

The Basics of Green Building and LEED[®]

By



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MAPEI has been leading our industry with “Green Building” since the 1980s. Long before the industry recognized the need for healthier products, MAPEI succeeded in developing products that were environmentally friendly. MAPEI currently provides over 100 “green” products to the industry.

Buildings account for one-sixth of the world's fresh water withdrawals, one-quarter of its wood harvest, and two-fifths of its material and energy flows (Roodman and Lenssen, 1995). Building "green" is an opportunity to use our resources efficiently while creating healthier buildings that improve human health, build a better environment, and provide monetary savings and benefits.

“Green Building” – What and why?

A green building, also known as a “sustainable” building, is a structure that is designed, built, renovated, operated, or reused in an ecological and resource-efficient manner. Green buildings are designed to meet certain objectives such as protecting occupant health; improving employee productivity; using energy, water, and other resources more efficiently; and reducing the overall impact to the environment.

- sus•tain•able
1 : capable of being sustained
2 a : of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged <sustainable techniques> <sustainable agriculture> b : of or relating to a lifestyle involving the use of sustainable methods <sustainable society>
Merriam-Webster Dictionary

One of the most frequently cited definition of sustainable development was that adopted by the World Commission on Environment and Development (the Brundtland Commission) in 1987: "A sustainable condition for this planet is one in which there is stability for both social and physical systems, achieved through meeting the needs of the present without compromising the ability of future generations to meet their own needs." The Brundtland Commission definition was selected because it acknowledges that sustainability has social and community as well as physical dimensions.

What Are the Elements of a “Green” Building?

Following is a sampling of green building practices.
Siting

- Start by selecting a site well-suited to take advantage of mass transit.
- Protect and retain existing landscaping and natural features. Select plants that have low water and pesticide needs, and generate minimum plant trimmings. Use compost and Recycled content paving materials, furnishings, and mulches help close the recycling loop.

Energy Efficiency

- Passive design strategies can dramatically affect building energy performance. These measures include building shape and orientation, passive solar design, and the use of natural lighting.
- Develop strategies to provide natural lighting. Studies have shown that it has a positive impact on productivity and well-being.
- Install high-efficiency lighting systems with advanced lighting controls. Include motion sensors tied to dimmable lighting controls. Task lighting reduces general overhead light levels.
- Use a properly sized and energy-efficient heating/cooling system in conjunction with a thermally efficient building shell. Maximize light colors for roofing and wall finish materials; install high R-value wall and ceiling insulation; and use minimal glass on east and west exposures.
- Minimize the electric loads from lighting, equipment, and appliances.
- Consider alternative energy sources such as photovoltaics and fuel cells that are now available in new products and applications.
- Computer modeling is an extremely useful tool in optimizing design of electrical and mechanical systems and the building shell.

Materials Efficiency

- Select sustainable construction materials and products by evaluating several characteristics such as reused and recycled content, zero or low off gassing of harmful air emissions, zero or low toxicity, sustainably harvested materials, high recyclability, durability, longevity, and local production. Such products promote resource conservation and efficiency. Using recycled-content products also helps develop markets for recycled materials that are being diverted from California's landfills, as mandated by the Integrated Waste Management Act.
- Use dimensional planning and other material efficiency strategies. These strategies reduce the

amount of building materials needed and cut construction costs. For example, design rooms on 4-foot (1,22 m) multiples to conform to standard-sized wallboard and plywood sheets.

- Reuse and recycle construction and demolition materials. For example, using inert demolition materials as a base course for a parking lot keeps materials out of landfills and costs less.
- Require plans for managing materials through deconstruction, demolition, and construction.
- Design with adequate space to facilitate recycling collection and to incorporate a solid waste management program that minimize waste generation.

Water Efficiency

- Design for dual plumbing to use recycled water for toilet flushing or a gray water system that recovers rainwater or other nonpotable water for site irrigation.
- Minimize wastewater by using ultra low-flush toilets, low-flow shower heads, and other water-conserving fixtures.
- Use recirculating systems for centralized hot-water distribution.
- Install point-of-use hot-water heating systems for more distant locations.
- Use a water budget approach that schedules irrigation using the California Irrigation Management Information System data for landscaping.
- Meter the landscape separately from buildings. Use micro-irrigation (which excludes sprinklers and high-pressure sprayers) to supply water in nonturf areas.
- Use state-of-the-art irrigation controllers and self-closing nozzles on hoses.

Occupant Health and Safety

Recent studies reveal that buildings with good overall environmental quality can reduce the rate of respiratory disease, allergy, asthma, sick building syndrome, and enhance worker performance. The potential financial benefits of improving indoor environments exceed costs by a factor of 8 and 14 (Fisk and Rosenfeld, 1998).

Choose construction materials and interior finish products with zero or low emissions to improve indoor air quality. Many building materials and cleaning/maintenance products emit toxic gases, such as volatile organic compounds (VOC) and formaldehyde. These gases can have a detrimental impact on occupants' health and productivity.

MAPEI maintains over 100 low-VOC products designed specifically to be environmentally friendly.

Provide adequate ventilation and a high-efficiency, in-duct filtration system. Heating and cooling systems that ensure adequate ventilation and proper filtration can have a dramatic and positive impact on indoor air quality.

Prevent indoor microbial contamination through selection of materials resistant to microbial growth, provide effective drainage from the roof and surrounding landscape, install adequate ventilation in bathrooms, allow proper drainage of air-conditioning coils, and design other building systems to control humidity.

MAPEI's BioBlock™ technology provides an additional line of product defense by inhibiting the growth of various types of odor- and stain-causing mold, mildew and bacteria.

Building Operation and Maintenance

Green-building measures cannot achieve their goals unless they work as intended. Building commissioning includes testing and adjusting the mechanical, electrical, and plumbing systems to ensure that all equipment meets design criteria. It also includes instructing the staff on the operation and maintenance of equipment.

Over time, building performance can be assured through measurement, adjustment, and upgrading. Proper maintenance ensures that a building continues to perform as designed and commissioned.

Who Governs or Regulates Green building?

Currently, there is no established federal or state guideline for green building. Many states have imposed various regulations that mandate certain requirements such as limiting VOC content of products, establishing indoor air quality standards and restricting certain chemicals from usage within the construction industry; however, to date there exists no single governmental standard for what a green building is or how to achieve green construction.

In an attempt to define and establish a measurable means of green building, the U.S. Green Building Council (USGBC) stepped forward in 2000 and began attempting to define what a green building is and how to provide a means of measuring and certifying whether construction is green.

What is the U.S. Green Building Council?

- The U.S. Green Building Council is leading a national consensus for producing a new generation of buildings that deliver high performance inside and out.
- Council members work together to develop LEED® products and resources, the Greenbuild annual International Conference and Expo, policy guidance, and educational and marketing tools that support the adoption of sustainable building.
- Members also forge strategic alliances with key industry and research organizations as well as federal, state and local government agencies to improve the “built” environment.

The USGBC’s mission statement is:

“The U.S. Green Building Council is the nation’s foremost coalition of leaders from across the building industry working to promote buildings that are environmentally responsible, profitable and healthy places to live and work.”

LEED: Leadership in Energy and Environmental Design

According to the U.S. Green Building Council, “The LEED (Leadership in Energy and Environmental Design) Green Building Rating System® is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. Members of the U.S. Green Building Council representing all segments of the building industry developed LEED and continue to contribute to its evolution and growth.”

Benefits of LEED

LEED was created to:

- define "green building" by establishing a common standard of measurement
- promote integrated, whole-building design practices
- recognize environmental leadership in the building industry
- stimulate green competition
- raise consumer awareness of green building benefits
- transform the building market

LEED provides a complete framework for assessing building performance and meeting sustainability goals. Based on well-founded scientific standards, LEED emphasizes state-of-the-art strategies for sustainable site development, water savings, energy efficiency, materials

selection and indoor environmental quality. LEED recognizes achievements and promotes expertise in green building through a comprehensive system offering project certification, professional accreditation, training and practical resources.

6 Standards of LEED

What areas of construction or renovations can I obtain LEED certification in? The following are the six (6) standards of LEED that are currently available or in development:

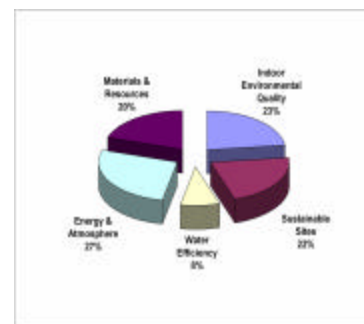
- New commercial construction and major renovation projects (LEED-NC) (*Launched in 2000*)
- Existing building operations (LEED-EB) (*Launched in 2004*)
- Commercial interiors projects (LEED-CI) (*Launched in 2004*)
- Core and shell projects (LEED-CS) (*Launched in 2005*)
- Homes (LEED-H) (*Launch planned for 2006*)
- Neighborhood Development (LEED-ND) (*In development*)

Example of LEED Rating System

- | 4 levels of certification | LEED-NC | LEED-EB |
|---------------------------|-----------|-----------|
| ○ LEED Certified | 26-32 pts | 28-35 pts |
| ○ Silver Level | 33-38 pts | 36-42 pts |
| ○ Gold Level | 39-51 pts | 43-56 pts |
| ○ Platinum Level | 52+ pts | 57+ pts |

NC = New Construction
EB = Existing Buildings
- Self-assessing system to guide project development
- 5 performance areas
- 64 regular + 5 innovation credits

5 Categories of LEED & Percent of NC Score



Who is using LEED?

Federal Users: Federal government projects account for over 10 percent of construction in the United States.

- **GSA:** The General Services Administration requires that all building projects in the 2003 construction budget meet LEED Certified level standards. It is not requiring that all projects apply for certification; however, it has more than 10 projects registered including federal courthouses, laboratories, border stations, and office buildings. The GSA is the nation's largest tenant, managing space in over 8,300 owned and leased buildings for over one million federal employees. GSA was the Council's first federal member.
- **Air Force:** The Air Force has developed a LEED Application Guide for Lodging projects currently awaiting release and has registered one project for LEED Certification.
- **Army:** The Army has adopted LEED into its Sustainable Project Rating Tool (SpiRiT), but is not requiring certification of its projects.
- **Department of State:** The Department of State has committed to using LEED standards on future projects.
- **DOE:** The Department of Energy supported the development of the LEED Rating System, training workshops, and reference materials.
- **EPA:** The Environmental Protection Agency participated in the pilot testing of LEED version 1.0, but did not earn project certification. The Agency currently has two laboratory projects registered and is supporting development of LEED for Existing Buildings.
- **Navy:** The Navy was the first federal entity to certify a LEED project, the Bachelor Enlisted Quarters at the Great Lakes Naval Training Center. This project was certified under the Pilot version of LEED. Navy currently has one project registered with LEED and is supporting the development of LEED Residential.

State Users: At present, no state requires LEED for public projects although several are considering it and encouraging use of LEED standards in both current public and private projects:

- **California:** California is currently considering LEED adoption and development of California LEED Supplement for state projects.
- **Maryland:** Maryland adopted LEED certification for all capital projects greater than 5,000 gsf in October 2001. An implementation plan for the new policy is pending. The state currently offers a green-building

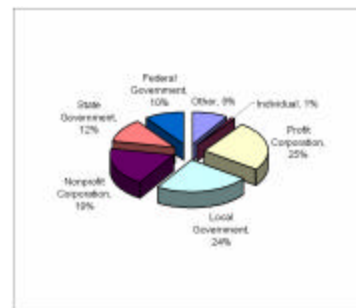
tax credit for non-residential projects.

<http://business.marylandtaxes.com/taxinfo/taxcredit/greenbldg/default.asp>

- **Massachusetts:** Massachusetts is considering LEED adoption for all state projects.
- **New Jersey:** The New Jersey Economic Development Authority is encouraging the use of LEED but not requiring certification of new projects built under its \$12 billion (USD) public school construction program.
- **New York:** Governor Pataki issued an executive order in June 2001 encouraging but not requiring state projects to seek LEED Certification. The New York State Green Building Tax Credit Program provides a tax incentive to commercial developments incorporating specific green strategies (not directly tied to LEED).
<http://www.dec.state.ny.us/website/dar/ood/grnbldg.html>
- **Oregon:** Oregon's 35% Business Energy Tax Credit for commercial development is tied to LEED certification:
 - 100,000 sq. ft. (9 290 m²) LEED Silver building eligible for \$105,000 (USD) tax credit
 - 100,000 sq. ft. (9 290 m²) LEED Gold building eligible for \$142,500 (USD) tax credit
- **Pennsylvania:** LEED Silver certification is required in new construction RFPs issued by the Dept. of Environmental Protection and Dept. of General Services.
www.gggc.state.pa.us/

* Other states including Arizona, Missouri, New York, and Wisconsin are also currently using LEED on public projects and/or intend to seek LEED certification.

Registered Projects by Owner Type for LEED-NC as of Dec. 2004



Excerpt from "An Introduction to the U.S. Green Building Council and the LEED Green Building Rating System®", U.S. Green Building Council, December 2004

Green Building Progress in the US Using the LEED Suite of Standards as a Measurement (As of March 2005)

LEED METRICS*	2005	2004	2003	2002	2001	2000	1999
NC Registrations [†]	1794	1733	1061	603	312	45	0
NC Certified Projects	180	167	82	38	5	0	0
NC Total million m ²	>22	>21	>14	>8	5.1	0.1	0
EB Registrations [†]	19	6	0	0	0	0	0
EB Certified Projects	14	12	2	0	0	0	0
EB Total million m ²	>0.9	>0.1	0	0	0	0	0
CI Registrations [†]	21	8	0	0	0	0	0
CI Certified Projects	24	21	0	0	0	0	0
CI Total thousand m ²	>68k	25	0	0	0	0	0
Total Workshop Attendees	22,821	22,495	14,606	7,905	NI	NI	NI
NC Accredited Professionals	19,342	19,200	5,978	2,443	NI	NI	NI

*Cumulative, includes previous year's data; e.g. 2002 includes 1999-2002

[†]Number of registrations does not include pilot projects.

NI = No Information

(Excerpt from "Radical Sustainable Construction: Envisioning Next-Generation Green Buildings", by Charles J. Kibert, Director & Professor and Kevin Grosskopf, Director & Assistant Professor of University of Florida, Gainesville, Florida, April 2005.)

Professional Accreditation – How and Why?

Attending a USGBC LEED workshop is the first step toward entering the rapidly growing green-building market. USGBC offers workshops conducted by the top green building practitioners in the country. USGBC also offers LEED topic modules.

USGBC offers LEED Professional Accreditation, which distinguishes individuals with detailed knowledge of LEED project certification requirements and processes and a comprehensive understanding of integrated design principles. LEED accreditation is awarded to building industry practitioners who successfully demonstrate proficiencies on a comprehensive exam given by the USGBC.

Purpose of Exam

- To ensure that a successful candidate has knowledge and skills necessary to participate in the design process, to support and encourage integrated design, and to streamline the application and certification process.
- To test understanding of green-building practices and principles, and familiarity with LEED requirements, resources, and processes.

Successful examinees earn:

- recognition as a LEED Accredited Professional on the USGBC website;
- one point toward LEED Certification of their green-building projects; and,
- a LEED Accredited Professional Certificate.

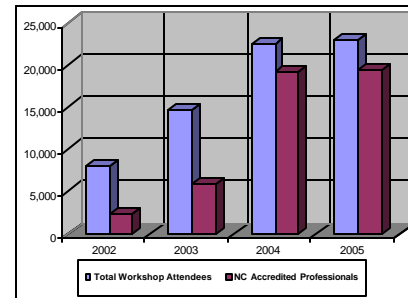
Exam Eligibility

The LEED Professional Accreditation Exam is not eligibility-based. However, the following

qualifications for the exam are strongly recommended:

- Tenure in green-building and construction industry knowledge.
- Familiarity with documentation process for LEED-certified projects.
- Knowledge of LEED credit intents, requirements, submittals, technologies, and strategies within their discipline.
- Practical experience working with multiple design disciplines.
- Understanding of life cycle cost and benefits of LEED.
- Familiarity with LEED resources and processes.

Growth in Number of LEED Professionals



Excerpt from the U.S. Green Building Council website at www.usgbc.org

Conclusion

Building green is a growing trend as architects and property owners become more and more conscious of preserving the environment and promoting healthier products and construction practices. As the industry improves knowledge and education regarding green building, MAPEI continues to stay ahead with innovative developments and the broadest set of LEED-qualified products in the industry.

About the Author: Donald L. House has more than 15 years' experience in all aspects of environmental, emergency response and health industries. Donald currently works for MAPEI as its Manager of Regulatory Affairs, providing regulatory oversight and support for all of MAPEI's locations in the Americas along with overseeing MAPEI's LEED Program since 2000.



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