

BUILDINGS

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Green Design: New Construction vs. Renovation

Discover the differences in LEED certification when considering new construction or the renovation of an existing building

By Daniel P. Perruzzi Jr.

The phrase "green or sustainable design" is a collective term for design strategies that seek to reduce the use of nonrenewable resources, enhance the use of renewable resources and recycled content, and minimize a project's impact on the environment. Those of us within the architectural community are becoming very familiar with making a case for green design. A project that's been designed with green principles in mind will consume less energy, can provide a healthier indoor environment for its occupants, and should cost only slightly more than a comparable project designed without green-design principles.

In making the case, there is a wide range of supporting data suggesting that green-design measures are effective at increasing the health and job satisfaction of workers, and that this generally leads to greater productivity and less sick days and other lost time. In addition, green-design principles are being rapidly accepted by local, state, and federal agencies, and by major U.S. corporations. Owners of new developments who employ green design are using it as a strategy to separate their properties from their non-green competition.

A recent article by Charles Lockwood in *Harvard Business Review* compares the impact of the green-design revolution with earlier innovations, such as the elevator and air-conditioning. Owners of existing properties, in addition to those developing new construction projects, are beginning to assess the greenness of their buildings and plan improvements to bring them into compliance with green standards.

LEED-EB vs. LEED-EB O&M

LEED for Existing Buildings: Operations & Maintenance (LEED-EB O&M) and LEED for Existing Buildings (LEED-EB) are the same rating system. LEED-EB O&M is essentially version 2.0 of LEED-EB. As of press time, the LEED-EB O&M rating system has passed member ballot and registration is available. The reference guide and submittal templates are currently under development; they're expected to be available in Spring 2008.



Margulies & Associates designed two LEED for New Construction (LEED-NC) projects for Blue Cross Blue Shield of Massachusetts. The 345,000-square-foot, Quincy, MA, facility (first photo) is LEED-NC certified. The second project, (second photo) a new, 329,000-square-foot office in Hingham, MA, is expected to be LEED-NC Silver certified.

Elements of Green Design through LEED

The U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) program consists of several rating systems that provide guidance on how to adopt green-design measures; they also objectively measure compliance levels. Current LEED point systems exist for new construction (new buildings and major renovations to existing buildings) and existing buildings (facilities that aren't undergoing major renovations, but want to establish current performance levels and identify improvements). Additional LEED point systems exist for other project types. Choosing the right rating system for a project is the first step in addressing the kinds of design strategies that must be considered if a project is going to achieve LEED certification.

All of the LEED rating systems are built around six categories. Within each category are specific measures that a project must accomplish to achieve a point in that rating system.

1. **Sustainable Sites.** The Sustainable Sites category identifies opportunities for public-transportation access, encouraging alternate transportation means, managing stormwater, minimizing light pollution, and reducing heat islands.
2. **Water Efficiency.** The Water Efficiency category contains measures for reducing water consumption in the landscape and within a building.
3. **Energy & Atmosphere.** Energy & Atmosphere is primarily concerned with the efficient design of HVAC systems and measures to establish and maintain critical performance guidelines for those systems.
4. **Materials & Resources.** Materials & Resources focuses on minimizing construction waste, diverting waste away from landfills and into recycling centers, and encouraging the use of locally available materials. This category also awards points for the use of recycled-content materials, as well as materials derived from rapidly renewable resources.
5. **Indoor Environmental Quality.** Indoor Environmental Quality awards points for using low-emitting materials, providing daylight and views, and implementing an IAQ-management plan.
6. **Innovation & Design Process** (or "Innovation in Operations," depending on which rating system you're using). Innovation & Design Process (Innovation in Operations) recognizes and awards projects that exceed requirements by implementing an innovative technology or design that's not recognized in any other category.

Specific compliance requirements are established within each of the categories. For example, in LEED-NC (LEED for New Construction), under Water Efficiency, Credit 3.1 is identified as Water Use Reduction. A project is awarded 1 point under this credit if it's designed to use 20-percent less water than if the project were designed to meet the minimum requirements of local codes and standards. Credit 3.2 offers another point if a project can demonstrate that it's designed to use 30-percent less water.

In some cases, a category has prerequisites that must be achieved before any points can be awarded. Using the example of LEED-NC, before any points in Energy & Atmosphere can be awarded, the project must demonstrate that it satisfies a series of prerequisites, including providing for fundamental commissioning of the HVAC system and meeting minimum energy-performance guidelines.

LEED New Construction or Major Renovations		
Sustainable Sites		No valid comparison
	Credit 6.2	Implement a stormwater management plan that reduces impervious cover, promotes infiltration, and captures and treats the stormwater runoff from 90% of the average annual rainfall using acceptable best management practices
Water Efficiency	Credit 3.1	Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements
	Credit 3.2	Employ strategies that in aggregate use 30% less water than the water use baseline calculated for the building (not including irrigation) after meeting the Energy Policy Act of 1992 fixture performance requirements
Energy & Atmosphere	Prerequisite 3	Document zero use of CFC refrigerants in new equipment

LEED Existing Buildings		
Sustainable Sites	Credit 3	Have in place a landscape management plan that minimizes pesticide usage, runoff of hazardous materials, and production of solid waste
	Credit 6	Implement a management plan that infiltrates, collects and reuses 15% of the rainfall collected on the entire site
Water Efficiency	Prerequisite 1	Establish a baseline of water usage depending on the building age
	Credit 2.1	Reduce water consumption below the base line established in Prerequisite 1 by 10%
	Credit 2.2	Reduce water consumption below the base line established in Prerequisite 1 by 20%
	Credit 2.3	Reduce water consumption below the base line established in Prerequisite 1 by 20%
Energy & Atmosphere	Prerequisite 3	Document zero use of CFC refrigerants in new equipment. For existing equipment, demonstrate payback/replacement options

Distinguishing New Construction vs. Renovation Goals

For a new building project, the planning process for sustainable design is relatively straightforward: The LEED-NC rating system is reviewed against the project scope. The owner and design and construction teams make collective decisions on the measures that can be implemented and those that aren't possible because they're either outside the scope of the project or are too expensive. From this early planning comes a sense of the points that are well within reach, the points that are possible (but a stretch to achieve), and points that will not be pursued.

For a renovation project, there are even more choices - an intention of the USGBC to address the varied nature of renovation projects. An existing building that's undergoing gut renovation (all HVAC and electrical systems removed and replaced, new exterior windows installed, exterior walls upgraded, and new interior construction throughout) would use the same LEED rating system as a new project (LEED-NC).

For owners who are looking to upgrade their existing buildings for the sole purpose of achieving a desired level of green, the USGBC has developed the LEED for Existing Buildings: Operations & Maintenance (or LEED-EB O&M) rating system. This program provides guidance, incentives, and recognition to owners who want to upgrade their existing buildings to meet LEED standards. The program also acknowledges that an owner with a building previously certified under a LEED rating system may want to prove that it's currently operating in a manner consistent with green practices, or identify where operations can be improved to bring its operations into compliance. As opposed to the LEED-NC rating system, which is based on design expectations, LEED-EB O&M is based on actual building performance.

As a first step, LEED imposes a specified period of time, or performance period, during which the performance of the project is quantified. Using that performance period, a baseline of current performance is established. The components that make up this baseline performance picture (HVAC, power consumption, heat loss, landscape management, etc.) are then compared against LEED-required performance levels. Just as with LEED-NC, the ownership team has the opportunity to identify the aspects of performance that it wants to bring into compliance with LEED requirements.

Differences do exist when comparing the two point systems. For example, the LEED-EB O&M rating system awards points for implementing a landscape-management plan that limits the use of pesticides and other harmful chemicals, and that encourages composting as opposed to generating solid waste from landscape maintenance. A parallel does not exist under the LEED-NC rating system because this point system is about *projected* performance.

Under Water Efficiency, the LEED-NC rating system awards points if it can be demonstrated that the designed plumbing systems will collectively consume less water when compared against a national code standard. In the LEED-EB O&M rating system, a baseline limit of water usage is first established by the age of the building. Points are then awarded based on how well the building performs above that baseline.

Both rating systems discourage the use of refrigerants containing chlorofluorocarbons (CFCs) because of the harmful effects these compounds have on the ozone layer. Appropriately, a prerequisite of getting any Energy & Atmosphere points under LEED-NC is the total elimination of these compounds. With existing buildings, LEED takes a more holistic approach. While replacing all equipment utilizing CFC-based refrigerants is ideal, such actions must be shown to have a payback period of less than 10 years. The entire LEED program is about encouraging waste reduction at all levels. Even though the complete elimination of CFC-based refrigerants is the goal, LEED-EB O&M balances this against the desire to minimize waste by keeping functional equipment in operation.

Now that the LEED-EB O&M rating system has been accepted for use by the industry, it will be interesting to see how many building owners take advantage of the program and begin auditing the performance of their buildings. Just as when buildings were renovated to take advantage of improvements in elevator and air-conditioning technologies, we may likely be on the cusp of a similar period in which buildings are upgraded to take advantage of new developments in sustainable design.

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