



Mr. Doug Anderson
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, N. W.
Washington, DC 20460

November 18, 2008

Doug and Emily:

On behalf of the Aluminum Extruders Council, thank you for the opportunity to comment on the proposed revisions to the Energy Star® program for Windows, Doors, and Skylights. The Aluminum Extruders Council (AEC) has approximately 135 members representing around 75% of all aluminum extrusion lines in the U.S. and Canada, including the frame lineal suppliers for both commercial and residential windows. Over 90% of all commercial fenestration is aluminum framed. Aluminum holds a lower share of the total residential window market, but aluminum is still a dominant material in the south where structural and durability concerns are paramount.

As we have for many years, we will continue to work with EPA and other stakeholders to advance energy efficiency of the fenestration industry while also considering other important factors such as life safety, structural and durability requirements, sustainability, and cost effectiveness. To that end, we offer the following comments on the proposed changes to the Energy Star program:

1. Southern Zone U-factor and SHGC

We are particularly concerned about the proposed 0.40 U-factor in the southern zone. This is a 33% reduction in U-factor in a zone where U-factor has little impact, and SHGC is much more important. This seems out of balance when the U-factor is being reduced by only 10-16% in the north, where U-factor *is* the key factor.

This number would effectively eliminate all aluminum-framed windows in this region, even when using thermally-broken frames. Aluminum framing remains an important technology in this zone. Central and northern housing markets saw a large switch to plastic windows over the last 15-20 years, but there are reasons aluminum has remained important in the south and southwest. Durability and structural performance are especially important in these regions. For example, the intense climate in Phoenix can easily lead to frame distortion and degradation (including increased air infiltration), and the structural and life safety concerns from tropical storm and hurricane events along the Gulf Coast and Florida are obvious. Aluminum framing provides an important way to cost-effectively meet these requirements, while also being a sustainable, green material with proven recyclability. Recyclability and more efficient use of materials reduce the ecological impact of a building. This includes reduced landfill waste, as well as reduced energy and emissions associated with manufacturing, transportation, and disposal.

Furthermore, this 33% drop in U-factor in a warm climate makes little sense when looking at energy savings — it would practically eliminate aluminum windows for only \$5-30 savings per year. EnergyGauge and RESFEN runs in ten cities in IECC Zone 2 show an average energy cost savings of only \$21 per year. This is also consistent with previous analysis by Lawrence Berkeley National Laboratory for Energy Star. In IECC Zone 1, the energy savings are actually zero or negative! How can we justify the exclusion of a product when there are no corresponding energy savings?

We understand the 0.40 U-factor was taken from the prescriptive table in the 2012 IECC for zone 2. However, note that for zone 1 (which is also in the Energy Star southern zone), the code specifically sets *no* requirement for U-factor because it has either little or negative impact on energy performance in this zone. Also, the 2012 IECC has not been adopted in any of these states, and will likely be modified (especially in Florida). The 2012 IECC is not perfect, and one mistake should not be continued into a second mistake.

Furthermore, capping Energy Star at the prescriptive levels in the IECC seems to only think about replacement windows in a big box store. However, Energy Star applies to all windows, and this ignores other methods of code compliance in new construction or large renovations such as area weighting, UA trade-offs, and performance analysis. □ For these cases, equivalent energy performance paths can be extended beyond base prescriptive criteria, and area-weighted averaging for the entire window package can also be allowed (e.g. in Energy Star Homes). This extends range of consumer choice and technology, and encourages flexibility and innovative approaches.

Recommendations:

- a) One simple fix would be to raise the southern U-factor to 0.45-0.50 to bring in more product types, including both operable and fixed aluminum windows with thermal breaks.
- b) Alternately, when looking at overall energy performance, it is clear that more energy savings can be achieved while still allowing all frame types by having a higher U-factor with a lower SHGC. Therefore, another option would be to reinstate the equivalent performance option for the south. Set the base criteria at U 0.40 and SHGC 0.25 consistent with the IECC prescriptive path, but recognize other equivalent options of higher U-factor with lower SHGC. Based on the previous performance option developed for this zone by LBNL:

U-Factor	Max SHGC
< 0.40	0.25
0.41-0.42	0.24
0.43	0.23
0.44-0.45	0.22
0.46	0.21

0.47-0.48	0.20
0.49	0.19
0.50	0.18

It's been stated that equivalent performance options should not be included because the northern zone performance option was not widely used. However, that was purely due to the artificial constraint imposed by the 30/30 tax credit, and had nothing to do with Energy Star. Performance-based criteria are core to one of Energy Star's guiding principles to account for equivalent functionality and performance of different product technologies. While providing the consumer equivalent energy performance, performance-based alternatives also provide manufacturers the ability to offer a wider range of options and innovative new products. Increased options for consumers lead to increased competition and decreased market prices for improved technologies.

- c) For window packages supplied to a single project site, allow compliance based on the area-weighted average of all products. This allows the builder to offer an "Energy Star Package" while including some flexibility between fixed, operable, and unique products.

2. Northern and North-Central Zones

Consistent with the discussion in the previous section, U-factor matters much more in the north than the south. Therefore, it is somewhat surprising that a 33% reduction in U-factor was suggested for the south, but only a 10-16% reduction for the north. Also, minimum SHGC plays a secondary role in the north. Phoenix and Boston are simply not the same. We support performance options in all zones, but if nothing else, a minimum SHGC should be established to ensure ultra-low SHGC glass that is appropriate for the south is not inappropriately installed in the north.

Recommendations:

- a) Adopt a 0.25 U-factor in the northern zone, and perhaps the north-central zone.
- b) Adopt a minimum SHGC in the northern zone. This need not be too aggressive, but just set conservatively to limit ultra-low SHGC glass that harms energy efficiency in the north. For example, SHGC > 0.30.
- c) Do not lower the SHGC any further in the north-central zone. This will *increase* energy use, not decrease it.

3. Environmental and Sustainability Issues

We understand EPA feels that neither they nor the industry are ready to incorporate life-cycle analysis (LCA) into the Energy Star criteria at this time. However, we would encourage EPA to dedicate more resources and effort to ensure it is included in the next round. EPA has the freedom and expertise to think more broadly about environmental and sustainability issues beyond simple energy consumption. LCA is one way to look at the whole picture.

Even in the short term, EPA should avoid unintended consequences that may be detrimental to the environmental interests of U.S. residents. For example, the proposed criteria in the southern zone will push consumers away from green materials like aluminum towards other materials that may have more questionable environmental performance, lack recycling infrastructure, and have lower durability. Regarding durability, IG certification is only one aspect of durability, and does not address long term energy performance of the frame. Frame deformation from thermal cycling can dramatically change air leakage and long term energy performance of the window over time. Regarding recyclability, we previously provided a detailed analysis that showed the embodied energy savings from the use of recycled aluminum can be as significant as the energy savings from proposed reductions in U-factor.¹ Both durability and recycled materials are consistent with the general sustainability goals of EPA, in that more efficient use of materials reduces the ecological impact of a building. This includes reduced landfill waste, as well as reduced energy and emissions associated with manufacturing, transportation, and disposal. Additionally, for certain materials, emissions associated with incineration and/or decomposition are of particular concern. It is clear we need to look more broadly than just U-factor and SHGC, and need to work towards examining all aspects of cradle-to-cradle sustainability.

Recommendations:

- a) Consider the environmental impacts of the proposed changes in each zone.
- b) Consider credits for recycled or biobased content as a short term substitute until LCA is more developed.
- c) Dedicate additional resources to ensure that LCA is technically sound and ready for inclusion in the next round of Energy Star.

¹ See detailed proposal at http://www.energystar.gov/ia/partners/prod_development/archives/downloads/windows_doors/AluminumExtrudersCouncil_15Aug08.pdf

4. Commercial Products

We agree with the scope of the current program: fenestration products installed in lowrise residential buildings, three stories or less. There is still some confusion with architects and specifiers about this, so Energy Star's marketing materials should emphasize the scope for lowrise residential.

As for windows in commercial applications, although many of our members with high performance commercial window technology might potentially benefit from a new program for commercial windows, we agree that commercial products are best addressed through integrated design for the whole building rather than individual components. Trying to come up with a new program that would account for the huge variety of commercial building types, energy profiles, structural performance, and other attributes is daunting. Therefore, we agree with EPA's position that high performance commercial windows are already considered by EPA's Energy Star program for Commercial Buildings, and there is not a need for a new window-specific program.

Thank you for your consideration, and please feel free to contact me at any time if you have any questions or would like further details.

Sincerely,

A handwritten signature in black ink, appearing to read "Thomas D. Culp". The signature is fluid and cursive, with a prominent flourish at the end.

Thomas D. Culp, Ph.D

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