January 30, 2017

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Brian Booher
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RE: ENERGY STAR for Exterior and Interior Storm Panels
12/30/16 Response by Doug Anderson to AAMA letter of 12/19/16

Dear Doug:

Thank you for your email response of 12/30/16 to AAMA's letter of 12/19/16 regarding the proposed ENERGY STAR storm panel program. In that email you asked AAMA to provide specific case studies or documented events showing safety concerns related to currently sold after-market storm window products; since the EPA does not have such documented evidence or independent statistics at this time. You also asked AAMA to provide the inputs used in the DOE Windows Thermal Analysis software for the results contained in our 12/19/16 letter.

Evidence of Safety Concerns

AAMA researched the Consumer Product Safety Commission (CPSC) – National Electronic Injury Surveillance System (NEISS) for storm panel injuries for a ten-year period (2006 through 2015). The NEISS database Product Code for Storm Windows is 1826 (from the NEISS Coding Manual). The inquiries included injuries related to storm panels. The total number of injuries related to storm window breakage using the NEISS sample of 100 hospitals is 56 over a ten-year period. The reports are attached.

Please see the description of how NEISS data is collected and represented in *NEISS A Tool for Researchers* (March, 2000)[i]

AAMA also contacted some experts in the field and their responses revealed the same concerns that AAMA has previously expressed. Namely, that the installation of after-market storm window products must:

- Meet structural requirements associated with wind and seismic loads; i.e. glazing thickness.
- Address potential issues with condensation as indicated by the climate.
- Recognize the potential damage to prime windows.
- Follow current building code guidance for the safety glazing requirements.

As suggested in your email, we accept your offer to contact storm window manufacturers to provide documentation on any safety concerns they might be aware of.

The federal safety glazing requirements in 16 CFR 1201.1 *Safety Standard for Architectural Glazing Materials* are referenced and required in current building codes. This standard includes testing to ANSI Z97.1-2015 *Safety Glazing Materials Used In Buildings - Safety Performance Specifications And Methods Of Test* which sets forth the testing requirements that must be met when safety glazing is required in building code.

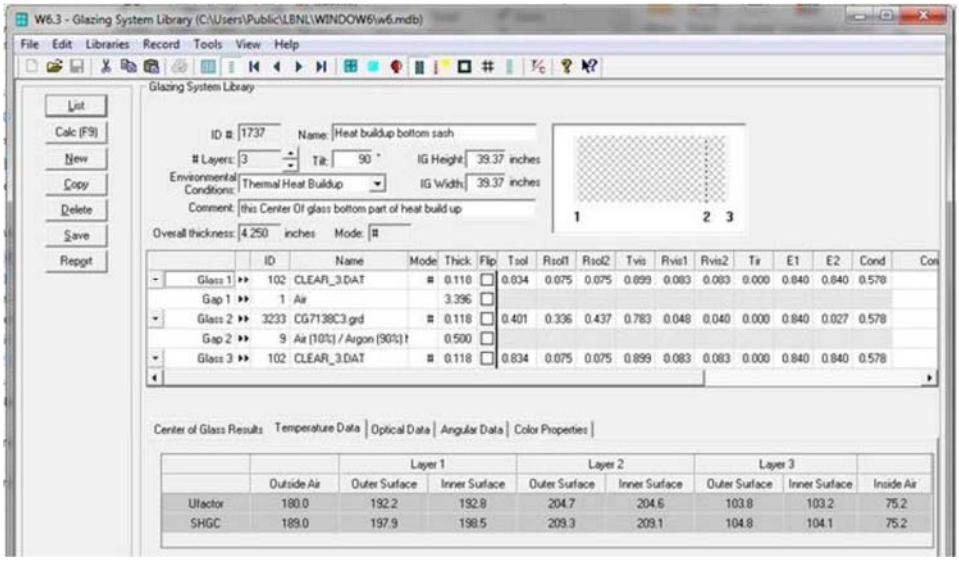
As mentioned previously, building code enforcement tends to be inconsistent for after-market products, as they are frequently used in applications where a building permit is not required. EPA's mission, as stated on its website is *"to protect human health and the environment."* For the same reasons that EPA included guidance for proper management of lead paint in the Windows, Doors and Skylights program, AAMA requests that EPA include appropriate safety provisions in the ENERGY STAR storm panel program. Doing so would represent a significant step in alleviating enforcement inconsistencies. Installing a storm window should not expose occupants, bystanders or the building itself to increased risks.

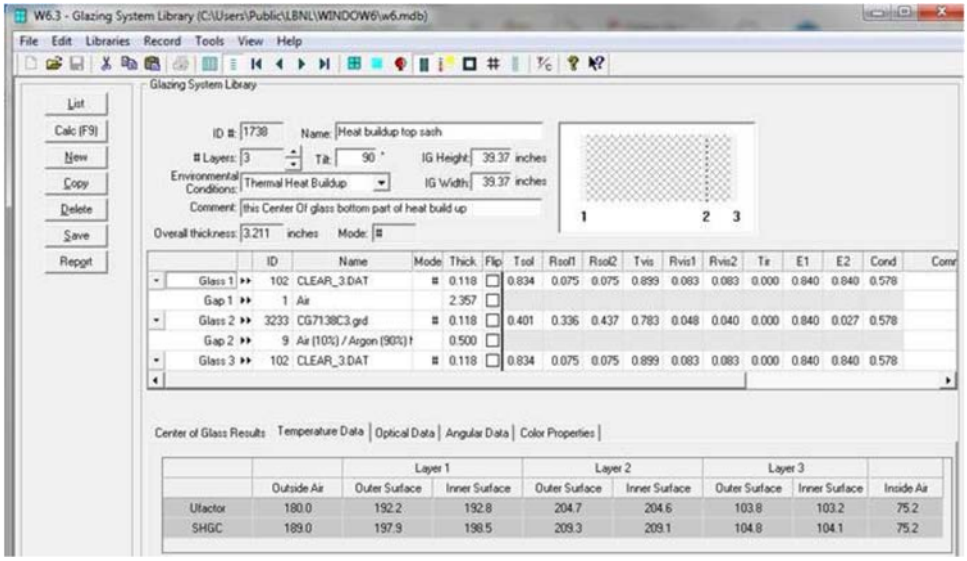
DOE Windows Thermal Analysis Software Inputs

WINDOW 6.3 was used to simulate a theoretical triple pane unit matching the glass spacing and glass makeup of an example common prime window with storm product attached on the outside. The below shown screen shots are the two different calculations that would represent the top sash and bottom sash for more accuracy in a common double hung configuration.

A physical test was performed in the lab. The values used for the simulation are based on actual numbers from that physical test, as shown in the screenshots below. A standard ASTM black plate was used to control the infrared to S. West USA conditions at 180 degree F maximum solar. Outside air is the temperature of the surface of the storm window. Layer 1 is the storm glass, Layer 2 is the outside glass of the window IG's, and Layer 3 is the inner glass panel of the IG. Inside air is the temperature of the test lab where the physical test was performed.

The simulation was kept simple so anyone can easily duplicate the output using WINDOW 6.3 software. The estimates and calculations are conservative due to the simple tools representing glass temperature. Note that a solar absorbing dark colored non-spectral surface will have a higher temperature than the 204.6 degrees F shown.





These results stress the importance of considering heat as a cause of potential glass breakage in prime windows when after-market storm products are installed.

Simply stated, spontaneous glass breakage can be caused by thermal stress. Thermally induced stresses in glass are caused by a positive temperature difference between the center and edge of the glass lite, meaning the former is hotter than the latter. The expansion of the heated glass center results in tensile stress at the edge of the glass. If the thermally induced stress exceeds the edge strength of the glass, breakage occurs.[ii]

AAMA would additionally like to point out the guidance provided by the U.S. Department of Housing and Urban Development ResearchWorks Volume 6, Number 5 (May 2009) publication *Storm Windows Can Make a Difference*, located here:
https://archives.huduser.gov/periodicals/ResearchWorks/may_09/RW_vol6num5t2.html

It points readers to an earlier HUD publication: *Windows & Doors*, Volume 4 of *The Rehab Guide* published by HUD's Office of Policy Development and Research (May 1999), a guidebook which acknowledges known issues related to installing storm windows. The guidebook is available from the HUD website here
https://www.huduser.gov/portal/publications/destech/doors.html

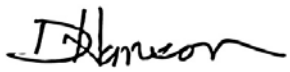
Excerpts from Chapter 5 *Storm Windows and Screens* are provided for your convenience reference:

> "Conventional storm windows are typically not suitable for installation on vinyl prime units because the elevated temperatures between the units escalate the expansion and contraction of the frames."
>
> "The performance of a storm unit should be evaluated as a complete assembly. The design and material of the frame, its assembly, the installation, and (perhaps most importantly) the weather-stripping details all contribute to performance, which can vary dramatically even among models from the same manufacturer. An AAMA certified manufacturer or NFRC program participant should be able to provide the performance rating for the full product line."
>
> "The addition of a storm unit will generally increase humidity and temperatures between units, which may damage either vinyl or wood window frames."

Even though prime windows and current after-market storm window products have certainly improved since the writing of the above-referenced documents, the effect of after-market storm window products on prime windows, as pointed out by HUD, are still valid and should be considered.

AAMA appreciates the continuing dialog with the EPA on glazing safety, heat load, and consumer education. We look forward to being informed of any after-market storm panel manufacturer input for heat buildup and safety concerns. Please do not hesitate to contact us with any further questions or comments.

Sincerely,



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Enclosure

[i] https://www.cpsc.gov/s3fs-public/pdfs/blk_media_2000d015.pdf

[ii] http://www.constructionspecifier.com/spontaneous-glass-breakage-why-it-happens-and-what-to-do-about-it/