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Preparing for the 2015 IRC

In the coming months, many States and local jurisdictions are looking at the 2015 I-Codes (the family of model building codes published by the International Codes Council, **iccsafe.org**). It is safe to say that most jurisdictions are facing the same dilemma as designer and contractors to fully understand the implications of the new codes.

Since our region changed from the 1999 BOCA National Building Code to the 2000 I-Codes, there have been many changes in the requirements for new construction. Updated every three years, arguably one of the biggest changes has been to energy conservation and the evolution of green construction codes and standards. The 2000 International Energy Conservation Code (IECC, formerly the CABO Model Energy Code) contained provisions for commercial and residential construction, but the residential provisions varied from the energy provisions in the International Residential Code (IRC, formerly the CABO One & Two Family Dwelling Code). In the 2012 code development cycle, the IECC and IRC energy conservation chapters for residential construction were identical for the first time. As the 2015 IECC and IRC are now available, what will the impact be?

In its news alert for the week of October 6-10, the Building Codes Assistance Project (BCAP) gave us some insight:

"On September 26, DOE published a Federal Register notice of preliminary determination regarding residential energy efficiency improvements in the 2015 International Energy Conservation Code (IECC). DOE has preliminarily determined that residential buildings meeting the 2015 IECC (as compared with buildings meeting the 2012 IECC) would result in national source energy savings of approximately 1.03 percent, site energy savings of approximately 1.12 percent, and energy cost savings of approximately 0.90 percent of residential building energy consumption."

Building Envelope

The prescriptive requirements of the IECC have generated significant discussion in the code development cycle process. There have been some significant changes in the IECC tables from year to year, but let's look at New Hampshire's two climate zones. The tables below show the progression of change in the prescriptive maximum U-Factors by assembly and the prescriptive minimum R-values. The U-Factor is the real measure of heat transmission through the entire building assembly, whereas the R-Value table lists the required level of insulation added to the typical assembly. It is important to note that "prescriptive" codes define the worst permittable assembly and allow the builder/designer to improve on that performance.

What the tables tell us is that the energy code requirements in our region haven't really changed much. We have definitely seen tightening requirements and new technologies advancing in glazing as window companies strive to improve their products. EnergyStar requirements are not listed, but they are a recommended U-Factor for windows that most window companies offer. Improving glazing performance also impacts National Green Building Program (NGBP) certification.

There are a number of opinions surrounding the requirements for wood frame walls. Looking at the U-Factor table, one can see that the frame wall assembly has been tweaked more than any other assembly. The effort to define the best wall requirement shows up in the R-Value table, where exterior continuous insulation requirements have been added to respond to air barrier and thermal break requirements. The results of the code development hearings don't quite make sense however. When reviewing the requirements for vapor retarders in IRC Table R702.7.1, we are told that an R-5 layer of interior continuous insulation can be used in Climate Zone 5 over a 2x4 wall, but R-7.5 or more is listed for a 2x6 wall (CZ5 lists R-7.5 over 2x4 and R-11.25 or more over a 2x6 wall).

Code Cycle	Climate Zone	Fenestration	Skylight	Ceiling	Frame Wall	Mass Wall	Floor	Basement Wall	Crawl Space Wall
2003 IECC	5 (HDD 5401-7200)	0.35 @15% of wall area		0.026	0.110	0.120	0.050	0.09325	0.060
2006 IECC		0.35	0.60	0.030	0.060	0.082	0.033	0.059	0.065
2009 IECC		0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
2012 IECC		0.32	0.55	0.026	0.057	0.082	0.033	0.050	0.055
2015 IECC		0.32	0.55	0.026	0.060	0.082	0.033	0.050	0.055
2003 IECC	6 (HDD 7201-9000)	0.35 @15% of wall area		0.026	0.110	0.120	0.050	0.060	0.060
2006 IECC		0.35	0.60	0.026	0.060	0.060	0.033	0.059	0.065
2009 IECC		0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
2012 IECC		0.32	0.55	0.026	0.048	0.060	0.033	0.050	0.055
2015 IECC		0.32	0.55	0.026	0.045	0.060	0.033	0.050	0.055

The key here is to understand the potential for moisture to enter the assembly from both inside and outside, and strive to keep the dew point out of the wall assembly so that moisture cannot condensate within the wall cavity. With higher levels of continuous rigid insulation to the outside, an interior vapor retarder may not be needed. For this reason, it may be a good practice by home builders to research their wall systems in terms of U-Factor and moisture migration rather than building to the prescriptive insulation level (e.g., R20-5).

Air Infiltration

Some of the most significant strides in the IECC have come from attention to controlling/limiting air infiltration. While it has been included in the energy code since the days of the Model Energy Code (MEC, ca 1985), it was not a primary factor in terms of building code review. The fenestration industry developed performance standards and certification programs to address air leakage, but other changes were less apparent until EnergyStar requirements were published. Now we are seeing requirements for blower door testing to demonstrate the rate of air leakage into new homes. Blower door tests and infrared photogra-

phy are extremely beneficial for diagnosing air leaks in existing homes too. Reports have noted that as much as 30 percent of an older home's energy bill may be attributed to cold air entering the house through openings in the thermal envelope.

Air tight construction has brought some new impacts to construction in the 2015 code. For example, new wood-burning fireplaces are required not only to have outside combustion air supply, but also tight-fitting dampers or doors. Doors are required to be listed and labeled to demonstrate that they provide the appropriate seal. Another update is the requirement for rooms containing fuel-burning appliances to have outside combustion air and be isolated from the rest of the building. This means that the mechanical room of the future has the equivalent of exterior wall/door/ceiling construction as if the mechanical room is an unconditioned space. The use of direct vent appliances can offset this requirement.

Prescriptive Minimum R-Values by Assembly

Code Cycle	Climate Zone	Fenestration	Skylight	Ceiling	Frame Wall	Mass Wall	Floor	Basement Wall	Slab R-Value & Depth	Crawl Space Wall
2003 IECC	5 (HDD 5401-7200)	0.35 @15% of wall area		R-49	R-21	R-14	R-21	R-11	R-13, 4ft.	R-20
2006 IECC		0.35	0.60	R-38	R-19 or 13+5	R-13	R-30	R-10/13	R-10, 2ft.	R-10/13
2009 IECC		0.35	0.60	R-49	R-20 or 13+5	R-13/17	R-30	R-10/13	R-10, 2ft.	R-10/13
2012 IECC		0.32	0.55	R-49	R-20 or 13+5	R-13/17	R-30	R-15/19	R-10, 2ft.	R-15/19
2015 IECC		0.32	0.55	R-49	R-20 or 13+5	R-13/17	R-30	R-15/19	R-10, 2ft.	R-15/19
2003 IECC	6 (HDD 7201-9000)	0.35 @15% of wall area		R-49	R-21	R-16	R-21	R-19	R-14, 4ft.	R-20
2006 IECC		0.35	0.60	R-38	R-19 or 13+5	R-15	R-30	R-10/13	R-10, 4ft.	R-10/13
2009 IECC		0.35	0.60	R-49	R-20 or 13+5	R-15/19	R-30	R-15/19	R-10, 4ft.	R-10/13
2012 IECC		0.32	0.55	R-49	R-20+5 or 13+10	R-15/20	R-30	R-15/19	R-10, 4ft.	R-15/19
2015 IECC		0.32	0.55	R-49	R-20+5 or 13+10	R-15/20	R-30	R-15/19	R-10, 4ft.	R-15/19

Ventilation requirements are another impact of building air tight. Range hoods with ducts to the outside and bath fans have included dampers for a long time. Newer requirements include make-up air for exhaust appliances, but a balanced ventilation system is still a good recommendation to replace indoor conditioned but stale air with fresh outside air that has been pre-heated by heat exchangers before entering the air supply system.

Distribution Loss

Another area of significant change in the IECC/IRC energy provisions are the requirements for sealed ducts and insulated distribution lines (hot water, forced air ducts) that are outside of the thermal envelope, and therefor in an unconditioned space.

Distribution loss is more of an issue than many realize. Homeowners may complain about cold air coming out of a heat register. They may say that it takes 10 minutes for the hot water to arrive at the shower head. Proper line sizing can contribute to greater efficiency as can reduced length of those lines. The 2015 I-codes encourage better design of distribution systems for air and water systems.

Lighting, Appliances and HVAC Equipment

Lighting (lamps and fixtures), appliances, and heating, ventilation and air conditioning equipment have been addressed in the 2015 codes just as they have been by EnergyStar and the NGBP. Selecting EnergyStar certified appliances and equipment have been a good practice for a long time.

Lighting efficiency is dramatically changing our environment. New lighting technologies (LED, low voltage, and compact fluorescent) have made incandescent lighting nearly obsolete. The 2015 code for Electrical Power and Lighting Systems requires "Not less than 75 percent of the lamps in permanently installed lighting fixtures shall be high-efficacy lamps…" This impact on power consumption is so significant that utilities across the country are implementing various incentive programs to encourage home owners to purchase high-efficacy lamps.

A Major Enhancement

Many of the changes discussed so far were introduced in the 2012 IECC and modified in the 2015 code. Some edits of the 2012 improved the code, and changes in the IRC version improve energy conservation measures with other building, mechanical and other sections of the code. Maybe the most intriguing addition to the 2015 IECC/IRC is Section R406 – Energy Rating Index Compliance Alternative.

In simple terms, the Energy Rating Index (ERI) offers a code compliance that parallels the performance path methods of above-code programs (EnergyStar and NGBP). The section provides specific guidance to the authority having jurisdiction as to required documentation and inspections. The rating provides a comparative index to the prescriptive requirements of the 2006 IECC (ERI=100). To comply via this path, a home's ERI will need to be 55 for Climate Zone 5, and 54 for Climate Zone 6.

Overall Review

Overall, the 2015 IECC and IRC residential energy conservation requirements are an improvement over the 2012 version. The changes over the 2009 versions may seem extreme in some areas, but they are actually in line with changes we have experienced in applying other above-code programs. The impact on EnergyStar and the NGBP will be interesting considering that those programs are required to generate even more efficient construction than the minimum requirements of the building codes.

This summary of the changes is intended only to alert readers to the nature of the changes. Educational programs are being planned to help builders and building officials understand the changes and implications. All building professionals are encouraged to purchase the 2015 I-Codes in preparation for future building design and construction. As New Hampshire gears up for adopting a new code, the 2015 requires minor change to insulation levels and encourages a performance path for compliance.

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