

## **EC41-09/10 Part I & Part II**

### **EECC Requested Final Action: Approved as Modified by the Public Comment**

#### **EECC Reason Statement:**

*EC41 should be approved as modified by this public comment or as submitted.*

By establishing a lower fenestration SHGC, EC41 represents a significant opportunity for increased energy efficiency by saving energy (kWh), particularly high-priced on-peak energy, reducing electric utility system peak demand and sizing of cooling systems, as well as improving the overall occupant comfort levels in climate zones 1-3. This proposal would reduce fenestration solar gain in warmer climates (zones 1-3) in the IECC by almost 17%. Even without factoring in the increased cost of high-priced on-peak energy that this proposal would avoid, this change would provide an average of approximately 1% in additional purchased energy savings (for heating and cooling), in addition to reduced peak electrical demand, over the values set in the 2009 IECC.

Existing SHGC requirements in the 2006 and 2009 IECC for commercial buildings (as well as ASHRAE 90.1) have already established a precedent for 0.25 SHGC – the IECC currently requires commercial windows to meet a 0.25 SHGC in zones 1-3. Furthermore, the current residential SHGC requirement – 0.30 SHGC – already effectively dictates a low solar gain low-e window and the proposed change simply requires a somewhat lower SHGC consistent with today’s technology. Even NAHB included a 0.25 SHGC in its EC16 proposal for climate zones 1-2 (see EC16, proposed Table 403.1.3).

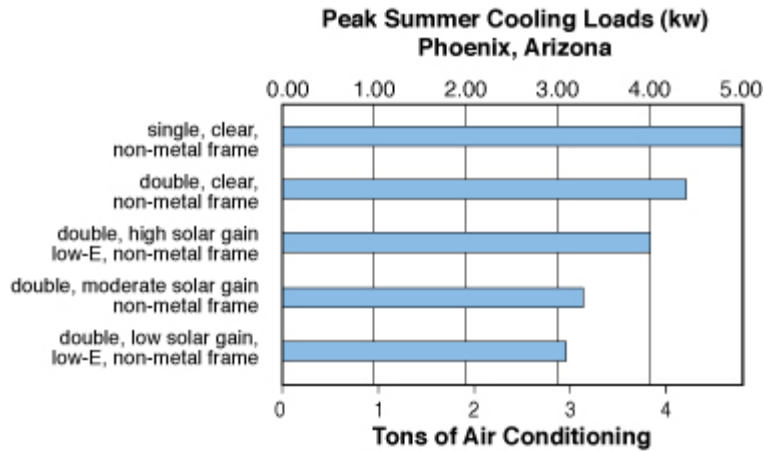
The IECC Development Committee narrowly voted to disapprove this proposal during the hearing by only 1 vote and a public assembly action to overturn the committee was unsuccessful by a very small margin; approximately 62% of the vote was favorable and wanted to overturn the Committee. This proposal offers a reasonable and cost effective improvement that will provide states and local jurisdictions that have substantial cooling requirements with an option to easily increase the efficiency of their code and should be approved.

The proposed modification is intended to address the IECC and IRC Committee’s reasons for disapproval, which stated, “The proposal would cause an undesirable decrease in visual transmittance for skylights, thus would in all probability cause an increase in use of lighting.” This modification would allow an exception for skylights that meet the current, 2009 IECC SHGC requirement of 0.30 SHGC, thereby resolving this single concern. While we do not agree with the Committee that possible small decreases in visual transmittance of light through skylights in homes offset the benefits of the lower SHGC, this exception would entirely remove this concern. As a result, we support the original proposal as submitted or as modified by this public comment.

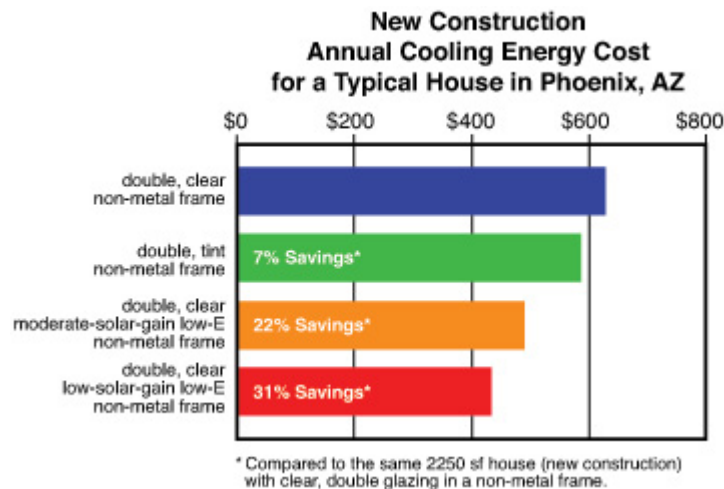
Product availability and technology to meet the proposed 0.25 SHGC is not an issue. According to the NFRC Certified Products Directory database, roughly half of the over 5 million window product types listed have an SHGC that will meet the 0.25 SHGC proposed in this code change. Given the number of window manufacturers who offer this product, it is not surprising that all but one of the major glass manufacturers for residential windows offer glass that would permit fenestration to meet the proposed requirement. Moreover, any additional cost for these products is minimal, since the current 0.30 SHGC requirement in the IECC often requires the same glass, and when it does not, the new glass package differs only in that it calls for a different low-e coating.

The graphs below from the website of the Efficient Windows Collaborative (See [www.efficientwindows.org/hvac.cfm](http://www.efficientwindows.org/hvac.cfm); [www.efficientwindows.org/energycosts.cfm](http://www.efficientwindows.org/energycosts.cfm); and [www.efficientwindows.org/lightview.cfm](http://www.efficientwindows.org/lightview.cfm)) illustrate the peak demand, HVAC sizing and energy savings

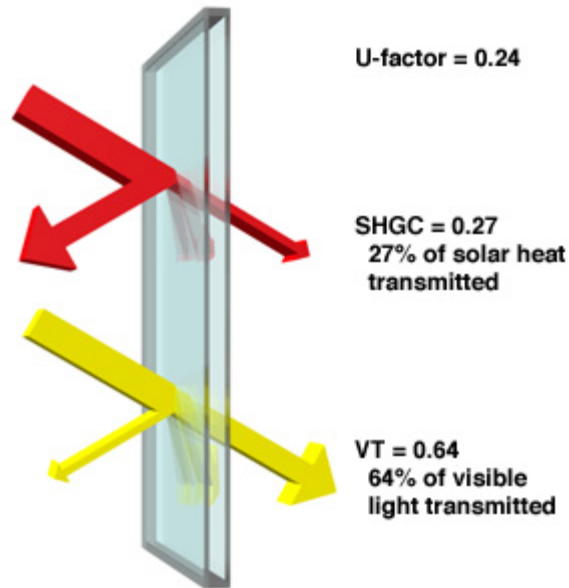
benefits of low solar gain glass, as well as showing how such glass can provide substantial benefits in solar heat reduction while retaining substantial visible light, if so desired (the solar heat gain is blocked primarily in the non-visible part of the spectrum). The first graph displays the benefits of low solar gain low-e (SHGC equal to or below 0.25), compared with some other SHGC options from a peak demand/HVAC sizing point of view:



The second graph displays potential cooling cost savings for moving from a moderate solar gain low-e product to a low solar gain low-e product – 22% savings to 31% savings:

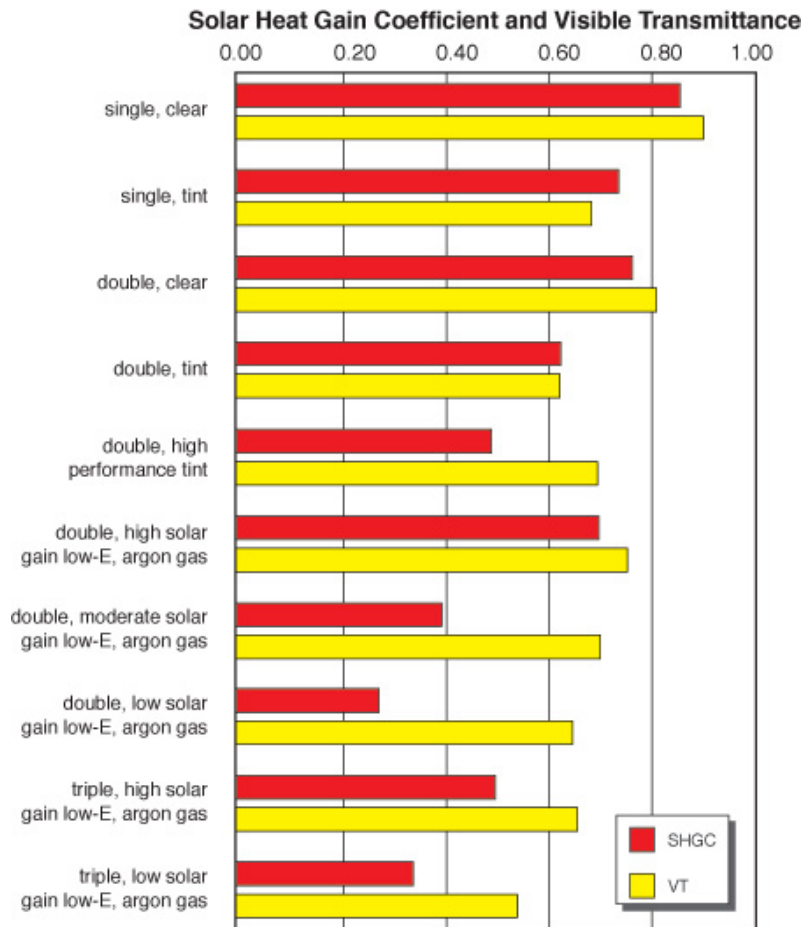


The third graph shows the effects of low solar gain glass (windows with an SHGC at or below 0.25) exclusive of frame (since windows are rated by NFRC with the frame, a 0.27 SHGC glass translates to a whole product SHGC below 0.25). Note that while glass can provide high visible light with low SHGCs, there are also alternatives that provide considerably lower visible light to reduce glare, along with a low SHGC, depending on the occupant’s priorities.



### Performance of Double-Glazed Low-Solar-Gain Low-E Glass (Spectrally Selective) and Argon Gas Fill

The fourth graph (again, just the glass and not the frame) shows how most of the visible light can be retained while reducing SHGC, if retaining visible light is a desired objective. A comparison of the third product in the graph with clear double pane glass against the three double pane products with low-e – the sixth (high solar low-e), seventh (moderate solar low-e) and eighth (low solar low-e) – shows that while visible light is reduced by a relatively small amount, SHGC is reduced drastically.



Note: All values are for glass only without frame. Source: Residential Windows by Carmody, Selkowitz, Arasteh and Hescong

In sum, this proposal is eminently reasonable and should be approved as submitted or as modified.

**EECC Proposed Modification to Original Proposal:**

**Part I - IECC**

**TABLE 402.1.1  
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT <sup>a</sup>**

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>b</sup>	SKY-LIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION SHGC <sup>b</sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>i</sup>	FLOOR R-VALUE	BASEMENT <sup>c</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>c</sup> WALL R-VALUE
1	1.2	0.75	0.25	30	13	3/4	13	0	0	0
2	0.65 <sup>j</sup>	0.75	0.25	30	13	4/6	13	0	0	0
3	0.50 <sup>j</sup>	0.65	0.25 <sup>e</sup>	30	13	5/8	19	5/13 <sup>f</sup>	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10/13	10, 2ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 <sup>h</sup>	13/17	30 <sup>g</sup>	10/13	10, 2ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 <sup>h</sup>	15/19	30 <sup>g</sup>	15/19	10, 4ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	38 <sup>g</sup>	15/19	10, 4ft	10/13

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 1-3, where the SHGC for such skylights does not exceed 0.30.

(Other footnotes remain unchanged)

**Part II - IRC**

**TABLE N1102.1  
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT <sup>a</sup>**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKY-LIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION SHGC <sup>b</sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>k</sup>	FLOOR R-VALUE	BASEMENT <sup>c</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>c</sup> WALL R-VALUE
1	1.2	0.75	0.25	30	13	3/4	13	0	0	0
2	0.65 <sup>j</sup>	0.75	0.25	30	13	4/6	13	0	0	0
3	0.50 <sup>j</sup>	0.65	0.25 <sup>e,1</sup>	30	13	5/8	19	5/13 <sup>f</sup>	0	5/13
4 except Marine	0.35	0.60	NR	38	13	5/10	19	10/13	10, 2ft	10/13
5 and Marine 4	0.35	0.60	NR	38	20 or 13+5 <sup>h</sup>	13/17	30 <sup>f</sup>	10/13	10, 2ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 <sup>h</sup>	15/19	30 <sup>g</sup>	10/13	10, 4ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	30 <sup>g</sup>	10/13	10, 4ft	10/13

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 1-3, where the SHGC for such skylights does not exceed 0.30.

(Other footnotes remain unchanged)

**Proposal History:**

**Committee Recommended Action on Original Proposal at Public Hearing:**

**Part I IECC – Disapproved**

**Part II IRC – Disapproved**

**Committee Reason(s) for Recommended Action:**

**Part I IECC** – The proposal would cause an undesirable decrease in visual transmittance for skylights, thus would in all probability cause an increase in use of lighting.

**Part II IRC** – The proposal would cause an undesirable decrease in visual transmittance for skylights, thus would in all probability cause an increase in use of lighting.

**Initial Recommendation of EECC:** Approve

**Initial Proposal for Reference:**

## **EC41–09/10**

### **Table 402.1.1; IRC Table N1102.1**

**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 table as follows:

**TABLE 402.1.1  
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT<sup>a</sup>**

CLIMATE ZONE	FENESTRATION U-FACTOR <sup>b</sup>	SKYLIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION SHGC <sup>b, b<sup>e</sup></sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>i</sup>	FLOOR R-VALUE	BASEMENT <sup>c</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE & DEPTH	CRAWL SPACE <sup>c</sup> WALL R-VALUE
1	1.2	0.75	<del>0.30</del> 0.25	30	13	3/4	13	0	0	0
2	0.65 <sup>j</sup>	0.75	<del>0.30</del> 0.25	30	13	4/6	13	0	0	0
3	0.50 <sup>j</sup>	0.65	<del>0.30</del> 0.25 <sup>e</sup>	30	13	5/8	19	5/13 <sup>f</sup>	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 <sup>h</sup>	13/17	30 <sup>g</sup>	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	20 or 13+5 <sup>h</sup>	15/19	30 <sup>g</sup>	15/19	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	38 <sup>g</sup>	15/19	10, 4 ft	10/13

(Footnotes remain unchanged)

**PART II – IRC BUILDING/ENERGY**

Revise table as follows:

**TABLE N1102.1  
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT<sup>a</sup>**

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT <sup>b</sup> U-FACTOR	GLAZED FENESTRATION SHGC <sup>b</sup>	CEILING R-VALUE	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE <sup>k</sup>	FLOOR R-VALUE	BASEMENT <sup>c</sup> WALL R-VALUE	SLAB <sup>d</sup> R-VALUE AND DEPTH	CRAWL SPACE <sup>c</sup> WALL R-VALUE
1	1.2	0.75	<del>0.35</del> 0.25	30	13	3/4	13	0	0	0
2	0.65 <sup>j</sup>	0.75	<del>0.35</del> 0.25	30	13	4/6	13	0	0	0
3	0.50 <sup>j</sup>	0.65	<del>0.35</del> <sup>e,j</sup> 0.25 <sup>e,j</sup>	30	13	5/8	19	5/13 <sup>f</sup>	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 <sup>h</sup>	13/17	30 <sup>f</sup>	10/13	10, 2 ft	10/13
6	0.35	0.60	NR	49	20 or 13 + 5 <sup>h</sup>	15/19	30 <sup>g</sup>	10/13	10, 4 ft	10/13
7 and 8	0.35	0.60	NR	49	21	19/21	30 <sup>g</sup>	10/13	10, 4 ft	10/13

(Footnotes remain unchanged)

**Reason:** This proposal increases energy efficiency, reduces peak demand and sizing of cooling systems, and improves comfort in climate zones 1-3 by lowering the prescriptive SHGC values to 0.25. The need for and viability of lower SHGCs for these cooling climates is already recognized in the 2006 and 2009 *IECC* for commercial buildings, where the prescriptive value without an overhang is 0.25, establishing a precedent for a 0.25 SHGC. This proposal would establish the same value for residential buildings as well.

This proposal would reduce fenestration solar gain in hot climates (zones 1-3) in the *IECC* by almost 17% and in the *IRC* by almost 29%. Without even factoring in the increased cost of on-peak energy that this proposal would avoid, this proposal would provide an average of approximately 1% in additional heating and cooling purchased energy savings, in addition to reduced peak electrical demand, over the values set in the 2009 *IECC*. There should be no negative construction cost impact from this increase in energy code stringency since the existing SHGC requirements already effectively dictate a low solar gain low-e window and the new requirements will also require low solar gain low-e glass, but only with a lower SHGC. Such lower SHGC glass is readily available in the market. Moreover, the potential for smaller HVAC systems could generate construction cost savings. Finally, by maintaining the same SHGC requirements for all three zones, this proposal will promote lower costs of construction as a result of economies of scale, reduced inventory requirements and increased competition among suppliers of these fenestration products.

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