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Ensuring Long-Term Performance

IGU Specifications and Test Methods Slated for Updates

BY RICHARD RINKA

The single most important element that's vital to the overall, long-term thermal performance of a complete fenestration system is the performance and durability of its sealed insulating glass (SIG). Fogging can interfere with that performance (and visibility) when the organic components to which insulating glass units (IGUs) are exposed (such as sealants, exterior components, adhesives, muntin bars, spacers and others) become volatile and condense, forming a "fog" on the inner glass surfaces. Loss of gas filling and compromise of the seals are also concerns.

The ability of an insulating glass unit (IGU) to resist such failures is spelled out by specifications issued by American Society for Testing and Materials International (ASTM). The foundational specification, ASTM E2190-10, or Standard Specification for Insulating Glass Unit Performance and Evaluation, sets forth performance requirements indicative of durability for SIG units with one or two airspaces (double- or triple-glazing), specifically with regard to fogging, frosting at warmer temperatures and loss of insulating gas over time.

To meet the North American Fenestration Standard (NAFS), windows with sealed IGUs must meet ASTM E2190, which is also required for third-party certification by the National Fenestration Rating Council (NFRC) and, by extension, the Energy Star program. AAMA and Dallas-based Associated Laboratories Inc. (ALI) jointly serve as one of four third-party certification bodies authorized to grant SIG certification.

E2190 is in turn based on three essential test methods that must be followed to assess IG performance. The primary test methods cited are:

ASTM E 2188-10, Standard Test Method for Insulating Glass Unit Performance: prescribes the testing sequence that encompasses periodic frost point determination per E546, Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units, or E576, Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units in the Vertical Position. Per E2188, six sample IG units are subjected to extended exposure at 60 degrees Celsius, high humidity and weather cycling (involving ultraviolet light, water mist and temperature cycling between +60 degrees Celsius and –29 degrees Celsius), without fogging or breaking when subjected to a frost/dew point of –40 degrees Celsius or colder.

ASTM E 2189-10, Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units: is used to show that the components in an IGU will not out-gas a volatile fog that could produce a chemical deposition on the interior glass surfaces. The volatile fog box test described in E2189 intensifies the real-world conditions that would create volatile fog by exposing two IGU samples to constant 50 degrees Celsius heat and ultraviolet light for seven days, with a chiller plate cooled by circulating 21 degrees Celsius cooling water placed against the low-E side of each IGU. After seven days, the IGU is inspected visually for presence of any volatile compounds that have condensed opposite the chiller plate on either IGU.

ASTM E2649-09, Standard Test Method for Determining Argon Concentration in Sealed Insulating Glass Units Using Spark Emission Spectroscopy: is used for IGUs filled with an insulating gas rather than air, such as argon, to confirm no reduction in gas concentration to less than 50 percent. The average concentration of six specimens must be at least 80 percent.

All of these documents have been reviewed by ASTM working groups charged with developing updates, with updated standards expected to be published later this year.

For E2188, concerns have been expressed regarding clarity. According to ASTM, some examples needing updates are, "timing on the final frost point, adding the number of cycles for weathering and revising requirements for the UV meter."

Regarding E2189, requirements are being revised for IG units with muntin bars, as well as adding better language to describe the internal components of the unit. A revision to the UV meter will also be made. Given the highly varied results obtained from the fog box test apparatus described, the test box specifications are being reevaluated and described more precisely to eliminate variation.

Also, in general, criteria for what constitutes fogging needs to be less subjectively defined. Light fog may be indiscernible to the untrained eye, but a spectrophotometer may be able to measure the shift in color that better defines the presence of fogging.

While ultimate IG performance criteria will likely not change, the laboratory test equipment and procedures will be fine-tuned to produce more consistent results and better ensure reliability going forward. ■

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