



NFRC Regulatory Affairs & Marketing Committee: Energy Codes Update

September 2015

Refresher: The Importance of Energy Codes

- ▶ States and local jurisdictions adopt energy efficient codes to establish the minimum legal standards for building construction - including fenestration
- ▶ Energy codes generally establish requirements for new buildings, additions & remodeling and replacement windows
- ▶ Jurisdictions typically adopt model codes, occasionally with local amendments

U.S. Law Requires Local Consideration and/or Adoption of Model Energy Codes

- ▶ For almost two decades, federal law has required jurisdictions to consider and/or adopt model energy codes
- ▶ Two primary national model energy codes
 - ▶ Residential construction = IECC
 - ▶ Non-residential construction = ASHRAE 90.1 and IECC

NFRC Role in Energy Codes

- ▶ Modern model energy codes incorporate NFRC procedures as the exclusive method for determining fenestration energy performance for both residential and non-residential construction (U-factor, SHGC)
- ▶ The only alternative is an extremely limited default table
- ▶ Virtually all state codes currently incorporate these requirements
- ▶ Code requirements have been an incredibly important driver of NFRC labeling by the residential window industry

IECC Requirement for NFRC Ratings - Section 303.1.3

▶ U-factor or SHGC:

- ▶ Must be “determined in accordance with NFRC 100 [or 200]”
- ▶ Must be “determined by an accredited, independent laboratory”
- ▶ Must be “*labeled* and certified by the manufacturer.”
- ▶ The word “*labeled*” is defined in IECC Ch. 2 as products:
 - ▶ “to which have been affixed a label, seal, symbol, or other identifying mark of a nationally recognized testing laboratory, inspection agency or other organization concerned with production evaluation”
 - ▶ “that maintains periodic inspection of the production of the above-labeled items and whose labeling indicates ... that the product meets identified standards”

Fenestration Default Tables: U-Factor

- ▶ Products lacking labeled and certified NFRC ratings are assigned a default value; no credit for low-e or gas fill
- ▶ Same values for all fenestration

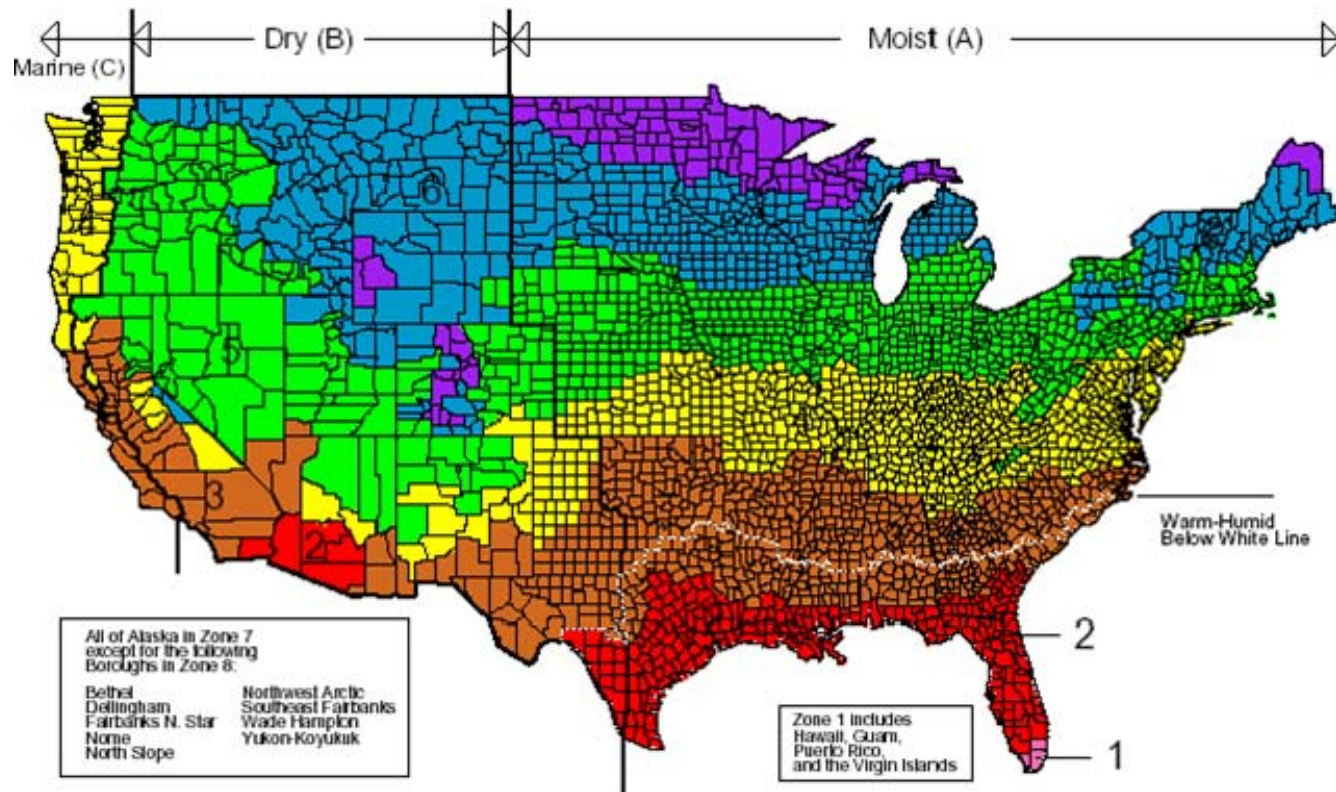
Frame Type	Single Pane	Double Pane	Skylight Single	Skylight Double
Metal	1.20	0.80	2.00	1.30
Metal with Thermal Break	1.10	0.65	1.90	1.10
Nonmetal or Metal Clad	0.95	0.55	1.75	1.05
Glazed Block	0.60			

Fenestration Default Tables: SHGC & VT

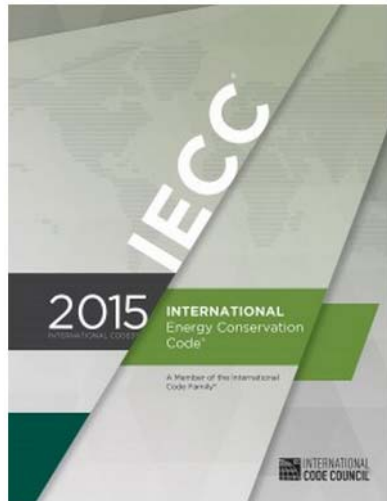
- ▶ Products lacking labeled and certified NFRC ratings are assigned a default value; no credit for low-e
- ▶ Same values for all fenestration

	SINGLE GLAZED		DOUBLE GLAZED		GLAZED BLOCK
	Clear	Tinted	Clear	Tinted	
SHGC	0.8	0.7	0.7	0.6	0.6
VT	0.6	0.3	0.6	0.3	0.6

U.S. Energy Code Requirements Vary by Climate Zone



2015 Version of the IECC is the National Model Energy Code



- ▶ 2015 IECC contains separate, stand-alone residential & commercial energy codes
- ▶ 2015 IRC Chapter 11 duplicates IECC residential energy provisions
- ▶ ASHRAE 90.1 establishes alternative requirements for high-rise residential and non-residential

DOE's Determination on 2015 IECC for Residential Construction

- ▶ The Department of Energy's positive determination on the 2015 IECC for residential construction was published June 11, 2015
- ▶ This determination triggers the requirement that states certify they have reviewed their energy codes and determined whether to update requirements to meet or exceed the 2015 IECC

2015 IECC

- ▶ Little change in basic residential requirements over 2012 IECC - 2015 was a cycle for consolidation of gains
- ▶ Reorganization of requirements between new and existing buildings
- ▶ New Energy Rating Index (ERI) compliance method reflective of the HERS rating system:
 - ▶ Requires that windows and insulation meet, at least, minimum prescriptive values from 2009 IECC
 - ▶ Sets reasonably aggressive “whole home” targets
 - ▶ Also includes the impact of equipment, appliances, lighting and size as trade-offs

2012 and 2015 IECC & NFRC

- ▶ U-factors and SHGCs:
 - ▶ Same basic approach since the mid-1990s
 - ▶ All fenestration ratings must be determined in accordance with NFRC or limited default table (no other options)
- ▶ VT:
 - ▶ NFRC VT recognized by IECC for the first time in 2012
 - ▶ VTs for fenestration (if required by the code) must be determined in accordance with NFRC or limited default table

Improved Residential Requirements in the 2012 and 2015 IECC

- ▶ More efficient fenestration in virtually all climate zones as compared to earlier codes; efficient low-e becomes universal product
- ▶ DOE studies have concluded that:
 - ▶ 2012 IECC saves between 25-38% in relevant energy costs over the 2006 IECC, depending on climate zone; the 2015 IECC saves 1% over the 2012 IECC
 - ▶ 2012 and 2015 IECC are cost effective everywhere

Residential: Lower Maximum Window U-Factor in Most Climate Zones

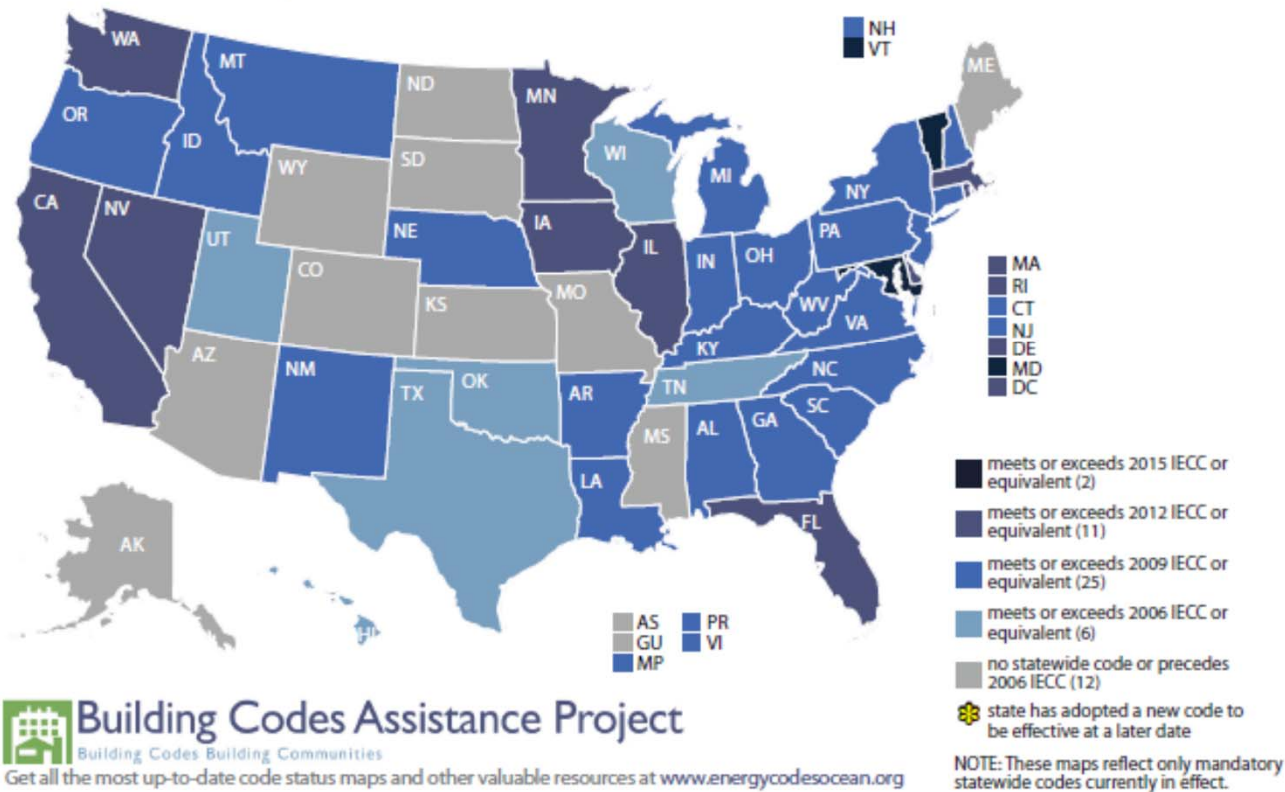
	2006 Code	2009 Code	2012 and 2015 Code
Zone 2	0.75	0.65	0.40
Zone 3	0.65	0.50	0.35
Zone Marine 4 and Zones 5-8	0.35	0.35	0.32

Residential: Lower Maximum Window SHGC in Certain Climate Zones

	2006 Code	2009 Code	2012 and 2015 Code
Climate Zones 1 through 3	0.40	0.30	0.25
Climate Zone 4 Except Marine	NR	NR	0.40

Status of State Code Adoptions for Residential Construction

Residential State Energy Code Status AS OF JULY 1, 2015



Building Codes Assistance Project
Building Codes Building Communities
Get all the most up-to-date code status maps and other valuable resources at www.energycodesocean.org

What about Commercial Fenestration????

- ▶ The model codes have improved remarkably
- ▶ An underlying issue that remains is that the IECC sets the same U-factor requirements for all frame types while ASHRAE 90.1 continues to establish different requirements for metal versus non-metal frames
- ▶ While there has been widespread code adoption, consistent code compliance and enforcement is still suspect

2012 & 2015 IECC -- Commercial Fenestration

- ▶ Substantially simplified and material neutral; new prescriptive vertical fenestration U-factors using three categories: Fixed, Operable and Entrance Door (skylights are addressed separately)
- ▶ Prescriptive table allows:
 - ▶ 30% window to wall ratio
 - ▶ Up to 40% window to wall ratio permitted if new daylighting provisions are satisfied
- ▶ 2015 IECC clarifies that all replacement fenestration must meet the same efficiency requirements as fenestration in new construction
- ▶ Minimum requirements for skylights in certain buildings

2012 IECC - Commercial Fenestration: Modified Approach to SHGC

- ▶ Table with SHGC adjustment multipliers for projection factor (C402.3.3.1)
- ▶ Simple, single set of maximum SHGC values by product type:

	Zone 1	Zone 2	Zone 3	Zone 4 Except Marine	Zone 5 & Marine 4	Zone 6	Zone 7	Zone 8
Vertical Fenestration SHGC	0.25	0.25	0.25	0.40	0.40	0.40	0.45	0.45
Skylights SHGC	0.35	0.35	0.35	0.40	0.40	0.40	NR	NR

2015 IECC -- Commercial Fenestration SHGC by Projection Factor and Orientation

- ▶ 2015 IECC added substantial complexity. Required prescriptive maximum SHGC values vary by Projection Factor and Orientation for each climate
- ▶ Each climate zone now has 6 different SHGC requirements (example below):

	ZONE 4 EXCEPT MARINE	
Orientation	SEW	N
PF < 0.2	0.25	0.33
$0.2 \leq \text{PF} < 0.5$	0.30	0.37
PF ≥ 0.5	0.40	0.64

2015 IECC -- Commercial Fenestration SHGC by Projection Factor and Orientation

- ▶ Base maximum SHGC values (PF<0.20; SEW orientation) remain the same as 2012
- ▶ To simplify, 0.25 SHGC will continue to comply everywhere for all orientations; 0.40 will continue to comply in climate zone 4 and higher; and 0.45 will continue to comply in climate zones 7-8
- ▶ As an alternative, SHGCs that vary by orientation and PF for each fenestration can be specified

2012/2015 IECC -- Commercial: Lower U-Factors for Most Zones Along With Changes to Classification

	Zone 1	Zone 2	Zone 3	Zone 4 Except Marine	Zone 5 & Marine 4	Zone 6	Zone 7	Zone 8
Fixed Fenestration U-Factor	0.50	0.50	0.46	0.38	0.38	0.36	0.29	0.29
Operable Fenestration U-Factor	0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37
Entrance Door U-Factor	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77
Skylights U-Factor	0.75	0.65	0.55	0.50	0.50	0.50	0.50	0.50

ASHRAE 90.1 Update

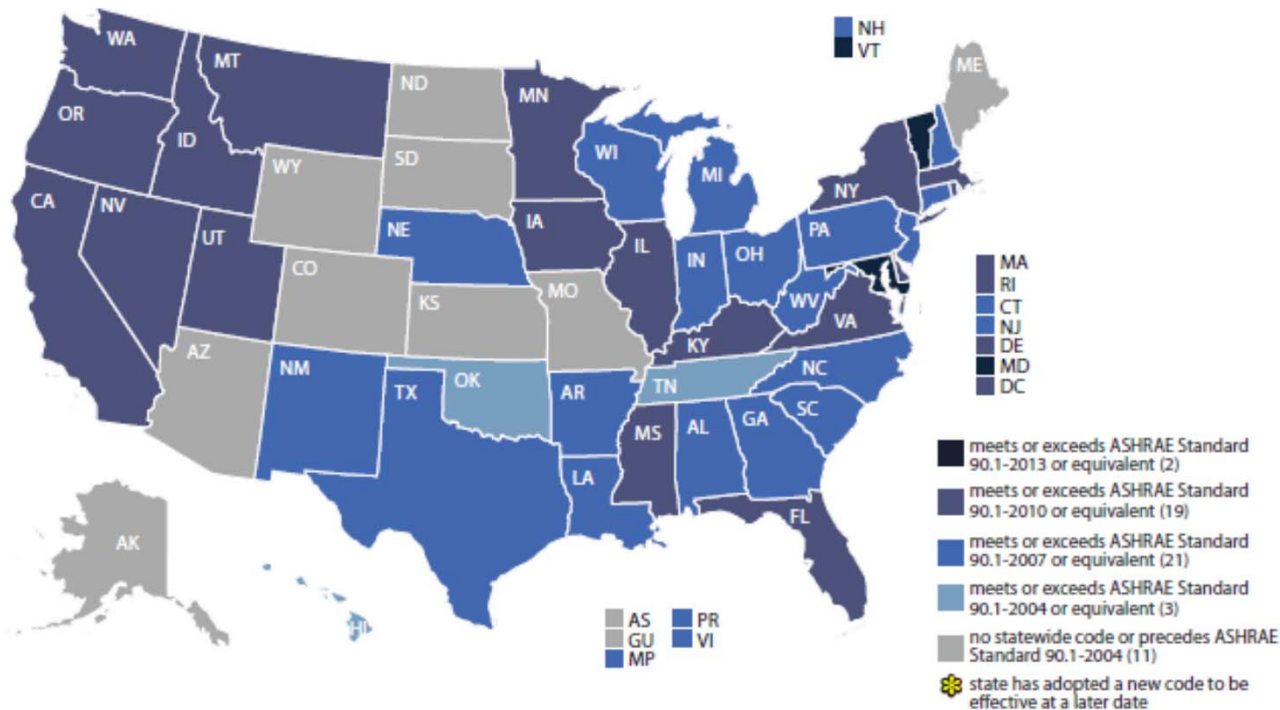
- ▶ US DOE issued a positive determination on ASHRAE 90.1- 2013 in September 2014 (an improvement over the 2010 version)
- ▶ States must certify that commercial energy codes meet or exceed ASHRAE 90.1-2013 within two years
- ▶ Although federal law specifies ASHRAE 90.1 as the benchmark, states commonly adopt the IECC for both residential and commercial construction (since ASHRAE 90.1 is an option under the IECC, this is generally considered sufficient)
- ▶ Unlike the IECC, ASHRAE has retained material differences (metal vs. non-metal frames) in fenestration requirements

2013 ASHRAE 90.1 - Nonresidential Vertical Fenestration: Higher U-Factors for Most Zones for Metal Than 2012/2015 IECC

	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
Metal Framing -- Fixed	0.57	0.57	0.50	0.42	0.42	0.42	0.38	0.38
Metal Framing -- Operable	0.65	0.65	0.60	0.50	0.50	0.50	0.40	0.40
Non-metal Framing	0.50	0.40	0.35	0.35	0.32	0.32	0.32	0.32
Metal Framing -- Entrance Door	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77

Status of State Code Adoptions for Commercial Construction

Commercial State Energy Code Status AS OF JULY 1, 2015



Unprecedented Adoption of Most Recent Model Energy Codes

- ▶ Most of states have already adopted the 2009 IECC and/or ASHRAE 90.1-2007
- ▶ More than one quarter of the states have now upgraded to the 2012 IECC or 2015 IECC
- ▶ DOE and the states are working towards improved compliance rates

2013 California Building Energy Efficiency Standards Rulemaking

- ▶ Improved Residential Performance Standards
- ▶ Improved NonResidential Performance Standards
- ▶ Both effective NOW
- ▶ Substantial improvements and increased stringency in fenestration requirements for both residential and nonresidential buildings

2013 California Building Energy Efficiency Standards Rulemaking Improved Residential Performance Standards:

- ▶ More stringent prescriptive criteria
 - ▶ Maximum 0.32 U-factor for all of California
 - ▶ Maximum 0.25 SHGC for almost all of California
 - ▶ The prescriptive path is also the baseline for the performance method

2013 California Building Energy Efficiency Standards Rulemaking Improved Nonresidential Performance Standards:

- ▶ Improved fenestration prescriptive criteria
 - ▶ **New** -- Minimum VT requirement
 - ▶ More stringent U-factor and SHGC values
 - ▶ **New** - Same values across entire state
 - ▶ Material-neutral vertical fenestration requirements
- ▶ The prescriptive path is also the baseline for the nonresidential performance method

2013 California Building Energy Efficiency Standards Rulemaking Improved Nonresidential Performance Standards:

		Fixed Window	Operable Window	Curtainwall / Storefront	Glazed Doors
Vertical Fenestration (Max 40% WWR)	Max U-Factor	0.36	0.46	0.41	0.45
	Max RSHGC	0.25	0.22	0.26	0.23
	Min VT	0.42	0.32	0.46	0.17

		Glass, Curb Mounted	Glass, Deck Mounted	Plastic, Curb Mounted
Skylights (Max 5% SRR)	Max U-Factor	0.58	0.46	0.88
	Max RSHGC	0.25	0.25	NR
	Min VT	0.49	0.49	0.64

2013 California Building Energy Efficiency Standards Rulemaking Improved Nonresidential Performance Standards:

- ▶ **New** -- Reduced site-built NFRC exception:
 - ▶ Under the old standards, 10,000 square feet of site-built fenestration was exempt from NFRC certification and labeling
 - ▶ The exemption has been reduced to 1,000 square feet of site-built fenestration in the new standards
 - ▶ This change should result in considerably more NFRC certification

2016 California Building Energy Efficiency Standards Rulemaking

- ▶ Adopted: August 12, 2015
Effective Date: January 1, 2017
- ▶ No changes to window performance requirements for residential or nonresidential
- ▶ However, substantial increased stringency in other parts of the residential code means that better performing windows provide builders the opportunity to trade-off some of the increased stringency

What Will the Next 5 Years Bring?

- ▶ NFRC ratings and efficient fenestration have generally been successfully adopted in residential construction - both new homes and with replacement windows - primary drivers have been the codes, Energy Star and tax credits
- ▶ With commercial buildings, however, the picture is not quite so rosy:
 - ▶ National model codes require reasonably efficient fenestration (although improvements can be made)
 - ▶ But in many locales, there is insufficient compliance and/or enforcement (at least for fenestration)

Regulatory Challenge Facing NFRC, Government, Stakeholders and Industry -- Topic for Consideration

In the non-residential context, can we - and will we - duplicate the success achieved with residential rating and labeling through a similar partnership between NFRC, energy codes and voluntary programs?

Disclaimer

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