Fogging Potential in Insulating Glass Units

Chemical fogging occurs when a material in the IG unit airspace volatizes and then later condenses on one of the inside surfaces of an IG unit. These volatiles may be liberated due to exposure to elevated temperatures and or solar irradiation.

Chemical fogging can look similar to condensation in the airspaces. Typically, it is more apparent in IG units with LoĒ coatings and will not dissipate. It is often caused by a temperature differential being applied over the unit. This can be caused by shadow patterns like those from building overhangs (Fig. 10-1).

Fig. 10-1: Chemical fogging as seen in a non-Cardinal IG produced unit. Chemical can be seen running down glass in area of internal grilles

Outside Factors

High temperatures on the glass and in the airspace can increase the risk for volatile fogging. The use of heat absorbing coatings, tinted glass, or internal grilles may increase the risk of volatile fogging.

Additionally, the unit's geographic location can also add to the high temperatures of the glass and airspace. Sunbelt locations (areas with high ambient temperatures and high solar intensities) can produce glass and airspace temperatures in excess of 150° F. Higher temperatures increase the likelihood of volatizing material in the airspace.

Testing for Fogging Potential

There are a number of industry accepted and proprietary tests for determining fogging potential of an IG system. These include:

- ASTM 2189
- CAN/CGSB 12.8-2017
- Cardinal's Fog Box Test

All three tests are similar though do vary some aspects of the test and consequently the severity of the test.

Fog testing is required to obtain IG certification through Insulating Glass Manufactures Alliance (IGMA), and the Insulating Glass Certification Council (IGCC). Failure to pass the volatile fog test is one of the leading reasons manufactures fail certification according to information from IGMA.

Cardinals Fog Box Test

In Cardinal's Fog Box test (fig. 10-2), a unit is tested for one week at 140° F with constant UV light and a 7 in^2 cold plate at 70° F. After this exposure, the unit is inspected in both transmission and reflection to determine if a volatile fog is present. If present the fog is rated on a scale of 1 to 5.

Fig. 10-2: View inside a Cardinal Fog Box

The rating system for fog in the Cardinal Fog Box Test is as follows:

1. Faint fog with no defined outline, little to no color
2. More visible fog, with no defined outline, possible color
3. Heavy fog with crisp outline of condenser plate, possibly multicolored
4. Heavy fog with liquid droplets (that may run if unit tilted vertically), obvious outline of the cold plate, potentially multicolored
5. Heavy fog with crystalline deposits, liquid droplets possible (that may run if unit tilted vertically), obvious outline of the cold plate, potentially multi colored

In addition to testing complete IG systems, Cardinal also evaluates components individually. This is done by employing a unit constructed with an all glass spacer (Fig. 10-3). This method, developed by Cardinal, allows for the determination if specific components are causing volatile fogging.

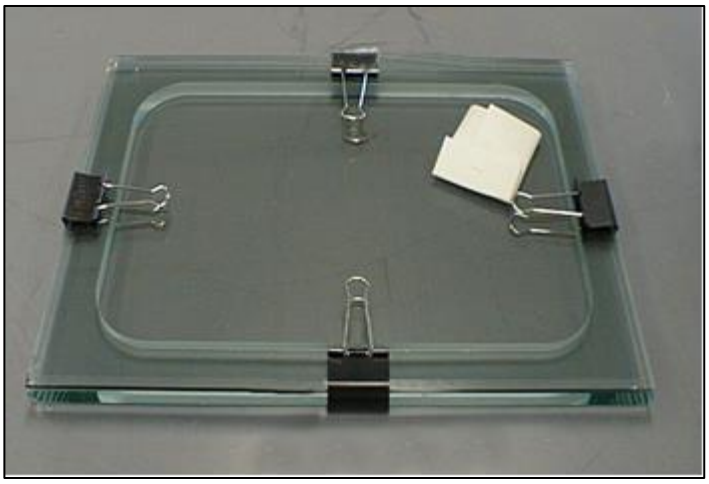

Fig. 10-3: Test unit with all glass spacer

The glass spacer replaces the traditional spacers and sealants in the IG unit, thereby eliminating the possibility they may falsely influence a test. The spacer is a ½ to 1" thick piece of glass with a water jet cut hole in the center portion.

The spacer is then mated with a piece of clear and LoĒ glass to produce an all glass IG unit. A representative amount of the material to be tested is placed in the airspace. Included in the airspace is a pack of desiccant to dry the airspace and prevent moisture failures.

Cardinal has and continues to work with our suppliers to evaluate and significantly reduce the potential of volatile fogging.

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