EC42-09/10 Part I & Part II
EECC Requested Final Action: Approved as Submitted

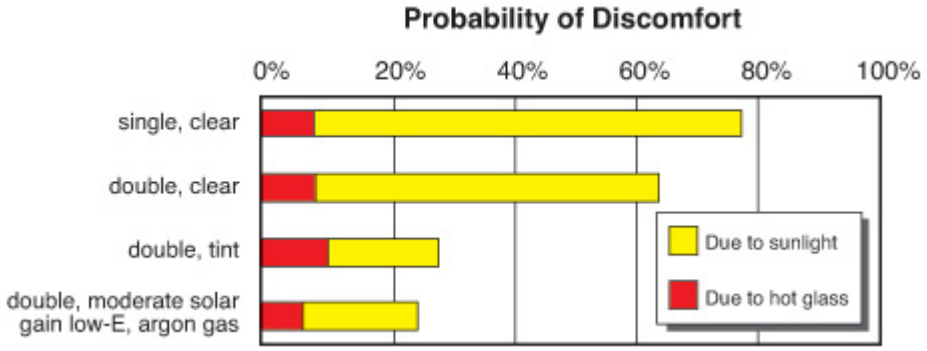
EECC Public Comment:

EC42 should be approved as submitted.

The IECC Development Committee disapproved this proposal by a single vote based upon the reasoning that because heating load could be increased in certain parts of the zone, it was not apparent that this change would result in energy savings. A subsequent floor assembly action failed by a very narrow margin, with over 64% of the voters in favor of the proposal.

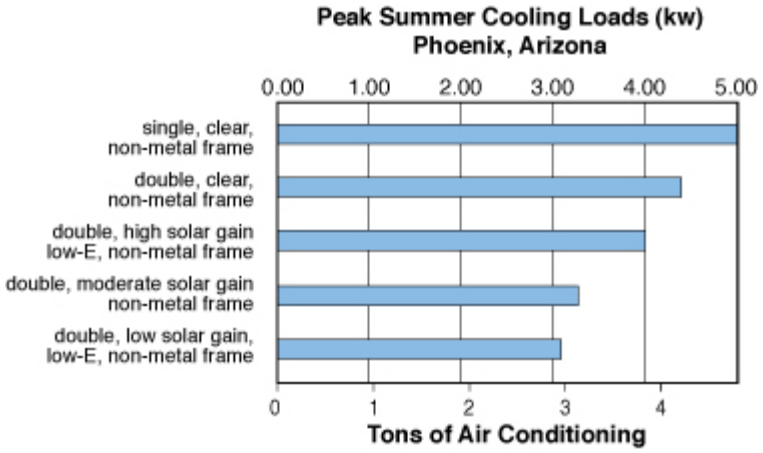
While it is possible that heating load could be increased in some cases, cooling loads will certainly be decreased by this proposal and the benefits of lower cooling load, lower peak demand and greater comfort outweigh this concern. The intent of the IECC, according to Section 101.3, is "the effective use of energy." Included in the effective use of energy is the impact of the energy use on comfort – after all, heating and cooling is primarily aimed at sustaining occupant comfort – as well as the time of use of energy, including the effects on peak demands, HVAC sizing and expensive peak energy costs. The committees failed to recognize the benefits of the proposed lower SHGC in this climate zone in this broader context.

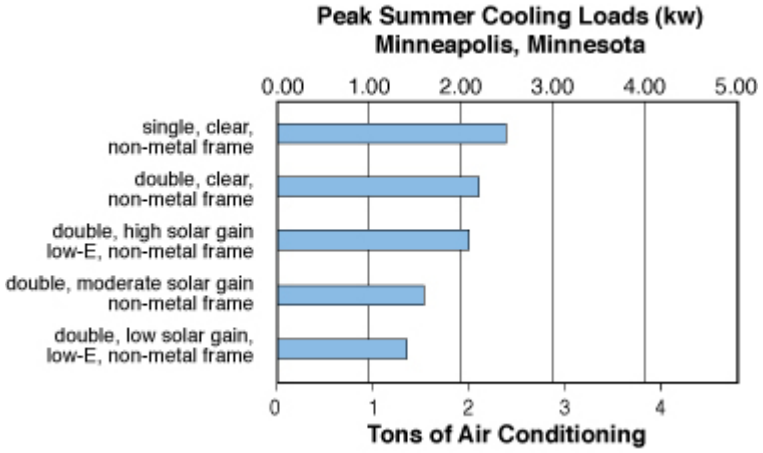
By contrast, the US Department of Energy has included a maximum SHGC requirement for years as part of its Energy Star program (the program's North-Central zone is roughly the same as IECC's zone 4). The current qualification criteria, released in April 2009, require this same maximum 0.40 SHGC. Such a maximum recognizes the reality that low SHGC windows increase comfort and reduce the likelihood of increased energy use from homeowners setting the thermostat lower to offset discomfort. Likewise, some states have already either adopted or are in the final stages of adopting an SHGC of 0.40 or lower in climate zone 4 because of the obvious benefits. The following graph from the Efficient Window Collaborative website (http://www.efficientwindows.org/comfort.cfm) demonstrates the discomfort issue:



This graph shows a reduction in the likelihood of discomfort from over 60% for a clear product down to almost 20% from a moderate solar gain (0.40 SHGC) product. As the EWC states on its website: "In summer, strong direct sunlight strikes people and interior surfaces, creating overheating and discomfort. Windows with low solar heat gain coefficients will reduce the solar radiation coming through the glass and associated discomfort. Low solar heat gain low-e glass (spectrally selective) reduces heat gain while still providing sufficient light and view."

The following graphs, also from the same website (see: http://www.efficientwindows.org/hvac.cfm), show the peak demand and HVAC savings potential from lower SHGCs in all climate zones. While the graphs demonstrate the benefits in Phoenix (climate zone 2) and Minneapolis (climate zone 6) – southern and northern climates – similar benefits would occur for climate zones in between like zone 4:





Most of the window products available would meet this standard. According to the NFRC Certified Products Directory database, 79% of the over 5 million product types listed would meet a 0.40 SHGC or lower.

This proposal should be approved as submitted based on the benefits outlined above.

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 committee was concerned that this limitation is justified for Climate Zone 4 because of the possibility that this could increase the heating load in some parts of the zone. Therefore, it is not apparent whether this would really save energy.

Part II IRC – The committee was concerned that this limitation is justified for Climate Zone 4 because of the possibility that this could increase the heating load in some parts of the zone. Therefore, it is not apparent whether this would really save energy.

Initial Recommendation of EECC: Approve

Initial Proposal for Reference:

EC42–09/10
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[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	SLABd R-VALUE & DEPTH	CRAWL SPACE[c] WALL R-VALUE
1	1.2	0.75	0.30	30	13	3/4	13	0	0	0
2	0.65[j]	0.75	0.30	30	13	4/6	13	0	0	0
3	0.50[j]	0.65	0.30	30	13	5/8	19	5/13[f]	0	5/13
4 except Marine	0.35	0.60	~~NR~~ 0.40	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)

PART II – IRC BUILDING/ENERGY

Revise table as follows:

TABLE N1102.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	FENESTRATION U-FACTOR	SKYLIGHT[b] U-FACTOR	GLAZED FENESTRATION SHGC [b]	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	0.75	0.35[j]	30	13	3/4	13	0	0	0
2	0.65[i]	0.75	0.35[j]	30	13	4/6	13	0	0	0
3	0.50[i]	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~~ 0.40[e]	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)

Reason: This proposal promotes "the effective use of energy" (see *IECC* section 101.3) by reducing the need for peak electricity by adopting a modest and conservative Solar Heat Gain Coefficient (SHGC) requirement in climate zone 4 except Marine.

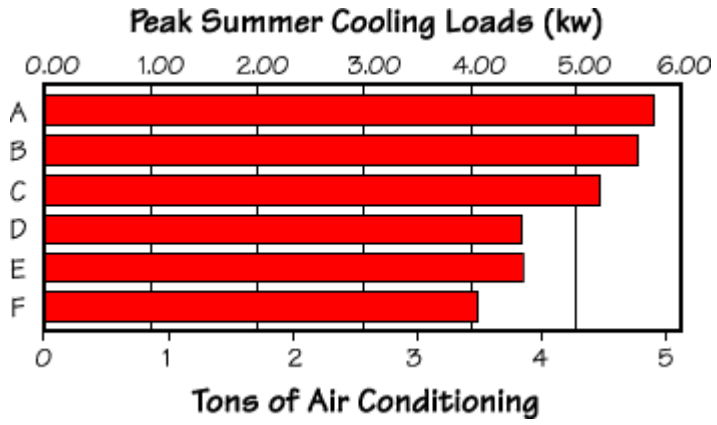
Precedent for a Maximum SHGC Requirement in Climate Zone 4.

DOE/EPA's ENERGY STAR for Windows program has included an SHGC maximum requirement in the North-Central zone (roughly *IECC* climate zone 4) for a number of years. The most recent Energy Star qualification criteria, released in April 2009, requires a maximum 0.40 SHGC in the North-Central zone. The 2009 American Recovery and Reinvestment Act (Stimulus Bill) goes even further, requiring a maximum 0.30 SHGC nationwide for the enhanced window tax credit. Chapter 5 of the *IECC* (Commercial Energy Efficiency) already requires a maximum SHGC of 0.40 in climate zones 4-6. ASHRAE 90.1-2007 also contains the same requirement in climate zones 4-6 for both high rise residential and commercial construction. See Table 5.5-4. It is time for the residential chapters of the *IECC* and *IRC* to move in the same direction.

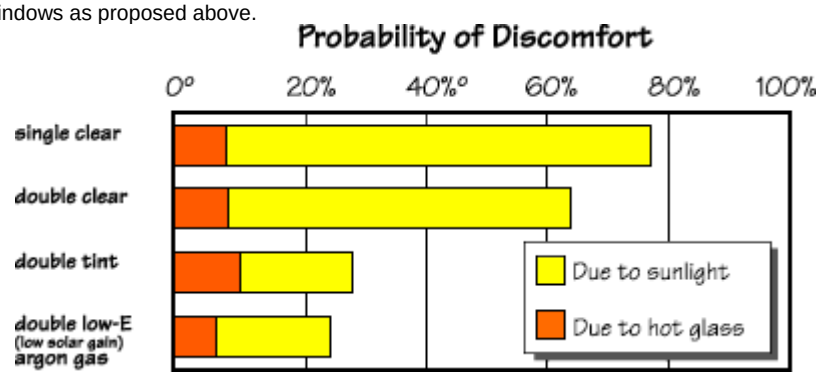
The proposed change would still allow a great deal of flexibility. The SHGC requirements in both ENERGY STAR and the Stimulus Bill apply to *each window*, as opposed to the area-weighted average flexibility allowed by the *IECC*. This proposal sets the *weighted average* at 0.40 SHGC, a level already achieved by most products on the market in climate zone 4.

Reduction of Peak Electricity Demand and Potential Energy Cost Savings.
Every state in climate zone 4 is "summer-peaking," meaning that demand for electricity is highest on the hottest summer days. Electricity during peaking times is scarce and exponentially more expensive on the open market. States have been forced to build and site new peaking power plants (or to revive retired, dirty plants) for the sake of keeping up with peak demand, due in large part to the increased use of air conditioners in new construction.

Windows with low SHGC are an obvious answer to this growing problem. The following chart, developed by the U.S. Department of Energy's Lawrence Berkley National Laboratory (LBNL), which is found on the Efficient Window Collaborative (EWC) website (www.efficientwindows.org), shows the potential for saving peak demand (and tons of HVAC) for different window types. Window E is a higher solar gain low-e double-pane window that meets the current U-factor requirement in climate zone 4. Window F is the low SHGC, low U-factor window that would meet the current U-factor requirement plus the SHGC maximum of this proposal. The reduction in peak cooling load is nearly half of a kW, reducing by almost a half ton the size of the air conditioning unit. As is readily apparent, improved windows will lead to smaller HVAC sizes (with lower costs to the homeowner) and lower peak cooling loads (saving the state from building additional peak capacity).



Similarly, the following chart shows the probability of discomfort during summer from sunlight and hot glass. The summertime probability of discomfort ranges from over 60% with double clear (which is currently allowed in climate zone 4 under the UA trade-off and performance paths) to almost 20% with low SHGC windows as proposed above.



Windows with low SHGC will reduce the volatility of temperatures in the home, which will reduce occupant discomfort and make it less likely that occupants will need to adjust the thermostat and use more energy.

Construction Costs/Benefits of a Low SHGC Requirement in Climate Zone 4.

There should be no increased construction cost for moving to a low SHGC requirement in climate zone 4. Climate zone 4 already requires a 0.35 U-factor window. Such a window, by definition, already incorporates low-e glass. Meeting a 0.40 SHGC merely requires that the low-e coating be designed to limit low solar gain, a feature that adds no additional cost.

On the other hand, use of lower SHGC windows will result in construction cost savings from properly downsizing the HVAC equipment.

Cost Impact: The code change proposal will not 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-13-T. 402.1.1-T. N1102.1.DOC