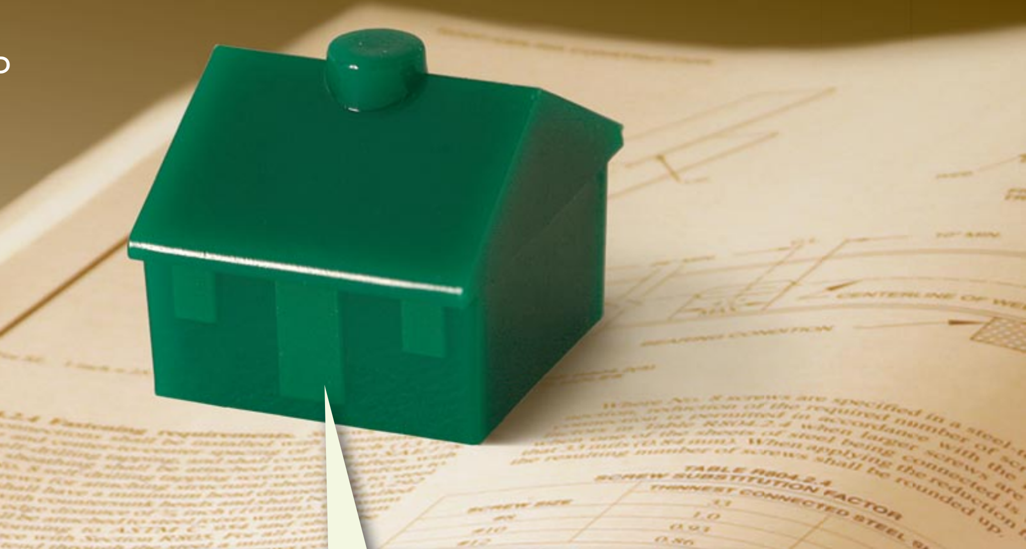
Green Yesterday, Code Today

Thanks to the green-building movement, energy efficiency is becoming a mainstay in the IRC and the IECC.

But what does it mean to you?

BY LYNN UNDERWOOD



New homes built using the recently released 2009 International Residential Code (IRC) or International Energy Conservation Code (IECC) will be more energy efficient than those built to previous standards. As a result, the process of building a house could become a bit more complex and, in some cases, a bit more expensive.

While construction-related energy codes flourished in the 1990s, they were conceived and grew during the energy crises and subsequent green-building movement of the 1970s. Recent spikes in energy costs have increased the attention on codes that limit energy waste. Those same energy-price increases also gained the attention of President Barack Obama, who made energy efficiency central to his stimulus package, specifying the need to improve energy efficiency in 2 million homes.

The 2009 building codes reflect practices that not only boost energy efficiency, such as air-sealing and increasing insulation, but also address sustainable-building practices, such as moisture control. Here, I've highlighted what I think are the 10 most significant energy-related code changes to the 2009 editions of the IRC and the IECC.

You help to create the code

Anyone can submit a legitimate suggestion to improve a building code. Of course, the process is a bit more complex than it sounds. To propose a code change, fill out the appropriate forms found at www.iccsafe.org and submit them (along with supporting rationale) to the International Code Council. Proposals are considered during public hearings, which take place every nine months with the appropriate committee (for example, building, plumbing, or

PERFORMING BLOWER-DOOR TESTS

Code: N1102.4.2 Building-envelope tightness must be less than or equal to 7 ACH (air changes per hour) when tested with a blower door at a pressure of 50 pascals. Testing can occur any time after rough-in and after all penetrations of the building envelope are made.

What it means to you: A blower-door test (photo right) measures the airtightness of buildings and should be used to test the tightness of all new homes. If a blower-door test isn't performed on a home, alternative criteria must be met. The criteria are so extensive, though, that builders will likely want to do a blower-door test instead of calling for inspections on the 17 different air-sealing measures listed in the code. This requirement does not specify who must observe the test (a local inspector or a third-party evaluator), so it is likely that a variety of testing conditions will arise. You might need to hire an independent third-party testing agency that would administer the test and give you a report that could satisfy the energy inspection. The implication is that leaks must be sealed. While proving that the house is tight could have costs (third-party verification or the purchase of testing equipment), most of the added cost will be in the attention to detail during construction and sealing leaks as you build. The average blower-door test costs around $500.

Bottom photo: Courtesy of the Energy Conservatory

INSULATING MASS WALLS

Code: **N1102.2.4** Refined insulation standards have been applied to mass walls to increase their performance in both hot and cold climates.

What it means to you: Code allows mass walls to be built to two different thermal-resistant standards based on the configuration of insulation in the assembly. The IRC classifies a mass wall as an above-grade wall made of concrete block, concrete, insulated concrete forms (ICF), masonry cavity, brick, earth, adobe, compressed-earth block, rammed earth, and solid timber/logs. Insulation installed on a mass wall creates what's called "thermal lag." The insulation increases the time it takes for hot or cold temperatures to transfer from the mass into the living space, reducing the strain on mechanical systems. Insulating the interior of a mass wall is more expensive because code requires a greater thermal resistance, which means more insulation.

USING MORE EFFICIENT WINDOWS

Code: **N1102.1** In certain warm climates, the thermal performance of windows has been increased.

What it means to you: Heat gain or heat loss from windows causes a significant loss of energy. Windows are rated by U-value, which is the inverse of R-value. The lower the number, the more efficient the window is at blocking heat flow. In climate zones 1 to 4, which are generally hotter in the summer, U-values have decreased, representing an increase in energy efficiency. Solar-heat-gain coefficients (SHGC) measure how well a window blocks heat from sunlight. These standards also have changed.

SHGC is expressed by a number between 0 and 1. The smaller the number, the less solar heat is transmitted into a home. In hotter climates (1 to 4), the SHGC requirement has been reduced considerably, which reduces the stress on cooling equipment and overall home operating costs.

INSTALLING MORE INSULATION AND SMALLER CATHEDRAL CEILINGS

Code: **N1102.1, N1102.2.2** In some areas, insulation requirements have been increased, or trade-offs that allowed for insulation reductions have been removed. In all areas, the size in which cathedral ceilings can be built has been limited.

What it means to you: In colder climates such as zones 5 and 6, wall insulation increased to R-20. Basement insulation also was added to portions of zone 3, where it previously was not required. The basement wall must have an insulating value of at least R-5; otherwise, a framed wall must be built to create an insulating cavity that performs to R-13.

In addition to these modest increases, there was a significant change in the IECC and the IRC. (Builders can follow either code.) Cathedral ceilings tend to allow limited insulation and can account for large energy losses. The IECC now limits the size of cathedral ceilings to 20% of the insulated ceiling area through provision 402.1.1. The IRC has limited the size of cathedral ceilings to 500 sq. ft. Massive cathedral ceilings (photo right) could be an architectural element of the past.

Top photo: Rob Yagid. Center photo: Rodney Diaz. Bottom photo: Brian Pontolilo.

mechanical). These committees may accept, adjust, or dismiss the proposed code. After several other votes and committee hearings, your proposal will be presented to the voting membership of the ICC in what's called final-action hearings.

Proposals that pass this hurdle then are compiled into a new published code every three years. This new book is called the model code. The code doesn't become law until an authority having jurisdiction (city, county, or state building departments, for example) adopts it. In almost all cases, this adopting locality usually modifies the code to reflect local interests. So for all the items discussed in national publications such as *Fine Homebuilding*, the adopting jurisdiction has the final word.

Codes foster progress; they don't suppress it

Codes and the building officials who enforce them have long been looked at as the enemy when it comes to home building. Although it's unfortunate that some jurisdictions seem resistant to change, the ICC is on your side when it comes to recognizing new building materials and techniques. Code cannot possibly cover every conceivable material or method of construction, but it has a built-in provision that allows you to use new products, materials, and innovative methods of construction. These innovations—as well as natural, sustainable materials—are encouraged and accepted through code R104.11, which states:

"The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design, or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method, or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code."

Put simply, a building inspector or official is compelled to accept new materials if they meet the intent of the code, which ultimately boils down to one consideration: safety.

Use innovative products and natural materials

The green movement has resulted in an explosion of new products and a turn to more sustainable, natural materials. To use a manufactured product that is not code-recognized, you need to acquire testing results from the manufacturer. Normally, new products are marketed after testing and evaluation are complete, but not always. A home show is a common venue to roll out untested new products. As a builder, you might consider one of these items. Ask vendors if their products have been tested by an independent laboratory and listed by an approved agency. Ask if an evaluation report is available or if they can cite a jurisdiction that has accepted the product by issuing a building permit. These questions are the same ones building officials will ask when you try to get your permit.

Natural materials such as adobe, rammed earth, straw bale, and earthen plaster have a proven performance record. However, these materials are not within the prescriptive provisions of the IRC. You can use these materials, but you must demonstrate that their performance meets a certain level of safety. That proof could simply require an analysis by a structural engineer, which would satisfy the code.

Most building inspectors are forward-thinking enough to accept innovative materials and products through a performance approach. You might encounter others who have limited experience or are headstrong. If you run into a problem, ask the official if they can recommend another acceptable approach. If they don't respond, remember that almost everyone has a boss. Theirs is the building official who interprets the code and who could overrule the inspector. □

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INSTALLING VAPOR RETARDERS

Code: R601.3 Class-I or -II vapor retarders are required on the interior side of framed walls in zones 5, 6, 7, and 8 and in Marine 4, except on basement walls; in the below-grade portion of any wall; and in construction where moisture or frozen moisture will not damage the materials used in the assembly.

What it means to you: Since the last edition of the IRC, the vapor-retarder requirements in the IECC, IRC, and IBC were changed based on an understanding of building science. This change moves the new vapor-retarder requirements into their proper code location because they are more reasonably related to the building shell. This means that in the prescribed zones, you'll need to install a vapor retarder (e.g., poly sheeting or closed-cell foam) on the interior side of a wall. A class-III vapor retarder can be used in lieu of class-I and -II products in some cases when the cladding is vented or insulated sheathing is used. This code, which was previously only part of the IECC, is now integrated into the IRC.

INSULATING MECHANICAL PIPES

Code: N1103.3 Mechanical-system piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) must be insulated to a minimum of R-3.

What it means to you: Although this might clear up an inconsistency between previously stated requirements of 1-in. insulation (which is approximately R-4), it at least raises the required insulation values from R-2 to R-3 as a compromise. Remember, though, that this code focuses on mechanical pipes, which could carry fluids such as glycol, not potable-water pipes.

Photo this page: Rob Yagid

PROGRAMMING THERMOSTATS

Code: N1103.1.1 In homes where the primary heating system is a forced-air furnace, at least one programmable thermostat must be installed.

This thermostat must be able to maintain zone temperatures from 55°F (13°C) to 85°F (29°C). The thermostat must initially be programmed with a heating temperature no higher than 70°F (21°C) and a cooling temperature no lower than 78°F (26°C).

What it means to you: Programmable thermostats have been a popular addition in many new homes because of customer demand. A typical programmable thermostat costs from $20 to $40 more than a similar manual thermostat. The U.S. EPA Energy Star Web site suggests that when used properly, programmable thermostats can save about $150 a year in energy costs. This code requirement is only for houses that use forced-air heating systems; complications can arise with other heating systems.

EXCEEDING THE ENERGY CODE

Code: N1101.8 A code official or local jurisdiction is permitted to allow a national, state, or local green-building or energy-efficiency program to exceed the energy efficiency required by the IRC or IECC. A building approved in writing by such a program will be considered compliant.

What it means to you: This update ensures that builders who use LEED, Energy Star, or a local green-building program may be able to comply with all energy-code provisions of the IRC and IECC. The above code provision allows a building official to deem the energy-efficient program as exceeding the energy efficiency required by the code. The value of this provision is that while the energy requirements of both the IRC and the IECC change, other programs initiated by cities, counties, and states sometimes do not—at least not at the same pace. Builders can disregard the energy requirements of the code only if the locality has approved the alternative program.

USING MORE EFFICIENT LIGHTING

Code: N1104.1, N1102.4.5 Half of all interior lamps in permanent light fixtures must be the high-efficacy type. Recessed can lights must meet air-leakage standards and must be air-sealed upon installation.

What it means to you: Lighting represents about 12% of the energy used in a home. You can lower that amount with high-efficacy lamps such as compact fluorescents or T-8 linear fluorescents. The rationale for the 50% standard is to allow flexibility in circumstances where a high-efficacy bulb would not perform well, such as when a compact-fluorescent bulb is operated by a dimmable switch.

The code also demands that all recessed lights meet an ASTM manufacturing tightness standard and be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering. Air-leakage testing for these fixtures has been an option for years. Now, manufacturers are able to meet a uniform testing standard. Essentially, they make better, tighter light fixtures because of this code change. It will be your job to install a gasket or to apply caulk as an air-sealing measure when the fixture is installed.

Navigating the code

Few people enjoy diving into the pages of the IRC or the IECC, mostly because the language is incredibly dense and partly because it's not always easy to find the codes you're looking for. The IRC and the IECC reference codes in different ways, making the process of finding the information you want much more difficult.

In the IRC, references to codes always lead with a letter (R, N, M, G, P, or E) that corresponds with a particular subject matter (residential general, energy, mechanical, gas, plumbing, or electrical). The IECC—and some other codes for that matter—do not follow the same format. They simply have a code number (404.2.6, or 1109.1, for example). Usually, the code number comes after the identifying acronym for a particular code (IECC, IPC, IBC, etc.).

The first one or two digits in all codes relate to the chapter where it's found. For example, section R602.10 is a provision within chapter 6 of residential general in the IRC. A code referenced as IPC 606 is found in chapter 6 of the International Plumbing Code. Table N1102.1 is in chapter 11 of the energy section in the IRC.

Top photo: Courtesy of Honeywell.
Bottom photo: Krysta S. Doerfler.