AGC

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Re: Criteria Revision – Public

Dear Rich and Emily:

AGC Flatglass North America, Inc.'s comments to Energy Star's Report of Draft Criteria and Analysis dated August 6, 2008, are attached.

Very truly yours,

Tom Mewbourne /tsz

Tom Mewbourne
Technical Specialist

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Public Comments
of
AGC Flat Glass North America, Inc.
to the
U.S. Department of Energy's
Energy Star Program's
Draft Report of Criteria and Analysis for Windows, Doors, and Skylights

Introductory Comments[1]

AGC Flat Glass North America is grateful to the Department of Energy (DOE) for the opportunity to comment on the Draft Criteria for Windows, Doors, and Skylights. We also commend the Department for the open process they have employed in developing the newest Energy Star Windows criteria. We believe that this process has resulted in criteria that is essentially fair to all competing stakeholders and technologies supplying the energy efficient fenestration market. Furthermore, we believe the new criteria will result in more market choices for consumers who are trying to create energy efficient homes.

AGC manufactures high performance windows for residential applications using both pyrolytic and sputter technologies to apply low emissivity (low-e) coatings to glass. In addition to its pyrolytically coated product (Comfort-E2), it also manufactures six (6) different sputter coated products. Three (3) of these use a single silver coat of low-e material to produce high SHGC products (Comfort Ti-Ps, Comfort Ti-R and Comfort Ti-AC). Three (3) others use a double silver coat of low-e material to produce low SHGC products (Comfort Ti-AC 40, Comfort Ti-AC 36, and Comfort Ti-AC 23).

At AGC, we pride ourselves on having developed a diverse line of products to provide solutions to a variety of unique consumer needs. These consumer needs include energy efficient windows for a variety of climates. While AGC and other glass manufacturers have developed products to respond to the need for different types of glass based on climate, the Energy Star program can give consumers the information and tools they need to choose the most effective fenestration products for their climates.

Understanding that climate contributes to the energy efficiency equation in homes, AGC supports DOE's decision to break with the past decisions of the International Energy Conservation Code (IECC) and the criteria established by predecessor Energy Star programs which failed to include consideration of the Solar Heat Gain Coefficient (SHGC) of fenestration in heating dominated regions of the north. DOE's decision to use Minimum Aggregate Energy Performance Criteria (Minimum Performance Criteria) that specify SHGCs in Energy Star zones (ES) 4 and 5 will lead to a significant energy savings in the north. It will also lead to a significant reduction in the number of annual energy dollars spent by northern homeowners and, because it will significantly increase competition between competing low emissivity (low-e) technologies in the north, it will also reduce the amount those homeowners will pay for windows bearing the Energy Star label.

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[1] The Draft Criteria and Analysis prepared by D & R International, Ltd. for Windows, Doors, and Skylights, dated August 6, 2008 will be referred to as the "Energy Star Report."

I. In Support of Minimum Performance Criteria Rather than Prescriptive U-factors Alone in ES 4 and 5.

A. Minimum Performance Criteria Best Achieves Energy Star Objectives.

One need only compare the insulation delivered by a northern wall (R value of 21) to a northern window (U-factor of 0.23 or an R value of 4.35), to realize that windows, no matter how well constructed using today's technologies, provide significantly less "insulation" than well constructed opaque walls. However, in addition to their transparency, windows offer another redeeming value to northern homes. Windows can be designed with a high SHGC to let the renewable energy of the sun reduce the amount of fossil fuels that would otherwise be burned heating homes in the north.

The proposed Energy Star criteria, for the first time, takes a quantum leap forward in maximizing the use of both pyrolytic and sputter coat low-e window technologies to save energy. This is done by using a Minimum Performance Criteria in ES 4 and 5, rather than a prescriptive U-factor alone. Recognizing that windows can be constructed using either pyrolytic or sputter coating technologies that will deliver both a low U-factor and a high SHGC which is able to maximize the use of renewable solar energy as a home heating fuel, Energy Star has adopted a Minimum Performance Criteria in both Phases 1 and 2 in ES 4 and 5.

In Phase 1 Double Glazed Insulating Glass Units (DGUs) will be used to meet the new criteria. In Phase 2, however, the Minimum Performance Criteria will drive the northern window market toward Triple Glazed Insulating Glass Units (TGUs) that can deliver U-factors significantly lower than current IECC levels, combined with high, matching SHGCs, calculated to maximize the use of solar heating energy while, at the same time, eliminating the use of ultra-low SHGC fenestration products in the north that can block up to 80% of the sun's energy.

Energy Star's Minimum Performance Criteria has numerous advantages:

1. The Minimum Performance Criteria will save more energy in ES 4 and 5 than a criteria based on U-factor alone.

2. The Minimum Performance Criteria will maximize reliance on a renewable, non-polluting energy source, the Sun, to reduce the amount of fossil fuels that must be burned to satisfy northern heating loads.

3. Using a Minimum Performance Criteria will level the playing field between the pyrolytic and sputter coating technologies, while yielding a significant increase in annual energy efficiency.

4. By leveling the playing field between the low-e coating technologies, Energy Star's Minimum Performance Criteria will maximize the number of products available in the marketplace to meet the new Energy Star criteria, in turn, increasing competition between the low-e technologies in the marketplace.

5. By increasing the number of complying products and increasing competition between low-e technologies, Energy Star's use of Minimum Performance Criteria will, in turn, lead to lower prices for Energy Star labeled windows in ES 4 and 5.

6. Increased competition and lower prices will make increased stringency more cost effective, and Energy Star labeled windows more affordable.

7. Making Energy Star labeled windows more affordable will increase their market penetration resulting in an increase in national energy savings directly attributable to the Energy Star Windows program.

Each of these advantages is consistent with objectives established by DOE in its letter to stakeholders dated October 9, 2007:

1. Significant energy savings realized on a national basis by:

   a. Substantially lower U-Factor in northern zones (initial target range: 0.20-0.30)

   b. Capturing winter solar gain using a minimum SHGC in the northern zones

2. Recovered investment for purchasers within a reasonable period of time through increased energy efficiency by allowing SHGC/U-Factor trade-offs in the northern zones in order to expand the range of available products.

B. The Minimum Performance Criteria Will Likely be Opposed by Some Marketers of Low SHGC Sputter Coat Products.

Energy Star's decision to break from energy code formulas that have historically ignored SHGC in the north, is the only sensible way to achieve Energy Star objectives. If U-factor alone is specified and SHGC in the north is ignored, annual fossil fuel consumption would increase when Energy Star labeled windows are used, even though windows capable of delivering greater energy efficiency are available using either pyrolytic or sputter coating technologies. That would run directly contrary to DOE's stated objective of achieving increased annual energy efficiency through the Energy Star Windows program.

Simply put, energy codes that ignore SHGC in the north and prescribe U-factor as their only criteria benefit some marketers of low SHGC products that are interested in marketing a single, low SHGC product throughout all climate zones from Miami, Florida to the Canadian border. However, homes using low SHGC window products in the north must inevitably burn more fossil fuels than homes using high SHGC windows. Why? Because low SHGC windows block solar energy from entering the home, in turn, requiring that home to burn more fossil fuel in order to compensate for the loss in solar energy.

In the south, ultra-low SHGC products are desirable since they permanently block much of the sun's energy from entering homes, thus, reducing cooling loads and increasing energy efficiency. However, in northern heating dominated climates, blocking the sun's energy from entering homes has the opposite effect on energy efficiency. Permanently blocking the sun's energy from entering homes in the north actually increases the amount of fossil fuels that must be burned to heat those homes.

Appendices A, B and C attached hereto, graph the average energy consumption of homes in ES 3, 4 and 5, respectively. These graphs use the same cities and the same regression coefficients used to develop the current Energy Star Report. Each graph plots energy consumption against windows having 0.30 and a 0.35 U-factors, respectively, and against windows having SHGCs ranging from 0.00 to 0.70. As can be seen on each of the three (3) attached graphs, **as SHGC increases in ES 3, 4 and 5, total annual energy consumption decreases.** The further north you go, from ES 3 to ES 5, the larger, or steeper, the decrease in total average energy consumption.

In short, beginning in ES 3 and going north to ES 4 and 5, higher SHGC windows reduce annual energy consumption by using the renewable, non-polluting energy of the sun as a home heating fuel, thus, reducing the amount of fossil fuels that need to be burned to heat these homes. However, these energy conservation facts often conflict with the desire of some marketers of low SHGC products to market a single, low SHGC product nationally from Miami to Canada.

Those interested in marketing a single product nationally, deploy a very simple formula to enable use of the same low SHGC products in both southern and northern markets. That simple formula is: Fashion prescriptive energy codes to have 1- a low SHGC in the south, 2- a low U-factor in the north, and 3- no rating for SHGC in the north. This makes the low U-factor of low SHGC products superfluous in the south and their low SHGC irrelevant in the north.

For essentially the same reasons, some segments of the industry abhor the use of performance based criteria or alternate paths in the design of energy codes. Performance based criteria, like that used by Energy Star in ES 4 and 5, recognize that the same low SHGC product that reduces energy consumption in the south will actually increase annual energy consumption in the north. As anticipated in the Energy Star report, in Phase 2, the Minimum Performance Criteria will no longer permit the Energy Star label to be used to market low SHGC double or triple silver low-e coated products from Miami to Canada. Instead, these ultra-low SHGC products will be limited to qualifying for an Energy Star label in the south where they are, in fact, energy efficient in reducing cooling loads.

However, both pyrolytic and sputter coat manufacturers alike have the ability to make glass with high SHGCs suitable for use in the north. In the case of sputter coat manufacturers, this can simply mean using a single silver coating of low-e. Like pyrolytically coated products, this type of sputter coated product has a low U-factor, but a high SHGC[2]. Of course, under

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[2] For example, LoE-178 #2, is a soft, sputter coat low-e product, which has a whole-window U-factor of 0.36 and a whole-window SHGC of 0.42. LoE-178 #3 is another sputter coat low-e that has a whole-window U-factor of 0.36 with a whole-window SHGC of 0.46. (The glazing SHGC of these products is 0.59 and 0.63, respectively). See, ***Energy Design Update,*** Vol. 26, No. 11, Nov. 2006, Table 2, p. 12 (Aspen Publishers).

current standards, that high SHGC will disqualify it from use in the south. That means it is not eligible for nationwide use. Even though sputter coat technology can yield products that have a high SHGC and are, therefore, more energy efficient than low SHGC products in the north, the inconvenience of having to manufacture a high SHGC product for the north and a different, low SHGC product for the south is likely to motivate some segments of the industry to oppose Energy Star's Minimum Performance Criteria.

The primary arguments likely to be used in opposition to the Minimum Performance Criteria employed by Energy Star will be "comfort," "peak load," or that the Minimum Performance Criteria is too complicated. However, none of these arguments justifies a change in the course charted by Energy Star's Minimum Performance Criteria in ES 4 and 5.

There is no scientifically accepted set of principles or standards that can determine whether one window is more "comfortable" than another. Studies that have attempted to "measure" comfort as applied to building occupants and windows have been forced to make unrealistic assumptions. For example, in a study done for the National Fenestration Rating Council (NFRC) in 2005, in order to create an environment in which "comfort" could be measured, the researchers assumed that the human subject was located within 3 feet of a floor to ceiling window; that the subject could not move away from the floor to ceiling window; and that nothing could be done to alter the solar gain through the window. If it was an operable window, it had to remain closed and no window drapery of any kind was provided. In another study, an occupant lays prone on a bed within 3 feet of a window that extends the full length of the subject's body. Again, the subject is not allowed to move and the window has no drapery.

The assumptions used in these studies are unrealistic and do not accurately or adequately model actual human experience in a way that would enable a reasonable reviewer to conclude that the conclusions they draw are in any respect valid or universal. "Comfort" is completely subjective. Creating wholly unrealistic assumptions in order to "measure" it is little more than junk science.

Reports of peak load attributable to residential windows are similarly unreliable since they, too, are typically developed using a host of unrealistic assumptions that significantly exaggerate the impact of windows. For example, in order to even make any peak load calculations, these studies typically assume that every home in the climate zone under consideration has central air conditioning. They then assume that, instead of opening windows, or closing blinds, or using fans or shades, northern consumers all run their central air conditioners 24-hours a day, 7-days a week at a constant thermostat set point all summer long. These assumptions are unrealistic and provide highly exaggerated estimates of the impact of residential windows on peak load.

Finally, complexity is not an acceptable basis upon which to reject the energy savings that the Minimum Performance Criteria is expected to yield. Those that will be determining whether a window will qualify for an Energy Star label under the Minimum Performance Criteria will be sophisticated window Manufacturers, not consumers. Those same manufacturers already deal with a host of complex NFRC and other rules governing energy efficient windows on a

daily basis. The consumer will see none of this. The consumer sees whether an Energy Star label is, or is not, affixed to the windows they intend to purchase.

If a window manufacturer lacks the sophistication necessary to readily understand and apply the Minimum Performance Criteria, it is safe to assume that the same manufacturer will not be able to understand other rules critical to the manufacture and marketing of high efficiency glazing, such as the NFRC rules governing how energy efficient windows are rated, or even the energy codes themselves that govern windows. Complaints concerning complexity should pose no real impediment to the Minimum Performance Criteria.

If, however, we were to accept that choosing windows with the best SHGC is a complicated proposition for the consumer, this would argue in favor of the Energy Star Program's role in promoting the Minimum Performance Criteria. For the Department of Energy to reject the energy savings that would result from the Minimum Performance Criteria on the basis that the consumer cannot be educated would run counter to the marketing mission of the Energy Star Program. The question the Department of Energy should be asking is not whether or not to eliminate the Minimum Performance Criteria, but rather how the Energy Star Program can best use its marketing expertise to encourage consumers to purchase the most energy efficient windows for their homes and locate these windows optimally.

Once windows are installed, they can affect a home's energy use for up to forty years or more. If high SHGC windows are used in the north, homeowners will reap the benefits of free solar heating while retaining control over summertime heat levels on the west face of the home by opening windows, using ceiling or other types of fans, or using curtains, screens, blinds or any number of external shading devices. If, on the other hand, low SHGC windows are installed in the north, these same homeowners will never realize the benefits of free solar heating in the winter since, once installed, low SHGC windows are a permanent barrier to the free heat of the sun.

II. Comments Pertaining to Phase 1 Criteria:

Phase 1 criteria should include a 0.30 minimum SHGC in ES 4 and 5.

A typical, triple silver low-e coated DGU can have an ultra-low SHGC of 0.21 and a U-factor from 0.30 to 0.25. Although its low U-factor is superfluous in Miami, its ultra-low SHGC will qualify it for an Energy Star label in Miami, Florida (ES 1) where an SHGC $\leq$ 0.25 is required. What is troubling, however, is that, in Phase 1, this same window will also qualify for an Energy Star label when used in Caribou, Minnesota (ES 5), only miles from the northern boarder of the U.S. and Canada, where a 0.30 U-factor (or less), coupled with an SHGC $\geq$ 0.15, qualifies for an Energy Star label.

If Phase I is intended to be transitional, readying the marketplace for the more stringent criteria required in Phase 2, does it really make sense to qualify for Energy Star labeling and, thus, encourage the northern marketing of triple low-e coated, ultra-low SHGC products in ES 4 or 5?

Unless a 0.30 minimum SHGC is added to the Phase 1 criteria in ES 4 and 5, marketing in the direction of using triple silver low-e coated, ultra-low SHGC products from Miami to Canada will be even more intense during Phase 1 due to the prescriptive provisions recently established in IECC zones 1-3 in the 2009 IECC. In that regard, the 2009 IECC still has no rating for SHGC in IECC zones 4-8 but, it sets a maximum SHGC of 0.30 for IECC zones 1-3. Many typical, double silver low-e coated DGUs will have SHGCs above the 0.30 maximum SHGC established for IECC zones 1-3. Therefore, the 0.30 SHGC in IECC zones 1-3, coupled with the absence of any SHGC rating in IECC zones 4-8 in the 2009 IECC, will already encourage use of ultra-low SHGC products in the north. If a minimum 0.30 SHGC is not included in Phase 1 of the Energy Star program, Phase 1 of the Energy Star program will do little more than provide an Energy Star label to the same product that will be marketed as compliant nationwide with the 2009 IECC.

If installed in a new home in Caribou, Minnesota during Phase 1, Energy Star labeled windows with a 0.21 SHGC and a U-factor of 0.30 will block 79% of the sun's renewable and pollution free energy from entering and heating that home all winter long. This will, in turn, force the homeowner to burn more fossil fuel to heat that home in the winter than would otherwise be required if high SHGC windows had been installed. If windows with a high SHGC of 0.62 and a U-factor of 0.33 had been installed, the homeowner would enjoy an SHGC increase of 0.41 which translates to a 195% increase in the amount of solar energy entering and heating the home in the winter. That would, in turn, require less fossil fuel to be burned every winter for heat.[3]

High SHGC windows are also highly adaptable and summertime heating levels from west facing windows in the north can easily be controlled, simply, by opening windows, using ceiling or other fans, using drapery, screens, awnings or other shading devices. However, the same is not true of low SHGC windows. Low SHGC windows permanently block solar gain. Since windows can have a lifespan of 40 or more years, that means that if windows with a SHGC as low as 0.21 are installed in a northern home in 2010, during Phase 1, they will permanently block 79% of the sun's heat from entering that home until the year 2050, or longer. That homeowner will pay a heavy energy conservation penalty in that more fossil fuels will have to be burned every winter to compensate for the loss of free solar energy blocked by the home's low SHGC windows.

If DOE's objective is to encourage use of renewable energy and, therefore, to reduce the annual consumption of fossil fuels, the Energy Star window criteria in Phase 1 should include a minimum SHGC of 0.30 in ES 4 and 5. This is particularly true since, without it, during the Phase 1 transitional period, synergy between the Phase 1 Energy Star criteria and the 2009 IECC will produce a powerful motive for manufacturers to market a single, Energy Star labeled, ultra-low SHGC product from Miami to Canada. In turn, this will result in wasting, not conserving, fossil fuels in the north.

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[3] The penalty for installing low SHGC glass in the northern US or Canada in a home with 200 square feet of windows during a 212-day heating season will be that the homeowner will have to burn an additional 4 million BTUs of fossil fuel to compensate for the loss of heat that would be supplied from the sun if high SHGC windows were used. ***Energy Design Update,*** Vol. 26, No. 11, Nov. 2006, p. 13 (Aspen Publishers). This is more specifically demonstrated in ES 4 and 5 by the energy consumption graphs attached hereto as Appendices B and C.

III. Comments Pertaining to Phase 1 and 2 Criteria:

A. Phase 1 and 2 criteria should eliminate the 0.55 SHGC cap in ES 4 and 5.

The only support for the 0.55 SHGC cap in the Energy Star Report is found at page 11:

> In ES4, ES5, and ES5a, DOE has set an upper bound of 0.55 on SHGC to prevent qualification of products with very high solar gain that would lead to overheating, discomfort, and customer dissatisfaction.

Nowhere in the Energy Star Report is there citation to any objective evidence of any kind to support DOE's proposed inclusion of a 0.55 SHGC cap in ES 4 or 5 in Phase 1 or Phase 2. In fact, the objective evidence is to the contrary. **SHGC levels above the proposed 0.55 cap will save more energy than SHGC levels below the proposed 0.55 cap in ES 4, and will save even more energy in ES 5**. See, Appendices B and C attached hereto.

"Overheating," "discomfort," and "customer dissatisfaction" are all completely subjective concepts. There, simply, is no objective or scientific basis upon which to measure or assess whether or what constitutes "overheating," "discomfort," or "customer dissatisfaction."

A number of serious problems exist in the imposition of a 0.55 SHGC cap in ES 4 or 5:

1. The cap is completely arbitrary. Will a 0.56 SHGC cause "overheating" but a 0.55 SHGC will not?

2. Given the new, more stringent criteria proposed in Phase 1 and Phase 2, consumer will have to pay a higher price for Energy Star windows. Because consumers will be paying more for them, it is logical to assume that they will be more careful in selecting them and seek more information about them. Consumers don't need to be protected from high SHGC glass. "Overheating, discomfort and customer dissatisfaction" can more reliably be overcome by opening windows, using ceiling or other fans, drapery, screens and overhangs rather than the imposition of an arbitrary 0.55 SHGC cap.

3. The imposition of 0.55 SHGC cap is not based on any objective or scientifically sound evidence. Worse, it will disqualify many products from having an Energy Star label that will, objectively, save more energy than products with lower SHGCs that will be awarded the Energy Star label. Arbitrarily disqualifying more energy efficient products from having an Energy Star label while awarding products the Energy Star label that are less energy efficient is not only illogical and counterintuitive, but also runs directly counter to the stated objectives of the Energy Star Program and DOE.

4. The Energy Star program is "designed to help reduce national energy consumption by increasing the energy efficiency of fenestration products in residential buildings." Energy Star Report, p. 4. As demonstrated in Appendices B and C, eliminating the 0.55 SHGC cap in ES 4 and 5 will help achieve the objective of reducing national energy consumption.

5. Nowhere do subjective criteria such as "overheating," "discomfort," or "customer dissatisfaction" appear amongst any of the "guiding principles" that should are be applied in revising the Energy Star criteria.[4]

6. Use of subjective criteria, such as overheating, discomfort or customer dissatisfaction, can result in the arbitrary exclusion of energy efficient products from the Energy Star Windows Program.

Finally, NFRC is in the process of developing a new solar spectral irradiance function (ASTM G197) which will, when adopted, increase SHGC values for all products. This will exacerbate the problems of having a 0.55 SHGC cap since this new NFRC rating methodology will take SHGC ratings of products that currently have a value below 0.55, to a rating above 0.55 and unfairly disqualify them from an Energy Star label.

There is no legitimate basis for the imposition of a 0.55 SHGC cap and it will arbitrarily disqualify energy efficient products from qualifying for an Energy Star label. The 0.55 SHGC cap should be eliminated from the Phase 1 and 2 criteria for ES 4 and 5.

B. Phase 1 and 2 criteria should not lower the SHGC cap from 0.55 to 0.40 in ES 3.

The current Energy Star criteria imposes a 0.55 SHGC cap in ES 3. Energy Star Report, Table 3, p. 18. There is no energy efficiency justification for lowering that cap to 0.40 in Phase 1 or 2 of the new criteria. While reducing the SHGC cap in ES 3 is technically unjustified, it will also disqualify numerous, energy efficient products from qualifying for an Energy Star label in this zone.

The Energy Star Report acknowledges that there is no energy efficiency basis upon which to impose a 0.40 SHGC cap in ES 3. "IECC 2009 has no SHGC criterion for this region, because the energy savings analysis shows that solar control provides only modest benefits in this climate zone." Energy Star Report, p. 18. No other justification for reducing the SHGC cap from 0.55 to 0.40 in this zone is articulated in the Energy Star Report. Perhaps, most surprising is that Appendix A attached hereto, which was prepared using the same regression coefficients upon which the Energy Star Report is based, actually establishes that a window with a 0.30 U-factor (which satisfies part of the new criteria), with an SHGC of 0.55, (which will disqualify it under the proposed criteria) actually saves more energy than the same window with an SHGC of 0.40 that meets the new criteria.

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[4] See, DOE's October 9, 2007, letter to Stakeholders indicating that the selection of new criteria will be guided by: "The Energy Star Label: A Summary of Product Labeling Objectives and Guiding Principles."

No technical justification exists to reduce the SHGC cap from 0.55 to 0.40 in ES 3 in Phase 1 or Phase 2. Moreover, if adopted, it, too, will deny an Energy Star label to products that achieve greater energy efficiency than those that are awarded an Energy Star label. This lack of technical justification and the fact that this change in criteria will deny the Energy Star label to products that are more energy efficient than those receiving the Energy Star label make the change to a 0.40 SHGC cap in ES 3 violative of DOE's policy to develop the new Energy Star criteria in accordance with the principles outlined in: "The Energy Star Label: A Summary of Product Labeling Objectives and Guiding Principles" and should, therefore, rule it out.

SUMMARY of COMMENTS.

1. The Minimum Performance Criteria is the best possible way to increase stringency and energy conservation in ES 4 and 5 in Phases 1 and 2.

2. The proposed criteria should impose a 0.30 minimum SHGC in ES 4 and 5 in Phase 1 (i) to avoid Energy Star labeling in ES 4 or 5, ultra-low SHGC products being encouraged in ES 1 and mandated in 2009 IECC zones 1–3, and (ii) to avoid Energy Star labeling of ultra low SHGC products in ES 4 and 5 in Phase 1 that will not be eligible for Energy Star labeling in ES 4 or 5 in Phase 2.

3. There is no technical, objective or energy efficiency basis stated in the Energy Star Report for the imposition of a 0.55 SHGC cap in ES 4 and 5 in Phases 1 or 2. The cap will arbitrarily eliminate numerous products from the Energy Star program that are demonstrably more energy efficient than other products that will qualify for the Energy Star label in ES 4 and ES 5.

4. There is no technical, objective or energy efficiency basis stated in the Energy Report for lowering the 0.55 SHGC cap in the current Energy Star program to 0.40. The lower SHGC cap will arbitrarily eliminate numerous products from the Energy Star program that are demonstrably more energy efficient than other products that will qualify for the Energy Star label in ES 3.

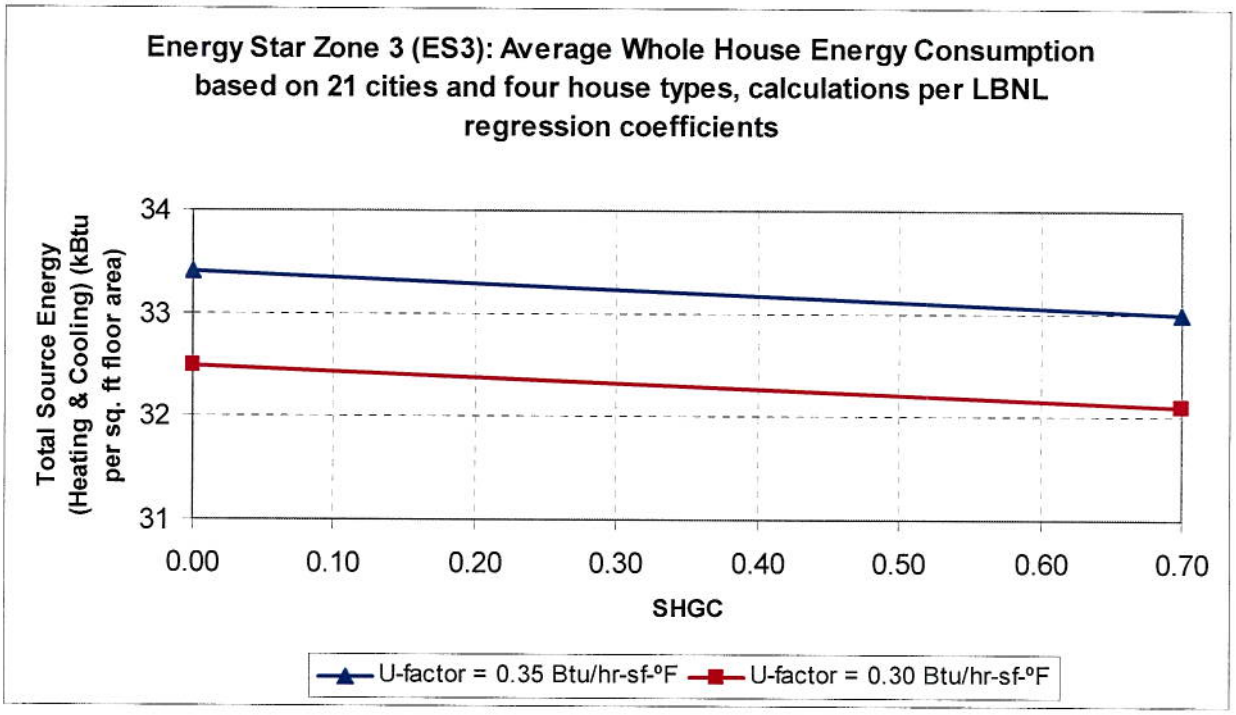
Respectfully submitted,

AGC Flat Glass North America, Inc.

APPENDIX A

Showing Average Annual Home Energy Consumption ES 3

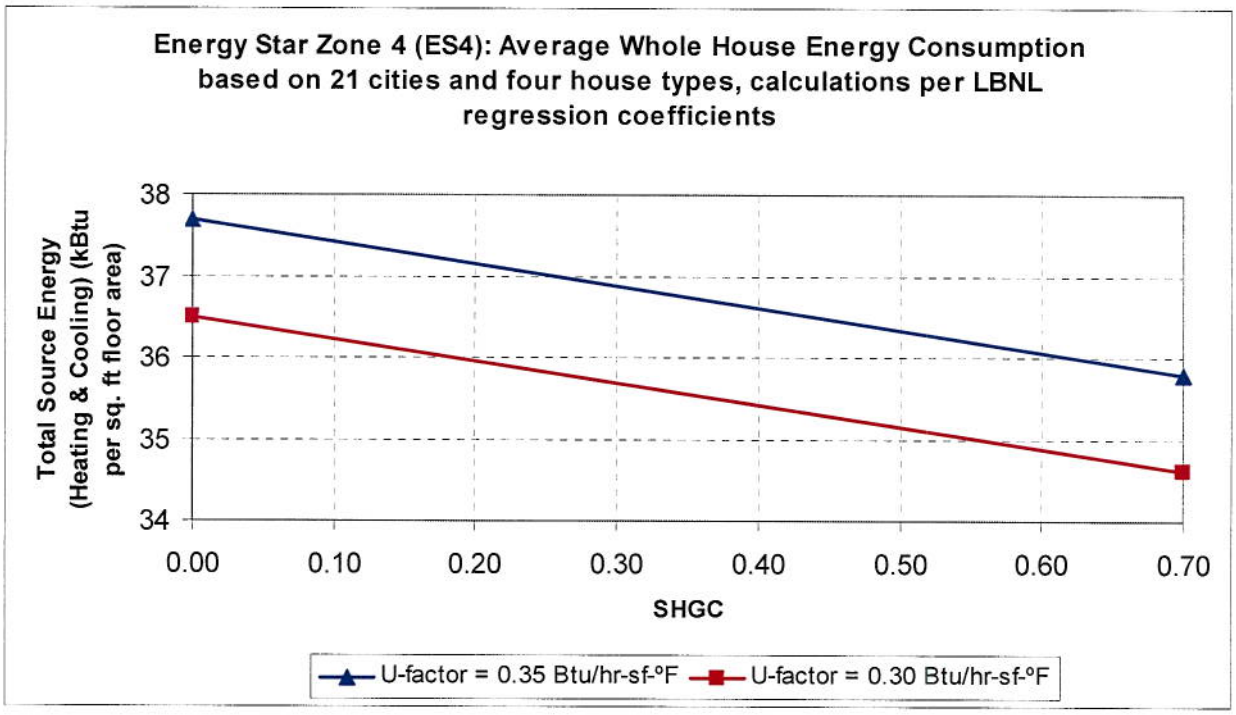
Using 0.35 and 0.30 U-factor and SHGC from 0.00 to 0.70



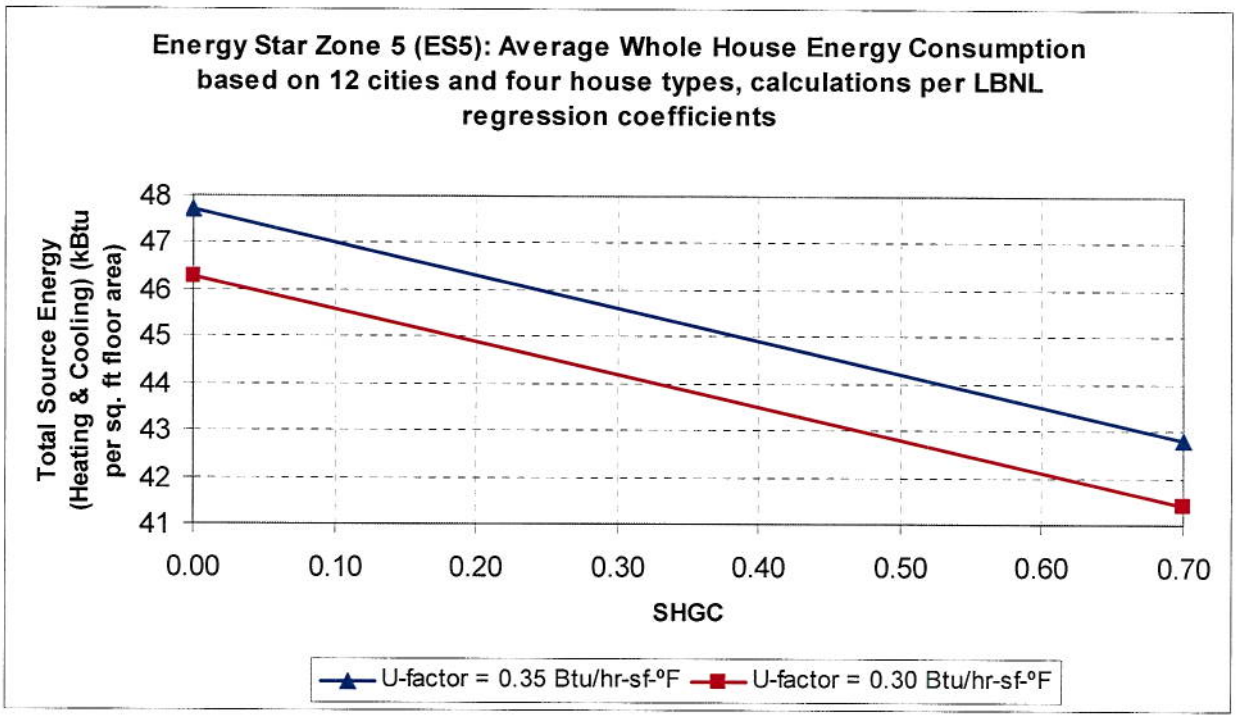
APPENDIX B

Showing Average Annual Home Energy Consumption ES 4

Using 0.35 and 0.30 U-factor and SHGC from 0.00 to 0.70



APPENDIX C
Showing Average Annual Home Energy Consumption ES 5
Using 0.35 and 0.30 U-factor and SHGC from 0.00 to 0.70



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