Designation: E2190 – 19

Standard Specification for Insulating Glass Unit Performance and Evaluation[1]

This standard is issued under the fixed designation E2190; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers preassembled permanently sealed insulating glass units with one or two cavities and preassembled insulating glass (IG) units with capillary tubes intentionally left open or closed.

1.2 This specification is applicable only to insulating glass units that are constructed with glass or suspended film.

1.3 This specification is applicable to both double-glazed and triple-glazed insulating glass units; for triple-glazed insulating glass units where both of the outer lites are glass and middle lite is either glass or a suspended film.

1.4 The qualification of test specimens is based on frost/dew point and on the absence of fog after the specified test durations.

1.5 The qualification of argon gas-filled test specimens is based on maintaining the specified argon gas amounts before and after testing to Test Method E2188.

1.6 Qualification under this specification is intended to provide a basis for evaluating the durability of insulating glass units.

1.7 This specification is not applicable to insulating glass units containing a spandrel glass coating due to test method limitations.

1.8 This specification does not cover other physical requirements such as appearance, thermophysical properties, heat and light transmission, and glass displacement.

NOTE 1—Insulating glass units qualified according to this specification are not necessarily suitable for structurally glazed applications. Factors such as sealant longevity when exposed to long term ultraviolet light and the structural properties of the sealant must be reviewed for these applications. For more information on the requirements for structural sealant glazing applications, refer to Specification C1369, Guide C1249, and Test Method C1265.

1.9 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.10 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.11 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C162 Terminology of Glass and Glass Products
C717 Terminology of Building Seals and Sealants
C1036 Specification for Flat Glass
C1249 Guide for Secondary Seal for Sealed Insulating Glass Units for Structural Sealant Glazing Applications
C1265 Test Method for Determining the Tensile Properties of an Insulating Glass Edge Seal for Structural Glazing Applications
C1369 Specification for Secondary Edge Sealants for Structurally Glazed Insulating Glass Units
E546 Test Method for Frost/Dew Point of Sealed Insulating Glass Units
E631 Terminology of Building Constructions
E2188 Test Method for Insulating Glass Unit Performance
E2189 Test Method for Testing Resistance to Fogging in Insulating Glass Units
E2269 Test Method for Determining Argon Concentration in Sealed Insulating Glass Units using Gas Chromatography
E2649 Test Method for Determining Argon Concentration in Sealed Insulating Glass Units Using Spark Emission Spectroscopy

[1] This specification is under the jurisdiction of ASTM Committee E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.22 on Durability Performance of Building Constructions.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3. Terminology

3.1 *Definition of Terms:*

3.1.1 For definitions of terms found in this Specification, refer to Terminologies C162, C717, and E631.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *baseline set, n*—a set of specimens, submitted for testing to this specification, all fabricated at the same time, with the same insulating glass construction (same sealants, same spacer, same glass thickness, same cavity thickness, etc.) but without internal components.

3.2.2 *cavity, n*—the space or gap between lites of an insulating glass unit. Cavities may be air-filled, or inert gas-filled.

3.2.3 *insulating glass unit, n*—a preassembled unit, comprising lites of glass, which are sealed at the edges and separated by dehydrated space(s), intended for vision areas of buildings. The unit is normally used for windows, window walls, picture windows, sliding doors, patio doors, skylights, or other types of fenestration.

3.2.4 *internal components, n*—the components in an insulating glass unit that do not contribute to water vapor control or gas retention of the cavity. Internal components may be decorative such as false muntins or brass caming, or may be functional such as internal blinds.

4. Performance Requirements

4.1 *Baseline Set Performance*—A baseline set (with no internal components) of IG unit specimens, fabricated at the same time, shall be submitted and meet the following:

4.1.1 Six specimens from the baseline set shall be tested to Test Method E2188, with no final frost/dew point warmer than –40 °C (40 °F).

4.1.2 Two specimens (if double-glazed) or four specimens (if triple-glazed) from the baseline set shall be tested to Test Method E2189 with no volatile fog visible after testing.

4.1.3 If argon filling is specified, the same six specimens in 4.1.1 shall also have an initial average argon concentration of 90 % or greater prior to testing to Test Method E2188, AND the final average argon concentration of the same six specimens shall be 80 % or greater after testing to Test Method E2188. No individual test specimen shall have an argon concentration of less than 50 %.

4.2 *Internal Component Performance*—If specifying internal components, additional testing to Test Method E2189 is required. This testing is supplementary and separate from the baseline set. It does not affect the results of the baseline set.

4.2.1 Two specimens (if double-glazed) or four specimens (if triple-glazed) made with internal components, using the exact same sealing system, geometry, and glass construction as the baseline set in 4.1, shall be tested to Test Method E2189 with no volatile fog visible after testing.

5. Test Specimens

5.1 *Specimen Size:*

5.1.1 Each test specimen shall measure 355 ± 6 mm by 505 ± 6 mm (14 ± ¼ in. by 20 ± ¼ in.).

5.2 *Glass Construction:*

5.2.1 For double-glazed specimens: 4 mm (5⁄32 in.) nominal glass with 12 mm (½ in.) cavity, or 5 mm (3⁄16 in.) nominal glass with 6 mm (¼ in.) cavity.

5.2.2 For triple-glazed specimens: 4 mm (5⁄32 in.) glass with 6 mm (¼ in.) cavities.

5.2.3 If the required glass constructions in 5.2.1 and 5.2.2 are not available from the submitting manufacturer, then thicker glass or wider cavities, or both, shall be allowed. (For example, using 6 mm glass with 12 mm cavity.) This may result in a more rigorous test.

5.2.4 All of the values noted in this section are nominal.

5.2.5 Tolerance of glass thickness shall be in accordance with Specification C1036.

5.2.6 Cavity tolerance shall be ±0.8 mm (1⁄32 in.).

5.2.7 There shall be no internal components in the baseline set.

5.3 *Glass Coatings* (if used)*:*

5.3.1 Coatings shall be included in the specimens, if the manufacturer uses coatings in normal production.

5.3.2 For double-glazing specimens, one lite of the specimen shall be clear and the other shall have a coating applied to the inner surface.

5.3.3 For triple-glazed specimens tested to Test Method E2188, both outer lites shall be clear glass and the middle lite shall have a metallic coating (either low E or reflective) on at least one surface.

5.3.4 For triple-glazed specimens tested to Test Method E2189 for the base set, one outer lite shall have a metallic coating (either low E or reflective). For specimens with internal components, the internal component shall be within the cavity with the metallic coating.

5.4 *Number of Specimens in a Submitted Baseline Set:*

5.4.1 Double-glazed with air or argon-filled units shall have 12 specimens per set.

5.4.2 Triple-glazed with air or argon-filled units shall have 14 specimens per set.

5.5 For qualifying specimens with argon gas fill, the specimens shall be made with the same gas-filling techniques as used for the manufacturer's production.

5.6 *Internal Components* (if used)*:*

5.6.1 If internal components are specified, supplementary testing to Test Method E2189 is required.

5.6.2 Specimens in this supplementary testing to Test Method E2189 shall be made with the internal components, using the exact same sealing system and geometry as the baseline set that was tested without internal components.

5.6.3 The specimens with internal components can be made at a different time than the baseline set.

5.6.4 There shall be three specimens (two tested, one spare) submitted for double-glazed IG and five specimens (four tested, one spare) submitted for triple-glazed IG.

6. Test Methods

6.1 *Baseline Set Testing to Test Method E2188:*

6.1.1 In accordance with Test Method E2188, prepare the specimens as directed and follow the testing procedure.