

Response to Comments on the Draft 2 Criteria Analysis Report

ENERGY STAR® for Exterior and Interior Storm Windows

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Background

In January 2016, the U.S. Environmental Protection Agency (EPA) released a Framework Document describing research and laying out the opportunity and rationale for introducing an ENERGY STAR specification for exterior and interior storm windows. EPA requested public comments on the concepts laid out in the Framework Document and, based on comments received and additional analysis, released a proposed Draft 1 of the specification in July 2017. Based on feedback to the Draft 1 specification, EPA released its proposed Draft 2 of the specification in April 2018. EPA requested and received additional public comments on the proposed Draft 2 criteria, which are available for review on the specification development web page:

http://www.energystar.gov/products/spec/exterior_and_interior_storm_panels_version_1_0_pd

EPA's responses to the Draft 2 comments can be found below:

Support for Proposed Specification

Several commenters expressed general support for EPA's proposed Draft 2 specification for storm windows and provided specific reasoning for their support of the specification. The comments included:

- Appreciation for the thorough process that EPA undertook to ensure that the specification for storm windows aligns with the new Standard Operating Procedure for Revising and Establishing an ENERGY STAR Product Specification published in April 2018.
- Agreement with EPA's conclusion that the proposed specification for storm windows meets all of the ENERGY STAR guiding principles.
- Support for the development of an ENERGY STAR specification for storm windows, because such products can deliver cost-effective savings to consumers, particularly low-income households.
- Agreement with EPA that storm windows are ideal for historic homes, which are often required to maintain certain physical features of the building or preserve its aesthetics.

EPA Response:

EPA thanks the commenters for their support of the proposed Draft 2 specification. EPA agrees that an ENERGY STAR specification for storm windows would provide cost-effective energy savings for consumers, differentiate products in the market, and provide benefits to a variety of market sectors.

Consumer Messaging

EPA received several comments regarding its consumer messaging efforts for the proposed storm window specification. While several commenters appreciated EPA's efforts to provide consumers with information on the website in addition to a consumer checklist, other commenters had additional suggestions. EPA addressed the commenters' specific suggestions below:

Consumer Education

One commenter supports EPA's use of the ENERGY STAR public website to provide information about the distinctions between fenestration products and provide homeowners with tools to help determine

the right application for their needs. This educational approach will serve to mitigate any consumer confusion regarding how low-e storm windows compare to replacement windows.

Two commenters suggested that EPA promote low-e storm windows through a consumer education campaign instead of developing an ENERGY STAR specification for storm windows. They also believe that the promotional and educational materials for consumers should go farther to ensure that no consumer will assume that ENERGY STAR storm windows are equivalent to ENERGY STAR windows. One commenter continues to believe that an ENERGY STAR storm window program may lead to confusion between ENERGY STAR certified primary windows and storm windows.

EPA Response:

EPA thanks the commenter for their support and appreciates the other commenters' concerns. As previously stated in response to comments on the Draft 1 specification, EPA believes that research published to date supports the development of an ENERGY STAR specification for this product category. EPA's goal is to help consumers choose a more energy-efficient option when shopping for a particular product category, and EPA's consumer messaging will make clear that storm windows and primary windows are separate product categories. EPA also appreciates the suggestion on its promotional and educational materials and will take them into consideration when developing content for consumers.

[Energy Savings Estimates](#)

Due to the wide range of performance and potential for misunderstandings, one commenter cautioned EPA against developing annual energy savings estimates and posting them on the ENERGY STAR storm windows web page.

EPA Response:

EPA understands that the energy savings from storm windows can vary greatly depending on the assumptions and how consumers use the product. However, EPA provides energy savings estimates for all of its product categories, and believes it is appropriate to provide energy savings estimates for storm windows. EPA will point out that any annual energy savings figures it posts are estimates based on certain average assumptions.

[Shade Operation Guidance](#)

One commenter inquired if EPA will provide guidance on optimizing shade operation, similar to the guidance EPA provides for matching operable storm windows to operable windows.

EPA Response:

EPA thanks the commenter for raising the issue. EPA currently provides general guidance about blinds and shades on the ENERGY STAR website, and will consider additional guidance specific to storm windows. EPA understands that consumers use their shading devices in a variety of ways to maximize their comfort and privacy. A D+R International study¹ concluded that consumer preferences for shading tend to align with optimal energy performance.

¹ Bickel, S., E. Phan-Gruber, and S. Christie. 2013. *Residential Windows and Window Coverings: A Detailed View of the Installed Base and User Behavior*. Silver Spring, MD: D+R International on behalf of U.S Department of Energy.

Consumer Checklist

Several commenters continue to support the inclusion of a consumer checklist as part of the storm window program, and agreed that it is an important means for consumers to better understand the product and what aspects should be taken into account when considering storm windows as an option. Commenters also suggested additional revisions to the new consumer checklist released alongside the Draft 2 specification. Specific suggestions included:

- In response to the question “Are your current windows difficult to clean?,” change the second sentence to “Consider storm windows with features designed to make cleaning easy,” since even non-operable storm windows can be easy to clean if designed with this in mind.
- State that potential storm window customers should first give careful consideration to replacing the existing window with an ENERGY STAR certified window for long-term, reliable energy cost savings, comfort and other benefits.
- Explain that unlike ENERGY STAR windows, the benefits from ENERGY STAR storm windows depends heavily on the existing window and its installation.
- Delete the guidance on using storm windows for noise reduction from the consumer checklist since it has nothing to do with energy efficiency.
- Delete the comment that it is easier to install storm windows than replacement windows, since professional installation should be encouraged in both cases.
- Revise the question and response to “Are your current windows still in good condition?” to ensure consideration is given to repairing a window that is not operating properly.
- Revise the question and response to “Are your current windows single pane or double pane with clear (not low-e) glass?” to communicate that energy savings will differ based on the characteristics of the primary window and the climate zone.
- Revising the answer to the question “Do your current windows open and close?” to provide more clarity for consumers on applicable building codes and the importance of emergency and escape rescue windows.

EPA Response:

EPA thanks the commenters for their support and for the suggested additions and revisions to the consumer checklist. EPA has considered all of this input in its revised consumer checklist, included in Appendix A of this document.

EPA would also like to respond to the suggestions that were not adopted in the new version of the consumer checklist:

- Several commenters requested the consumer checklist further promote and differentiate ENERGY STAR windows over storm windows. However, EPA notes that the consumer checklist is intended to provide information to consumers that are already considering storm windows, and EPA does not believe the consumer checklist is the proper forum to compare windows to storm windows, as this may confuse consumers.
- While noise reduction is not directly related to energy efficiency, it is an added benefit that storm windows can provide and is relevant to the consumer decision-making process. EPA believes the consumer checklist is an appropriate place to mention this feature.

- EPA does not believe mentioning that storm windows provide more energy savings in northern climate zones compared with southern climate zones is relevant to a consumer's purchasing decision because storm windows will only be installed in one climate zone. The relevant comparison, regardless of climate zone, is the savings for ENERGY STAR certified storm windows compared to non-certified clear glass storm windows.

ENERGY STAR Label

Two commenters support the changes to the proposed labels in Draft 2. They specifically applauded EPA's decision to include a climate map on the label and not require performance information be displayed on the product. One commenter believes the change to the proposed labels in Draft 2 will help alleviate any potential confusion between a storm window program and the existing program for windows, doors, and skylights.

Another commenter believes that labels 1 and 2 in the Draft 2 specification will be confusing when two Zone 4 compliant products (one as high solar gain vs. one with low solar gain) are displayed side by side. If EPA is not going to eliminate solar criteria in the Northern zone, the commenter suggested EPA consider adding a third label specifically for climate zone 4.

Two commenters stated that the certified label should be required to show the actual certified performance values for the specific product. One commenter sees no good reason not to include this information, and believes it will help consumers make the best and most informed energy efficiency decision. Another commenter stated that it is a disservice to consumers to force them to go the ENERGY STAR storm window web page to search for this information when making a purchasing decision.

EPA Response:

EPA thanks the commenters who support the changes to the proposed labels in Draft 2.

EPA appreciates the other commenter's concern about climate zone 4, but does not believe adding a third label specifically for climate zone 4 is necessary. There is no product under the proposed criteria in Draft 2 that only meets the criteria in climate zone 4, making a label exclusively for climate zone 4 impossible. EPA permits both high and low solar gain products in climate zone 4 because both options are cost-effective. EPA plans to provide guidance to consumers on what to consider when choosing between high and low solar gain storm windows.

EPA also appreciates the concerns regarding including certified performance on the label. The ENERGY STAR program, across all product categories, does not require that the actual certified performance values on the label. ENERGY STAR is designed to be a binary choice.

Definitions

One commenter provided feedback related to the definitions used in the Draft 2 specification, including:

- Change the definition in draft 2 for air leakage to "A measure of the rate of air passing through a material or assembly in the presence of an applied pressure difference, expressed in units of cfm/ft² (L/s/m²)."

- Change the definition in draft 2 for emissivity to "The relative ability of a surface to reflect or emit heat by radiation. Emissivity ranges from 0.00 to 1.00."
- Change the definition in draft 2 for solar transmittance to "The ratio of transmitted radiant flux in the solar spectrum (300nm to 2500nm) to incident radiant flux in the solar spectrum."

EPA Response:

EPA thanks the commenter for their suggestions and will revise the definitions for air leakage, emissivity, and solar transmittance accordingly. By aligning its definitions with AERC, EPA will ensure consistency across the market of the relevant metrics used to measure storm window energy performance.

Scope

One commenter appreciated the clarification that storm doors are excluded from the Draft 2 specification and encouraged EPA to consider adding storm doors along with other window attachment categories in the near future.

EPA Response:

EPA thanks the commenter for their support and their recommendation that EPA consider adding storm doors along with other window attachment categories in the near future.

Additional Criteria Analysis

EPA received positive feedback on the criteria analysis from several stakeholders, as well as a number of specific suggestions that are addressed below.

Minimum Solar Transmittance (Tsol)

One commenter suggested that the modeling shortcut of using equal window area on all orientations is reasonable for determining average energy performance, but fails on 2 of 4 orientations when used to determine a minimum solar gain. For ENERGY STAR to deem a minimum solar transmittance (Tsol) cost-effective, the commenter believes the analysis must be conducted for an asymmetric, west-dominated building.

EPA Response:

EPA thanks the commenter for raising the issue of window orientation. EPA modeled additional orientation scenarios in select cities in IECC zones 4, 5, and 6. The results in Figure 1 below show that high Tsol remains cost-effective for homes with east/west and west-dominant orientations in these climate zones. EPA also found that the payback for low Tsol products for east/west and west dominated orientations was similar to high Tsol products in the North-Central Zone (zone 4). Low Tsol products remain less cost-effective than high Tsol products in zones 5 and 6. Based on this analysis, and the broad support from other stakeholders for the proposed specification, EPA believes that a minimum solar transmittance for the northern climate zone is appropriate and justified.

Table 1: Payback Results for select cities in IECC climates zones 4-6 and window orientation:

Location and Climate Zone		Window Type	Payback for low-E (Years)		
			East-West	West	Equal
New York, NY	4	0.20 emissivity / 0.77 T _{sol}	7.9	7.9	8.9
		0.17 emissivity / 0.46 T _{sol}	7.8	7.1	10.3
Seattle, WA	4 *	0.20 emissivity / 0.77 T _{sol}	11.2	10.8	12.3
		0.17 emissivity / 0.46 T _{sol}	81.0	40.9	893.5
Washington, DC	4	0.20 emissivity / 0.77 T _{sol}	8.6	8.4	9.9
		0.17 emissivity / 0.46 T _{sol}	10.5	9.8	14.2
Kansas City, MO	4	0.20 emissivity / 0.77 T _{sol}	9.0	8.9	10.3
		0.17 emissivity / 0.46 T _{sol}	8.2	7.7	10.7
Raleigh, NC	4	0.20 emissivity / 0.77 T _{sol}	11.0	10.9	12.5
		0.17 emissivity / 0.46 T _{sol}	12.0	10.6	16.8
Boston, MA	5	0.20 emissivity / 0.77 T _{sol}	6.6	6.4	7.2
		0.17 emissivity / 0.46 T _{sol}	14.3	12.1	21.9
Chicago, IL	5	0.20 emissivity / 0.77 T _{sol}	10.3	10.2	11.4
		0.17 emissivity / 0.46 T _{sol}	11.0	11.4	13.7
Pittsburgh, PA	5	0.20 emissivity / 0.77 T _{sol}	8.2	7.8	8.9
		0.17 emissivity / 0.46 T _{sol}	10.8	9.8	13.1
Denver, CO	5	0.20 emissivity / 0.77 T _{sol}	11.5	11.2	13.3
		0.17 emissivity / 0.46 T _{sol}	13.7	12.8	21.0
Minneapolis, MN	6	0.20 emissivity / 0.77 T _{sol}	8.6	8.5	9.5
		0.17 emissivity / 0.46 T _{sol}	10.8	9.9	13.6
Burlington, VT	6	0.20 emissivity / 0.77 T _{sol}	5.3	5.1	5.8
		0.17 emissivity / 0.46 T _{sol}	11.8	9.8	16.4

***Note:** Seattle is in the ENERGY STAR Northern Climate Zone with a proposed T_{sol} requirement of greater than 0.55.

Fan Energy in RESFEN

One commenter pointed out that the RESFEN software EPA used in its analysis uses the DOE-2 analysis engine, which is no longer supported by DOE and was developed over 20 years before Energy Plus (the software the U.S. Department of Energy (DOE) and Pacific Northwest National Labs (PNNL) currently use). Therefore, the commenter asked that all storm window program development be halted until appropriate analysis can be conducted. As an example, the commenter noted that the RESFEN energy modeling software does not account for fan energy, which could be a significant part of HVAC energy use. The commenter further suggested that the inclusion of fan energy would reduce the energy benefit of passive solar heating from low-e glass with high solar transmittance.

EPA Response:

EPA thanks the commenter for their suggestion. EPA used RESFEN powered by DOE-2 for its analysis under this proposed specification, which is the only publically available modeling tool for fenestration energy consumption. While DOE and some national labs have begun using the Energy Plus model for

research purposes, RESFEN powered by DOE-2 is widely used by industry stakeholders. In the future, EPA will consider using updated software if available and demonstrated to be more accurate. EPA believes that the inclusion of fan energy would not change the conclusion that low-e glass with high solar transmittance is cost-effective in the Northern Climate Zone. While passive solar heating increases fan energy use in the cooling season, it also reduces fan energy use in forced air heating systems during the heating season. In addition, including fan energy in the equation would increase the net energy use of the system and likely increase net energy savings, resulting in improved cost-effectiveness.

[Payback Analysis](#)

One commenter disagreed with EPA's use of "average" electricity prices in its payback analysis since electricity prices are highly dependent on fuel prices, which can be volatile between seasons. They suggested using the appropriate winter fuel prices for heating costs and summer electric prices for cooling costs.

EPA Response:

EPA thanks the commenter for raising this issue. EPA used the same energy price assumptions that were used by PNNL². In order to confirm that these price estimates were appropriate, EPA calculated the average summer (June-August) and winter (December-February) electricity and natural gas prices from 2011-2018. EPA concluded that the energy prices assumed in its analysis reflect the appropriate prices for heating and cooling seasons.

[Performance Metrics](#)

Several commenters expressed support for the metrics that EPA proposed in the Draft 2 specification. One commenter appreciated EPA's willingness to consider alternative performance metrics such as the AERC Energy Performance (EP) ratings, since multiple eligibility paths would offer manufacturers flexibility to choose one that aligns best with their business. Another commenter supported the certification criteria in Draft 2, but encouraged EPA to consider adopting AERC's EP metric in the next major specification revision.

EPA Response:

EPA thanks the commenters for their support and suggestions. EPA plans to consider AERC's Energy Performance metric once AERC has completed development of its rating and certification process and an appropriate comparative analysis is provided by stakeholders.

[Qualification Criteria](#)

EPA received several comments in support of qualification criteria proposed in the Draft 2 specification, as well as a number of concerns and suggestions. EPA has addressed the specific stakeholder comments below.

² Culp, Thomas D., & Cort, Katherine A. *Energy Savings of Low-E Storm Windows and Panels across US Climate Zones*. United States.

Emissivity

Several commenters expressed support for the proposed criteria based on the additional analysis of emissivity levels conducted for Draft 2.

One commenter asked if an emissivity criteria of 0.22, while cost-effective, is stringent enough. If more than one value is cost-effective enough, as EPA claims, the commenter suggests EPA should set the criteria at a level that saves more energy (at least set a lower emissivity in the northern climate zone).

Another commenter pointed out that the additional analysis EPA performed for Draft 2 only evaluated low-e storm windows installed over single-pane wood framed windows and excluded double-paned wood and metal-framed windows, which were included in the PNNL analysis EPA has relied upon to justify cost effectiveness. While further analysis that includes double-pane wood and metal framed windows may show low-e windows with emissivity values up to 0.22 are cost effective in all climate zones, the commenter does not believe EPA should make that determination until it has conducted this additional analysis.

EPA Response:

EPA thanks the commenters for their support of the Draft 2 criteria for emissivity, as well as their concerns.

Stringency is not the only factor that EPA considers when proposing an ENERGY STAR specification. In this case, EPA balanced cost-effectiveness with broad product availability and existing market signals. The proposed emissivity level of 0.22 allows manufacturers to choose between a variety of low-e glass options and aligns the criteria with existing regional storm window programs. EPA will continue to evaluate the market for storm windows and plans to revisit the criteria in the future as needed.

The results of EPA's analysis of additional glass options showed that there was not a significant difference in cost-effectiveness between emissivity of 0.22 and 0.15 for single-pane wood frame primary windows. As suggested by the commenter, EPA conducted additional RESFEN modeling to evaluate the payback for low-emissivity storm windows installed over double-pane clear-glass primary windows and found that the difference in payback between 0.22 and 0.15 was greater than the result for single-pane windows. On average, the payback was 5.4 years longer for 0.22 compared to 0.15 over double-pane primary windows, but only 1 year longer over single-pane primary windows (see table below for summary results). In general, the results for double-pane primary windows are consistent with PNNL's previous analysis. Despite the longer payback differential, EPA believes a proposed emissivity criterion of 0.22 is justified because it is still cost-effective for the consumer, allows a greater variety of glass options for manufacturers to select, and aligns with regional programs. EPA will reevaluate the specification after it becomes effective to determine if increased stringency is justified.

Table 2: Payback for variety of low-e glass options over single and double-pane wood frame windows in climate zones 3-6.

IECC Zone	Zone 6		Zone 5		Zone 4		Zone 3	
	Single	Double	Single	Double	Single	Double	Single	Double
Emissivity 0.15 Tsol 0.69	7.9	15.2	9.8	18.1	9.7	20.5	10.6	17.5
Emissivity 0.20 Tsol 0.77	7.7	15.1	9.9	18.8	10.3	20.8	13.8	27.2
Emissivity 0.22 Tsol 0.69	8.7	19.7	10.9	23.0	10.8	26.9	11.8	19.8
Emissivity 0.17 Tsol 0.46	13.3	-15.4	14.7	24.0	11.5	19.6	7.7	12.7

Air Leakage

One commenter suggested that studies cited by EPA justify more stringent air leakage criteria and EPA provided no justification for not proposing more stringent criteria. Although air leakage is not being used to justify the program, the commenter stated that this is not a sufficient reason not to require good performance. They are concerned that the proposed air leakage maximum is far worse than it is for ENERGY STAR windows. The commenter encourages EPA to at least require actual test performance values for air leakage be collected so that EPA can re-evaluate the criteria early on.

EPA Response:

EPA thanks the commenter for raising this issue. AERC’s air leakage studies demonstrated that air leakage performance may be possible; however, AERC did not test a broad range of products or establish a market baseline for air leakage. EPA’s proposed criteria are intended to establish air leakage as an initial performance metric for this product category without making the criteria overly restrictive. EPA will collect actual air leakage data as part of the certification process and will reevaluate the criteria as needed based on the performance of certified products.

Solar Transmittance

Several commenters expressed support for the proposed criteria based on the additional analysis conducted for Draft 2 regarding solar transmittance in different regions.

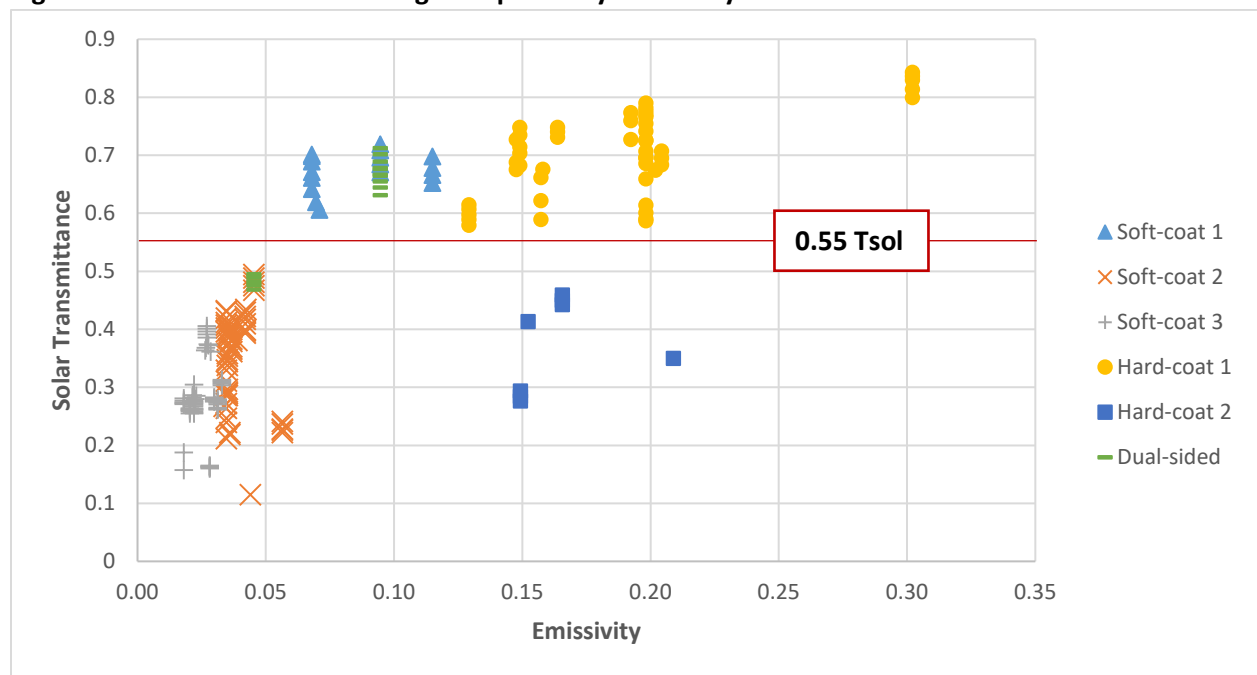
One commenter is concerned that the ENERGY STAR storm windows criteria are not sufficiently rigorous in comparison to ENERGY STAR windows. The commenter suggested that, if EPA is not going to eliminate climate zones, then EPA should provide greater differentiation between the two zones than simply using a solar transmittance value of 0.55. The commenter does not believe that calling 0.54 solar transmittance low solar gain and 0.56 solar transmittance high solar gain makes sense. The commenter also wondered why EPA used 0.46 solar transmittance in its analysis if it is going to set the criteria at 0.55 in the southern zone. They cited earlier EPA analysis that suggested that products with much lower

solar transmittance than 0.55 are available on the market, and asked if EPA examined whether additional cost-effective energy savings could be obtained from lower SHGCs than 0.55 or 0.46. Similarly, the commenter wondered why EPA used 0.69 and higher solar transmittance in its analysis if it is going to set the criteria at 0.55 in the northern zone. If the northern zone is to be limited by only high solar transmittance, they suggest at least using 0.65 as the minimum criteria.

EPA Response:

EPA thanks the commenters for their support of the proposed criteria for solar transmittance in Draft 2. The proposed solar transmittance criteria for high and low solar transmittance represented a natural break in the performance distribution of products listed in the IGDB (See Figure 1). There are no applicable glazing options currently certified in the IGDB between 0.46 and 0.58 T_{sol}. In addition, the proposed requirement for the northern zone matches the current RTF regional specification. As previously stated, EPA believes that reinforcing existing market signals for this initial product category specification is beneficial to the market.

Figure 1: Distribution of certified glass options by emissivity and solar transmittance



Interior Storm Windows in the Southern and South-Central Climate Zones

Several commenters appreciated EPA conducting additional analysis on interior storm windows in the Southern and South-Central climate zones and agreed with the conclusions. One commenter suggested it will provide consumers in these regions with more energy-saving options than in Draft 1.

EPA Response:

EPA thanks the commenters for their support of the additional analysis conducted on interior storm windows in the Southern and South-Central climate zones in Draft 2.

Differentiation among Low-E Storm Windows

One commenter suggested that the proposed criteria would only differentiate between low-e storm windows and clear glass storm windows. The commenter suggested that the ENERGY STAR program for storm windows must differentiate better performing low-e storm windows to be valuable to consumers. They do not believe an ENERGY STAR specification is needed strictly to help consumers understand the difference between storm windows with low-e glass and storm windows with clear glass.

EPA Response:

EPA thanks the commenter for their concern. The purpose of the ENERGY STAR program is to help consumers identify more energy-efficient products within a given product category. The research that EPA cited in the CAR and the additional analysis performed in response to comments confirm EPA's conclusion that the most appropriate specification level is one that differentiates storm windows with low-e glass from storm windows with clear glass. EPA concluded that the difference in payback between 0.15 emissivity and 0.22 emissivity was not significant enough to justify more stringent criteria for an initial product specification. In addition, EPA found that a low-e glass option with higher emissivity may outperform an option with lower emissivity, depending on the solar transmittance of the two options, meaning that a lower emissivity is not automatically better. In the future, EPA plans to evaluate the criteria to determine whether further differentiation of energy-efficient products in the category is warranted.

Future Products

Another commenter feels that if there is to be an ENERGY STAR storm window program, the criteria should be developed so as to not be a barrier to future innovation and improved efficiency in products. They cited the example of an insulating glass unit storm product that could be more efficient. No method has been established under the current criteria to permit this product to comply. If ENERGY STAR does not provide a means to recognize this product, it is less likely the product will ever be produced.

EPA Response:

EPA thanks the commenter for the feedback. EPA bases its proposed specifications on products currently available in the market. EPA will consider alternative products and alternative certification methods as they become available in the market.

Safety / Structural

One commenter encouraged EPA to require safety and structural certification as part of the ENERGY STAR specification. The commenter stated that most residential manufacturers use ASTM E1300 certification for safety and wind resistance and requested that EPA reconsider their decision to not require ASTM E1300 based on the incorrect assumption that the standard is not widely used. They stress that glazing thickness affects energy performance, and therefore EPA should not state the standard is not related to energy performance. In addition, the commenter states that building codes are clear that after-market products must comply when the use of tempered glass is required. The commenter also states that EPA must require a third-party drop test report because drop testing is a critical criteria that has been used in the industry for over 40 years, and it is not safe to have unbalanced products endorsed by EPA. The commenter concludes that a consumer checklist is not a sufficient safety protocol.

Another commenter agreed with EPA's decision not to require eligibility requirements unrelated to energy performance, stating that those requirements would increase product costs unnecessarily.

EPA Response:

EPA thanks the commenters for their suggestions. EPA continues to believe that additional third-party certification around safety and structural features (including) is not necessary to include in the ENERGY STAR specification. While EPA agrees that glass thickness effects energy performance, the energy performance is already captured by emissivity and solar transmittance. As with other fenestration products that EPA certifies, market forces and local regulations encourage manufacturers to use safety and structural certification without the ENERGY STAR program requiring that certification. EPA understands that installation instructions are not a safety protocol; however, the instructions reinforce the need to follow local building codes.

Third-Party Certification

Several stakeholders provided comments on the third-party certification process as it relates to the proposed Draft 2 specification. EPA thanks the commenters for their input and has addressed their comments below.

Support for Proposal

Two commenters support the added language in Draft 2 with respect to certification and testing, stating that it further bolsters the ability of the ENERGY STAR label to serve as a differentiator for quality in the market.

EPA Response:

EPA thanks the commenters for their support of the added language in Draft 2 regarding certification and testing.

Certification Expiration

One commenter asked if certification and test results ever expire, and if so, under what conditions.

EPA Response:

EPA thanks the commenter for raising this question. ENERGY STAR provides minimum guidance on certification requirements, with the specifics of certification procedures and expirations set by individual participating certification bodies.

Product Listing Guidance

One commenter suggested that, because EPA intends to have a consumer accessible QPL for storm windows, EPA should advise certification bodies on how product models (or defining characteristics) should be listed on the Qualified Product List. This will create greater consistency among certification bodies about how products should be represented, in addition to helping consumers more easily identify ENERGY STAR certified storm window models that meet their needs.

EPA Response:

EPA thanks the commenter for raising their concern and providing feedback. EPA will advise certification bodies on how product models should be listed.

Low-e Characteristics

One commenter stated that the testing approach prescribed for low-e characteristics is unclear. It does not seem the specific storm product is actually being tested for its properties, but rather the test result is a comparison to a sample glass product to determine whether there is a match. The commenter would like further clarification on why this approach was chosen.

EPA Response:

EPA thanks the commenter for requesting clarification. Certification bodies may certify storm window products by using commercially-available handheld equipment to compare the properties of the glass used in the storm window to the properties of a sample glass product provided by the glazing manufacturer. This approach was chosen because glass is certified for the IGDB using a round robin Inter-laboratory comparison, which provides a rigorous confirmation of the energy performance properties, and is an accepted industry-standard certification process. Certification Bodies will be required to provide by EPA with the specific approach labs will use for their comparison procedures.

Plant Inspections

One commenter believes plant inspections should be a mandatory part of the certification process, stating that there is no other way to provide a reasonable assurance that the products actually meet the performance claimed by the manufacturer. After-market verification testing cannot provide sufficient assurance alone.

EPA Response:

EPA thanks the commenter for their suggestion. ENERGY STAR requires certification and verification based on product testing, not on plant inspections. Certification bodies may independently choose to require plant inspections or other requirements as part of their own certification and verification procedures.

Appendix A – Consumer Checklist

Consumer Checklist for ENERGY STAR Storm Windows

Are ENERGY STAR Certified Storm Windows right for you?

Note: EPA plans to make this consumer checklist available on the ENERGY STAR website to help consumers make informed decisions about purchasing low-e storm windows. EPA has incorporated suggestions from stakeholders on the first draft of the consumer checklist, which was released with the Draft 1 specification.

ENERGY STAR certified low-e storm windows can be an affordable way to help reduce energy costs.

What is a “low-e” storm window? A storm window with low-e glass has a microscopically thin, almost invisible, durable coating that reduces heat loss through the window glass when it is cold outside, saving on heating bills. Some low-e glass also has a low solar transmittance (Tsol) rating that blocks heat coming in from the outside and can help to keep your house cooler in the summer, saving on air conditioning bills. Some types of durable plastic storm windows may also have low-e characteristics.

Why are ENERGY STAR certified storm windows better than other storm windows? The ENERGY STAR label makes it easy to select low-e storm windows that are designed to deliver cost-effective energy savings in your area. ENERGY STAR certified storm windows are tested and certified to meet the program requirements and are subject to additional routine performance verification testing.

Which ENERGY STAR certified storm windows are best for my location? The climate where you live affects which low-e storm window product is best in your location. Therefore, every ENERGY STAR certified storm window has a label with a map to indicate which part of the country that product is designed for. Look for the label to determine whether the storm windows you are considering are ENERGY STAR certified in your location.

How much energy can I save with ENERGY STAR certified storm windows? Your energy savings can vary greatly, depending on where you live, the size and efficiency of your home, and the performance of your existing window system. You can find average annual energy cost savings estimates for typical homes on the ENERGY STAR storm windows web page.

How do ENERGY STAR certified storm windows differ from ENERGY STAR certified windows? Storm windows are installed as attachments to existing primary windows. Exterior storm windows are installed on the outside of your primary windows, and interior storm windows are installed on the inside of your primary windows. On the other hand, ENERGY STAR certified primary windows have a full frame and at least two layers of glass, which may also have low-e coatings. Consumers completely replace their existing primary windows when installing ENERGY STAR certified primary windows. See the web page for ENERGY STAR certified windows, doors and skylights for more information about the benefits of full window replacement.

What else should I consider in my purchasing decision?

- ✓ **Are your current windows still in good condition?** Storm windows work best when installed over working primary windows that are in good condition. If your current windows are rotted, not operating properly, or damaged beyond reasonable repair, adding low-e storm windows may not be appropriate. Instead, consider replacing them with new ENERGY STAR certified windows.
- ✓ **Are your current windows single-pane or double-pane with clear (not low-e) glass?** Low-e storm windows offer the most savings potential when installed over single-pane windows that do not have low-e glass. You will also save energy with low-e storm windows installed over double-pane windows that have clear glass, but you should expect a longer payback period.
- ✓ **Do your current windows have metal frames?** It is very important to use thermal breaks (small non-metal separators) when installing ENERGY STAR certified primary windows over metal-framed primary windows. Storm windows typically have aluminum frames, and this can conduct outside heat or cold through the metal frame of the primary window, diminishing the expected comfort and energy savings.
- ✓ **Is your home historic?** Low-e storm windows can be a good option if you live in a neighborhood with historic preservation requirements or you like the historic look of your original windows. Check to make sure that the historic preservation requirements in your neighborhood (if any) allow the use of storm windows.
- ✓ **Are your current windows tinted?** If your current windows already have tinted glass, adding a low-e storm window may reduce the visible light transmitted through the window, making them even darker. Some people prefer tinted glass to reduce glare, while others prefer more daylight.
- ✓ **Do your current windows open and close?** Interior and exterior storm windows are available in both operable and fixed models. Choose a storm window that matches the operability of your current windows. This is especially important when installing storm windows in bedrooms and other places where emergency escape and rescue windows may be needed or are required by building codes.
- ✓ **Are your current windows difficult to clean?** Adding storm windows to older, difficult-to-open windows may make cleaning windows more difficult. Consider storm windows with features designed to make cleaning easy.
- ✓ **Is your neighborhood or street noisy?** Adding storm windows can be an inexpensive way to reduce noise from outside, making your home somewhat quieter.
- ✓ **Do I need my storm windows to have safety glass?** Safety glass is stronger than regular glass and is designed to shatter into little pieces (instead of larger, more dangerous shards) when broken. There may be state or local residential building codes that require safety glass in storm-prone regions or more accident-prone locations in the home (near stairs, for example). Check your local building code

requirements for more information.

- ✓ **Do you live in a place where the temperature gets extremely hot (above 115 degrees Fahrenheit)?**
In very hot climates and under certain conditions, low-e storm windows can trap heat between the original window and the storm window. If you already have double-pane or low-e coated windows **and** you live in a hot, sunny climate where the temperature frequently goes above 115 degrees Fahrenheit, you should consider awnings, solar screens or full replacement with ENERGY STAR certified low-SHGC windows as an alternative to storm windows.

- ✓ **Should you have a professional install your ENERGY STAR certified storm windows?** If your ENERGY STAR storm windows are not installed correctly, you may not realize all of the possible energy savings benefits. Professional installers can correctly install storm windows and inform you of local building code requirements and other considerations. All ENERGY STAR storm windows are required to include (or have a web link to) detailed installation instructions.