IBPSA-USA, Houston Chapter

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"IBPSA is a non-profit international society of building performance simulation researchers, developers and practitioners, dedicated to improving the built environment."

Content page no.

LEED 2009: ENERGY STANDARD CHANGES & IMPACTS

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1. INTRODUCTION

LEED projects registered after March 2009 are now required to certify under the updated LEED 2009 program. In regards to energy performance, LEED 2009 has upgraded its energy standard from ASHRAE 90.1-2004 to 90.1-2007. This change impacts Energy and Atmosphere (EA) Prerequisite 2 – Minimum Energy Performance and EA Credit 1 – Optimize Energy Performance. This article explores the key changes in the standards and the impacts one can expect to see in their energy simulations as a result.
EA Prerequisite 2 requires compliance with the mandatory provisions (Sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4) of the standard AND a minimum demonstrated 10% improvement in the proposed building performance rating (Appendix G of ASHRAE 90.1-2007), which is down from the prerequisite of 14% in the previous LEED version. The building performance rating compares the energy cost difference between a baseline building designed to the ASHRAE 90.1 energy standard versus the proposed (as designed) building. There are alternative prescriptive paths to demonstrate compliance that will not be discussed in this article.
EA Credit 1 – Optimize Energy Performance (Option 1 – Whole Building Energy Simulation) provides credit for energy cost improvement percentages that go beyond the 10% prerequisite. The scoring system and points threshold has changed in LEED 2009, with up to 19 points available (previously 10 for New Construction), with one (1) point for a 12% energy cost improvement, with each two (2) percentage points equivalent to another point for the credit up to 19 points (48% energy cost improvement.

2. CHANGES TO ASHRAE 90.1

The following provides a summary of the Houston climate performance factors that have changed between ASHRAE 90.1-2004 and 90.1-2007, while also noting some key requirements that have remained the same. These will impact our energy comparisons for EA Credit 1 and the mandatory provisions of EA Prerequisite 2 and include:

1. Improved glazing U-factor (90.1-2004 $\rightarrow$ 90.1-2007):
    a. Curtain-wall construction: 1.22 $\rightarrow$ 0.70 Btu/hrFt2ºF ; SHGC of 0.25 remains the same.
    b. Other Metal Framing: 1.22 $\rightarrow$ 0.75 Btu/hrFt2ºF; SHGC of 0.25 remains the same.

2. Improved roof U-factor (90.1-2004 → 90.1-2007):

    a. Insulation entirely above deck: 0.063 (R15) → 0.048 Btu/hrFt^2°F (R20)

3. U-factor of walls (steel framed) remain unchanged from 2004:

    a. 0.124 Btu/hrFt^2°F (R13)

4. Improved air-cooled AHUs minimum efficiencies (90.1-2004 → 90.1-2007):

    a. up to 5 ton : 12 → 13 SEER

    b. 5 - 11.25 ton: 10.3 → 11.2 EER

    c. 11.25 – 20 ton: 9.7 → 11.0 EER

    d. 20 – 63 ton: 9.5 → 10.8 EER

    e. >63 ton: 9.2 → 9.7 EER

    f. Requirements for split systems have also shifted similarly except they remain about 0.2 EER less than these packaged systems listed above

5. Improved cooling efficiency of air-source heat pumps have increased by a similar margin as the packaged air-cooled units (90.1-2004 → 90.1-2007):

    a. ex. < 5 ton: 12 → 13 SEER

6. Efficiencies of water-source heat pumps (WSHP) remain unchanged from 2004

7. Minimum chiller efficiencies of both air-cooled and water-cooled chillers have not changed, but the thresholds defining when to model them in the baseline building have changed:

    a. **Air-Cooled** – Efficiency: 2.80COP (9.6EER) / 3.05IPLV.

    b. **Water-Cooled (Screw or Scroll)** - used in baseline model for buildings > 150,000 ft^2 and < 600 tons (cutoff between screw and centrifugal chillers was 240,000 ft^2 in 90.1-2004 without reference to tonnage); Efficiency: 4.9 COP / 5.6 IPLV

    c. **WaterCooled (Centrifugal)** - used in baseline model for buildings > 150,000 ft^2 and > 600 tons; Efficiency: 6.10 COP / 6.4 NPLV.

8. The calculation of design fan power limitation in the baseline model of EA credit 1 has changed. The change includes:

    a. The fan power limitation in small constant volume PTAC systems has been reduced significantly from approximately 0.8 W/cfm to 0.3 W/cfm.

    b. There is a increase in the baseline fan power limitation for larger systems, including additional pressure credits for high efficiency filters (MERV 9+), sound attenuation, fully ducted return and/or exhaust systems, return and/or exhaust airflow control devices, and heat recovery devices.

9. Lighting Power Densities remain the same as in 2004 for the Building Area Method, Space-by-Space Method, and the Exterior Lighting Power Allowance calculations.

10. Square footage thresholds used to determine the HVAC system type is the baseline building model has changed in Appendix G of 90.1-2007 as shown below:

TABLE G3.1.1A *Baseline* HVAC System Types

Building Type	Fossil Fuel, Fossil/Electric Hybrid, & Purchased Heat	Electric and Other
Residential	System 1 – PTAC	System 2 - PTHP
Nonresidential & 3 Floors or Less & <~~75,000~~ 25,000 ft^2	System 3 – PSZ-AC	System 4 – PSZ-HP
Nonresidential & 4 or 5 Floors & <~~75,000~~ 25,000 ft^2 or 5 Floors or Less & ~~75,000~~ 25,000 ft^2 to 150,000 ft^2	System 5 - Packaged VAV w/ Reheat	System 6 - Packaged VAV w/PFP Boxes
Nonresidential & More than 5 Floors or >150,000 ft^2	System 7 - VAV w/Reheat	System 8 - VAV w/PFP Boxes

Notes:
Residential building types include dormitory, hotel, motel, and multifamily. Residential space types include guest rooms, living quarters, private living space, and sleeping quarters. Other building and space types are considered nonresidential.
Where no heating system is to be provided or no heating energy source is specified, use the "Electric and Other" heating source classification.
Where attributes make a building eligible for more than one *baseline* system type, use the predominant condition to determine the system type for the entire building.

11. The condition that defines the mandatory requirement for the use of Demand Control Ventilation (DCV) has changed from AHUs that have OA flows greater than 3,000 cfm AND: Occupant densities of 100 people per 1,000 ft^2 (90.1-2004) → Spaces larger than 500 ft^2 and occupant density of 40 people per 1,000 ft^2 (90.1-2007).

3. LEED EAc1 IMPACTS

The impact of the transition from ASHRAE Standard 90.1-2004 to 90.1-2007 will vary from project to project. Some examples as are as follows:

- Buildings using packaged/DX equipment will see an approximate 8 – 13% increase in cooling efficiency of equipment. These are new minimum efficiencies for equipment specification, and also the efficiencies used in defining the baseline building energy model. For cooling systems that constitute 25% of total energy consumed in a Houston building, a 10% improvement in the baseline system efficiency will likely result in a 2 – 2.5% reduction in the energy cost improvement.

- Residential buildings with PTAC or PTHPs units will see a decrease in fan power in the baseline building model by slightly more than half. The previous fan power allowance was out of line with reality, and this correction brings the fan power closer to what would be seen in a typical design. For fan systems that constitute 10% of total energy consumed in a building, a 50% improvement in the baseline system fan power will result in a 4 – 4.5% reduction in the energy cost improvement.

- Floor-to-Ceiling vision glass in curtain-wall construction will see a significant impact in the new U-factor for glass in the baseline building models. For example, on a high rise office tower with full height vision glass, the change of the glazing U-factor from 1.22 to 0.70 Btu/hrFt2ºF, results in an approximately 3.5% reduction in the energy cost improvement.

- The new design flow fan power limitation for the baseline building energy model for non-PTAC units in 90.1-2007 is greater by approximately 7 – 11% than 90.1-2004. Pressure credits for high efficiency filters and/or heat recovery devices additionally drive the limitation higher. This is the one change in the standard that will raise the fan power and total energy consumption of the baseline model. Using the same high-rise office tower example form the bullet above, implementing the fan power allowance of 90.1-2007 including MERV 13 filters and energy recovery, resulted an approximately 1.4% increase in the energy cost improvement.

4. SUMMARY

The intent of this article was to present a snapshot of some of the major changes that arrived with LEED 2009, specifically the differences between ASHRAE 90.1-2004 and 2007 versions, and highlight the impact these changes will have on projects seeking LEED certification.

The 2007 version of 90.1 energy standard is certainly more stringent as noted, and each specific project will be uniquely impacted by these changes. The author estimates that the majority of projects certifying under the old LEED system would demonstrate an energy cost performance that would outperform the same project similarly certifying under the new LEED 2009 program on the order of 1- 4%. Despite this increase in efficiency of the energy standard in the upgrade to LEED 2009, meeting the minimum prerequisite energy performance is not perceived by the author to be any more difficult, since the minimum 14% energy cost improvement of the old LEED program has been adjusted down to 10%.

The information provided is not the result of a comprehensive analysis of changes to LEED 2009, but is intended to provide some preliminary direction/insight to project teams that may be less familiar with the changes in the LEED and ASHRAE standards.

EVENTS

IBPSA-USA, Houston, September 29

Our next meeting would be held at Kirksey on September 29, 5:30pm.

Agenda: Ecotect

Please coordinate with *Dat Lien (dat_lien@gensler.com)* if you would like to include questions or topics related to Ecotect. Though it is primarily used by architects, we would, over a period of several meetings, discuss key issues of this software especially those relevant to engineering design.

Other events of interest:

SIMBUILD 2010

4TH National Conference of IBPSA-USA, August 11-13, New York.

http://ibpsa.us/simbuild2010/

Seventeenth Symposium on Improving Building Systems in Hot and Humid Climates

August 24-26, 2010, AT&T Conference Center

Austin, Texas

file:///T:/2009667/NEWSLETTER/Aug2010/CATEE%20and%20H&H%20Schedule%202010.htm

7TH Annual American Solar Energy Society's (ASES) National Solar Tour

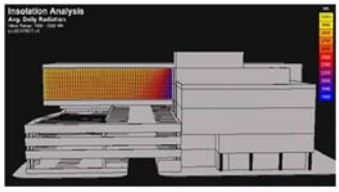
Saturday, October 2, 2010; Social : 9 am – 12 pm; Tour : 12 pm - 5 pm

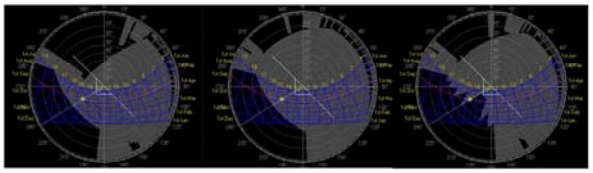
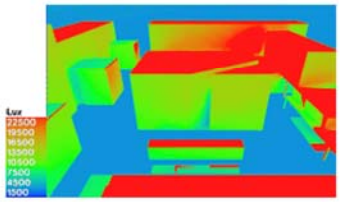
http://www.houstonsolartour.com/

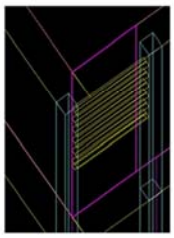
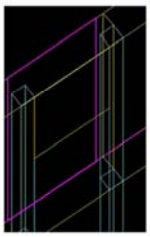
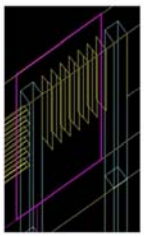


IBPSA-USA, Houston

IBPSA (the International Building Performance Simulation Association) is a non-profit international society of building performance simulation researchers, developers and practitioners, dedicated to improving the built environment.



Sept. 29th, 2010, 5:30pm

Kirksey
6909 Portwest Drive
Houston, Texas 77024

Discussion: Ecotect

Photos from left to right:
eschipul's photostream: http://www.flickr.com/photos/eschipul/1033105082/
Hickey & Robertson: http://www.architectureweek.com/cgi-bin/awimage?dir=2008/0123&article=news_1-3.html&image=13731_image_3.jpg

LAST MEETING

At the last IBPSA-USA, Houston meeting at Rice & Gardner, members and guests discussed their take on Trane Trace, energy modeling, LEED and coordination issues between engineers and architects for modeling. There was also a conference call with Trane CDS Support for attendees to ask about modeling techniques with Trace as well as hear about upcoming updates to the software. Afterwards, everyone enjoyed pizza and refreshments thanks to the local Trane office.

QUESTIONS ???

We are starting this section to address your questions on LEED Energy modeling, technical issues related to different modeling programs, or opinion of experienced modeling personnel. Please send them to *Norman J. Conger (nconger@chpengr.com), Subject: IBPSA-QA* and we would direct them to one of our fellow members. All Q&As would be included in the newsletter starting from November.

Are You a Member???

To become a member, simply fill out the application form found at the address below:
http://www.ibpsa.us/membership.shtml
Existing members may use the form to renew their membership or update their contact information.

Visit the IBPSA-USA, Houston Chapter at: http://ibpsausahouston.wordpress.com/

Call for Articles

This newsletter serves as a wonderful tool to circulate useful information and upcoming events across the modeling community. Please share these with us along with your own opinions by contacting *Kapil Upadhyaya (kapilu@kirksey.com)*. All comments are greatly appreciated.