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More than LEED

New Green Building Certification Systems Offer a Range of Sustainability Benchmarks

BY CATHERINE BOBENHAUSEN

Building designers who reach for sustainable, high-performance goals have a number of decisions to make. As always, they can choose either to design independently, not tethered to a pre-established "best practice" framework; or they can elect to follow an established rating system to benchmark the attributes of their design against those of others. The best-known and most widely used certification system is the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED), but several other systems are gaining traction within the green building industry.

Industrial hygienists often focus on the indoor environmental quality aspects of running the building, including indoor air quality, mechanical system operation, and sometimes acoustics. Certification systems can introduce best practices early in the design, with consistent reminders throughout, so that the measures actually make it into the building and the building users take note.

TO CERTIFY OR NOT TO CERTIFY

Attentive architects and engineers focus their practice on understanding the needs and aspirations of their clients. They add a street-savvy, reality-based sense of the possible, given constraints of budget and schedule. They rely on practiced skill with aesthetics in three dimensions, knowledge of space requirements, workable design ideas, an understanding of flow patterns around and inside buildings, familiarity with a wide palette of durable and aesthetic building products, and use of building science and techniques for condensation prevention, drainage, and rainwater management. At times they use computer modeling to design for energy efficiency and comfort (for example, by using computational fluid dynamics to avoid condensation and uncomfortably cold perimeter conditions). They crosscheck the codes, standards, and local requirements. Then they have to deal with specifications, construction documents, bid packages, and actual construction.

So how does overlaying a green building certification system on an already complicated design process benefit the designer, and ultimately those living in these buildings?

If the ideals embedded in the certification system are aligned with those in the building, the experience can be challenging, but satisfying. When a design team adopts an established rating system, it must break down the silos of specialized work just to meet the system's requirements and integrate work practices, beginning at conceptual design. Green building certification confirms that green building design features and operations are actually incorporated into the building.

But problems arise if the ideals embedded in the certification system are *not* aligned with those of the ultimate building users. For example, early in LEED's evolution, designers of LEED-rated commercial

buildings tended towards narrow, open floor plates to maximize views and daylight. Maybe there were exposed ceilings with no acoustical tiles, and polished concrete or bamboo flooring instead of carpeting. People complained of noise and distracting conversations. Acoustical barriers, baffles, and clouds or electronic sound masking systems have been added after the fact to improve building acoustics.

The current, fourth version of LEED (LEEDv4) now includes a call for acoustical attention, in terms familiar to the acoustical designer: sound isolation performance, reverberation time and reverberant noise buildup, paging, masking and sound reinforcement systems, and control of HVAC background noise.

Also, operable windows can be a control issue for building managers when people open them at will, ignoring how the HVAC systems run and the wasting of fuel and money. Solutions and teachable moments arose from this type of conflict. At the LEED Platinum Phillip Merrill Environmental Center, which houses the Chesapeake Bay Foundation headquarters, a total energy management system (TEMS) currently monitors weather and indoor temperatures. When conditions are right, the TEMS shuts down the mechanical system and lights up "open windows" signs!

LEED AND ITS ALTERNATIVES

Designers are offered a dizzying array of rating systems, each growing in complexity to align with many opportunities to improve energy performance, water use, site preservation, resource conservation, and indoor environmental quality. Much emphasis has been placed on energy use reduction, with less on indoor air quality. Below, I'll compare the latest version of LEED with three alternative rating systems.

LEED

LEED dominates the green building market. According to the U.S. Green Building Council, LEED is used in 135 countries, encompassing 9.3 billion square feet of commercial/institutional real estate and more than 117,000 residential units.

As of March 2013, there were over 195,000 LEED Accredited Professionals (compared to 6,500 CIHs). LEED has divided and subdivided in many ways to suit specific market niches. Currently LEED has 21 adaptations, which are shown in Table 1.

LEEDv4 was released at the Greenbuild 2013 conference in November. It incorporates many innovative options for lower material emissions and better indoor environmental quality, such as increased emphasis on emissions testing in addition to VOC content and disclosure of chemical formulations in building products.

Green Globes

Green Globes was established in 2004 by the Green Building Initiative (GBI), a nonprofit organization that promotes energy-efficient and environmentally sustainable buildings. About 850 projects have been certified in the Green Globes program, and another 250 projects have been registered. In October 2013, the U.S. General Services Administration recommended that federal projects use either LEED 2009 or Green Globes 2010 as third-party green building certification programs. This recommendation effectively elevated Green Globes' status.

According to the GBI website, Green Globes uses a questionnaire-driven assessment to guide users, covering project management, site, energy, materials and resources, emissions, and indoor environment. Projects achieving at least 35 percent of a 1,000-point scale can earn certification at one of four levels. While LEED is based on an electronic upload of documentation, Green Globes sends auditors (third-party assessors) to sites to supplement the document review. The system offers tracks for design of new buildings or significant renovation, management and operation of existing buildings, building emergency management, building intelligence, and fit-up.

Like LEED, Green Globes covers topics for indoor environmental quality and refers to many of the same references and standards. The main difference between them concerns the weighting or scoring systems. Green Globes has no prerequisites (except for the 35 percent minimum) and rewards increments of accomplishment, recognizing higher levels of achievement based on the number of points a building acquires. LEED has stringent prerequisites and fewer gradations, and therefore fewer divergent pathways to accomplish certification. A Green Globes project could have outstanding achievements in site design, energy, water efficiency, materials use and indoor air quality and receive a rating even

Table 1. LEEDv4 Rating Systems

Building Design and Construction Rating System	
1	New Construction
2	Core & Shell
3	Schools
4	Retail
5	Hospitality
6	Data Centers
7	Warehouses & Distribution Centers
8	Healthcare
9	Homes
10	Mid-Rise
Interior Design and Construction Rating System	
11	Commercial Interiors
12	Retail
13	Hospitality
Existing Buildings: Operation and Maintenance Rating System	
14	Existing Buildings: Operations & Maintenance
15	Schools
16	Retail
17	Hospitality
18	Data Centers
19	Warehouses and Distribution Centers
Neighborhood Development Rating System	
20	Neighborhood Development Plan
21	Neighborhood Development

though (for example) it doesn't meet the requirements of ASHRAE 62.1 *Ventilation for Acceptable Indoor Air Quality* in one rarely-occupied zone in the basement. This building would not be eligible for LEED certification, since full compliance with ASHRAE 62.1 is a LEED prerequisite. Green Globes advocates argue that the rating system avoids the hazard of diverting resources to peripheral items for little specific environmental gain.

What does Green Globes offer a designer, with respect to indoor environmental quality? The opportunity to purposefully consider:

- compliance with ASHRAE 62.1-2010 for ventilation air quantity
- low-VOC adhesives, sealants, paints, coatings, and floor coverings
- mechanical system design, materials selections, and installation locations to reduce potential for mold
- use of filters with a minimum efficiency rating value (MERV) of 13
- better layout and access for filter change-out and for HVAC equipment maintenance
- cooling towers designed to prevent *Legionella* (drift control)
- domestic hot water systems designed to prevent *Legionella*
- ability to flush out the building with 100 percent outside air, while maintaining reasonable indoor temperature and humidity conditions
- compliance with ASHRAE 15 *Safety Standard for Refrigeration Systems*
- exterior envelope commissioning, to control infiltration

Note that many of these items are also found in the LEED rating system.

BREEAM

The Building Reasearch Establishment Environmental Assessment Methodology (BREEAM) is dominant in the United Kingdom and is widely used in other European countries. In BREEAM, the number of total points that can be achieved varies depending on basic project inputs, but is normally close to 100. Indoor environmental quality is addressed in the section called "Health and Wellbeing," which is worth a total of 15 points, with each point assigned to a single topic.

BREEAM addresses the same indoor air quality concepts as LEED, with credits focused on material selections (such as low-VOC content products and emissions testing for formaldehyde and other volatile chemicals), good ventilation design, controlling or eliminating environmental tobacco smoke (ETS), pre-occupancy building flush-outs, and post-construction emissions testing of completed spaces. The primary variations in BREEAM have to do with the referenced standards (European vs. American) and with BREEAM's emphasis on material emissions testing and (in some cases) product content reporting; for wall coverings, for example, BREEAM requires reporting of vinyl chloride monomer, formaldehyde levels, and migration of heavy metals. BREEAM clearly had an influence on the development of some of LEEDv4's revised materials credits.

As with LEEDv4, post-construction, pre-occupancy air quality testing can be performed. Where levels are found to exceed the BREEAM limits, the project team confirms the measures that have or will be undertaken, in accordance with the IAQ plan, to reduce the TVOC and formaldehyde levels.

Passivhaus

Passive House (known in Germany, where it originated, as Passivhaus) is a concept for designing buildings with minimal heating and cooling loads, which reduces or eliminates the need for mechanical heating and cooling. The goal of Passive House is to significantly reduce energy consumption and peak energy demand. The key components are a super-insulated, air-tight building envelope and strategic use of solar loads and shading.

Unlike a typical house that relies on natural infiltration to replenish indoor air, an air-tight Passive House is designed with mechanically supplied ventilation distributed evenly throughout the structure to prevent condensation in exterior walls, while exhausting air (but capturing heat) to eliminate odors and other indoor contaminants. By combining mechanical ventilation with energy recovery, a Passive House delivers a steady supply of filtered, tempered outside air.

The Passive House standard established by the International Passive House Association (iPHA) has been executed on a range of buildings throughout Europe, from single family homes to a 20-story office building in Austria. In the U.S., the Passive House Institute U.S. (PHIUS) is gaining traction, with single-family and small commercial buildings becoming certified.

Unlike LEED, Green Globes, or BREEAM, the Passive House program encourages, but does not require, adherence to other sustainable goals such as low-emitting materials selection or reduced water usage. However, there are ancillary benefits to a building designed to the Passive House standard, such as thermal comfort (even temperatures throughout), substantial soundproofing, and significantly smaller mechanical equipment and space requirements.

INTEGRATED DESIGN

Some say that rating systems, by requiring design integration, offer the "front-end alignment" that drives a project purposefully forward. Rating systems are excellent for documenting, tracking, and reporting the design/construction team's progress in meeting defined tasks. Such a focus is beneficial as long as it meets the needs of the building's users.

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