

September 3, 2021

Douglas W. Anderson
Product Manager for Windows, Doors, and Skylights ENERGY STAR® Labeled Products
Anderson.doug@epa.gov
windows@energystar.gov

Dear Doug and others responsible for the U.S. ENERGY STAR program:

On behalf of the Fenestration and Glazing Industry Alliance (FGIA), we are asking for reconsideration of the proposed ENERGY STAR 7.0 Draft 1 Residential Windows, Doors and Skylights Specification requirements. FGIA offers alternative recommendations which our members believe are more in line with the spirit of continuous improvement of the program and its acceptance by consumers. FGIA represents more than 350 member companies who manufacture and market windows, doors and skylights and the components that go into them for residential and commercial applications — many of whom are ENERGY STAR partners who label millions of products every year with the ENERGY STAR label.

There are millions of inefficient (single- and double-pane clear) windows, doors, and skylights in existing U.S. housing stock that need to be replaced with more energy-efficient options to help America achieve energy savings, net-zero energy, and reduced greenhouse gas emissions (GHGs) goals. FGIA recognizes the vital role the ENERGY STAR program plays in encouraging Americans to make energy-efficient choices in new construction, remodeling, and replacement projects. To remain viable to American consumers, ENERGY STAR must deliver value through affordable, cost-effective choices, and realistic payback returns. Therefore, it's essential to balance the competing needs of improved energy performance, and energy savings, with affordable and desirable products for consumers. As the core marketing investors in this program, and as our industry's many years of experience demonstrate, consumers know best.

FGIA's comments focus on several key areas:

Point 1) Our members question the analysis on which the proposed ENERGY STAR 7.0 specification is based, particularly when some data appears to stem from out-of-date EnergyPlus calculations or the focus on lowest cost options, rather than averaged-priced options. Our members believe that the lack of certainty in data may damage the ENERGY STAR brand, along with consumer as well as partner confidence in it. Therefore, our members request that the data and the assumptions on which it is based be rerun, with greater clarity, transparency, and explanations in how numbers were arrived at and clear detail in how formulas were calculated, to ensure their accuracy and instill greater confidence in the validity.

Point 2) Paybacks appear to provide limited (or little) return for consumers, at just \$3.59 a month in potential savings on energy bills, far less than the cost to invest in ENERGY STAR products. Rerun monthly savings estimates to ensure their accuracy and express them in terms of cost savings on monthly energy bills for consumers.

Point 3) For windows in the Northern Zone, start with a 0.25 U-factor and no minimum Solar Heat Gain Coefficient (SHGC) to be implemented no sooner than January 1, 2024, for ENERGY STAR 7.0. Then follow with ENERGY STAR 8.0, implementing a 0.21 U-factor in the Northern Zone no sooner than January 1, 2029.

As it relates to the proposed 0.22 U-factor for the Northern Zone, the significant investment costs for consumers and substantial development costs for manufacturers outweigh the potential savings to achieve minimal improvement.

Point 4) Remove the proposed minimum SHGC requirement for the Northern Zone.

Point 5) Has EPA done an analysis of the expected increase in embodied carbon versus the expected decrease in operational carbon that will result in this change from double-pane to triple-pane to confirm that this change results in an overall reduction in GHGs?

Point 6) Occupant comfort considerations need to be considered year-round, not just in winter. Proposed SHGC specifications associated with the Equivalent Energy Performance options are inappropriate for northern climates and may trigger discomfort for consumers due to excessive heat gain in summer months for structures not designed for passive solar, particularly with existing structures. For the Northern Zone, eliminate the equivalent energy efficient options, especially until accurate data is available to justify alternative compliance paths.

Point 7) For the North-Central Zone, change the U-factor to 0.27, no sooner than January 1, 2024.

Point 8) EPA should move IECC Climate Zone 5 into the North-Central Zone.

Point 9) Move the Northern Zone “islands” in California and North Carolina back to the North-Central Zone.

Point 10) The Southern Zones’ SHGC presents challenges for contemporary fixed windows, with no tradeoff options. Keep the 0.25 SHGC that is currently in place for the two Southern zones, rather than reducing it to 0.23.

Point 11) Take sliding glass doors out of the proposed criteria for windows and leave them in the door criteria.

Point 12) Simplify ENERGY STAR skylight criteria, set the U-Factor at 0.53, maintain SHGC at no less than 0.28.

Point 13) NAFS certification should be required for ENERGY STAR 7.0, as it is for the Most Efficient Program.

Point 14) Implement ENERGY STAR 7.0 no sooner than January 1, 2024, due to pandemic strains on supply chains and equipment suppliers.

Point 15) Reassert the message that ENERGY STAR is intended to be a voluntary, above code program that is not intended to serve as a model for state or local energy codes.

More details about FGIA’s points follow.

Point 1) Rerun calculations to ensure accuracy, avoid conflicting messages with energy savings, embodied carbon.

- FGIA members question both the assumptions and the math used in calculating paybacks, particularly with the reported error in EnergyPlus for any version prior to 9.4, when “simple glazing” may have been used in a regression analysis. We understand that the error of glazing systems having a negative absorptance at certain incident angles was corrected in version 9.4. Running the 9.5 version of EnergyPlus yielded an average of a two percent reduction in heating energy, but the cooling and fan energy rose up to 12 percent compared to results

from versions prior to 9.4. FGIA asks that the calculations be rerun or re-simulated to ensure that they are correct, accurate and up-to-date.

- There are some gaps in data that is essential to clearly explain exactly how the data was calculated. For example, what is the detail in the simulation runs for the four HVAC types and four foundation types? A comment is included that LBNL derived a proportioning routine. However, it's unclear whether site energy is used. What is that and how were the proportions weighted? Is there an embedded source factor, or site energy? Please provide further explanation.
- It appears that site heating, site cooling, and site fan energies have been added together to determine the total energy number. Is that the appropriate metric in calculating energy? Does this assume that site energy use is added in? Please further explain the validity of the data presented, and the resulting Equivalent Energy Performance options.
- The site analysis is inappropriate. Energies formerly were identified as source energy. However, that assumption has changed. The equitable way to add energies together is either through carbon, or through expressing it in dollars, and that dollar calculation of energy should be considered in the proposed 7.0 specification.
- What are the savings for SHGCs above 0.40, and what is the payback for consumers? It's important to understand, as it also may impact the comfort for a consumer.
- Has EPA considered whether the SHGCs will increase or decrease ENERGY STAR options and adoption in all zones, based on the U-factors specified?
- The July 7, 2021, cover letter by Doug Anderson states, "*The ENERGY STAR program focuses on the incremental cost between non-ENERGY STAR products and better performing low-cost products and best sellers.*" Consumers typically don't make choices on incremental costs for ENERGY STAR products. Instead, they compare the total cost for an ENERGY STAR certified product versus alternatives, and contrast that with the features and benefits they value in each option. Thermal or energy performance factors are only a few of the diverse product features and attributes consumers consider in choosing new windows, doors, and skylights.
- FGIA members question why a 0.35 U-factor window is cited in the proposed specification since it isn't base energy code. Could EPA instead base its comparison on where ENERGY STAR levels now are set?
- We question the methodology used by EPA in only calculating the cost for technology in the ENERGY STAR 7.0 proposed specification over the prior version, versus looking at the total overall proposed cost or cost range to the consumer. To make sure consumer affordability is a factor, energy cost savings must be compared and contrasted versus the total cost of the product versus alternatives, not just the incremental cost investment required to achieve ENERGY STAR 7.0.

Point 2) Concerns about payback periods for consumers

- Ultimately, consumers measure the value of the ENERGY STAR program by the dollar savings in their energy bill each month.
- If the program does not provide significant cost savings on energy bills for consumers, ENERGY STAR could suffer the same lack of adoption as the Most Efficient program. The latest Ducker report from November of 2020 shows less than a two percent market share for Most Efficient program products. The proposed 7.0 specification increases will add significant cost to consumers to buy higher-performing products. FGIA members know from experience that potential energy savings alone will not convince consumers to buy high-performing products.
- When comparing ENERGY STAR Version 6 products to Version 7 products, the payback goes out to almost 20 years based on data provided by EPA's analysis report. Table 7 and Table 11 indicate the incremental cost of market baseline, which is higher than EPA's stated under 13-year payback target. It's important to consider the benefit to consumers choosing between Version 6 products versus Version 7. Therefore, it's questionable how consumers would see the benefit and payback going from Version 6 to Version 7, with such a long payback period.
- For example, in Table 11 of the "Criteria Analysis Report by EPA of July 2021," the proposed cost savings for the Northern Zone is misleading in showing an annual cost savings of \$113.99, on a window with a U-factor of 0.22 and a 0.30 SHGC, compared with the current ENERGY STAR U-factor of 0.27, which amounts to only a \$43.13 a year difference. On a monthly basis, that's only a \$3.59 savings for replacing an entire house full of windows

costing thousands of dollars. The consumer would need to invest substantially more to obtain products with 23 percent less U-factor versus the current ENERGY STAR program. We are very concerned that this large 23 percent jump in product performance, for which the consumer only saves \$3.59 a month, will cause a strong, negative reaction by consumers.

Table 11. Annual Cost Savings and Payback for the Northern Climate Zone (Proposed Criteria Highlighted)

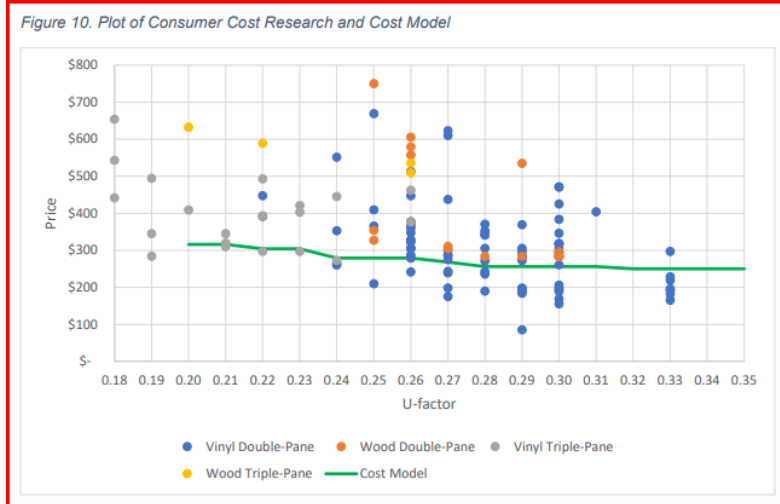
U-factor	SHGC	Savings (\$/year)	Payback (years)
0.20	0.30	\$131.97	11.9
0.21	0.30	\$122.98	12.8
0.22	0.30	\$113.99	11.3
0.23	0.30	\$105.13	12.2
0.24	0.30	\$96.25	7.2
0.25	0.30	\$87.40	7.9
0.26	0.30	\$79.29	8.7
0.27	0.30	\$70.86	6.0

Share complete details on energy cost savings from proposed changes to SHGC.

- Consumers often choose divided lite styles in windows and doors, which presents challenges for qualifying for the ENERGY STAR 7.0 specification.
- The SHGC comments shared in the July 27, 2021, EPA webinar showed beneficial savings at 0.45, 0.50, and EPA data supports that. What are the energy savings gained from the proposed SHGC levels? For example, is it a linear pattern, or are there diminishing returns?

Base the cost model on average price, not the lowest price.

- FGIA members also note that the cost model for the 0.22 U-factor window is based on the lowest price cited by EPA data, while other products are actually much higher in price. If the average price had been used, as our members believe it should have been, the model would actually be \$449, and not \$315, as reported in the cost line. This selective use of data represents a 29 percent cost increase to consumers, which is not listed in the savings analysis.



Point 3) For the Northern Zone, start with a 0.25 U-factor and no minimum SHGC for ENERGY STAR 7.0.

- Because of the payback period concerns mentioned above, FGIA members recommend a two-step approach to spread the price impact out over time and lower the payback period for consumers.
- For windows in the Northern Zone, start with a 0.25 U-factor and no minimum SHGC for ENERGY STAR 7.0 to be implemented no sooner than January 1, 2024.
- Then follow with ENERGY STAR 8.0, implementing a 0.21 U-factor in the Northern Zone no sooner than January 1, 2029.

Point 4) Do not implement a minimum SHGC for the Northern Zone.

- Neither ENERGY STAR, nor the IECC, have ever required a minimum SHGC in the northern climate zones. Adding such a requirement now does not appear to be justified.
- It is FGIA's understanding that the proposed minimum SHGC of 0.17 in the Northern Zone is based on the finding that SHGCs below 0.17 result in VTs below 40 percent. However, FGIA members question why 40 percent visible transmittance (VT) was selected as the minimum acceptable level for typical homeowners in northern regions. Is this simply EPA's opinion, or is it supported by market research? FGIA asks EPA to justify the 40 percent VT and the resulting SHGC minimum of 0.17.

Point 5) Concerns about increase in embodied carbon, especially if triple-pane products are required

- FGIA recognizes the USA's desire to reduce greenhouse gas emissions (GHGs). Reducing the heating and cooling in homes (and thus the emissions associated with them, for example, operational carbon) is one key strategy for doing so, and at which the ENERGY STAR program is aimed.
- Another key factor is to reduce the emissions caused by sourcing and manufacturing the building products used to build homes and buildings – the embodied carbon. Achieving a U-factor of 0.22 will most likely in all circumstances require triple-pane glazing, which will increase the embodied carbon of the glazing used by approximately 50 percent (because of the extra pane of glass using conventional technology).
- FGIA would like to know if EPA has done an analysis of the expected increase in embodied carbon versus the expected decrease in operational carbon that will result in this change from double-pane to triple-pane to confirm that this change results in an overall reduction in GHGs. We understand Americans are striving to reduce the

embodied carbon in the building envelope. Therefore, it's important to avoid any conflicting messages with energy savings and embodied carbon.

Point 6) Occupant comfort considerations need to be considered year-round, not just in winter.

- In the July 7 letter, it stated that *“EPA does not include thermal comfort as a criteria parameter for its program because thermal comfort is not a product energy performance parameter.”* FGIA is, therefore, curious as to why “comfort factor” was cited by EPA for the first time in the July 27 webinar. What methodology was used in calculating it? If “comfort factor” is incorporated in the new specification, how will that be rated?
- Does EPA have any data to justify why -10°F conditions, as cited in the Comfort Factor calculation have been referenced? If so, please provide an analysis as to how many areas of the U.S. are affected by -10°F conditions. Furthermore, the -10°F reference is an extreme condition if IECC Zone 5 is not moved to the North-Central Zone.
- Winter discomfort is mentioned, but why is there no reference to summer discomfort? If comfort is mentioned, year-round comfort — both in the winter and the summer — has to be considered, to help prevent overheating in the summer. Discomfort could increase with the recommended high SHGC levels proposed for the Equivalent Energy Performance options.
- The analysis does not show the impact of the home’s orientation on energy savings. The analysis on orientation is based on site energy savings. However, Table 12 and 13 both show equal energy and a 35 percent reduction in dollar savings.
- FGIA recommends that EPA fully consider all comfort aspects, particularly for the higher proposed SHGC levels. Was consumer comfort level taken into full consideration? FGIA suggests lowering SHGC levels that create comfort conflicts for consumers.
- Canada’s ENERGY STAR program recognizes that U-factors are getting more stringent, and that high solar gain products can cause discomfort in certain applications. Therefore, a minimum Energy Rating (ER) is no longer required for compliance on the U-value path as of January 2020. If EPA decides to lower the U-factor, implementing high SHGC options for ENERGY STAR may not be best for consumers.

Point 7) For the North-Central Zone, change the U-factor to 0.27, no sooner than January 1, 2024.

- Based on the recommendation of Point 3), and the need to balance consumer cost with savings on energy bills, FGIA recommends a maximum U-factor of 0.27 for the North-Central Zone, implementing no sooner than January 1, 2024.

Point 8) Move IECC Zone 5 from the Northern Zone to the North-Central Zone.

- FGIA members are curious to learn more about the weighting used. What happens if IECC Zone 5 is moved? Will the paybacks be considerably longer and how will that impact consumer adoption of the program? Zone 5 is 75 percent of the Northern Zone alone, and when it is left in the Northern Zone, it distorts the data.
- The proposed Northern Zone criteria will conflict with the 2021 IECC where Climate Zone 5 now has a maximum SHGC of 0.40, where the proposed ENERGY STAR criteria is proposing minimums and SHGC’s higher than the IECC SHGC of 0.40. This sends a conflicting message to consumers.

Point 9) Move the Northern Zone “islands” in California and North Carolina back to the North-Central Zone.

- FGIA members support EPA’s general intent of aligning the ENERGY STAR zones with the climate zones adopted by ICC and ASHRAE. However, the practicality of the Northern Zone “islands” in California and North Carolina is questionable. During the July 27, 2021, webinar, EPA indicated a willingness move these “islands” back to the North-Central zone. FGIA supports doing so as these “islands” will likely create significant distribution and logistics challenges that would overshadow any energy savings benefits.
- This would automatically be addressed if IECC Climate Zone 5 is moved to the North-Central Zone as FGIA encourages EPA to do.

Point 10) Southern Zones' SHGC presents challenges for contemporary fixed windows, no tradeoff options

- The SHGC proposed at a 0.23 maximum in two southern zones will be challenging to achieve for fixed windows with today's popular, thin, contemporary sightlines. EPA's analysis was based on double-hung windows (DH) but should also account for other types of windows, particularly fixed windows. If energy performance is desired, de-incentivizing narrow-framed fixed windows with low air infiltration rates is counter to the purpose of ENERGY STAR. Therefore, we recommend EPA maintain the 0.25 SHGC maximum. The ratio of glass to frame area in a large, fixed window with a slim profile creates more challenges to achieve the proposed ENERGY STAR specification.
- EPA cites the 0.23 maximum SHGC in the California Title 24 as a supporting reason to match the SHGC in the ENERGY STAR South-Central and Southern Zones. The 0.23 SHGC in Title 24 can be achieved by area-weighted averaging, or a performance path can be used as an alternative if the products' SHGC is higher than 0.23. That option does not exist with ENERGY STAR. The product either meets or is lower than the required SHGC and is not compliant.

Point 11) Proposal to apply ENERGY STAR windows specification to full-lite sliding patio doors



Swinging Door Specification Proposal

- Reduce U-factor for ≤1/2-Lite and >1/2 Lite categories
- Reduce SHGC for >1/2-Lite in Southern and South-Central Zones

Version 6			Version 7		
Glazing Level	U-Factor	SHGC	Glazing Level	U-Factor	SHGC
Opaque	≤ 0.17	No Rating	Opaque	≤ 0.17	No Rating
≤ 1/2-Lite	≤ 0.25	≤ 0.25	≤ 1/2-Lite	≤ 0.23	≤ 0.23
> 1/2-Lite	≤ 0.30	Northern North-Central	> 1/2-Lite	≤ 0.28	Northern North-Central
		Southern South-Central			Southern South-Central
		≤ 0.40			≤ 0.40
		≤ 0.25			≤ 0.23

EPA

51

- FGIA suggests taking sliding glass doors out of the proposed windows criteria and leaving them in the proposed door criteria, as they have been in Version 5.0 and 6.0.
- French-style doors often look the same from their appearance, and it's a matter of buyer preference whether they are sliding or hinged. In a whole-house package, people typically choose the same Low-E glass package for the whole house, even if it means they don't have an ENERGY STAR certified door.
- Typically, it will be more difficult for a patio door to achieve a 0.22 U-factor than it will be for a window with the same glass package.
- EPA's justification that sliding patio doors are now in the ENERGY STAR Most Efficient windows category is not a compelling argument, due to the lack of consumer interest in and adoption of the Most Efficient program.

Point 12) Simplify the ENERGY STAR skylight criteria, set U-factor at 0.53, maintain SHGC at no less than 0.28.

- While FGIA members understand the desire to simplify the skylight zones, it appears in doing so that unintended consequences have occurred. For example, in the combination of the North-Central, South-Central and Southern Zones into one, the new U-factor and SHGC thresholds are lower than any previous levels established in prior versions. Therefore, the proposed combined zone recommendation may be too aggressive. Instead, FGIA recommends establishing a U-factor of 0.53, the lowest U-factor that was in the prior specification, and a SHGC

of no less than 0.28, as was the lowest SHGC in the three zones previously in the prior specification, rather than the proposed 0.25.

- Maintaining a U-factor requirement of 0.50 for the Northern Zone as well would ensure that top-performing products would stand out, without raising costs to end consumers. In its prior response to exclude skylights from the Most Efficient program, EPA already previously deemed it's not cost justifiable to lower the U-factor below this level.
- FGIA supports the simplification of skylight zones by combining the three southern zones into a single zone.
- Skylights include Tubular Daylighting Devices (TDDs), domed devices, and plastic glazing, which each have their own unique attributes. While we appreciate innovation, it's important for EPA to consider revising skylight numbers to best reflect the unique product types and to fit market needs.
- ENERGY STAR officials acknowledged that in a cold climate, condensation may occur on skylights at the 7.0 proposed specification. Skylights manage condensation with weep systems, to direct moisture to the exterior of a home or commercial structure. FGIA skylight members believe it's encouraging to see language on EPA's ENERGY STAR website that informs consumers that condensation is normal, and skylight products have been designed with management systems to direct condensation to the exterior. Skylights generally collect more interior condensation than other fenestration products since moist warm air rises and collects on these surfaces more than others.
- We support maintaining "Any" as the SHGC criteria for skylights in the North Zone. This particularly helps those seeking passive house design criteria to use products readily-available in their market, while building toward high energy efficiency standards.
- Since there is no minimum SHGC for skylights in the proposed 7.0 specification, FGIA recommends that no minimum SHGC level be established for windows or doors in the Northern Zone either.



Skylight Specification Proposal

- Reduce U-factor to improve insulating power
- Simplify specification to 2 sets of criteria
- Reduce SHGC in Southern U.S. to reduce heat gain

Version 6			Version 7		
Climate Zone	U-Factor	SHGC	Climate Zone	U-Factor	SHGC
Northern	≤ 0.50	Any	Northern	≤ 0.45	Any
North-Central	≤ 0.53	≤ 0.35	North-Central		
South-Central	≤ 0.53	≤ 0.28	South-Central	≤ 0.50	≤ 0.25
Southern	≤ 0.60	≤ 0.28	Southern		

Point 13) NAFS certification should be required for ENERGY STAR 7.0, as it is for the Most Efficient Program.

- The North American Fenestration Standard AAMA/WDMA/CSA 101/I.S.2/A440 (NAFS) certification is required for the ENERGY STAR Most Efficient Program for windows and sliding doors, and therefore should also be required for ENERGY STAR 7.0.

Point 14) Implement no sooner than January 1, 2024, due to pandemic strains on supply chains.

- With a rapidly spreading Delta variant of COVID-19 putting a greater strain on already strained supply chains during the global pandemic, FGIA encourages EPA to allow manufacturers sufficient time to make the necessary changes in their product designs, supply chain material sourcing, sales, production equipment timelines, marketing, customer service and training materials, and more. Presently, dies for making new product framing materials can take six months or more alone, glass is in short supply, as are many essential components like selected sealants. To add to the challenges, lumber is in shorter supply with wildfires raging across the U.S. and Canada, and lumber prices skyrocketing some 300 percent versus the prior year, adding to supply chain volatility. Therefore, FGIA recommends EPA allow adequate time for manufacturers to transition to new the 7.0 guidelines, by not implementing the program any sooner than January 1, 2024.

Point 15) FGIA members promote interest in ENERGY STAR and provide energy-efficient products.

- EPA's intent is for ENERGY STAR to be better than typical energy codes. As EPA expands its promotion of the program, it's important for EPA and others to reassert that ENERGY STAR is a voluntary program that's designed to be above code. Therefore, we ask EPA to encourage jurisdictions NOT to adopt ENERGY STAR as their local energy code requirements.
- Energy codes have multiple ways to comply, for example with performance approaches that allow different ways to achieve desired targets. ENERGY STAR does not allow for multiple approaches and was not designed for that.

FGIA looks forward to partnering with EPA in the development of the ENERGY STAR program to strike a reasonable balance to drive greater energy savings by advancing the ENERGY STAR specification, while still continuing the goal of advancing the ENERGY STAR brand and market share over time. Please give strong consideration and deep investigation into our main points conveyed in this letter.

While we recognize that many products now exist on the market today that may meet the proposed specification, our industry's concern is that there has been little demand for products like those in the ENERGY STAR Most Efficient program, which is a niche segment. The Most Efficient program and the offering are not as well-recognized as the ENERGY STAR brand itself.

FGIA members continue to be longtime leaders in providing the millions of finished windows, doors, and skylights, components and expertise that has helped stimulate demand for the ENERGY STAR brand across all markets. We look forward to our continued partnership with EPA and ENERGY STAR to help advance the program and its adoption by Americans.

If you have questions about the information provided by FGIA, or to discuss it further with our stakeholders, please contact me at kkrafka@fgiaonline.org.

Sincerely,

Kathy Krafka Harkema

Kathy Krafka Harkema
U.S. Technical Operations Director
Fenestration and Glazing Industry Alliance (FGIA)
kkrafka@fgiaonline.org