

EC34-09/10 Part II

EECC Requested Final Action: Approved as Submitted

EECC Public Comment:

EC34 should be approved as submitted.

It has already been approved by the IECC committee and should be approved as submitted and incorporated into the IRC as well for code consistency and improvement in energy efficiency. The proposal substantially increases energy efficiency in climate zones 1-3 by requiring lower, more realistic fenestration U-factors and is designed to match windows which are cost-effective and available in all markets. A lower glazing U-factor is a proven energy saver for both heating and cooling energy, thereby providing savings on natural gas, heating oil and electric bills.

As recognized by the IECC Committee in its reason statement, “this proposal represents an increase in stringency and therefore energy savings that is reasonably easy and cost effective to achieve.” While the IRC committee complained of the lack of supporting cost data, a review of the proposal itself shows that it directly addresses the cost issue. Low-e windows are already required in these climate zones due to the SHGC requirements and there is no market upgrade cost to move from aluminum to vinyl frames – as a result, the substantial energy cost savings from the windows required by this proposal comes at virtually no increased window cost. Windows that meet the U-factors proposed in EC34-09/10 are widely available. In fact, according to a review of the NFRC Certified Products Directory database, over 93% of all products certified have a U-factor of 0.50 or less; 79% have a U-factor of 0.40 or less, and 67% have a U-factor of 0.35 or less. By using cost-effective technology already widely available in the market, this proposal achieves substantial energy savings over the U-factors currently in the IECC and those contained in other code proposals.

Proposal History:

Committee Recommended Action on Original Proposal at Public Hearing:

Part I IECC – Approved as Submitted

Part II IRC – Disapproved

Committee Reason(s) for Recommended Action:

Part I IECC – This proposal represents an increase in stringency and therefore energy savings that is reasonably easy and cost effective to achieve.

Part II IRC – This proposal is not supported by cost data to demonstrate reasonable return on investment for such an aggressive change in stringency.

Initial Recommendation of EECC: Approve

Initial Proposal for Reference:

EC34-09/10

Table 402.1.1, Table 402.1.3; IRC Table N1102.1, Table N1102.1.2

Proponent: Bill Prindle, ICF International, representing the Energy Efficient Codes Coalition; Jeff Harris, Alliance to Save Energy; Harry Misuriello, American Council for an Energy-Efficient Economy (ACEEE); Garrett Stone, Brickfield, Burchette, Ritts & Stone; Steve Rosenstock, Edison Electric Institute; Brian Dean, ICF International

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IECC COMMITTEE. PART II WILL BE HEARD BY THE IRC BUILDING/ENERGY COMMITTEE. SEE THE TENTATIVE HEARING ORDERS FOR THESE COMMITTEES.

PART I – IECC

Revise tables as follows:

**TABLE 402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR ^b	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC ^{b, e}	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁱ	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE & DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	4-2 NR	0.75	0.30	30	13	3/4	13	0	0	0
2	0.65 <u>0.40</u>	0.75	0.30	30	13	4/6	13	0	0	0
3	0.50 <u>0.35</u>	0.65	0.30	30	13	5/8	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 ^h	13/17	30 ^g	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 ^h	15/19	30 ^g	15/19	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	38 ^g	15/19	10, 4 ft	10/13

(Footnotes remain unchanged)

**TABLE 402.1.3
EQUIVALENT U-FACTORS^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR ^d	CRAWL SPACE WALL U-FACTOR ^c
1	4-20 <u>0.50</u>	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.65 <u>0.40</u>	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.50 <u>0.35</u>	0.65	0.035	0.082	0.141	0.047	0.091c	0.136
4 except Marine	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.057	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.057	0.060	0.033	0.050	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.028	0.050	0.065

(Footnotes remain unchanged)

PART II – IRC BUILDING/ENERGY

Revise tables as follows:

**TABLE N1102.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT ^b U-FACTOR	GLAZED FENESTRATION SHGC	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ^k	FLOOR R-VALUE	BASEMENT ^c WALL R-VALUE	SLAB ^d R-VALUE AND DEPTH	CRAWL SPACE ^c WALL R-VALUE
1	1.2 <u>NR</u>	0.75	0.35 ^j	30	13	3/4	13	0	0	0
2	0.65 <u>0.40</u>	0.75	0.35 ^j	30	13	4/6	13	0	0	0
3	0.50 <u>0.35</u>	0.65	0.35 ^{e, j}	30	13	5/8	19	5/13 ^f	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13 + 5 ^h	13/17	30 ^f	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	20 or 13 + 5 ^h	15/19	30 ^g	10/13	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	30 ^g	10/13	10, 4 ft	10/13

(Footnotes remain unchanged)

**TABLE N1102.1.2
EQUIVALENT U-FACTORS^a**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT U-FACTOR	CEILING U-FACTOR	FRAME WALL U-FACTOR	MASS WALL U-FACTOR ^b	FLOOR U-FACTOR	BASEMENT WALL U-FACTOR	CRAWL SPACE WALL U-FACTOR
1	1.20 <u>0.50</u>	0.75	0.035	0.082	0.197	0.064	0.360	0.477
2	0.65 <u>0.40</u>	0.75	0.035	0.082	0.165	0.064	0.360	0.477
3	0.50 <u>0.35</u>	0.65	0.035	0.082	0.141	0.047	0.091 ^c	0.136
4 except Marine	0.35	0.60	0.030	0.082	0.141	0.047	0.059	0.065
5 and Marine 4	0.35	0.60	0.030	0.060	0.082	0.033	0.059	0.065
6	0.35	0.60	0.026	0.060	0.060	0.033	0.059	0.065
7 and 8	0.35	0.60	0.026	0.057	0.057	0.033	0.059	0.065

(Footnotes remain unchanged)

Reason: This proposal substantially increases energy efficiency in climate zones 1-3 by specifying lower, more realistic fenestration U-factors that more closely resemble actual windows used to meet current requirements in these zones and, as a result, will close a significant gap in trade-off compliance paths and performance path calculations as well as make the code more efficient.

The current window U-factor requirements in the three southernmost climate zones are unreasonably high, given the current *IECC* SHGC requirement of 0.30 and *IRC* SHGC requirement of 0.35. To meet the SHGC requirement in these three zones, builders typically use low solar gain, low-e glass. As a result, the only issue is a reasonable choice of frame to meet increasing energy efficiency demands. With such a frame, the resulting product has a much lower U-factor than the current requirements for these climate zones. The practical effect of this lower U-factor for actual windows is that users who follow the Total UA alternative or the Simulated Performance Alternative automatically receive unnecessary free trade-off credit (the difference between the artificially high U-factor requirement and the window's actual U-factor), which is then used to reduce efficiency elsewhere in the home.

The proposed change sets U-factors at reasonable levels designed to match reasonably efficient windows available in all markets. According to the *2005 ASHRAE Handbook of Fundamentals* (page 31.8, Table 4), a low solar gain, low-e window (0.05 emissivity) with a ½ inch air space typically achieves the following U-factors:

	Operable w/o Argon	Fixed w/o Argon	Operable w/Argon	Fixed w/Argon
Aluminum Thermal Break	0.47	0.41	0.44	0.37
Wood/Vinyl	0.39	0.35	0.36	0.31

This proposal would continue to allow, under the prescriptive compliance path, any frame in climate zone 1, but would require a builder to use a more reasonable 0.50 U-factor (reflecting the range of U-factors portrayed above) where they elect to use a UA trade-off or the performance path. In climate zone 2, this proposal would use a vinyl framed window without argon as the baseline prescriptive path window (wood and clad-wood framed windows would also meet this requirement as well as some aluminum thermal break framed windows). In zone 3, to achieve a 0.35 U-factor, this proposal would typically require the addition of argon (beyond the level for climate zone 2) for the prescriptive path window. While this proposal may require some to switch from aluminum to vinyl windows if they choose to use the prescriptive path, there does not appear to be an additional cost to achieve the 0.40 or better U-factor, given that the cost of vinyl and aluminum window frames are reportedly very competitive. While there is a slight additional cost to add argon, such cost is relatively minimal and more than offset by the benefits of a better U-factor in climate zone 3. There is

also precedent for much lower U-factors in these climate zones. For example, under the 2009 American Recovery and Reinvestment Act (Stimulus Bill), the federal tax credit for replacement windows specifies a 0.30 U-factor nationwide.

This proposal substantially increases energy efficiency in climate zones 1-3. The table below illustrates the estimated energy cost savings from the prescriptive changes in climate zones 2 and 3 over the current 2009 *IECC* and *IRC* values. . These savings are significant and when coupled with other proposed code modifications can lead to significant overall energy savings for homes.

	Climate Zone 1	Climate Zone 2	Climate Zone 3
Heating, Cooling, Hot Water Purchased Energy Cost Percent Savings	-	7.5%	6.2%
Total Purchased Energy Cost Percent Savings (also including major appliances and lighting)	-	5.3%	4.5%

The proposed change is designed to match windows available in all markets. While most wood or vinyl-framed double-pane windows already meet the 0.35 U-factor requirement, any frame type could also be used under either the Total UA alternative or the Simulated Performance Alternative. In our experience, these values are already achieved by many, if not most, of the windows sold in these climate zones.

This proposal represents a reasonable and cost effective improvement that will provide states and local jurisdictions with an option to easily increase the efficiency of their code.

Cost Impact: The code change proposal will increase the cost of construction.

PART I – IECC

Public Hearing: Committee: AS AM D
 Assembly: ASF AMF DF

PART II – IRC BUILDING/ENERGY

Public Hearing: Committee: AS AM D
 Assembly: ASF AMF DF

ICCFILENAME: PRINDLE-EC-14-T. 402.1.1-T. N1102.1