Designation: E2190 – 10

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 airspaces and preassembled insulating glass units with capillary tubes intentionally left open.

1.2 This specification is applicable only to sealed insulating glass units that are constructed with glass.

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 inner 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 the qualifications in 1.3 and 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 sealed insulating glass units.

1.7 This specification is not applicable to sealed 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—Sealed 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. No other units of measurement are included in this 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 and health practices and determine the applicability of regulatory limitations prior to use.*

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

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:*

[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.

Current edition approved Nov. 1, 2010. Published November 2010. Originally approved in 2002. Last previous edition approved in 2008 as E2190 – 08. DOI: 10.1520/E2190-10.

[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.

3.2.1 *sealed 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, or other types of fenestration.

4. Performance Requirements

4.1 To pass the specification for Test Method E2188:

4.1.1 Six units shall complete all testing unbroken. These units shall have frost/dew points determined and reported. The final frost/dew points shall be –40°C or colder when measured in accordance with Test Method E546 or equivalent.

4.2 To pass the specification for Test Method E2189:

4.2.1 The units that complete Test Method E2189 shall have no fog visible after testing.

4.3 To pass the specification for argon filled units:

4.3.1 The average initial argon gas concentration of the specimens prior to testing to Test Method E2188 shall be a minimum of 90 %. No individual test specimen shall have an argon concentration of less than 50 %.

4.3.2 The average final argon gas concentration of the six specimens after testing to Test Method E2188 shall be a minimum of 80 %. No individual test specimen shall have an argon concentration of less than 50 %.

4.4 *Fog*—No fog shall be visible after testing in accordance with Test Method E2189.

5. Test Specimens

5.1 Each test specimen shall measure 355 ± 6 mm by 505 ± 6 mm and shall be composed of two or three lites of glass.

5.2 The glass and airspace thickness(es) for qualification under this specification shall be 4 mm glass with 12 mm airspace or 5 mm glass with 6 mm airspace.

5.3 For triple-glazed units, 4 mm glass with 6 mm airspaces shall be used.

5.4 If the required glass constructions in 5.2 and 5.3 are not available form the submitting manufacturer, then thicker glass or wider airspaces, or both shall be allowed. (For example, using 6 mm glass with 12 mm airspace.) This may result in a more rigorous test.

5.5 All of the values in 5.2 through 5.4 are nominal.

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

5.5.2 Airspace tolerance(s) shall be ±0.8 mm.

5.6 If specifying internal components, then these components shall be present in the test specimens made for testing to Test Method E2189.

5.7 Twelve double-glazed test specimens shall be submitted when testing to this specification. If specifying internal components, three of these specimens shall contain those components and shall be designated for testing to Test Method E2189.

5.8 Fourteen triple-glazed test specimens shall be submitted when testing to this specification. If specifying internal components, five of these test specimens shall contain those components and shall be designated for testing to Test Method E2189.

5.9 If specifying argon gas fill:

5.9.1 The test specimens shall be argon filled using the same gas filling techniques as those used for manufacturing.

5.9.2 For double glazed, argon gas filled specimens:

5.9.2.1 Nine of the submitted test specimens shall be designated for testing with Test Methods E2188 and E2649. These specimens shall not contain any internal components such as muntin bars.

5.9.2.2 The remaining specimens of the set (three double-glazed units) shall be designated for Test Method E2189 where two of the test specimens are selected for testing. These specimens shall be the three specimens containing internal components if qualifying internal components as specified in 5.8.

5.9.3 For triple glazed, argon gas filled specimens:

5.9.3.1 Nine specimens shall be designated for testing with Test Methods E2188 and E2649. The test specimens shall have both outer lites made of clear glass and the middle lite shall have a metallic coating (either low E or reflective) on at least one surface. These specimens shall not contain any internal components such as muntin bars.

5.9.3.2 The remaining test specimens of the set (five triple-glazed units) shall be designated for Test Method E2189, where four of the specimens shall be tested. These specimens shall be the five specimens containing internal components if qualifying internal components as specified in 5.9.

6. Test Methods

6.1 *For Air-Filled Units:*

6.1.1 Test six randomly selected specimens for 14 days in the high humidity phase, followed by 63 days in the weather cycle phase followed by 28 days in the high humidity phase in accordance with Test Method E2188.

6.1.2 Test two randomly selected double-glazed or four triple-glazed specimens for 7 days in accordance with Test Method E2189.

6.2 *For Argon-Gas Filled Units:*

6.2.1 Measure the argon gas concentration of each test specimen (between six and nine depending on possible breakage) designated for testing to Test Methods E2188 and E2649. Measurements shall be determined using Test Method E2649. For triple-glazed units, the argon gas concentration shall be determined for all airspaces.

6.2.2 Calculate the average argon gas concentration of all measured specimens to the nearest whole percent. This is the average initial argon gas concentration for the test set.

6.2.3 Randomly select six of the specimens in 6.2.1 in accordance with Test Method E2188.

6.2.4 After determining the final frost/dew points of the six test specimens, measure the argon gas concentration of each of the same six specimens. The argon gas concentration can be measured using either Test Method E2649 or Test Method E2269. For triple-glazed units, the argon gas concentration shall be determined for all airspaces.

TABLE 1 Summary of Qualifications Specification E2190

	Double-Glazed		Triple-Glazed	
	Air filled	Gas filled	Air filled	Gas filled
# Units to submit	12	12	14	14
Glass Construction: (Glass/Spacer/Glass) or (Glass/Spacer/Glass/Spacer/Glass	4/12/4 or 5/6/5	4/12/4 or 5/6/5	4/6/4/6/4	4/6/4/6/4
# Units tested in Test Method E2188 (and Test Method E2649 for argon fill)	6	6	6	6
If qualifying coatings, the coating shall be place ONLY on:	1 lite of glass	1 lite of glass	1 outer lite of glass	at least one surface of inner lite
Internal Components	Optional	Not allowed	Optional	Not allowed
Final Frost Point ≦	–40°C	–40°C	–40°C	–40°C
Average initial argon concentration	N/A	90 % minimum	N/A	90 % minimum
Average final argon concentration	N/A	80 % minimum	N/A	80 % minimum
Concentration of each specimen	N/A	50 % minimum	N/A	50 % minimum
# Units in Test Method E2189	2	2	4	4
Internal components	Include if being qualified	Include if being qualified	Include if being qualified	Include if being qualified
Test Method E2189: After testing	No Fog	No Fog	No Fog	No Fog

6.2.5 Calculate the average argon gas concentration of all six specimens to the nearest whole percent. This is the final average argon gas concentration for the test set.

6.2.6 From the test specimens designated for Test Method E2189 testing, randomly select two double-glazed specimens and test for seven days in accordance with Test Method E2189. If testing triple-glazed specimens, randomly select and test four specimens.

6.3 The test durations are net testing periods. If the test is interrupted for any reason, the remaining portions shall be completed to qualify for the testing.

6.4 If a specimen has any visible deposits in the air space, do not qualify this set of test specimens for that test.

7. Qualification

7.1 When all test specimens have met the requirements as described in Section 4, this set of test specimens shall be deemed to be qualified according to this specification.

7.2 If a specimen fails to meet the requirements as described in Section 4, this set of specimens shall not be qualified according to this specification. (Table 1.)

8. Report

8.1 *Test Methods:*

8.1.1 Report all information as required in the Report Section of Test Method E2188.

8.1.2 Report all information as required in the Report Section of Test Method E2189.

8.1.3 If argon filled insulating glass is specified, report the initial and final average argon gas concentrations for the test set.

8.2 *Test Qualifications:*

8.2.1 Report whether or not the set of test specimens meets the qualifications of this specification.

9. Keywords

9.1 gas concentration; insulating glass units; seal durability; sealed insulating glass units; unit performance and evaluation

APPENDIX

(Nonmandatory Information)

X1. EXAMPLE DATA SHEET FOR THIS SPECIFICATION

X1.1 See Fig. X1.1

.

Date _____

Manufacturer _____ Code _____ Report No. _____

Address _____

Attention _____ Telephone No. _____

Description of Test Speciemens:

Size (width by height) _____ Glass thickness and type _____

Type of Spacer and Finish _____

Type and Amount of Desiccant _____

Type of Sealant(s) _____

Other Features (band, barrier coat, corner, etc.) _____

Manufacture Date (month/year) _____

Date Received at Laboratory _____ Date Testing Started _____

	E 2189 Fogging Test (7 Days)		E 2188 Initial Frost/Dew Point		E2188 High Heat and Humidity 14 Days		E2188 Accel. Weather Cycle 63 Days		E2188 High Heat and Humidity 28 Days		Initial argon con.	Initial Argon con.	Average Initial Argon Con.	Final argon fill	Final argon fill	Average Final Argon Con.
	Cavity1	Cavity 2 (if reqd.)	Cavity1	Cavity 2 (if reqd.)	Cavity1	Cavity 2 (if reqd.)	Cavity1	Cavity 2 (if reqd.)	Cavity1	Cavity 2 (if reqd.)	Cavity1	Cavity 2 (if reqd.)	-	Cavity1	Cavity 2 (if reqd.)	-
Test Unit #	Fog Present Yes/No	Fog Present Yes/No	°C	°C	°C	°C	°C	°C	°C	°C	%	%	%	%	%	%
1													-			-
2													-			-
3													-			-
4													-			-
5													-			-
6													-			-
7													-			-
8													-			-
9													-			-
10													-			-
11													-			-
12													-			-
13													-			-
14													-			-
Ave.																

FIG. X1.1 Example Data Sheet