BUILDING ENERGY CODES PROGRAM

Setting the Standard

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

January 2009

Challenging the Status Code

The U.S. Department of Energy (DOE) and fellow efficiency advocates hit a home run for energy efficient homes at the 2008 International Code Council® (ICC) Final Action Hearings. More energy efficiency improvements were considered–and approved–at the Hearings than ever before in International Energy Conservation Code® (IECC) history.

The results of the Final Action Hearings help DOE make powerful strides toward its goal of reducing the energy consumption of household features regulated by the 2012 IECC by 30% compared to the 2006 IECC. This third article of the *Setting the Standard* series about DOE's progress toward its residential 30% goal highlights the results of the Hearings.

How much savings?

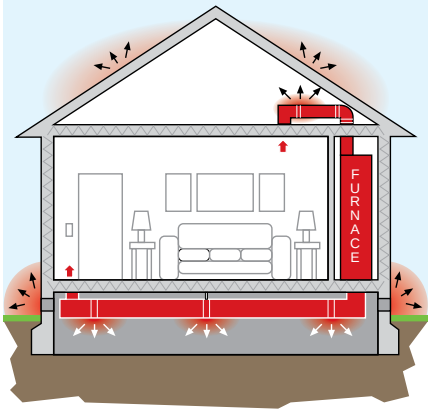
American homes built to the improved code will consume less energy and the families who live in them will save energy costs. For example, EC71, an approved code change that requires pressure testing in residential construction to verify duct sealing in unconditioned spaces, is estimated to reduce energy consumption in new homes by an average of 8-12%.

Additional approved proposals raise this savings number. Wide regional variability, uncertainty in technology penetrations estimates, and other variables make the number difficult to pinpoint. However, estimates from DOE's Building Energy Codes Program (BECP) residential experts suggest the 2009 IECC will be at least 15% and possibly even 18-20% more energy efficient than its 2006 predecessor. In addition, owners of 2009 IECC-compliant homes will achieve positive cash flow within a few years.

More about EC71

Approval of the duct pressure testing proposal, EC71, will make leaky, poorly sealed new ducts in unconditioned attics, basements, and crawlspaces a thing of the past. This measure could result in the biggest energy savings of any single code change in IECC history.

The IECC has required duct sealing for years. However, numerous studies have shown that visual inspection alone does not ensure good duct sealing. Ducts are regularly found to leak 20%, 30%, or even more of their conditioned air into attics, crawlspaces, or the outdoors.



Ducts are regularly found to leak a high percentage of conditioned air.

If ducts are not sealed properly during construction, moisture problems can develop in attics, crawlspaces, and other building cavities when warm humid air leaks into those cool spaces and condenses. EC71 corrects this problem for homeowners, reducing potential future costs and the number of comfort complaints faced by builders.

EC71 allows flexibility in who performs the test and at what stage of construction, minimizing cost and impact. In addition, a properly sealed HVAC system can be smaller and less costly to install.

Other changes with major impact

EC84 – At least 50% of installed lighting must be as efficient as compact fluorescent lights.

EC18 – Vertical fenestration U-factor requirements are reduced from 0.75 to 0.65 in climate zone 2, 0.65 to 0.5 in climate zone 3, and 0.4 to 0.35 in climate zone 4.

EC22/26 – The maximum allowable solar heat gain coefficient is reduced from 0.40 to 0.30 in climate zones 1, 2, and 3.

EC91 – Trade-offs between equipment efficiency and envelope measures are no longer permitted in the IECC.

Learn More

For more information about the results of the 2008 Final Action Hearings, visit the ICC web site, www.iccsafe.org.

Read BECP's full article about the ICC Final Action Hearings at www.energycodes.gov/news/items/112108_icc_decisions.stm.

Raising the Standard of Energy Efficiency

In each edition of *Setting the Standard*, Building Energy Codes Program (BECP) staff report progress on their work to increase the efficiency of ANSI/ASHRAE/IESNA[1] Standard 90.1-2010 by 30% relative to the 2004 version of the Standard. BECP's strong partnership with ASHRAE is key to achieving this 30% goal. For this article, BECP staff interviewed Mick Schwedler, chair of the ASHRAE Standing Standard Project Committee 90.1, about the present and future of the Standard.

Incorporating addenda

Standard 90.1 is a work in progress. From the moment a new version is published, every three years, the Standard continues to evolve toward even more rigorous energy savings requirements. Publishing Standard 90.1-2007 was the first major step toward the 30% goal. As the next step, fifteen addenda are currently slated for inclusion in the Supplement to 90.1-2007.

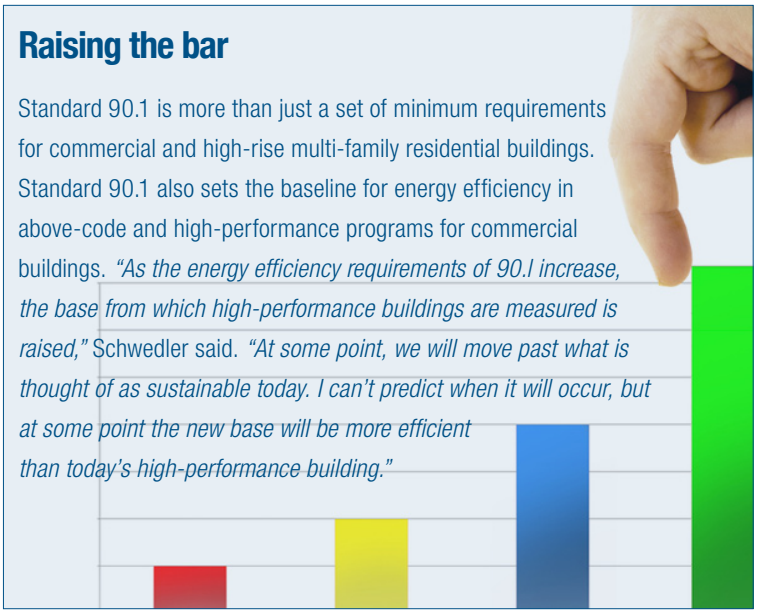
"Several of the new addenda will have a significant impact on the 30% goal," Schwedler said, singling out addenda "i" and "h." Addendum "i" will save energy by minimizing exterior lighting. The new exterior lighting requirements will be based on the building lighting needs and design differences associated with building location, Schwedler explained. High-density urban areas, residential suburban areas, and rural locations will all have different exterior lighting requirements. Addendum "h" helps minimize the energy required to heat the volume of ventilation air that must be provided to a breathing space per Standard 62.1 (ASHRAE's ventilation standard for commercial buildings.)

> Supplements to Standard 90.1 are compilations of all addenda approved in the 18-month period after publication of a new version of Standard 90.1. The addenda in the Supplement will be part of the next version of Standard 90.1

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

Raising the bar

Standard 90.1 is more than just a set of minimum requirements for commercial and high-rise multi-family residential buildings. Standard 90.1 also sets the baseline for energy efficiency in above-code and high-performance programs for commercial buildings. *"As the energy efficiency requirements of 90.I increase, the base from which high-performance buildings are measured is raised,"* Schwedler said. *"At some point, we will move past what is thought of as sustainable today. I can't predict when it will occur, but at some point the new base will be more efficient than today's high-performance building."*



"Most of the fifteen addenda approved for the Supplement apply throughout the country–as well as across building types," said Schwedler. "Addendum 'h' will help reduce reheat energy in more humid locations, like Houston, and reduce heating energy in cold climates, like Chicago, by allowing air to be delivered at a temperature that allows better mixing in the climate zone."

Measuring progress

To make sure the Standard is effective in moving toward the 30% goal, BECP is working to verify the effectiveness of new addenda. BECP commercial experts will provide whole-building simulation results to ASHRAE and DOE to track progress towards the 30% goal. Using the EnergyPlus building energy simulation tool and design requirements from Standard 90.1-2004 as the baseline, they will simulate a set of building models. As addenda are approved, the requirements from those addenda will be included in the building models and the simulations redone to track progress. From Schwedler's standpoint, the analysis support from BECP will help the 90.1 committee perform even better comparisons for energy cost saving ideas.

If you are a code official who would like to be part of the ASHRAE process, ASHRAE welcomes your participation and insights. Contact ASHRAE at www.ashrae.org/technology/page/1952.

Tackling challenges

Meeting the 30% goal does have a few uphill battles. The time-consuming consensus process is one of the biggest challenges, Schwedler said. The process involves public review and comment, personal contact with each commenter, and analysis of comments prior to a final decision on an addendum. All of these steps are performed by the committee members, people Schwedler describes as "dedicated volunteers whose available time is limited by a number of circumstances."

Adoption and enforcement are challenges as well. Publishing Standard 90.1-2010 will be an important achievement, but it must be adopted and enforced by states or local jurisdictions if its energy saving potential is to be achieved. Educating code officials, building owners, architects, engineers, and contractors by providing courses on Standard 90.1 and webcasts, done in conjunction with BECP, is a significant part of the adoption and enforcement process, Schwedler said.

Looking forward

With only two years remaining to reach the 30% goal, Schwedler expects energy efficiency goals for Standard 90.1 to keep moving forward. "I believe that future goals will move toward 50% savings." Having completed a series of Advanced Energy Design Guides that were 30% better than Standard 90.1-1999, ASHRAE has already begun work on higher level Advanced Energy Design Guides–at 50% better than the 90.1-1999 level, and 75% guides have been discussed, he said.

Attention Code Officials: Help Us Help You Better!

Code officials, the Building Energy Codes Program (BECP) wants to be sure you have the education and training resources you need to address common problems and issues you encounter in your work and to conduct plan reviews and compliance checks efficiently and effectively.

Now is your chance to tell us how the resources provided by BECP are working for you and what additional tools, materials, and information you need.

Please take a moment to provide feedback at www.energycodes.gov/survey/index.php?sid=29999&lang=en. Your feedback will lead to new and improved BECP resources.

Subscribe to BECP's RSS feed!

Keep up with the latest news in building energy codes by subscribing to the Building Energy Codes Program (BECP) RSS feed. BECP's RSS feed offers news directly from BECP as well as links to energy codes-related news around the Web.

What is RSS?

An RSS (Really Simple Syndication) feed alerts subscribers that a website has been updated. It is an easy, automated way to keep up with news, database alerts, and more.

How do I sign up?

Subscribe today at www.energycodes.gov/news/rss/index.stm!

Cool Down with "Reflective Insulation" Materials

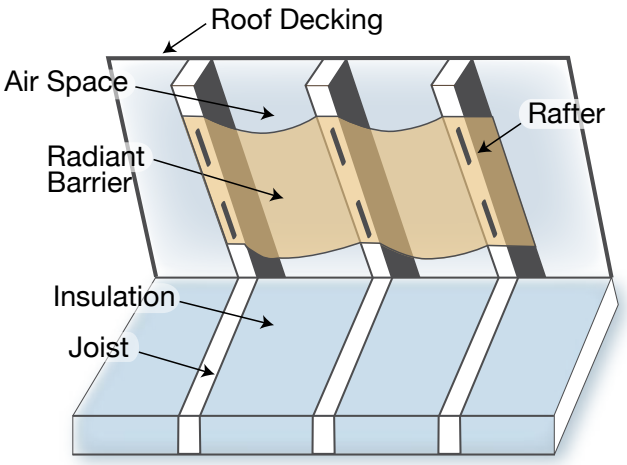
The Building Energy Codes Program (BECP) Technical Support team recently received several questions about the R-values of "reflective insulation" materials and how to use them in residential home construction. This article clears up some of the confusion about this product and how it should be used.

What are reflective insulation systems?

Reflective insulation systems are typically made from multiple layers of aluminum foil with a variety of backings such as kraft paper, plastic film, polyethylene bubbles, or cardboard. Reflective systems are typically located between roof rafters, floor joists, or wall studs.

If a single reflective surface is used alone and faces an open space, such as an attic, it is called a radiant barrier. All radiant barriers **must** have a low thermal emittance[2] (0.1 or less) and high reflectance (0.9 or more). Radiant barriers are installed in buildings to reduce summer heat gain and winter heat loss.

For existing buildings, the radiant barrier is typically fastened across the bottom of joists, as shown in the figure below. In new buildings, foil-faced wood and foam products are available. Foil-faced wood can be used for roof sheathing (installed with the foil facing down into the attic) or other locations to provide the radiant barrier as an integral part of the structure. Foil-faced foam will serve as a radiant barrier if the foil faces an air space, such as the air space between wall sheathing and a brick wall.



Reflective insulation and radiant barrier products must have an air space adjacent to the reflective material to be effective.

Reflective insulation and radiant barrier products **must** have an air space adjacent to the reflective material to be effective.

Reflective insulation systems and radiant barriers can help reduce cooling costs, particularly in attics, because the surface temperature of the roof can get very high on hot, sunny days. Some studies show that radiant barriers can lower cooling costs between 5% and 10% when used in a warm, sunny climate. They are designed to block radiant heat transfer across open spaces. The resistance to heat flow depends on the heat flow direction, and this type of insulation is most effective in reducing downward heat flow.

Using reflective insulation materials

Reflective insulation and radiant barrier products **must** have an air space adjacent to the reflective material to be effective. The reflective qualities of these products will **not** yield any benefit when air spaces are unavailable, for example under concrete slabs.

R-value for reflective insulation systems

One point of confusion surrounding reflective insulation materials is the R-value. R-value determinations for reflective insulation (and all other insulation products) **must** be in compliance with the FTC rule 16 CFR 460, Section 5 (www.ftc.gov/bcp/rulemaking/rvalue/16cfr460.shtm#5). The R-values for multi-layer reflective insulation systems vary according to whether they are used in attics, walls, or floors, and the product label **must** give separate values for each orientation. The R-value for a radiant barrier depends on the surface emittance, the orientation relative to the heat flow direction, and the thickness of the air space. R-values of radiant barrier in open spaces can range from 1.32 to 4.55, with the higher values corresponding to downward heat flow (attics in the summer and floors in the winter).

Radiant barriers can receive credit for energy code compliance, but they **must** use the FTC-based R-value or use the performance approach of the International Energy Conservation Code® (IECC) performance path for states that have adopted the IECC. The performance path requires the use of computer software that properly accounts for the performance of radiant barriers. Note that RES*check*™ code compliance software does not have this capability.

[2] Thermal emittance refers to a material's ability to release absorbed heat. Surfaces with a high thermal emittance will radiate heat gained back into the space.

Ask an Expert

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

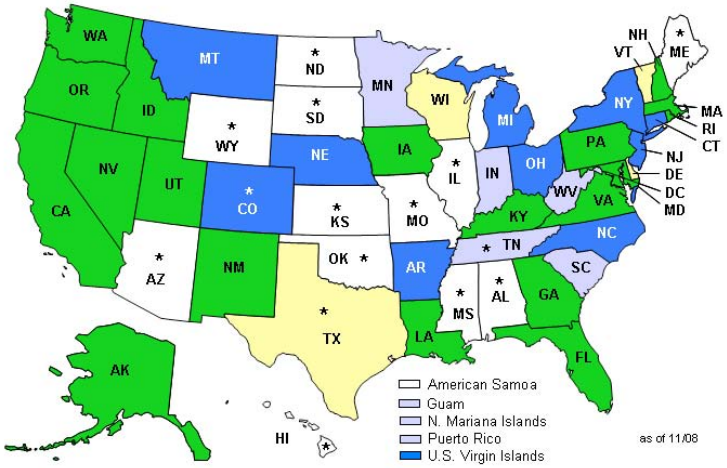
Email questions about residential and commercial energy codes to BECP Technical Support at techsupport@becp.pnl.gov, or submit an inquiry at www.energycodes.gov/support/helpdesk.php.

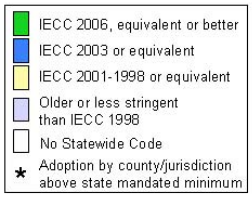
Q: Is the information on the BECP website for the Status of State Codes up to date?

A: The Status of State Energy Codes pages on www.energycodes.gov provides the most current information on energy code adoption in each state compared to any other resource available. Our program staff work closely with each state to maintain the most up-to-date energy code information and resources for our users. We provide commercial and residential maps of each state's current approved energy code and maps of which states can use BECP's no-cost code compliance software, RES*check*™ and COM*check*™. These maps can be downloaded by our users for training or other purposes. Next year we are planning on providing additional information to users on each state's code cycle, links to state codes (if applicable), construction starts, and additional notes on current state activities.

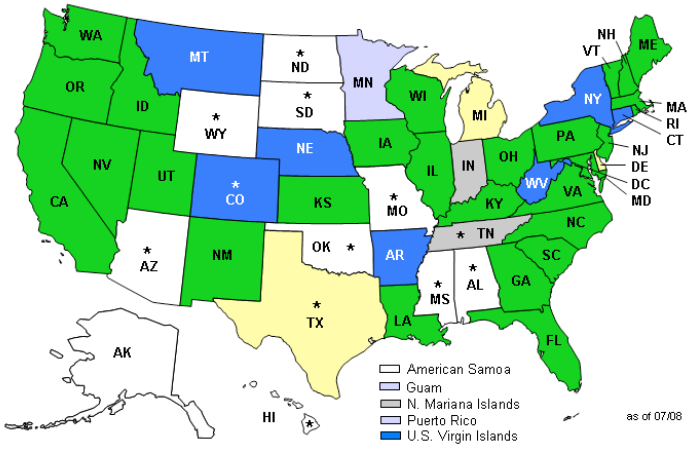
Please note that any views or opinions that may be presented in this newsletter feature, *Ask an Expert,* are solely those of the author(s) and do not necessarily represent those of the program or DOE. The governing jurisdiction, in which the project is located, has the final authority for all energy code issues. This organization is not liable for the consequences of any actions taken on the basis of the information provided.

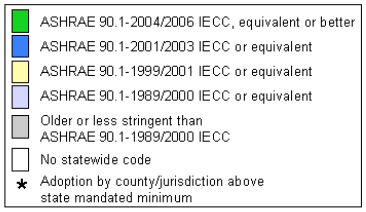
Status of Residential Energy Codes





Status of Commercial Energy Codes





Calendar of Events

What's going on?

January 19-24, 2009 The World Future Energy Summit 2009 in Abu Dhabi. Contact www.WorldFutureEnergySummit.com.

January 24-28, 2009 ASHRAE Winter Meeting in Chicago. See www.ashrae.org.

February 16-18, 2009 2009 RESNET Building Performance Conference in New Orleans. Contact www.natresnet.org.

Add your event to the BECP calendar!

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.

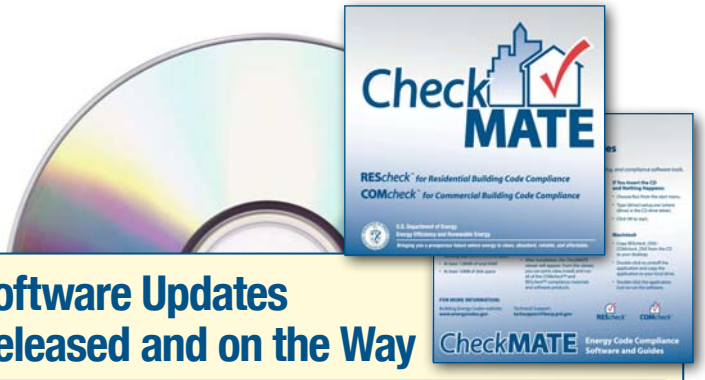
Training Events

The Building Energy Codes Program (BECP) website has a wealth of no-cost resources for the energy codes community. Visit www.energycodes.gov for training, software, news, and more!

Get AIA Continuing Education Credits

BECP's three-part webcast series about ASHRAE's Advanced Energy Design Guides is online now! These guides, developed in collaboration with partner organizations, including DOE, are companion above-code documents for ANSI/ASHRAE/IESNA Standard 90.1-1999. They demonstrate how buildings may be built to be 30% more energy efficient than the Standard. The live broadcasts were attended by more than 3,800 members of the energy codes community. Watch the recorded webcasts today to earn American Institute of Architects Continuing Education System Learning Units.

Recorded webcasts are always available through www.energycodes.gov.



Software Updates Released and on the Way

What's New?

- RES*check*™ version 4.2.0 was released in August with new features to support additions and alterations in the 2006 International Energy Conservation Code® (IECC). RES*check* version 4.2.0 for the Macintosh® was released in October.
- RES*check-Web*™ was deployed in September; the redesign allows resizable table columns, pop-ups, and increased support for more browsers, including Safari.
- COM*check*™ version 3.6.0 was released at the end of September and includes changes to support ANSI/ASHRAE/IESNA Standard 90.1-2007. COM*check* version 3.6.0 for the Macintosh was released in October.
- The COM*check* Prescriptive Package Generator now supports the 2006 IECC and state codes based on the 2006 IECC. This Web-based application allows users to generate their own code-compliant insulation and window packages rather than following predefined prescriptive packages.

Access the latest RES*check* and COM*check* downloads as well as Web-based versions of the software at 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
Tech Support:
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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. Send comments and contributions to Loel Kathmann at Pacific Northwest National Laboratory (techsupport@becp.pnl.gov).

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