

green progress, change for the better LEED[®] 2009

from the editor ...

In his recent Green Building Impact Report, Rob Watson, executive editor of GreenerBuildings.com, indicated that green building impacts are both encouraging and cautionary. He stated that LEED buildings are having a major impact on reducing the overall environmental footprint on an individual basis. However, he noted that for LEED to significantly help to reduce the overall environmental footprint, there is still additional progress that needs to be made. This newsletter discusses the changes made to LEED for 2009 to get us closer to our common goal of a greener future.

Introduction. From a high-level perspective, 2008 was a year in which the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ achieved high momentum. The number of LEED certified projects increased to over 2,000, LEED registered projects exceeded 17,000 and LEED Accredited Professionals (APs) topped 69,000. With such growth, it may have seemed like a good time to sit back and “ride the wave.”

However, members of the U.S. Green Building Council (USGBC), the non-profit organization that developed LEED, knew that there were some issues with the current system that needed to be addressed. For example:

- Separate LEED documents existed for schools, new construction, retail, and other building types. While the specialization by building type was warranted, it began to

cause confusion among practitioners. With the assortment of similar, but different, rating systems, the situation was ripe for errors to occur inadvertently.

- The LEED Accredited Professional distinction was becoming less understandable. A person who had taken the test years ago was still accredited, but did the test taken correspond to their present work?
- Some critics of LEED also stated that perhaps the focus of the rating systems had moved away from the core of “Leadership in Energy and Environmental Design,” and it was time to reexamine the systems.

USGBC wanted to ensure that these issues were addressed and expended a significant amount of volunteer and staff time, money and work to address them. The result was LEED v3—which includes LEED 2009, a new LEED accreditation and certification process and LEED Online version 3.

LEED 2009 – What Changed?

In order to address the concerns listed above, several changes were made to LEED as you know it. The result is a more harmonious and streamlined LEED rating system.

- First, in order to eliminate the inconsistencies across LEED products, a new “bookshelf” concept was implemented. Each credit is a separate “book” and is the same for all applicable LEED rating systems. Each rating system consists of its own “bookshelf” of credits.

- Second, professional accreditation and the certification practices for buildings are now the responsibility of the Green Building Certification Institute (GBCI). This is discussed in more detail below.
- Third, credit weighting was changed. Below, we cover this at a high level and then dig into some HVAC-related specifics.
- Fourth, USGBC wanted to address the fact that due to regional conditions, there are credits that should be different. This is also touched on below.
- Finally, in response to the marketplace, USGBC committed to a two-year development cycle, so the next changes will be LEED 2011. This provides stability to the marketplace, but still allows USGBC to respond rapidly when necessary.

Certification and Accreditation

At the 2008 GreenBuild convention, Peter Templeton and Beth Holst of the Green Building Certification Institute (GBCI) delivered presentations addressing the changes for both professional accreditation and LEED project certification. GBCI is responsible for both under LEED 2009. Please refer to www.gbci.org for the latest information.

Building Certification. In the past, projects were reviewed by USGBC with the support of independently contracted reviewers. In mid-2008, it was announced that ten certification

organizations would be responsible for performing project reviews. Beginning in January 2009, GBCI began administering this process and overseeing the certification process. In the 2008 announcement, it was stated that not only was this third-party certification important, but, "it...allows USGBC to stick to the knitting of advancing the technical and scientific basis of LEED." So GBCI concentrates on certification and USGBC focuses on the LEED products.

Personal Accreditation. The first subject Templeton addressed was the credentialing of present or "legacy" LEED professionals. He made it very clear that present LEED APs do *not* need to retake the exam. People may still register for the present LEED AP examinations until March 31, 2009.

Present LEED APs must agree to the code of ethics and will remain in the active LEED AP database until June 2011—even if they do nothing else. If one "opts in" between June 1 and June 30, 2009, the initial fee is waived. To remain on the active list beyond June 2011, a total of 30 hours of professional training (6 hours being LEED specific) must be completed.

The new credentialing system consists of three tiers, with biennial credentialing requirements differing by tier. No matter the tier, everyone must sign the disciplinary policy and agree to credentialing maintenance. To maintain credentials, many of the same professional development hours that are accepted for professional engineers or architect licenses may be used. In addition, some credit(s) may also be available for presentations (e.g., seminars at conferences such as GreenBuild). These specifics were not available at the time of printing.

The three tiers break down as follows:

- **Tier 1: LEED Green Associate**
This level requires one to be involved in support of LEED projects, employed in the sustainable field or engaged in

green education, and to submit to an application audit. An examination covering basic, or core, information across all LEED products must be passed. Finally, 15 hours of education (3 hours LEED specific) must be completed every two years.

- **Tier 2: LEED Accredited Professional**

This level represents in-depth knowledge in a particular field or LEED rating system. In addition to meeting the requirements of a Green Associate, one must demonstrate experience on a LEED project and document work on a specific LEED project within the last three years. This can be done through LEED online verification or employer attestation. In addition, an examination *covering the chosen specialty* must be passed. For example, someone could pass the LEED for Homes examination and become a LEED AP with a specialization in Residential Design and Construction. Once accredited, 30 hours of professional development (6 hours LEED

specific) must be completed every two years.

- **Tier 3: LEED AP Fellow**

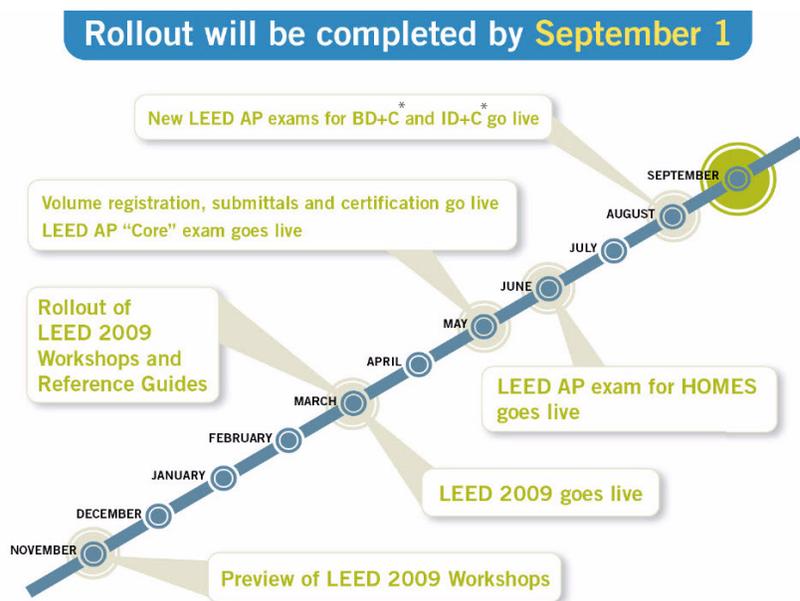
This level is available to leading professionals who have made major contributions to green building. This is established by a peer review of their project portfolio.

As of this newsletter's writing, not all the specifics are available. A timeline as of February 2009 is shown in Figure 1. More credentialing information will become available throughout 2009 on the GBCI website: www.gbci.org.

LEED 2009 Rating System

The LEED 2009 credit point lists, or scorecards, are the result of important development initiatives undertaken by USGBC. The USGBC identified energy efficiency and climate change as urgent priorities; the changing allocation of points among LEED credits reflects that shift. The re-weighting resulted in the redistribution

Figure 1. LEED 2009 Rollout Schedule



Graphic courtesy of USGBC©

*BD+C = Building Design & Construction; ID+C = Interior Design & Construction

Table 1. Credit Distribution for New Construction

	LEED NC 2.2	% of LEED NC 2.2	LEED 2009	% of LEED 2009
Sustainable Sites	14	20%	26	26%
Water Efficiency	5	7%	10	10%
Energy & Atmosphere	17	25%	35	35%
Materials & Resources	13	19%	14	14%
Indoor Environmental Quality	15	22%	15	15%
Innovation & Design Process	5	7%	*6	
Regional Bonus	0		*4	
Rating System Total	69		100	

*Bonus points available toward a LEED 2009 maximum of 100

of the available points in LEED so that a given credit's point value more accurately reflects its potential impact on the environment.

The first step taken in re-weighting LEED involved deciding which environmental impacts LEED should address. The 13 impact categories were derived from the EPA's TRACI program (the Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts). The initial weighting applied to each category was based on input from the National Institute of Standards and Technology (NIST). For the Greenhouse Gas Emissions category, building energy consumption was based on a combination of CBECS, Energy Star and EPA eGRID data.

LEED credits were then organized into activity groups based on core building functions. Each activity group represents a group of credits associated with the same issue. For example, the "Building Systems" activity group includes credits related to building energy use.

The LEED Steering Committee and USGBC staff also provided specific requirements that guide the weighting system: Credits must total 100 points, be positive integers and be static independent values.

Upon determining the impact categories and activity groups, the LEED Steering Committee used a basic weighting equation. The equation

combines information on building impacts, building functions and the association with the activity group—a binary relationship indicating whether or not a credit contributes to reducing an impact. This approach was implemented in a spreadsheet called LEED 3.0 Credit Weighting Tool.

The Result. The new LEED 2009 rating system consists of 100 points. Thresholds required for certification are:

- Certified – 40
- Silver – 50
- Gold – 60
- Platinum – 80

Additionally, there are 10 bonus points that can be used to help a project achieve its desired certification level:

- 5 bonus points for Innovation and Design,
- 4 more bonus points for Regional Priority and
- 1 point for a LEED Accredited Professional as a member of the project team.

As illustrated in Table 1, the re-weighting process produced differences in category points for LEED New Construction (NC) 2009 as compared to NC 2.2. The relative value and weight of the top three categories (Sustainable Sites, Water Efficiency, and Energy and Atmosphere) comprises more than 70 percent of the

100 base points. The EA section alone increased to 35% of the overall base points.

What does this mean for the HVAC practitioner? More than ever, reduced energy consumption and a smaller carbon footprint will be at the forefront of all LEED building designs and projects.

Regionalization

Previously, LEED had been applied uniformly across the U.S. and point values were equally achievable across various regions. The USGBC now has introduced regional bonus credits to increase the value of pursuing credits that address environmental areas of concern in a project's region. This enhances the flexibility of LEED and more effectively addresses the need for regional adaptation. For example, in locations where water use is critical for sustainability, such as India, Mexico or the southwest U.S., a regional credit targeted at reducing water usage could be added. The possible exportation of LEED to other countries is greatly enhanced by this regional adaptation.

Specific Changes to HVAC

Water Efficiency Prerequisite. The USGBC responded to feedback on water savings by adding a prerequisite for water efficiency. In LEED 2009, the baseline water usage is expanded from the original Energy Policy Act of 1992, adding the Energy Policy Act of 1995 and the Uniform Plumbing Code or International Plumbing Code of 2006. The proposed water usage must be 20 percent below baseline. (In LEED version 2.2, this savings would have earned a credit point.) Besides high-efficiency fixtures for water savings, water collected from the cooling coil condensate can help contribute to this prerequisite.

Table 2. Water Efficiency Credits

Credit	Description	LEED NC 2.2		LEED 2009	
		Maximum credits	Maximum %	Maximum credits	Maximum %
1.1	Water Efficient Landscaping, Reduce by 50%	1	1.45%	2	2.0%
1.2	Water Efficient Landscaping, No Potable Use Or No Irrigation	1	1.45%	2	2.0%
2	Innovative Wastewater Technologies	1	1.45%	2	2.0%
3	Water-Use Reduction	1-2		2-4	
3.1	20% Reduction (30% in 2009)	1	1.45%	2	2.0%
3.2	30% Reduction (35% in 2009)	2	2.9%	3	3.0%
3.3	40% Reduction	N/A		4	4.0%
WE Section		5	7.2%	10	10.0%
Rating System Total		69		100	

Credit. The credit re-weighting affected the Water Efficiency category. The overall category point total has doubled from 5 to 10 points as shown in Table 2. Credits 1.1 and 1.2 deal with water-efficient landscaping.

- Credit 1.1 calls for the reduction of water consumption for landscaping by 50 percent compared to a baseline. Credit 1.2 is awarded for no potable water use or irrigation for landscaping.
- Credit 2 addresses Innovative Wastewater Technologies.

All three of these credits doubled in value from 1 to 2 points.

- Credit 3 covers total water-use reduction compared to a baseline. The greater the water reduction, the more credit points earned.

It is likely that these LEED modifications will result in the following changes:

- Increased rainwater capture
- Re-use of water within buildings
- Selection of modeling programs that calculate building make-up water
- Condensate recovery

Indoor Environmental Quality. The main difference for the Minimum IAQ performance prerequisite is the reference to ASHRAE Standard 62.1-2007 instead of 2004. The 2007 version of the standard has been modified significantly. Designers should review 62.1-2007.

Credit. Credit points remained the same in this section, but the impact of the credit points was reduced overall (refer to Table 3). Under the Outdoor Air Delivery Monitoring credit for mechanically ventilated spaces, a direct outdoor airflow measurement device must now be provided for each

Table 3. Indoor Environmental Quality Credits

Credit	Description	LEED NC 2.2		LEED 2009	
		Maximum credits	Maximum %	Maximum credits	Maximum %
1	Outdoor Air Delivery Monitoring	1	1.45%	1	1.0%
2	Increased Ventilation	1	1.45%	1	1.0%
3.1-3.2	Construction IAQ Management Plan	2	2.9%	2	2.0%
4.1-4.4	Low-emitting Materials	4	5.8%	4	4.0%
5	Indoor Chemical & Pollutant Source Control	1	1.45%	1	1.0%
6.1-6.2	Controllability of Systems	2	2.9%	2	2.0%
7.1-7.2	Thermal Comfort	2	2.9%	2	2.0%
8.1-8.2	Daylight & Views	2	2.9%	2	2.0%
EQ Section		15	21.7%	15	15%
Rating System Total		69		100	

mechanical ventilation system serving sparsely occupied spaces. The device must be capable of measuring outdoor airflow rate with an accuracy of plus or minus 15 percent of the design minimum outdoor air rate, as defined now by the 2007 edition of standard 62.

Due to the reduction in the overall percentage of the credit points, it is likely that there will be a little less emphasis on the IEQ section.

Energy & Atmosphere. For NC 2009, EA Prerequisite 1 requires a 10 percent reduction in energy cost compared to a building that complies with ASHRAE 90.1-2007. Projects in California are permitted to use Title 24-2005, Part 6, in place of ASHRAE 90.1-2007 for this option.

There are two prescriptive options to meet the prerequisite:

- The ASHRAE Advanced Energy Design Guides—available for free from ASHRAE: www.ashrae.org/aedg.
- Compliance with the Advanced Buildings Core Performance Guide developed by the New Buildings Institute. Limited building types, sizes and sections of the guide apply. Refer to www.advancedbuildings.net.

Significant changes took place to the Optimize Energy Performance, On-site Renewable Energy and Measurement & Verification credits. All these changes deal with energy directly. Enhanced Commissioning, Enhanced Refrigerant Management, and Green Power requirements did not change, although the number of points did.

EA Credit 1: Optimize Energy Performance. To make it simple to achieve EAc1 points on small buildings, there are two prescriptive paths that do not require computer modeling. The Energy & Atmosphere technical advisory group (or TAG) created language that allows up to 3 credit points to be obtained on small buildings by following a *prescriptive* path.

The first prescriptive path requires meeting all the recommendations in the ASHRAE Advanced Energy Design Guides. One credit point can be obtained for small offices, small retail or small warehouses and self-storage buildings. [For another option, refer to “AEDG/Modeling Alternative,” p. 6.]

The second prescriptive option is based on the Advanced Buildings Core Performance Guide by the New Buildings Institute. Offices, schools, public assembly, and retail less than 100,000 square feet can be used under this option. To achieve 1 point, all the requirements in Sections 1 and 2 must be implemented.

In addition to the single credit point, an additional point may be earned by employing three of the Enhanced Performance Strategies shown below. Up to 2 additional points may be earned.

Enhanced Performance Strategies

- Daylighting and Controls
- Additional Lighting Power Reductions
- Plug Loads/Appliance Efficiency
- Supply-Air Temperature Reset

- Indirect Evaporative Cooling
- Heat Recovery
- Premium Economizer Performance
- Variable-Speed Control
- Demand-Responsive Buildings (Peak Power Reduction)
- On-Site Supply of Renewable Energy
- Fault Detection and Diagnostics

So the Core Performance Guide can be used to attain up to 3 points in a prescriptive manner. These two prescriptive options allow the project team the opportunity to achieve 1 to 3 points on smaller buildings, with no modeling required.

However, there are up to 19 points available if modeling is performed, so many project teams opt to model, using Appendix G from ASHRAE 90.1-2007. Remember that the prerequisite is now 10 percent less energy cost compared to ASHRAE 90.1-2007 for new construction and 6 percent for existing building renovations. Each additional 2 percent of energy cost savings accrues another credit point (refer to Table 4). Needless to say, there is significant emphasis on optimizing the energy within the project.

EA Credit 2: On-Site Renewable Energy. There is also increased emphasis on renewable energy—covered by EA Credit 2. The available points from on-site renewable energy increased to a maximum of 7: 1 point for the first 1 percent plus 1 point for each additional 2 percent as shown in Table 5.

Those who implement on-site renewable energy usually attempt to reduce the project energy consumption (see EAc1) first. That way the same size renewable system becomes a greater percentage of the project’s energy cost. This helps to make on-site renewable energy systems more cost effective.

Table 4. EAc1 Points Availability

New Buildings	Existing Building Renovations	Points
12%	8%	1
14%	10%	2
16%	12%	3
18%	14%	4
20%	16%	5
22%	18%	6
24%	20%	7
26%	22%	8
28%	24%	9
30%	26%	10
32%	28%	11
34%	30%	12
36%	32%	13
38%	34%	14
40%	36%	15
42%	38%	16
44%	40%	17
46%	42%	18
48%	44%	19

Table 5. On-Site Renewable Energy EAc2

% Renewable Energy	Points
1%	1
3%	2
5%	3
7%	4
9%	5
11%	6
13%	7

EA Credit 5: Measurement & Verification. Only one change was made to EAc5, the Measurement & Verification credit, but it’s significant.

In LEED NC 2.2, a point was given for an M&V plan, but if there were discrepancies between the measured and expected data, there were no requirements for changes to be made. The hope was that building owners would undertake plans to decrease their energy costs to the expected values—and reap the benefits. However, some project teams may have used the credit to simply “get a

AEDG/Modeling Alternative. While the TAG's decision was to allow 1 prescriptive point by implementing all the recommendations in the AEDG, there's another alternative that teams may want to consider—here the K-12 Schools Guide is used as an example.

In its analysis, the K-12 Schools AEDG was compared with ASHRAE 90.1-2004 and has savings shown below. These are compared to 90.1-2004, but the LEED 2009 comparison is with 90.1-2007.

K-12 AEDG: Savings compared to 90.1-2004

- At least 30 percent
- Daylighting, but not high-efficiency lighting, 30-45 percent
- High-efficiency lighting, but not daylighting, 24-41 percent

So the design team could specify a building based on the AEDG recommendations, and then model that building as the proposed design. In many cases, the modeled savings may give significantly more than the single credit point allowed by following this prescriptive path. Modeling adds more work, but may be very beneficial in achieving the LEED certification level being sought.

point" rather than as a way to keep the building operating efficiently.

This led to LEED 2009 requiring a process for corrective action to ensure energy savings are realized if measured results show that expected energy savings are not being achieved.

Thirty-five percent of LEED points are now covered in the EA section—and there is significant incentive for project teams that use integrated approaches to reduce energy use and bring into play or increase on-site renewables. As always, we encourage people to not "look for points" but find ways to reduce the energy and environmental impacts of their projects.

LEED Canada Updates

The USGBC was not the only one revamping its LEED program for 2009. The Canada Green Building Council (GBC) staff, volunteers, TAG members and many others have been working extremely hard to update a number of the LEED Canada documents to release in 2009. In fact, the following three programs received approval from Canada GBC members in balloting in late 2008 and early 2009:

- LEED Canada for Homes, with a March release of the Reference Guide
- LEED Canada for Existing Buildings
- LEED Canada for New Construction version 2.0

Many of the LEED Canada credits are modified for the conditions in Canada, while others mirror those used in the U.S.

One example of the latter is that the LEED Canada and LEED U.S. Enhanced Refrigerant Management credit now use the same method. For LEED Canada Homes, it is EA Credit 11; for Existing Buildings, it is EA Credit 5; and for New Construction, it is EA Credit 4.

For those unfamiliar with this credit, here's a quick summary:

- If no refrigerant is used, the credit is achieved.
- If any refrigerant is used, this method balances refrigerant global warming and ozone depletion potentials as recommended by a Technical Scientific Advisory Committee.
- It's very important for those new to these calculations to understand that there is no refrigerant that receives a "free pass." No matter the refrigerant, (R134a, R-123, R410a, etc.) a calculation must be performed.

- If that calculation results in a "score" of 100 or less for the project, the credit is earned.

The balloted document gives some guidance for project teams by stating, "Select HVAC&R equipment with reduced refrigerant charge and increased equipment life."

A spreadsheet that performs the calculation is available at: www.trane.com/Commercial/Uploads/XLS/891/EAc4Calculator_LEEDV2-2.xls.

Trane's TRACE™ 700 software program can be used for LEED Canada submittals.

Closing Thoughts

LEED 2009 requirements have changed significantly. There is increased emphasis on Sustainable Sites, Water Efficiency, and Energy & Atmosphere. Project teams are likely to devote more time and effort to these aspects of LEED projects. We leave you with these thoughts:

- Reducing energy use and costs can be achieved by an integrated building approach implemented by the entire building project team. First reduce the loads, and then examine the HVAC system. As shown in the Engineers Newsletter, "Energy-saving Strategies for LEED® Energy and Atmosphere Credit 1 (EAc1)," "off-the-shelf" systems can yield significant savings—even if the cooling and heating loads are not reduced.
- When performing simulation or Exceptional Calculation Methods (ECM) to gain EAc1 credit points, the adage "Garbage In, Garbage Out" (GIGO) still applies. It's important to understand simulation methods as well as ECM (spreadsheets or other calculations) to ensure that energy is saved in the building—not just in

the calculation. Modeling programs have improved and some offer enhanced capabilities.

- Many teams developed LEED NC 2.2 worksheets to determine which credits to attempt. With the significant changes in LEED 2009, re-examination of these sheets needs to occur.

Finally, and most importantly, the entire emphasis of LEED and what project teams are doing needs to stay focused on the end result: not “points,” but the effect on the environment. The bottom line goal is more sustainable buildings that are not only good for the environment, but for society, and your business.

By Mick Schwedler, manager, applications engineering, Trane. You can find this and previous issues of the Engineers Newsletter at www.trane.com/engineersnewsletter. To comment, e-mail us at comfort@trane.com

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