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GLAZING REQUIRMENTS UNDER THE 5TH EDITION FLORIDA ENERGY CODE, RESIDENTIAL

One of the most significant changes to the residential provisions of the 5th Edition *Florida Building Code, Energy Conservation* Volume, are the requirements for glazing U-Factors and Solar Heat Gain Coefficients (SHGC). Most of the values have been lowered. While this is not a major issue when demonstrating energy code compliance under the performance path as specified under Section 405, *Simulated Performance Alternative*, the problem arises when fenestration products in an existing building are replaced as energy code compliance is generally demonstrated per the prescriptive path method.

It is important to understand that *Thermal Efficiency Standards* for renovated buildings are mandated by *Florida State Statute* 553, as follows:

> ***553.903 Applicability.*** *This part applies to all new and renovated buildings in the state, except exempted buildings, for which building permits are obtained after March 15, 1979, and to the installation or replacement of building systems and components with new products for which thermal efficiency standards are set by the Florida Building Code-Energy Conservation. The provisions of this part shall constitute a statewide uniform code.* (Emphasis added.)

Note that the above section specifically includes the wording "… or replacement of building systems and components…"

> ***553.906 Thermal efficiency standards for renovated buildings.—****Thermal designs and operations for renovated buildings for which building permits are obtained after March 15, 1979, must take into account insulation; windows; infiltration; and HVAC, service water heating, energy distribution, lighting, energy managing, and auxiliary systems design and equipment selection and performance. Such buildings are not required to meet standards more stringent than the provisions of the Florida Building Code-Energy Conservation. These standards apply only to those portions of the structure which are actually renovated.*

Note that the above section specifically includes "windows". (Emphasis added.)

Therefore, it is clear that glazed units are components and as such, the minimum energy efficiency requirements are applicable to replacement glazed units including windows, sliding glass doors, glazed French doors, and skylights.

It is appropriate to review the glazed product requirements under the current (2010) edition of the code, as follows:

101.4.7 Building systems. Thermal efficiency standards are set for the following building systems where new products are installed or replaced in existing buildings and for which a permit must be obtained. New products shall meet the minimum efficiencies allowed by this code for the following systems:

Heating, ventilating or air conditioning systems;

Service water or pool heating systems;

Electrical systems and motors;

Lighting systems.

303.1.3 Fenestration product rating. *U*-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table 303.1.3(1) or 303.1.3(2). The solar heat gain coefficient (SHGC) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled SHGC shall be assigned a default SHGC from Table 303.1.3(3).

TABLE 303.1.3(1)
DEFAULT GLAZED FENESTRATION *U*-FACTOR

FRAME TYPE	SINGLE PANE	DOUBLE PANE	SKYLIGHT	
			Single	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			

TABLE 303.1.3(2)
DEFAULT DOOR *U*-FACTORS

DOOR TYPE	*U*-FACTOR
Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

TABLE 303.1.3(3)
DEFAULT GLAZED FENESTRATION SHGC

SINGLE GLAZED		DOUBLE GLAZED		
Clear	Tinted	Clear	Tinted	GLAZED BLOCK
0.8	0.7	0.7	0.6	0.6

402.3.6 Replacement fenestration. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC in Table 402.1.1.

FENESTRATION *U*-FACTOR[b]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b]
0.65[j]	0.75	0.30

Only the relevant portions of Table 402.1.1 are shown for brevity.

Notice the Fenestration U-Factor value of .65 and Glazed Fenestration SHGC of .30. Footnote j permits a maximum U-Factor of .75 for impact rated glazing.

Footnote b states that the Fenestration U-Factor column excludes skylights and that the SHGC column applies to all glazed fenestrations.

Next, we compare the requirements under the 5th Edition (2014) of the code, as follows:

R101.4.7 Building systems and components.
Thermal efficiency standards are set for the following building systems and components where new products are installed or replaced in existing buildings, and for which a permit must be obtained. New products shall meet the minimum efficiencies allowed by this code for the following systems and components:

Heating, ventilating or air conditioning systems.
Service water or pool heating systems.
Lighting systems.
Replacement fenestration.

Notice that the section now includes **components** with **replacement fenestrations** added to the list.

R303.1.3 Fenestration product rating.
U-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table R303.1.3(1) or R303.1.3(2). The solar heat gain coefficient (SHGC) and *visible transmittance* (VT) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled SHGC or VT shall be assigned a default SHGC or VT from Table R303.1.3(3).

TABLE R303.1.3(1) DEFAULT GLAZED FENESTRATION *U*-FACTOR

FRAME TYPE	SINGLE PANE	DOUBLE PANE	SKYLIGHT	
			Single	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			

TABLE R303.1.3(2) DEFAULT DOOR *U*-FACTORS

DOOR TYPE	*U*-FACTOR
Uninsulated Metal	1.20
Insulated Metal	0.60
Wood	0.50
Insulated, nonmetal edge, max 45% glazing, any glazing double pane	0.35

TABLE R303.1.3(3) DEFAULT GLAZED FENESTRATION SHGC AND VT

	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

Notice that there were no revisions to Section R303.1.3 and that the values in the default tables have not changed.

R402.3.6 Replacement fenestration.
Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC in Table R402.1.1.

CLIMATE ZONE	FENESTRATION *U*-FACTOR[b, j]	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]
1	.65	0.75	0.25
2	0.40	0.65	0.25

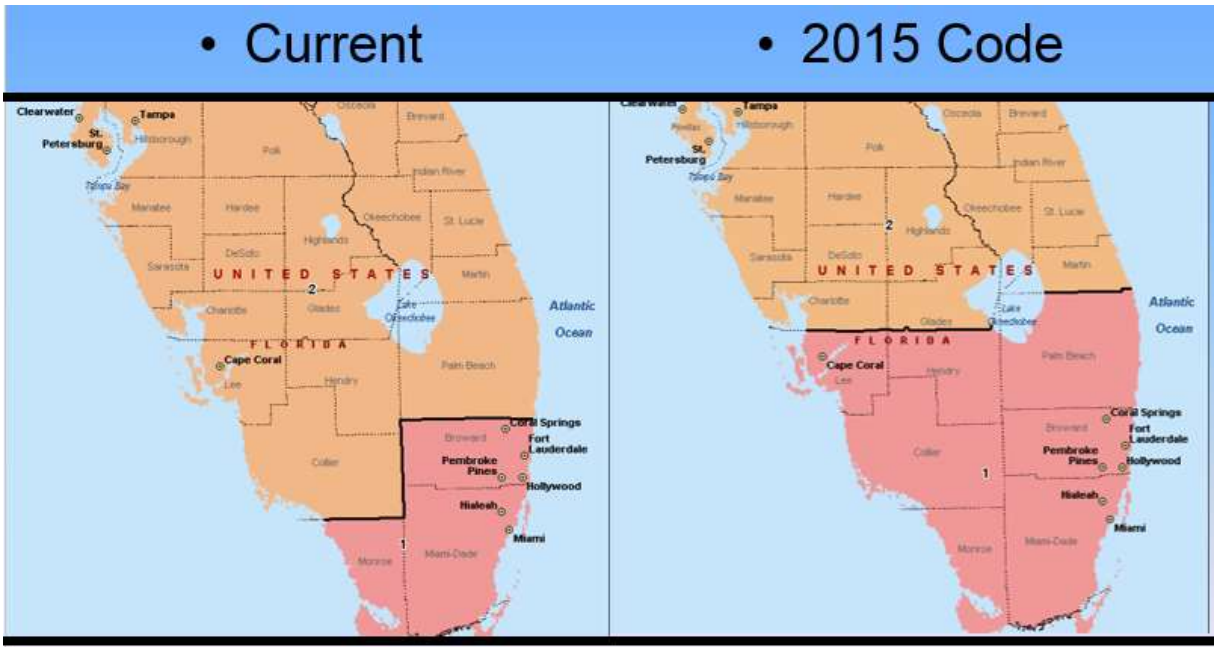
Only the relevant portions of Table 402.1.1 are shown for brevity.

The applicable table footnotes, which have been revised, are as follows:

b. The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration. Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.

j. For impact rated fenestration complying with Section R301.2.1.2 of the *Florida Building Code, Residential* or Section 1609.1.2 of the *Florida Building Code, Building* the maximum *U*-factor shall be 0.75 in Climate Zone 1 and 0.65 in Climate Zone 2.

Note that Climate Zones have been added to the table and that some of the values have decreased. Regarding climate zones, Zone 1, as identified by the pink shading, has been expanded under the 5th Edition of the code, as follows:



Note the changes to the U-Factor and SHGC values, as follows:

Current (2010)	5th Edition
Zone 2	Zone 2
• U = 0.65	• **U = 0.40**
– 0.75 for impact	– **0.65** for impact
• SHGC = 0.30	• **SHGC = 0.25**
Zone 1	Zone 1
• U= 0.65	• U= 0.65
– 0.75 for impact	– 0.75 for impact
• SHGC = 0.30	• **SHGC = 0.25**

So, what's the problem? The issue is that under the current (2010) code, components ARE NOT included in Section 101.4.7, *Building Systems*. Further, Table 101.4.1, *Non-Exempt Existing Buildings*, included a footnote regarding renovated buildings as follows:

Note that although the envelope is included, footnote d exempted buildings that did not meet the definition of a "Renovation".

TABLE 101.4.1
NONEXEMPT EXISTING BUILDINGS[a]

Date-Related		
	Permitted before March 1979	**Permitted after March 1979**
Not previously conditioned	Minimum efficiency levels shall be met for components being changed: Envelope: Section 402 or 502 Equipment: Section 403 or 503, 504 Lighting: Section 404 or 505	Considered an addition, meet current code
Occupancy type change	Minimum efficiency levels shall be met for components being changed: Envelope: Section 402 or 502 Equipment: Section 403 or 503, 504 Lighting: Section 404 or 505	Meet current code[c]
Not Date-Related		
Addition	Meet code for addition[b,c]	
Renovation[d]	Minimum code envelope, equipment and lighting efficiency levels shall be met for components being changed. Envelope: Section 402 or 502 Equipment: Section 403 or 503, 504 Lighting: Section 404 or 505	
New building systems (HVAC, service hot water or pool heating, lighting, motors)	New products installed or replaced in existing buildings shall meet the minimum efficiency allowed for that system. Equipment: Section 403 or 503, 504 Lighting: Section 404 or 505 HVAC indoor and outdoor units ≤ 65,000 Btu/h that are not designed to operate together shall be matched. HVAC equipment sizing is required per Section 403 or 503.	

Table 101.4.1m Footnote d:

[d] Buildings undergoing alteration that vary or change insulation, HVAC systems, water heating systems, or exterior envelope provided that the estimated cost exceeds 30 percent of the assessed value of the structure (see Ch. 2, Definitions).

As Defined:

RENOVATION. Any structural repair, reconstruction or restoration to a structure, the costs of which equals or exceeds, over a 1-year period, a cumulative total of 30 percent of the assessed value of the structure when that value is assessed, either:

1. Before the improvement or repair is started; or
2. Before the damage occurred, if the structure has been damaged.

For the purposes of this Code, renovation occurs when the first alteration of any wall, ceiling, floor, or other structural part or mechanical system of the building commences, whether or not that alteration affects the external dimensions of the structure.

As previously discussed, Section R101.4.7, *Building Systems*, was revised in the 5th Edition code to INCLUDE components and further, Table 101.4.1, WAS NOT carried forward into the 5th Edition of the code. Therefore, under the residential provisions of the 5th Edition (2014) *Florida Building Code, Energy Conservation* Volume, replacement glazed products will have to meet the U-Factor and SHGC coefficients specified in Table R402.1.1 when demonstrating compliance under the prescriptive path method.

Now, here's the major portion of the problem. Glass manufacturers CANNOT meet the reduced values with single pane glass. Double pane glass will be necessary and that includes impact rated units. When demonstrating compliance under Section 405, *Simulated Performance Alternative*, single pane glass MAY be sufficient based upon certain design factors and increased efficiency in other areas. However, if demonstrating compliance under the prescriptive path method, the U-Factor and SHGC values specified will have to be met, which are more stringent under the 5th Edition code than the values in the current 2010 Edition of the code.

It is reasonable to state that the majority of new residential construction demonstrates energy code compliance by use of the performance path method and that depending on the scope of the work, small additions, minor alterations, building system and component replacement generally demonstrate compliance by the prescriptive method. However, there is nothing in the code that would prevent the use of the performance path method when constructing an addition, performing an alteration or replacing portions of the building systems or components.

It is therefore recommended that builders consult with an energy code consultant, energy rater and/or their design professional prior to performing a renovation or alteration. You may find that demonstrating energy code compliance by the performance path method to be of assistance.

Respectfully Submitted,

John Farinelli

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