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## North Carolina Has a New Energy Conservation Code!

By R. Christopher Mathis

### Executive Summary

On Friday, June 24, 2011, Governor Beverly Perdue signed SB 708 into law and, with it, approved a new Energy Conservation Code for the residential and commercial buildings in North Carolina. This new code, the fruit of over two years of work, will save home and business owners money on their monthly energy bills and help retain and create jobs in every region of our state. It delivers significant improvements in insulation levels, window performance and building envelope air leakage reduction. The new code also includes the High Efficiency Residential Option (HERO) Appendix which delivers a 30% improvement in minimum energy efficiency over the state's current energy code. The new NC Energy Conservation Code has an effective date of January 1, 2012.

### Report

After over two years of effort, numerous setbacks and delays, and the hard work of a vast group of supporters and advocates, North Carolina has a new energy conservation code which will go into effect January 1<sup>st</sup>, 2012 – less than six months away. The action to get the code approved by the legislature and governor has been a long and arduous process, but the fruits of that effort are significant for everyone in the building industry and all North Carolinians.

### Residential Energy Efficiency Improvements

The provisions of the 2012 North Carolina Energy Conservation Code (NCECC) will result in improved homes across the state of North Carolina. Significant improvement was made in the areas of envelope leakage reduction, duct tightness, window performance, wall insulation and lighting efficiency. Table 1 shows the residential prescriptive values adopted for the 2012 NCECC.

**Table 1: Prescriptive Envelope Requirements: Residential**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE	BASEMENT WALL R-VALUE	SLAB R-VALUE & DEPTH	CRAWL SPACE WALL R-VALUE
3	0.35	0.65	0.30	30	13	5/10	19	10/13	0	5/13
4	0.35	0.60	0.30	38 or 30 cont.	15, 13+2.5	5/10	19	10/13	10	10/13
5	0.35	0.60	NR	38 or 30 cont.	19, 13+5, or 15+3	13/17	30	10/13	10	10/13

One important improvement is a reduction in fenestration solar heat gain coefficient to 0.30 (from 0.40). This 25% improvement prioritizes reductions in solar gain as a necessary tool to help address North Carolina's growing peak power problem. These improvements in solar heat gain coefficients

cover over 90% of the state defined by climate zones 3 and 4 (Wilmington to Asheville). The 0.30 SHGC level is consistent with values for southern climates in the 2009 IECC. A more aggressive 0.25 SHGC is contained in the 2012 IECC and in the HERO alternative.

Similarly, fenestration U-factors were lowered across the state from 0.40 to 0.35, a welcome improvement in heating season performance especially on the heels of North Carolina's worst winter on record.

Another item of note is the required improvement in wall R-values in climate zone 4 (Raleigh to Asheville, as well as St. Louis to Washington D.C.). This change demonstrates the clear recognition that improving the energy performance of walls is a priority and that continuous insulation is a proven method for achieving these goals.

As in the IECC, air leakage control in the 2012 NCECC has become a significantly higher priority. Building envelope air tightness must be demonstrated either through compliance with an air sealing checklist or, alternatively, a blower door test that demonstrates delivered air tightness at less than 5 ACH50. When the air leakage test option is elected, the resultant value must be displayed on the building certificate along with all other construction attributes required.

Additional residential improvements include:

- A requirement for a programmable thermostat
- Heat pump strip heating controls
- A larger percentage (75%) of energy efficient lighting installed
- Improved duct tightness and mandatory duct testing.

Duct testing has been a requirement in the North Carolina Code for at least one code cycle, and now all HVAC ducts must be tested, demonstrating leakage no greater than 6 CFM per 100 square feet of conditioned floor area. Like building envelope testing, tested duct leakage performance values must be shown on the compliance certificate.

Efficiency gains are also delivered through the requirement that at least 75% of the lamps in permanently installed fixtures be high efficiency lamps.

Probably one of the most important, yet unsung, benefits of the 2012 NCECC is the jobs it will create right here in North Carolina. North Carolina's manufacturing base includes glass and window companies, a variety of insulation manufacturers and installers, caulk, sealant and spray foam manufacturers, as well as manufacturers of energy efficient lighting. North Carolina's new energy code will put North Carolinians to work.

The new energy code also will support the continued growth of North Carolina's clean energy job sector, by employing the growing number of home energy raters and building diagnosticians across our state from duct testing to envelope testing to building modeling, to determine code compliance – the energy code will create jobs in the service sector as well.

Another important inclusion in the 2012 NCECC is a voluntary appendix that defines a High Efficiency Residential Option (HERO) for those builders and contractors that are seeking to deliver a home that is 30% more energy efficient than North Carolina's current code. This 30% HERO alternative offers prescriptive paths that require slightly better insulation, fenestration, air sealing, equipment, and lighting packages to deliver even greater savings. Table 2 shows some of the aspects and typical values

in this higher efficiency option. For example, the window provisions in the HERO option have a lower SHGC, delivering even greater peak power and air conditioning savings. It is anticipated that this HERO option could be tied to green building programs, tax credits, utility incentives, greater appraisal evaluations, mortgage incentives and other market pull forces for those seeking to build better than the minimum code.

**Table 2: Prescriptive HERO Appendix Values**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE	FLOOR R-VALUE	BASEMENT WALL R-VALUE	SLAB R-VALUE	CRAWL SPACE WALL R-VALUE
3	0.32	0.65	0.25	38	19, 13+5, or 15+3	5/10	19	10/13	5	10/13
4	0.32	0.60	0.25	38	19, 13+5, or 15+3	5/10	19	10/13	10	10/13
5	0.32	0.60	(NR)	38	19, 13+5, or 15+3	13/17	30	10/13	10	15/19

Again, energy efficient windows, improved insulation and other building provisions define the HERO options for beyond-minimum-code performance.

### **Commercial Building Performance**

The provisions of the 2012 NCECC that address commercial building energy performance are similarly innovative, delivering improved efficiency and enabling a wide array of design options to achieve the minimum performance requirements. In addition to the mandatory provisions that have long existed in the code, compliance in North Carolina now also requires designers to selection at least one of six additional energy efficiency options for every building. These include:

- An option for more efficient mechanical equipment
- An option for energy efficient lighting
- An option for energy efficient ventilation systems
- An option for higher efficiency service water heating systems
- An option to take credit for onsite supply of renewable energy, and
- An option on automatic daylighting control systems.

As in the residential section of the code, the commercial provisions prioritize building envelope performance. The new minimum requirements show improved energy efficiency levels through slightly higher R-values for ceilings, walls, floors and slabs, slightly better window performance with lower U-factors and SHGCs required, increased reliance on energy efficient lighting and other improvements. These efficiency improvements in the commercial provisions cross all climate zones and all building types covered under the commercial code.

In many cases, these improvements to North Carolina’s energy code for commercial buildings deliver levels of energy efficiency greater than the prescriptive provisions of ASHRAE Standard 90.1, the alternative compliance path included in the code. Table 3 shows the specific improvements to the commercial opaque envelope provisions in the code for each of North Carolina’s 3 climate zones.

The improved code prioritizes improved insulation, continuous over the building envelope, improved insulation levels for metal buildings, mass walls, metal and wood framed walls, and slab-on-grade floors.

**Table 3: Commercial Opaque Prescriptive Provisions of the NCECC 2012 (partial listing)**

Climate Zone	3		4		5	
	All Other	Group R	All Other	Group R	All Other	Group R
<b>Roofs</b>						
Insulation entirely above deck	R - 25 ci	R-25 ci	R - 30 ci	R-30 ci	R - 30 ci	R-30 ci
Attic and other - wood framing	R-38	R-38	R-42	R-42	R-42	R-42
Attic and other - steel framing	R-38	R-38	R-49	R-49	R-49	R-49
<b>Walls, Above Grade</b>						
Mass	R-7.6 ci	R-9.5 ci	R-9.5 ci	R-11.4 ci	R-11.4 ci	R-15 ci
Metal framed	R-13 + 7.5 ci	R- 13 + R-7.5 ci	R-13 + R-10 ci	R-13 + R-12.5 ci	R-13 + R-12.5 ci	R- 13 + R-15 ci
Wood framed and other	R-13 + R-3.8 ci	R-19, R-13+ R-5, or R-15 + R-3	R-13 + R-7.5 ci	R-19, R-13+ R-5, or R-15 + R-3	R-13 + R-10 ci	R-19, R-13+ R-5, or R-15 + R-3
<b>Walls, Below Grade</b>						
Below-grade wall <sup>f</sup>	R-7.5 ci	R-7.5 ci	R-7.5 ci	R-10 ci	R-7.5 ci	R-10 ci
<b>Floors</b>						
Mass	R-12.5 ci	R-12.5 ci	R-14.6 ci	R-16.7 ci	R-14.6 ci	R-16.7 ci
Joist / Framing	R-30 <sup>e</sup>	R-30 <sup>e</sup>	R-38	R-38	R-38	R-38
<b>Slab-on-Grade Floors</b>						
Unheated slabs	NR	R-10 for 24 in.	R-15 for 24 in.	R-15 for 24 in.	R-15 for 24 in.	R-20 for 24 in.

The commercial provisions of the code also reflect North Carolina’s energy and peak load concerns by dramatically improving the minimum requirements for windows. Table 4 shows the commercial window performance provisions in the 2012 NCECC.

**Table 4: Commercial Fenestration Provisions of the 2012 NCECC (Partial Listing)**

CLIMATE ZONE	3	4	5
<b>Vertical Fenestration (30% maximum of above-grade wall)</b>			
<b>Framing materials other than metal with or without metal reinforcement or cladding</b>			
<i>U</i> -Factor	0.32	0.32	0.30
<b>Metal framing with or without thermal break</b>			
Curtain Wall/Storefront <i>U</i> -Factor	0.45	0.45	0.38
Entrance Door <i>U</i> -Factor	0.77	0.77	0.77
All Other <i>U</i> -Factor	0.45	0.45	0.45
<b>SHGC-All Frame Types</b>			
SHGC: PF < 0.25	0.25	0.25	0.40
SHGC: 0.25 ≤ PF < 0.5	0.33	0.33	NR
SHGC: PF ≥ 0.5	0.40	0.40	NR
<b>Skylights (3% maximum, 5% if using automatic daylighting controls)</b>			
<i>U</i> -Factor	0.60	0.60	0.60
SHGC	0.35	0.35	0.40

Non-metal window *U*-factors have been lowered to 0.32 in climate zones 3 and 4 (90% of the state) and 0.30 in climate zone 5. Peak savings are delivered with lower solar heat gain coefficients in each climate zone – 0.25 in climate zones 3 and 4 and 0.40 in climate zone 5. While there remain some of the material-specific biases in this table, these values will help push other states in the region, as well as the national model code, to continue to address improved window performance.

The commercial code also requires HVAC systems to be properly sized, the systems be appropriately tested and balanced, and system performance specifications be listed on the compliance certificate. Again, energy efficient lighting, and lighting controls figures prominently in the delivering of the

improved levels of energy efficiency in the 2012 NCECC. Maximum lighting power densities have been reduced across the board for all occupancy classes and uses.

### **Conclusions**

The 2012 North Carolina Energy Conservation Code represents the essential starting point toward securing and protecting North Carolina's energy future. North Carolina's buildings are its single largest energy consumer and therefore represent the single largest opportunity for protecting our state against an uncertain energy future. The new code is a key part of our state's interest in creating durable "clean energy jobs" and revitalizing our beleaguered manufacturing and construction industries. January 1, 2012 launches a new day and a new path for North Carolina's energy future.

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