

GREEN BUILDING REPORT

Raising the Bar On High-Performance Buildings: LEEDv4 and ASHRAE 90.1-2010

by jessica baker and justin herzing

THE U.S. DEPARTMENT OF ENERGY projects that by the end of 2015, about 25 states, concentrated on the East and West coasts, will have adopted the 2012 version of the International Energy Conservation Code (IECC). This latest version of the IECC heavily references ASHRAE Standard 90.1-2010, a standard that includes several updates to requirements for mechanical, electrical, and lighting systems. The new standards for these systems will contribute significantly to energy savings, as compared to the 2007 90.1 standard.

As of July 9 of this year, all federal projects must be designed to comply with ASHRAE 90.1-2010. In addition, ASHRAE 90.1 has been the referenced energy standard within all LEED rating systems, including the latest release of LEED v4. For the immediate future, projects can be registered under both LEED 2009 and v4; as of June 1, 2015, however, all new projects will need to be registered under the LEED v4 rating system. Due to this interconnection, it is important to compare and analyze the changes within both LEED v4 and ASHRAE 90.1-2010 simultaneously.

Given the many LEED references to ASHRAE 90.1 in regard to building energy use and goal-setting for improvement over the baseline, there can be no doubt of the interconnection that exists between 90.1 and the LEED rating system. As seen in the chart at right, ASHRAE standards for building energy use have become more

LEED requirements for energy use are based on ASHRAE 90.1, so changes to that standard have helped to make LEED targets for efficiency more stringent, as indicated in the chart by the percent reductions from the previous version.

stringent over time.

While ASHRAE 90.1-2010 incorporates numerous revisions from the previous version, the bulk of the mechanical and energy-related updates occur within chapters 5, 6, 8, and 9.

Two notable modifications focus on the building envelope within Chapter 5. Continuous air barriers for buildings are now required in order to be compliant with 90.1-2010. To go along with this, fenestration and door leakage allowances have been expanded upon and leakage-testing methods have been updated with stricter requirements.

For fenestrations, Chapter 5 requires

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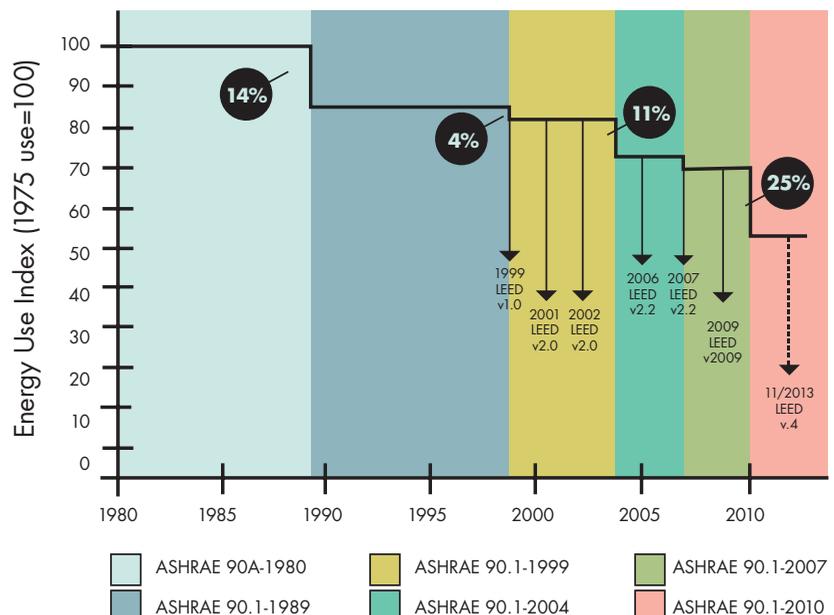
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Standards Get Tougher on Energy Use



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that the total area of south-facing windows on all buildings be greater than or equal to the total area of east- as well as west-facing windows for compliance. Skylights are also now required for buildings 5,000 square feet and over, less than four stories, and with ceilings higher than 15 feet.

Chapter 6 focuses solely on HVAC systems within buildings. The first of several modifications to 90.1 within this chapter has to do with equipment part-load efficiencies. It is recognized that most buildings do not operate at full load for many hours over a 24-hour period. As a result, 90.1-2010 has homed in on increasing off-peak or part load equipment efficiencies.

In an effort to further decrease energy us and increase building efficiencies, Chapter 6 of 90.1-2010 now requires greater insulation thicknesses on piping delivering liquids above 105 F and up to 350 F. Additionally, outside air economizers and exhaust air energy recovery systems are required for compliance in a larger number of climate zones than previous versions of 90.1.

Chapter 8 of ASHRAE 90.1 deals primarily with building power systems. The most prominent revision within this chapter deals with 15 and 20 amp, 120V receptacles within office spaces and computer classrooms. The added requirement is for 50 percent of these receptacles to have automatic controls installed. Therefore, while energy savings should result, power system complexity will be increased.

Chapter 9 focuses on interior and exterior lighting requirements. Several updates were made within this chapter, with the first focused on further reductions to interior and exterior lighting power allowances. Almost all room types, including classrooms, conference rooms, lobbies, lounges, and enclosed offices and sales areas, have seen a reduction in lighting power allowances. The exceptions include corridors, stairways, and open office space, which have been allotted slightly higher lighting power allowances per 90.1-2010.

Chapter 9 also focuses on daylighting and daylight controls. To meet ASHRAE 90.1-2010, daylighting controls are now required in spaces where more than 250 square feet of floor area is illuminated by daylight via side-lighting or windows, or where more than 900 square feet of floor area is illuminated by daylight via top-lighting or skylights.

Finally, to comply with Chapter 9 of 90.1-2010, any alterations or renovations done on a building that involve more than

In LEED v4, Many Changes to Credits

LEED v4 BD&C CREDIT CATEGORY	NO. OF CREDITS & PREREQUISITES	NO. OF REVISED CREDITS	NO. OF NEW CREDITS
Integrative Process*	2	1	1
Location and Transportation	8	7	1
Sustainable Sites	13	9	1
Water Efficiency	7	3	4
Energy and Atmosphere	11	7	3
Materials and Resources	12	6	4
Indoor Environmental Quality	12	10	2

* Integrative Process is not a credit category but has been shown for reference.

Among the most significant changes to LEED credits are those in the Materials and Resources category, which are intended to drive the market toward increasing use of Environmental Product Declarations and Health Product Declarations.

10 percent of the interior or exterior lighting will have to incorporate automatic shutoff for all new lighting systems. The 2010 standard also requires that all enclosed spaces contain at least one lighting control device with one control step in addition to on/off control and an occupant sensor/timer.

UPDATES TO LEED

LEED v4 introduces many new updates, yet maintains multiple items that have not changed in the transition from LEED 2009. Some of those unchanged items are the 100-point-based certification system, availability of regional priority and pilot credits, and the LEED AP credentialing. Items that have changed within v4 are the addition of a new credit category (Integrative Process), expansion of the market sectors that are addressed, inclusion of international requirements, and a greater focus on whole building performance.

The chart above highlights credits within LEED v4 that have been modified or are new. As seen within each credit category, most credits have experienced revisions, and new credits have been added.

Among the most significant changes are those found in the heavily revised Materials and Resources category. This overhaul will essentially shift toward rewarding the use of materials with multiple sustainable attri-

butes. This credit category alone will also prompt a whole market change toward increasing product transparencies.

One of the new credits within this section that is drawing increased attention from building owners and design professionals is Building Product Disclosure and Optimization — Environmental Product Declarations. This credit requires the design team to use 20 different materials from five different manufacturers, all of which must have completed Environmental Product Declarations (EPD).

EPDs are similar in nature to Material Safety Data Sheets (MSDS) but focus strictly on building materials and their environmental impact, as measured by seven life cycle impact categories within LEED. Those categories are: global warming potential (GWP), ozone depletion potential (ODP), photochemical ozone creation potential, acidification potential, eutrophication potential, depletion of abiotic resources (elements), and depletion of abiotic resources (fossil fuels).

The manufacturers must obtain all EPDs from third-party reviewers such as Underwriters Laboratory (UL). At present, materials with completed EPDs are not readily available from all manufacturers across all building material product segments. Their creation will take time and initial investment by manufacturers. For projects seeking to pursue this credit, the design team and owner must be aware of the limited availability and the potential increased

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A Beginner's Guide to ASHRAE 90.1 and LEEDv4

ASHRAE 90.1

ASHRAE publishes various standards and guidelines for use and reference regarding HVAC systems. ASHRAE Standard 90.1 is the published energy standard for commercial buildings, with the exception of low-rise residential buildings. ASHRAE 90.1 provides guidelines for construction-related items such as wall and glazing insulation values, lighting power densities, and mechanical equipment efficiencies, with updates and revisions to this standard issued on a three-year basis. ASHRAE 90.1 is not a code, but rather a standard that is referenced and adopted by the International Energy Conservation Code (IECC), a subset of the International Building Code (IBC). In a study commissioned by the U.S. Department of Energy, estimated savings in energy use and energy cost totaled more than 18 percent when applying the 2010 version of ASHRAE 90.1 in comparison to the 2007 version.

LEED v4

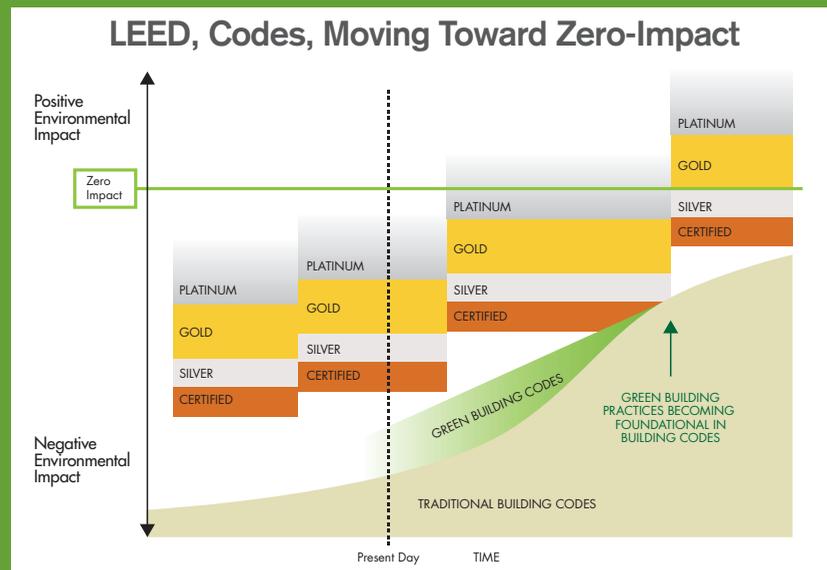
The U.S. Green Building Council, in November 2013, released Version 4 of its rating system with significant changes and updates over the previous LEED 2009 rating system. Holistic changes have been made within Ver-

sion 4 to better address the wide variety of building types to which users apply LEED — there are now 21 different types of buildings and market sectors referenced within the certification program. Providing an increased number of market sectors expands the application range of the standard, especially within specialized market sectors such as data centers.

Currently, projects pursuing LEED can register under either the LEED 2009 or LEED v4 rating system until the LEED 2009 registration sunset date of June 1, 2015. After this date, all projects must be registered under the LEED v4 rating system. Projects registered under LEED 2009 have until June 1, 2021, to finish the application for certification submission to USGBC.

The chart below is a graphical representation of how the various versions of LEED compare to each other and the ultimate goal of zero-impact facilities. It illustrates why buildings that currently achieve levels of Certified or Silver may struggle to meet the requirements for a Certified building under the LEED v4 rating system.

— Jessica Baker



material costs.

Along similar lines as the previous credit, the Building Product Disclosure and Optimization — Material Ingredients credit is also attracting notice. This credit requires the use of 20 different

materials from five different manufacturers that all have completed Health Product Declaration (HPD) sheets. HPD sheets are similar in nature to the nutritional information listed on food products, except that all ingredients

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within the particular building item being evaluated must be listed down to 0.1 percent. Impacts on human health, such as carcinogens, must be identified for each ingredient listed for that material. These sheets also must be completed by third-party testing agencies. Again, this type of documentation will take time and resources for manufacturers to build up their inventory of products with completed test data. As a result, project teams pursuing this credit should be mindful of these requirements in the early design phases.

For years the industry has been anticipating significant building energy-use reductions as well as updates to standards and building certifications similar to ASHRAE 90.1 and LEED. Up to now, these two documents have made movements toward the future of green buildings and have done so in small increments. With the more significant recent changes, however, there has been a greater leap toward the goal of net-zero or positive impact buildings, making it clear that the future is now. ■

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BRIEFINGS

Good News for 90.1

Following preliminary analysis that ASHRAE/IES's 2013 energy efficiency standard contains energy savings over the 2010 standard — 8.5 percent source energy savings and 7.6 site energy savings — the U.S. Department of Energy (DOE) has issued a ruling that establishes the 2013 standard as the commercial building reference standard for state building energy codes.

The determination means that states are required to update their codes to meet or exceed the 2013 standard within two years. Currently, states must meet or exceed the 2010 standard, which serves as the commercial building reference standard for state building energy codes under the federal Energy Conservation and Production Act.

For more information, visit DOE's 90.1 site at www.energycodes.gov/determinations

Need More LEED (Credentials)

A recent U.S. Green Building Council (USGBC) study of job postings from across the United

States revealed that demand for the LEED Accredited Professional (LEED AP) and LEED Green Associate credentials grew 46 percent over a 12-month period.

The study, conducted by USGBC education partner Pearson, using data provided by Burning Glass, found a total of 9,033 U.S. job postings from March 2013 to February 2014 that required a LEED credential. Top fields being advertised included available positions in mechanical, electrical, and civil engineering; construction management; architecture; software development; sales management; property management; and interior design, among others.

A secondary 90-day study that Pearson conducted, using data from Burning Glass, found that, from January 2014 to March 2014, 2,354 U.S. green-building-related positions had LEED as the skill in highest demand by a wide margin. LEED appeared in 59 percent of all postings, compared to the second-most-

required skill, which appeared in 17 percent of the postings.

For more information on LEED credentials, visit www.usgbc.org/credentials

LEED in Motion Retail

More than 8,000 retailers worldwide use the LEED rating system, according to the U.S. Green Building Council's latest LEED in Motion report.

The report, released at last month's Greenbuild conference, also shows how LEED Volume has helped companies like Starbucks, which recently certified its 500th LEED store. Kohl's has the second most, with 434.

In total, there 7,921 LEED retail projects (either certified or registered), comprising nearly 516 million square feet of space.

For more information and to download the LEED in Motion Retail report for free, visit: go.usgbc.org/retail

U.S. GREEN BUILDING COUNCIL PERSPECTIVE

The Rise of the LEED City

By Christopher Gray and Jeremy Sigmon

The District of Columbia made history last month when it announced that it had surpassed 100 million square feet of LEED-certified commercial space. Only three other cities — Chicago, New York, and Houston — can make such a claim. Washington's inclusion in the "LEED 100 million club" is cause for celebration for all of us in the green building community, and it is especially remarkable considering the stark geographic and demographic differences between D.C. and its fellow club members.

Washington is the 23rd most populated city in the United States, whereas Chicago, New York, and Houston are three of the top four most populated cities in the nation. D.C. is also a much smaller city geographically speaking, than its LEED peers. Washington's total geographic area (61 square miles) is less than half the landmass of Chicago, the second smallest city to certify more than 100 million square feet of LEED space. Additionally, anyone who has ever spent a significant amount of time in the district can appreciate how many projects and how much effort it would take for a city that is legally devoid of skyscrapers and boasts wide, Parisian-style boulevards to develop such a large amount of LEED space.

The district's impressive record in transforming its built environment can be attributed to several factors: political prioritization from D.C.'s local government, the widespread adoption of LEED by the federal government (which has an outsized impact on the D.C. real estate market), and local consumer demand. These factors are the reason why Washington, which will be hosting the Greenbuild International Conference and Expo in 2015, currently has 155 square feet of certified LEED space per person — more than any other city or state per capita.

Local leadership has been especially strong under Mayor Vincent Gray, who should be recognized as a model politician when it comes to green building. At a recent green building summit hosted by his building department, Gray said,

"If I sound enthusiastic about our work on sustainability, it's because I am!"

Gray has traveled the country and every D.C. neighborhood, proudly promoting his community-developed Sustainable D.C. Plan. The plan features green building as a central strategy for addressing a wide variety of the district's energy, economic, environmental, and quality-of-life goals.

What does this all mean for the future of green building? It means that through proactive engagement with the consumer market, cooperation from federal, state, and local governments, and a continued commitment to innovation, the green building movement's goal of transforming our built environment within a generation is completely realizable. If small to mid-sized cities such as Washington, D.C., can make this significant of an impact in less than a decade (counting back from the passage of the Green Building Act of 2006), then there is no reason why other, similar-sized cities cannot follow suit.

The collective work of the green building industry has the potential to create many more LEED "100 million" cities. Last month, the U.S. Green Building Council released the results of a year-long study showing that demand for LEED Professionals increased by a staggering 46 percent between March of 2013 and February of 2014. Considering that this same time period was relatively poor in terms of the creation of new professional jobs (the federal government's budget sequester coincided directly with the onset of the study), it is even more apparent that the green building movement is continuing to gain momentum across the country (and world).

These trends reinforce the idea that events such as D.C.'s inclusion in the "LEED 100 million club" are not isolated incidents, but rather important milestones for a truly transformative movement. The green building community is standing on the precipice of many monumental achievements to come. We are now entering the age of the LEED city. ■

Christopher Gray is a communications specialist at the U.S. Green Building Council. Jeremy Sigmon is the council's director of technical policy.