



BUILDING ENERGY CODES PROGRAM

# Setting the Standard

U.S. Department of Energy • Office of Energy Efficiency and Renewable Energy

September 2008



The ICC Final Action Hearings will take place September 17-23, 2008, at the Minneapolis Convention Center, Minneapolis, Minnesota. Energy code sessions will begin Sunday, September 21, in the afternoon.

## Challenging the Status Code

Interested in energy efficient buildings? The U.S. Department of Energy (DOE) invites you to be part of an unprecedented event: the 2008 Final Action Hearings of the International Code Council® (ICC).

This event is in the spotlight of this second article of the *Setting the Standard* series about DOE's goal to reduce the energy consumption of International Energy Conservation Code® (IECC) compliant homes by 30%, relative to the 2006 IECC, by the year 2012.

The Final Action Hearings will close a three-year code development cycle that has considered more energy efficiency improvements than any development cycle in the history of the IECC. These improvements primarily affect residential buildings and can result in significant energy cost savings for American families.

But the code-change proposals that support these improvements can only become part of the official 2009 revision of the IECC if enough qualified ICC members *vote* on each proposal. Every member of the energy codes community can influence these votes if they *participate* in the hearings and *testify* in support of energy efficiency.

Can't attend the hearings? No problem. It's easy to watch them via webcast through ICC's website, [www.iccsafe.org](http://www.iccsafe.org)!

## The table is set

The IECC Code Development Committee approved a slate of proposals that promises residential energy savings of 15% or more at the first Code Development Hearings in late February. Moving these improvements into the 2009 IECC requires a simple majority vote of qualified ICC members who attend the Final Action Hearings.

Numerous homes with energy improvements well beyond what these proposals will achieve have been built for low or no cost under the Building America and ENERGY STAR programs. DOE believes these proposals will result in positive cash flow to homeowners within only a few years. Some of the more significant residential proposals approved in the first Code Development Hearings promise to:

- Assure air distribution ducts are not leaking costly conditioned air into unheated crawl spaces, basements, and attics – *submitted by DOE, this duct testing proposal may save more energy than any single code change in IECC history.*
- Assure at least 10% of lighting energy actually goes to light new homes, instead of 95% being wasted as heat.
- Require at least half of lighting be as efficient as compact fluorescents.
- Close significant loopholes in the performance compliance path.
- Improve glazing performance in the southern United States.
- Bring the total improvement in energy efficiency to unprecedented levels, gaining ground toward DOE's 30% goal.

ICC's Public Comments process has further improved some of these proposals. For example, DOE suggested a modification to an air-sealing proposal to require whole-house pressure testing in residential construction. If approved, this proposal will make leaky, poorly sealed new homes a thing of the past.

## A second chance

Not only will proposals approved at the first Code Development Hearings be included in the 2009 IECC, but a number of energy-saving proposals that were disapproved by the Code Development Committee have been reworked in response to that committee's comments and are on the Final Action agenda.



## Raising the Standard of Energy Efficiency

In each edition of *Setting the Standard*, Building Energy Codes Program (BCEP) staff provide an update about their work to increase the efficiency of ANSI/ASHRAE/IESNA<sup>1</sup> Standard 90.1-2010 by 30% relative to Standard 90.1-2004. BCEP's forward motion toward the 30% goal is being supported by a strong partnership with ASHRAE.

Recent articles focused on BCEP's achievements in lighting to support the 30% goal. This article highlights another major BCEP activity to improve the Standard: whole-building simulation.

### Upgrading to EnergyPlus

BCEP is now using the U.S. Department of Energy's (DOE) new, state-of-the-art, simulation tool, EnergyPlus. Moving to EnergyPlus and leaving older tools like DOE-2 and BLAST behind established a need to develop new prototypical buildings to support Standard 90.1. The obvious way to fill this need was to use DOE's ongoing prototypical building development in EnergyPlus called DOE Commercial Building Benchmarks.

### The beginnings of benchmarks

The Benchmarks were intended to provide a consistent basis to compare DOE programs and activities and to track progress toward DOE's goal of net zero energy commercial buildings by 2025. These building prototypes have also proved useful for code development. DOE plans to formally release the Benchmark buildings to the public in Fall 2008.

Draft Benchmark buildings were developed under DOE direction in collaboration with Lawrence Berkeley National Laboratory, the National Renewable Energy Laboratory (NREL), and Pacific Northwest National Laboratory (PNNL).

The drafts were designed to be compliant with Standard 90.1-2004 and, where possible, to have building characteristics, such as building size, aspect ratio, and window-to-wall ratio, derived from DOE's 2003 Commercial Building Energy Consumption Survey (CBECS).

### From draft to definitive

BCEP staff conducted an extensive review of the drafts with help from the ASHRAE SSPC 90.1 Simulation Working Group. The review generated valuable feedback from members of ASHRAE's mechanical and envelope subcommittees, including private sector designers and industry representatives.

Feedback from the review is being incorporated into the first publicly released version of the DOE Benchmark buildings. NREL and PNNL staff also incorporated insights from the ASHRAE Advanced Energy Design Guides (AEDG) for Small Offices, Small Retail, Warehouses, K-12 Schools, and Highway Lodging into the appropriate DOE Benchmarks. These incorporations add the value of building industry participation and public review provided in those guides.

The final Benchmark building set will ultimately comprise 17 Benchmark building types from schools and offices to retailers and eateries.

### Majority and multipliers

The 17 Benchmark buildings will account for more than 80% of commercial building energy use. National weights for each of these building categories are available through the CBECS database.

Each of these 17 building types will be modeled in 17 climate locations, yielding nearly 300 total simulations. The 17 climate variations proposed for the analysis represent all of the climate zones identified in the United States and used in Standards 90.1-2004 and 90.1-2007.

### What about 30%?

BCEP staff members are using two of the more complex Benchmark buildings—large office and hospital—to support the ASHRAE mechanical subcommittee's efforts to improve mechanical system requirements in Standard 90.1. BCEP staff will use the medium office, mid-rise apartment, and warehouse Benchmark buildings to support the envelope subcommittee's efforts to improve their nonresidential, residential, and semi-heated envelope requirements.

BCEP will use all Benchmark buildings to provide feedback to DOE and ASHRAE on how ASHRAE is progressing toward 30% improvement. BCEP will also use Benchmark buildings for DOE's formal determination of energy savings for Standards 90.1-2007 and 90.1-2010.

Learn more about EnergyPlus at [www.eere.energy.gov/buildings/energyplus](http://www.eere.energy.gov/buildings/energyplus).

For more information about CBECS, visit <http://www.eia.doe.gov/emeu/cbecs>.

Download ASHRAE AEDGs free of charge at [www.ashrae.org/publications/page/1604](http://www.ashrae.org/publications/page/1604).

<sup>1</sup> The American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers/Illuminating Engineering Society of North America

## Highlights: Energy Codes 2008

*Energy Codes 2008* was held in St. Paul, Minnesota, July 22-25, 2008. Every year, hundreds of members of the energy codes community benefit from this one-of-a-kind event sponsored by the U.S. Department of Energy's (DOE) Building Energy Codes Program (BECP).

### Reaching the community

*Energy Codes 2008* reached 226 attendees from 41 states and territories. Participants included architects, builders, code officials, and energy code advocates as well as representatives from industry, trade associations, and model code organizations.

### Training and education

Two days of meetings included plenary sessions as well as residential and commercial technical tracks. *Energy Codes 2008* presenters discussed DOE's efforts to make codes and standards 30% more stringent, designing and building with energy efficiency in mind, the challenges of code enforcement, and more. Pre- and post-training sessions offered tutorials about DOE's code compliance software, COMcheck™ and REScheck™, as well as training specific to Minnesota's residential and commercial energy codes.

### Buildings tour

Participants were treated to a tour of buildings with energy efficient and green features. This year's tour agenda included the Minneapolis Public Library, which was designed by world-renowned architect Cesar Pelli; the St. Paul District Energy Plant; mixed-income housing at the Wellstone Phase III and Ripley Gardens; and the mixed-use development, The Winnipeg.

BECP staff would like to extend a special thank you to the many tour leads, hosts, and organizers who made the building tours possible.

### What about 2009?

Be sure to attend *Energy Codes 2009*! Don't miss next year's opportunity to learn about a wide variety of energy codes- and standards-related topics and to network face-to-face with other members of the energy codes community through formal and informal meetings. BECP staff will post information on [www.energycodes.gov](http://www.energycodes.gov) as it becomes available.

See all presentations from *Energy Codes 2008*, the final agenda, and an attendees list at [www.energycodes.gov/news/ecodes2008/index.stm](http://www.energycodes.gov/news/ecodes2008/index.stm).



**Photo 1)** The States Rally featured successes, challenges, and some fantastic cowboy apparel.

**2)** The Cracker Barrel sessions facilitated small, focused discussions. **3)** Building tour participants visited the Minneapolis Public Library, which has energy efficient and green features as well as striking architecture. **4)** The St. Paul District Energy Plant, part of the *Energy Codes 2008* building tour, is fueled by renewable resources.

## Bruce Nelson Receives 2008 Jeffrey A. Johnson Award!

Bruce Nelson was awarded the 2008 Jeffrey A. Johnson Award for Excellence in the Advancement of Building Energy Codes and Performance. Jean Boulin of the U.S. Department of Energy (DOE), presented Bruce with the honor at the Building Energy Codes Program (BECP) annual training event, *Energy Codes 2008*, held in St. Paul, Minnesota, in July 2008.



Jean Boulin (left) presents the Jeffrey A. Johnson Award to Bruce Nelson.

### About the award

Jeff Johnson was an energy codes leader and visionary whose work made a significant difference at the national level. He served at the California Energy Commission, managed BECP during his tenure at Pacific Northwest National Laboratory, and was Executive Director of New Buildings Institute, Inc.

The Jeffrey A. Johnson Award commemorates Jeff and his commitment to advance energy efficiency. Every year, it is given to an energy codes professional or team who demonstrates Jeff's level of excellence in support of the nation's goals for energy-efficient buildings.

### About Bruce

Bruce is a Senior Engineer with the Minnesota Department of Commerce, Office of Energy Security. He has worked in all facets of energy codes, driving them forward for over 30 years, and he actively participates in national codes and standards committees.

Bruce was instrumental in developing the first air tightness standard for single-family residential construction in 1994. Today, this standard remains the most stringent standard for air tightness in the nation. Bruce also played a key role in establishing standards that provide protection from back drafting. Congratulations Bruce!

Winners of the Jeffrey A. Johnson Award are selected by committee from a group of nominees. The 2008 committee comprised representatives from BECP, the New Buildings Institute, Northeast Energy Efficiency Partnerships, and the Seattle Department of Planning & Development. The committee's decision is based on nominees' achievements, impact, innovation, collaboration, and passion demonstrated in their energy efficiency and energy codes work.

## What's Going On?

*Energy Codes 2008* pass you by?

Finding out about webcasts too late?

Not sure how to get the energy codes community to attend a training event, workshop, or conference of your own?

### The Building Energy Codes Program calendar is for you!

Our calendar is populated by the community, for the community. Anyone can add to the calendar. It displays local, regional, and national information.

View upcoming events or submit an event or training of your own at [www.energycodes.gov/events/index.php](http://www.energycodes.gov/events/index.php).





## Ask an Expert

Every month, the Building Energy Codes Program's (BCEP) Technical Support team responds to hundreds of code-compliance inquiries from builders, architects, engineers, and code officials from around the country. Every issue of *Setting the Standard* offers frequently asked questions from the codes community and answers from BCEP's codes experts.

**Q: We have a commercial project in Illinois using the 2006 International Energy Conservation Code® (IECC). The 2006 code version does not have a choice for standing seam metal roofs either with or without thermal blocks. Are thermal blocks now required without exception? If they are not required, will a standing seam roof with 4-inch insulation and no thermal blocks meet the code requirements for an automotive-type use? The calculated U-factor for 4-inch insulation without thermal blocks is .06. The building is only heated (not cooled) and will be heated with gas.**

**A: The 2006 IECC prescriptive requirements in Table 502.2(1) specify that metal building roofs must have R-5 thermal blocks in addition to the specified level of insulation.** For Illinois in zones 4 and 5, that results in an R-19. This number is based on the prescriptive path only.

The 2006 IECC does not show the corresponding U-factors that can be met as an alternative. These U-factors were added to the IECC in the 2007 Supplement to the 2006 IECC. The corresponding U-factor for a metal building standing seam roof with an R-5 thermal block and R-19 batt insulation is U-0.065. This value is taken directly from the requirements for climate zones 4 and 5 in ANSI/ASHRAE/IESNA Standard 90.1-2004.

The 2006 IECC provides the option to use the envelope requirements from Standard 90.1-2004 per Section 501.2 (or Standard 90.1-2004 in its entirety per Section 501.1 of



Email questions about residential and commercial energy codes to BCEP Technical Support at [techsupport@becp.pnl.gov](mailto:techsupport@becp.pnl.gov), or submit an inquiry at [www.energycodes.gov/support/helpdesk.php](http://www.energycodes.gov/support/helpdesk.php).

the 2006 IECC). Confirmation that this value in Standard 90.1-2004 is for a standing seam metal building roof with thermal blocks may be found in Table A2.3 of Standard 90.1-2004.

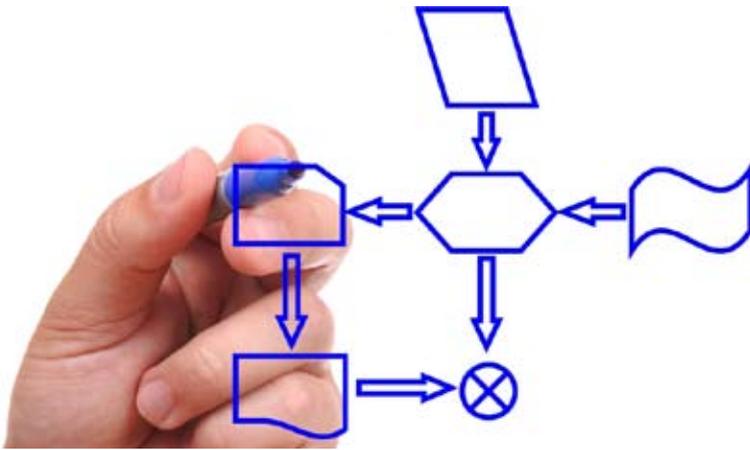
Thermal blocks are required without exception if you stick to the prescriptive requirements found in the 2006 IECC. If you look at other compliance paths available to you within the IECC, you may be able to meet the code requirements without the use of thermal blocks. This depends on the compliance path you choose and your climate zone.

If your calculated U-value is 0.06, then it should be acceptable because 0.06 is below 0.065. The fact that the building is not cooled does not lessen the code requirements. You can take advantage of the heated-only aspect by using a performance-based method such as Section 506 of the 2006 IECC or Chapter 11 of Standard 90.1-2004. However, both of these will require whole-building simulation.

**Q: My client used the tradeoff method in REScheck for a house in Louisville, Kentucky. The house is built, and now my client is being asked to insulate the basement walls, even though the basement is an unconditioned space. The inspector was shown the building envelope compliance report, but the inspector is unfamiliar with REScheck. The inspector requires everyone to install insulation in basements according to the new Kentucky Building Code (which is based on the 2006 International Building Code). Do the basement walls need to be insulated? Is the home's envelope in compliance?**

**A: The 2006 IECC does not require walls in unconditioned basements to be insulated.** However, the code does require insulation in the floor above the unconditioned basement. In addition, any ducts in the basement need to be insulated. Alternatively, if there is an expectation that the basement might be converted into a conditioned living space in the future, you can insulate the walls of the basement rather than insulating between the basement and first floor.

All *Ask an Expert* answers reflect the *opinions* of BCEP staff. BCEP **does not provide** formal code interpretations. For formal code interpretations, contact your code official or submit an inquiry to the American Society for Heating, Refrigerating and Air-Conditioning Engineers or to the International Code Council.

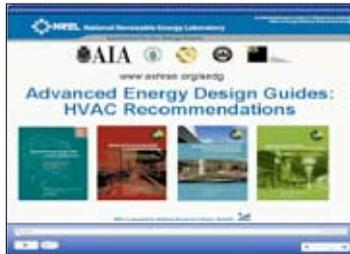


## Training Events

### AEDG Webcast Series

The Building Energy Codes Program's (BCEP) webcast series about the American Society for Heating, Refrigerating and Air-Conditioning Engineers' (ASHRAE) Advanced Energy Design Guides (AEDG) came to an end September 11.

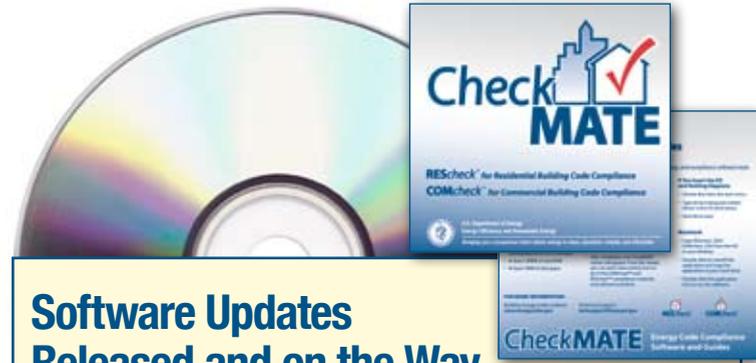
AEDGs are companion above-code documents for ANSI/ASHRAE/IESNA Standard 90.1-1999, which demonstrate how buildings may be built to be 30% more energy efficient than the Standard. They were developed in collaboration with partner organizations, including the U.S. Department of Energy.



The first two AEDG webcasts, *Overview of the Lighting Recommendations* and *Overview of the Mechanical Recommendations*, garnered over 2800 attendees. *Overview of the Envelope Recommendations* completed the three-part series.

Many of BCEP's recorded webcasts, including the AEDG series, qualify viewers to receive American Institute of Architects Continuing Education System Learning Units.

**Recorded webcasts are always available through [www.energycodes.gov](http://www.energycodes.gov).**



## Software Updates Released and on the Way

### What's New?

REScheck™ Package Generator was released in June 2008 with support for the 2006 International Energy Conservation Code® (IECC) and 2006 International Residential Code®. REScheck version 4.2.0 was released August 2008. The new version of the software:

- Enables 2006 IECC additions and alterations specifications
- Features an enhanced Beyond Code Advisor
- Excludes the Massachusetts state code because Massachusetts projects are now to be based on the 2006 IECC.

### Coming Soon!

- ANSI/ASHRAE/IESNA Standard 90.1-2007 in COMcheck™
- Updates for REScheck-Web software and COMcheck Package Generator

Access the latest REScheck and COMcheck downloads at: [www.energycodes.gov/compliance\\_tools.stm](http://www.energycodes.gov/compliance_tools.stm).



U.S. Department of Energy

### Energy Efficiency and Renewable Energy

Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Building Energy Codes Website:

[www.energycodes.gov](http://www.energycodes.gov)

Tech Support:

[www.energycodes.gov/support](http://www.energycodes.gov/support)

*Setting the Standard* is published by the Building Energy Codes Program of the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy at the Pacific Northwest National Laboratory. Its purpose is to encourage information exchange among building industry professionals and organizations, state and local code officials, and researchers to facilitate timely development and early adoption of the building energy conservation standards. The Building Energy Codes Program would like to continue sending you information about energy codes and compliance tools, but if you would like your name removed from our contacts list, go to [www.energycodes.gov/unsubscribe.stm](http://www.energycodes.gov/unsubscribe.stm). Send comments and contributions to Loel Kathmann at Pacific Northwest National Laboratory ([techsupport@becp.pnl.gov](mailto:techsupport@becp.pnl.gov)).

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