



IGMA TB-1300-23

NGA FB75-23

Compatibility Testing of Insulating Glass PIB Primary Sealant with Respect to Glazing Materials

An FGIA and NGA Document

The intent of this document is to discuss methods of compatibility testing of glazing components with respect to Polyisobutylene (PIB) primary sealant in an insulating glass unit (IGU). Glazing system components include, but are not limited to, setting blocks, glazing sealants, spacer materials, shims and backer rods (see Figure 1). Compatibility testing of the glazing system components may be performed by the component manufacturers, PIB supplier, or a third-party test laboratory.

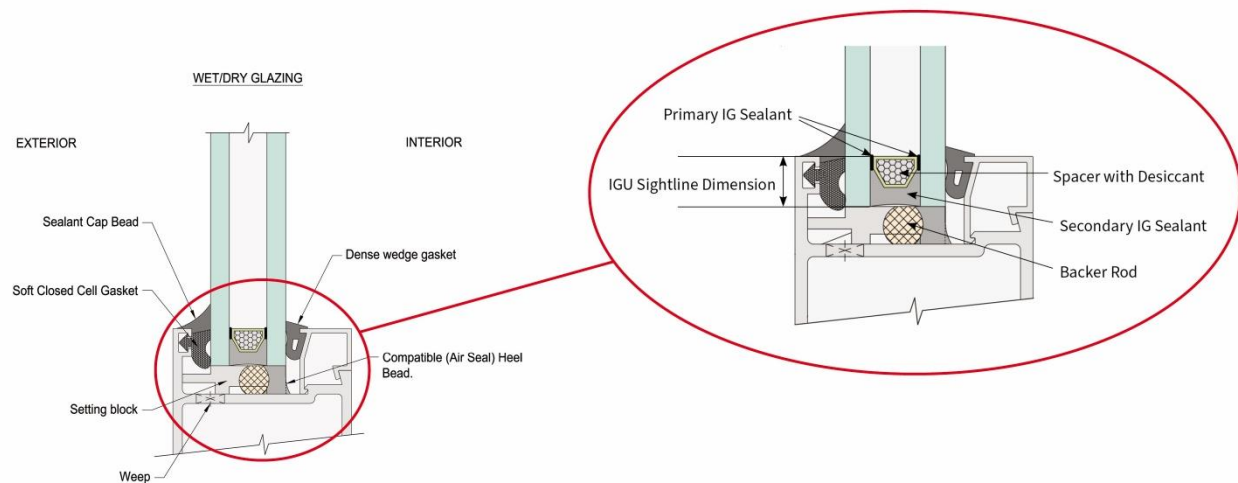


Figure 1: Typical Commercial Glazing cross section (left) and zoomed in detail (right)

In reviewing existing compatibility testing standards (see Additional Resources below), NGA/FGIA determined that the ift Rosenheim test method was the most applicable for this purpose. The test method directly assesses the effects of incompatible glazing materials on PIB primary sealants. Since no comparable consensus-based methods exist in North America, tests were performed to validate the ift Rosenheim test method, developed by ift Rosenheim GmbH in Germany. This document provides validation of the ift Rosenheim “Three-Compound Test” as well as reviews the ift Rosenheim “IGU Test” (see Appendix).

Potentially incompatible materials coming from the glazing components include, but are not limited to, plasticizers, volatile vapors, oils, solvents and other organic components commonly used in proximity to, or in contact with, IGUs containing PIB primary sealant.

Several factors can lead to migration of PIB or an incompatible material beyond the sealant sightline that may have negative effects on the IGU perimeter seal performance. This may include loss of adhesion and/or compromised moisture barrier or gas retention properties as well as negative aesthetic effects. PIB performance during service may be affected by factors such as ultraviolet light (UV), heat, and/or diffusion of incompatible materials throughout the entire glazing system. Another factor is the incompatibility of the PIB primary sealant to other glazing materials used in the glazing system cavity.

The two ift Rosenheim documents that address glazing system compatibility testing are:

- ift-Guideline DI-01/engl/1 “The usability of sealants Part 1, Testing of materials in contact with the edge-sealing of IGUs”¹
- ift-Guideline DI-02/engl/1 “The usability of sealants Part 2, Test of Materials in contact with the edge of laminated glass and laminated safety glass”²

Third Party Test Labs

This list, though not exhaustive, includes laboratories that may be able to provide the *ift Guideline DI-01/1* testing services and a report:

- Intertek (www.intertek.com)
- Chemir/EAG (www.eag.com)
- Akron Rubber Development Laboratory (www.ardl.com)

Disclaimer: Other Factors Affecting Compatibility

Specific installation practices and variations in environmental conditions to which the IGU units will or may be exposed after installation may affect compatibility beyond those observed in the testing results.

References

¹ift-Guideline DI-01/engl/1 “The usability of sealants Part 1, Testing of materials in contact with the edge-sealing of IGUs,” ift Rosenheim, Rosenheim, Germany, <https://www.ift-rosenheim.de/shop/guideline-part-1-usability-sealants-glass>

²ift-Guideline DI-02/engl/1 “The usability of sealants Part 2, Test of Materials in contact with the edge of laminated glass and laminated safety glass”, ift Rosenheim, Rosenheim, Germany, <https://www.ift-rosenheim.de/shop/ift-guideline-usability-part-2-glass-laminated-sealant-safety-glass-download>

Additional Resources

ASTM C1087 *Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems*

ASTM D217 *Standard Test Methods for Cone Penetration of Lubricating Grease*

IGMA TM-3100-09 *Voluntary Guidelines for the Identification of Visual Obstructions in the Air Space of Insulating Glass Units*

TR-1000 *Voluntary test method for chemical effects of glazing compounds on elastomeric edge seals*

NGA FB27-11 *Guidelines for the Appearance of Insulating Glass Unit Edges in Commercial Applications at the Time of Installation*

APPENDIX

Validation of ift Rosenheim Test Method

Both ift Rosenheim test methods directly assess the effects of incompatible glazing materials on PIB primary sealants. Since no comparable consensus-based methods exist in North America, tests were performed to validate the ift Rosenheim test method, developed by ift Rosenheim GmbH in Germany. The results of this study support the use of the ift guideline as written to study short-term incompatibility, and use of the companion IGU Test.

IFT Guidelines DI-01 and DI-02^{1,2}

Available from ift Rosenheim GmbH (www.ift-rosenheim.de), these two documents specify methods for testing glazing system components that come into direct or indirect contact with each other. Guideline DI-01 discusses testing of materials in contact with the edge seals of IGUs. With respect to PIB compatibility, the ift test procedures in DI-01, sections 4.1 and 4.3 determine if certain materials can be combined “without negative interactions having a detrimental effect on the function of the component”. There is also a Peel Test (P2, of DI-01), which is not considered since it does not involve the primary sealant.

Guideline DI-02 involves materials that contact the edge of laminated glass.

Three-Compound Test P1 (Section 4.1 of DI-01)

Intended to serve as a test for incompatibility damage that would appear relatively quickly (i.e. short-term incompatibility), the “*Three-Compound Test P1*” (section 4.1) provides useful information on effects of migrating components from secondary and glazing sealants into the PIB through direct and/or indirect contact. Component migration in a glazing system is not limited to components that touch each other – materials seek equilibrium and may diffuse throughout the edge seal (Figure 2).

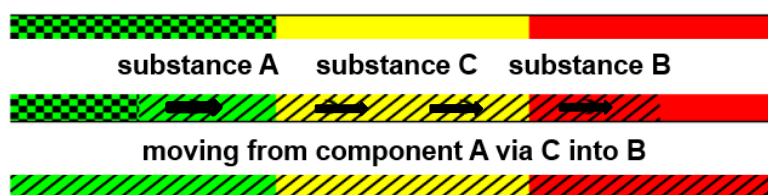


Figure 2: Depiction of materials migrating to other components in indirect contact.

Round Robin Testing

The ift Rosenheim guideline describes a test sample setup wherein the volumetric ratio between sealants is not representative of the conditions present in a glazing system. Additionally, the test is run for 28 days at 50°C (122°F). A design of experiment was run to determine if volumetric ratio and/or test temperature would affect the results of the test. The test was carried out using the ift protocol as a control, with additional variants modifying the volumetric ratio of PIB to secondary sealant to glazing sealant as well as increasing the test temperature from 50°C to 70°C (122 to 158°F). These experiments were performed with a known compatible and incompatible glazing sealant.

The results of this study support the use of the ift guideline as written to study short-term incompatibility – with cone penetration as an optional additional evaluation tool. This guideline comes with the caveat that this “*Three-Compound Test*” represents a severe scenario, with a large amount of incompatible compound and small amount of silicone that could potentially “defend” the PIB, and is intended to be used in conjunction with the longer-term tests also present in the ift guideline.

Test on IGU with Test Material in Contact ('IGU-Test') P3 (Section 4.3)

The “*IGU Test*” found in section 4.3 of the ift guideline is intended to serve as a companion PIB compatibility test to the “*Three-Compound Test*” described above. It is a longer-term test (24 weeks of climate cycling) that tests the entire IGU, using units with no glazing material applied as a control and units with a 10 mm thick bead of glazing sealant applied on the edge for test units. If the intended end use of the IGU includes an exposed edge condition (e.g. structurally glazed), the test units are also exposed to UV.

After testing, the PIB primary sealant is visually assessed for softening, adhesion, or other irregularities (refer to the ift standard for details). Butterfly testing and/or additional analytical work may be helpful to the evaluation.

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