating system is organized into five environmental categories and one expertise/design category. Also listed under each category are potential areas where roofing "credits" may be attained. An example of a credit specifically related to roofing would fall under the category of Water Efficiency (conservation), under Stormwater Management, where a garden roof system (GRS) allows for natural evaporation and filtration rather than releasing rainwater into the storm drainage system. Under Sustainable Sites, and Heat Island Reduction - Roof, a credit is available for a building using a roof meeting the required reflectance and emissivity ratings for 75% of the roof area, or the installation of a garden roof system (GRS) roof for at least 50% of the roof area.

Environmental Categories:

1. Sustainable Sites:
   a. Cleaning, paints, sealants, and maintenance of building exterior.
   b. Use green/vegetated roofs.
   c. Heat island reduction – non roof.
   d. Heat island reduction – roof.
2. Water Efficiency:
   a. Reduction in watering roof/courtyard.
   b. Roof, stormwater collection system.
3. Energy and Atmosphere:
   a. Adhere to/meet applicable EPA EnergyStar® requirements.
   b. Building maintenance.
   c. Photovoltaic roof system or solar panels on the roof.

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d. Exceeds ASHRAE 90.1 by specified percentages.

4. Materials and Resources:

   a. Building re-use.

   b. Manufacturing of roofing materials within 500 miles.

   c. Recycling asphalt shingles for paving/parking.

5. Indoor Environmental Quality:

   a. No known credits apply directly to roofing.

Expertise/Design Category:

1. Innovations in Operations and Upgrades is the expertise/design category:

   a. LEED™ Accredited Professional.

Certification Process

A project is registered and then goes through the certification process. Based on the established categories and system, the project attains certain credits which equate to its overall certification level.

The USGBC LEED™ website recommends that you register your project during the initial/early stages and assemble a design team with LEED™ Accredited Professionals to prepare documentation and calculations to satisfy LEED™ prerequisites and credit submittal requirements.

- There is a registration fee and certification fee that are based on building sizes.
- Four levels of certification are based on total accumulative credits:
- Certified: 26-32 credits
- Silver: 33-38 credits
- Gold: 39-51 credits
- Platinum: 52-69 credits

Technical Issues

The USGBC website also offers the following two technical support services: TSAC and CIR.

TSAC is the Technical and Scientific Advisory Committee, which provides support for each of the LEED™ products and advice on technical issues as assigned by the LEED™ Steering Committee and the USGBC Board of Directors. TSAC is currently reviewing the affects of the following two products/materials on the environment; (1) PVC/vinyl, and (2) HCFCs/refrigerants/ozone depletion. Consideration is being given to awarding a credit for avoidance of these products and materials. Both issues are still under review.

CIR is an acronym for Credit Interpretation Requests and Rulings, which is available to members of USGBC as a reference for previous credit interpretations. This process provides a peer review of proposed credits, and a searchable database of previous credit interpretations.

Professional Accreditation

The last exam date for the original test format was August 19, 2004 for the LEED™ NC Accreditation. This exam was based on LEED™ NC Version 2.0. The revised exam is based on LEED™ NC Version 2.1. According to the website, accreditation updates will not be required within each major step of LEED™ (i.e., 2.0 to 2.1 to 2.2). However, there is not a definitive ruling from the Curriculum and Accreditation Subcommittee or the LEED™ Steering Committee on how accreditation will be maintained over time or between major steps. General requirements include:

- $250.00 for members, $350.00 for non-members.
- Four-hour exam with sites throughout the country.
- Training workshops are strongly recommended but not required.

USGBC LEED™ EB AND CS:

The two new categories that will also likely apply to roofing are LEED™ EB, which is currently being finalized, and LEED™ CS, which is currently under development. LEED™ for Existing Buildings (LEED™ EB) was developed on the basis of LEED™ for New Construction (LEED™ NC). This is a performance standard for upgrading existing buildings and operating these facilities in a sustainable way on an ongoing basis. This includes buildings originally LEED™ NC certified (after 5 years) and those using LEED™ for the first time.

LEED™ EB certification is based on actual building operating performance, not design expectations. This category requires at least one year of building operating performance data to substantiate credits (three months for LEED™ NC buildings). A streamlined process is planned for future LEED™ re-certification, up to five years with supporting data equivalent to the number of years.

The LEED™ EB was initiated in 2001, and in March 1, 2004, USGBC released the LEED™ for Existing Buildings Rating System, targeting 26 billion gross square feet (gsf) of existing commercial building space with environmental benchmarks for optimizing building operations and maintenance. During the review period March 1, 2004 to March 30, 2004, over 90 buildings, representing 17

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million gsf, participated in the pilot program.

For building upgrades, use LEED™ EB if more than 50% of the building occupants remain in the building during the building upgrade. The building is defined as the whole building or portion of a whole building that is being addressed in LEED™ certification application. The LEED™ EB rating system is organized into the same six categories:

1. Sustainable sites,
2. Water efficiency,
3. Energy and atmosphere,
4. Materials and resources,
5. Indoor environmental quality, and
6. Innovations in operations and upgrades.

Because LEED™ EB is a performance-based standard, not prescriptive, this flexibility will allow the application of the rating system to historic buildings.

- Building must meet all LEED™ EB prerequisites.
- Certification can be achieved by meeting 32 credits (40% of 80 points).
- No conflicts were found with the Department of Interior's Standards for Treatment of Historic Properties.
- An appendix exists in the LEED™ EB Reference Guide.

The LEED™ CS Core and Shell projects (pilot version) is being developed for the property developer who is not responsible for the interior space, to be done under a tenant upfit. This category is limited to the site and the core and shell of the building, which would include the building envelope and roof systems.

Cool Roofing

Energy Star® was a major catalyst in the green environmental trend for roofing. Initially used for appliances, this voluntary partnership among DOE, EPA, product manufacturers, local utilities, government agencies, and retailers, incorporated roofing into the program in 1999. Although controversy exists, this is still the most widely recognized criterion. Energy Star® adheres to the definitions of ASTM E-1918 for slopes less than 2:12 requiring a minimum initial solar reflectance (reflectivity) of 0.65 and 0.50 after three years as tested in accordance with ASTM E-903. Emittance (emissivity) is not considered. Energy Star® allows any qualified lab, including the manufacturer's lab, to complete the testing, and has no follow-up procedures. Energy Star® also permits cleaning of the roof prior to the three-year aged reflectance determination.

The Cool Roof Rating Council is a non-profit organization whose mission is to provide a fair, accurate, and credible performance rating system for roofing materials based on the applicable ASTM tests. CRRC provides criteria for testing similar to Energy Star®, but does not allow cleaning prior to the three-year test, has follow-up procedures required of the manufacturer, and requires independent labs certified by one of two organizations.

USGBC LEED™ requirements accept Energy Star® ratings, but also require an emissivity rating of 0.9 tested in accordance with ASTM E-408.

Recent changes in other organizations in the industry include:

- Solar Smart Roof Alliance is an organization of roofing service and roofing product trade associations (API, ARMA, ERA, NRCA, NAIMA, PIMA, RCMA, SPRI) who are committed to providing credible information about the environmental performance and economic issues regarding sustainable and reflective roofing systems.
- The Roof Coating Manufacturers Association (RCMA) has recently formed the White Coatings Council to address the needs of the design/construction industry in assisting with the establishment of clear criteria for use of coatings in the roofing industry.
- Underwriters Laboratory is now offering reflectivity and emissivity testing in accordance with the applicable ASTM standards for compliance with Energy Star®, local and state energy codes, and LEED™ requirements.

As with several roof products, the advantages of coatings have increased from a “green” perspective but the potential disadvantages have not disappeared, they have only temporarily been forgotten. Issues such as product type, surface preparation, compatibility, priming, adhesion, application, water resistance, and the application environment (weather and temperature) must be addressed.

The appeal of sprayed-in-place polyurethane foam roofs (SPUF) has also increased, based on the new green perspective. But from a technical standpoint, the advantages (energy efficiency, wind resistance, damage resistance, renewability) still exist, as do the disadvantages [environmental affects during application and reroofing, contractor-critical, onsite-fabricated, potential performance based on coating type

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used, details (or lack thereof), blowing agents].

Researchers have confirmed the common sense belief that roofs with high reflectance degrade with time as dirt (biomass) accumulation shields the surface. Different climates also have a significant affect, with regions such as the Southeastern U.S. with significant "cooling months" having the greatest potential savings.

The significance of reflectivity in urban locations should be balanced with the effect of reflectivity onto adjacent and surrounding buildings (walls/windows), the amount of insulation within the assembly, and the ratio of roof areas to wall areas in these locations.

Green Roofing

The term "green roofing" is often thought of as synonymous with "high performance roofing systems" and sustainable design and construction. Green roofing does not necessarily mean garden roofs, and cool roofing does not necessarily mean white roofs. In an overall perspective, there are many different ways in which a roof can be considered green, whether based on reflectivity and emissivity, recycled materials, or a garden roof system (GRS).

As noted by Bas Baskaran in a January 2004 article in *RSI*, SPRI has recommended the industry adopt the term "Garden Roof System (GRS)" to eliminate the confusion with the term "green roofing." GRS refers to roofing/waterproofing assemblies that allow for the planting of vegetation on rooftops, ranging from mosses and herbs to grasses, flowers, shrubbery, and trees. These systems are unique in that they have the typical design professionals: architect, engineers, and general and roofing contractors; but they also may include landscape architects, landscapers, gardeners, and the facility managers.

Conceptual programs, like ORNL R30/30 year roof systems, will likely not be attainable with conventional systems, but are possible with garden roof systems (GRS). These systems are all the rage in Europe, but unlike when single-ply roofs, modified bitumens and synthetic stucco (EIFS) where brought over from Europe, we need to improve the criteria and process in the United States.

Garden Roof System (GRS) assemblies are divided into at least two categories, but the definitions are not consistent in the industry.

> Extensive – are typically less than 60 psf, with a growth medium of 1 to 8 inches, including mosses, herbs, and grasses that typically require minimal watering and little maintenance.
>
> Intensive – are typically more than 60 psf with growth medium greater than 8 inches, including a range of vegetation, including bushes and trees that typically require irrigation and regular maintenance.

These two categories are sometimes further subdivided to include semi-intensive and ultra-intensive, realizing that garden roof systems can range from 20 psf to 300 psf. The garden roof system make up will also affect components and total assembly used (root barriers, drainage layers, filter or water retention layer, type of growing medium, etc.)

Green Roofs for Healthy Cities is a membership-based association of public and profit organizations working to promote "garden roof systems (GRS)" in North America. They have developed and are providing workshops to educate the industry on these systems.

Conclusions

The exact definition of a green, cool, and/or sustainable roof is still debatable, but there is a consensus in regards to its significance and the impact it is having on the roofing industry. For this reason, we need to stay abreast of the ongoing changes and be aware of the standards being developed as they relate to our profession.

We must realize that with any roofing system we may consider, the advantages and disadvantages that previously existed with the specific system remain; we have only compounded or increased the factors we must evaluate the system by. A "balance" is needed when considering the requirements of the various "green" initiatives and how they will be considered with the typical performance characteristics for the specific system.

Also, we must remember the lessons we have learned in the past, which are still applicable.

- Do not be the "guinea pig" for a new system or product because the literature states it is environmentally friendly, is Energy Star® certified, or earns a LEED™ credit. Does the product have a track record?
- A roof system is expected to do many things (keep us dry, provide wind and fire resistance, save energy through insulation R values, deal with cool roof issues, adhere to or attain LEED™ Certification, while also being durable, impact-resistant, provide aesthetics, low maintenance, and reasonable costs.) When we put a greater emphasis or need on one performance characteristic, we often sacrifice others. These choices

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will also affect the cost and the service life of the assembly.

- The available length of warranty does not determine the life expectancy of the system for life cycle cost analysis. Also, warranties do not protect the owner; they limit the liability of the manufacturer. Do not make decisions based on if the warranty will or will not be provided.
- Success is in the details. Ninety percent of all leaks in environmentally friendly roof systems occur at penetrations and terminations, which is typical of all roof systems.
- Contrary to marketing efforts, the components and systems do not need to be proprietary products. An adequate number of options exist for these systems. You will pay a premium for proprietary systems.
- A local, quality contractor base must be available and have experience with installing the specific roof system to have a chance for success.

Therefore, our challenge is to still apply sound fundamentals in weighing options, making selections and determinations, and advising owners. We simply need to be aware of the various perspectives, changes, and trends occurring within the industry.

The roofing industry's challenge is to translate this interest and momentum into practical guidelines that lead to improvements in the long-term performance of the roof systems – within a given financial budget.

1. Cash, Carl G., *Roofing Failures*, Spon Press, 2003.

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