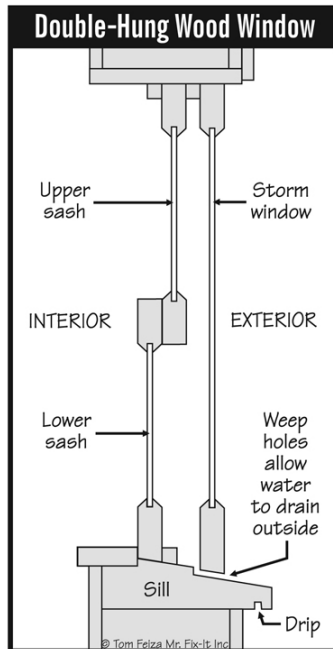


## Indow Response to EPA proposal for Energy Star certification for Exterior and Interior Storm Panels

### Background

Interior and Exterior Storm Panels function very differently due to their respective locations relative to primary fenestration and how they act as a vapor and air barriers.



5010

Exterior storm windows are designed to allow sufficient airflow from the interior of the structure to the outside environment to allow water vapor laden warm air to escape without condensation. Due to the inevitable build up of condensation, exterior storm windows typically feature weep holes to allow pooling water to escape. Thus, exterior storm windows allow relatively high levels of air infiltration *by design*. Due to the difficulty of installing and removing exterior storm windows, especially on the 2nd and higher floors of a building, they are most often designed to be operable. The operable nature of exterior storms provides further vectors for air infiltration. Furthermore, exterior storm windows are frequently constructed with glass glazing and aluminum framing. Glass and aluminum are excellent conductors, often further reducing the energy efficiency benefits that exterior storm windows provide.

High performing interior storm windows are designed to be much more airtight than exterior storm windows. A tight interior storm window will block warm moist air from reaching the surface of single- or double-pane windows, preventing condensation from occurring at all. Because interior storm windows may be designed to

be very easy to install and remove they can be constructed as a monolithic panel. If an occupant wishes to operate the primary fenestration they can easily and very quickly remove the interior storm window entirely. The option to create a monolithic panel that covers the entire inside surface of the window frame means that interior storm windows can be very airtight.

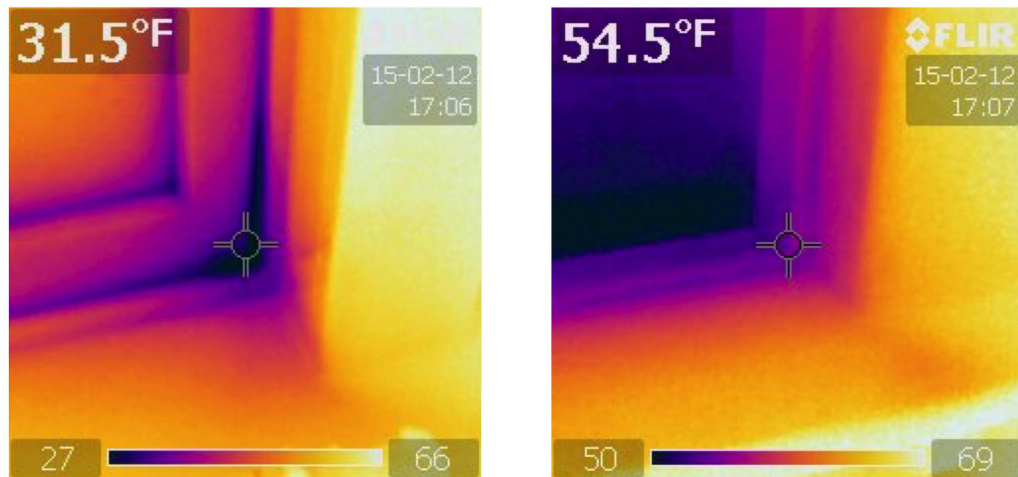


The option to rapidly install and remove interior storm windows means that one very favorable

way to design such devices is by using acrylic glazing. Acrylic has several very significant advantages over glass: 1) it weighs 50% less than glass, making it much



easier to handle; 2) it is much stronger than glass, making it much safer to handle; and 3) it is a dramatically better insulator than glass. Benefit 3 is important in ways that computer energy efficiency software has thus far failed to model. Due to its superior insulating properties acrylic typically has a warmer surface temperature than glass. The warmer surface temperature means that human occupants feel significantly more comfortable due to the higher mean room surface temperatures. When combined with the outstanding draft reduction of monolithic interior storm windows, human occupants feel so much more comfortable that they can turn down the thermostat, which results in significantly greater energy savings.



*The photo on the left shows the surface temperatures of the inside surface of double pane windows without an acrylic interior storm window installed. The photo on the right shows a 23 degree warmer surface temperature of an acrylic interior storm window installed on the inside of the same double pane windows.*

Two independent studies, one done by the US Department of Energy and the other completed by Portland State University, both recorded approximately 20% heating and cooling energy savings. These studies demonstrate an outstanding result that can be matched only by very high end replacement windows.

Since interior storm windows are frequently constructed of acrylic, not glass, it is critical to note that there is no acrylic that functions exactly the way that Low-E glass does. There is no low-e acrylic glazing listed in the IGDB.

### **Proposed Changes for EPA Testing Metrics for Energy Star Ratings**

Due to the inherently different designs of exterior and interior storm windows Indow proposes that the EPA create separate qualification criteria for exterior and interior



storms. Exterior storms use glass and can qualify under the current proposed Product Certification and Test Methods.

Indow proposes the following changes and comments for *interior storm windows*:

Product Certification and Test Methods

- AERC is working to develop technical procedures for product certification and expects to begin certifying products in early 2017

Indow proposes that AERC & EPA consider the cumulative energy saving performance of the fenestration system as a whole including both primary and secondary, interior glazing

- EPA seeks comment on the applicability of the following industry accepted test methods to exterior and interior panels:
  - Solar transmittance of glazing materials measured in accordance with NFRC 300-14 and be listed in the IGDB
  - Emissivity of glazing materials measured in accordance with NFRC 301-14 and be listed in the IGDB

Indow proposes that for South-Central and Southern regions that alternative metrics be developed for IR filtering acrylic, such as the IRB6 and IRB7 acrylic types manufactured by Plaskolite. Product data sheet attached. This glazing material should be added to the IGDB.

- Air leakage tested in accordance with ASTM E283 at a test pressure of 75 Pa (1.57 psf) applied to the exterior and interior sides of the product

Indow proposes that interior storm windows be tested inside a fixture, that might variously include a sheet of aluminum or other metal with holes cut into it to approximate the airflow through a typical double hung, single-pane window. In our very strongly held opinion 75 Pa is an unrealistic amount of air pressure to determine the air infiltration through a fenestration system that includes a primary and secondary glazing. Such air pressures are rarely encountered in the real world. Instead, Indow recommends that testing be conducted at 25 Pa and that calculations be performed to normalize the results at industry standard 50 Pa. Testing at 75 Pa will greatly exaggerate the air infiltration through an Indow window insert since our product mounts inside a window frame using a compression tube and is not rigidly held in place.

Indow further proposes that interior storms be allowed to qualify in the Northern and North-Central regions based exclusively on air-infiltration performance. For the South-Central and South regions, Indow proposes that alternative, IR filtering glazing such as Plaskolite's IRB6 and IRB7 be tested for qualification.



- EPA proposes using glazing materials listed in the IGDB to assess availability of products at different criteria levels

As the reduction of air infiltration and the use of materials that have superior insulating properties such as silicon tubing and acrylic glazing are common with interior storm windows, Indow strongly recommends that glazing materials be expanded to include acrylic. In the Northern and North-Central regions such acrylic could be clear acrylic in the South-Central and Southern regions such acrylic could include IR filtering acrylic such as the IRB6 and IRB7 acrylic manufactured by Plaskolite.

#### New Surface temperature delta metric

Indow proposes a new metric that captures the temperature delta of the surface temperature of the outermost layer of fenestration vs. the inside surface of the innermost layer of fenestration. For instance, the test might observe a temperature 32 degrees on the outside layer of the primary glazing and a temperature of 60 degrees on the inside surface of the innermost layer of fenestration. Highly effective systems would have deltas in the top 25% of all tested systems.

**From:** Sam Pardue [mailto:sam@indowwindows.com]  
**Sent:** Friday, February 12, 2016 2:28 PM  
**To:** windows@energystar.gov  
**Subject:** Indow's response to Energy Star 2 of 2

Hello,

Please find attached supporting materials associated with the email with the subject line 'Indow's response to Energy Star 1 of 2.' Attached please find:

- A study by the United States Department of Energy documenting an approximate 20% savings on heating and cooling loads
- A second independent study by Portland State University documenting an approximate 20% savings on heating loads
- A product data sheet for Plaskolite's IR filtering acrylic
- Test data from Portland State University documenting the performance of Plaskolite's IR filtering acrylic

--

Sam Pardue  
CEO, Founder  
Indow®  
Office: 503-284-2260

Indow window inserts boost your comfort, cut your costs and cap your carbon. [Learn more.](#)