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Standard Test Methods for Seal Durability of Sealed Insulating Glass Units¹

This standard is issued under the fixed designation E 773; 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 These test methods cover procedures for testing the performance of preassembled permanently sealed insulating glass units against accelerated weathering and fogging.

1.2 These test methods are applicable only to sealed insulating glass units, with one or two airspaces, fabricated for vision glass areas for use in buildings, such as sliding doors, windows, wall systems, and picture windows.

1.3 These test methods are not applicable to sealed insulating glass units that are constructed from vision materials other than glass.

1.4 The values stated in metric (SI) units are to be regarded as the standard.

1.5 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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. A specific hazard statement is given in Note 2.*

2. Referenced Documents

2.1 ASTM Standards:

E 546 Test Method for Frost Point of Sealed Insulating Glass Units²

E 774 Specification for Sealed Insulating Glass Units²

3. Descriptions of Terms Specific to This Standard

3.1 *chemical dew point*—the temperature (Note 1) at which organic vapor or other chemical begins to condense on the interior glass surface of a sealed insulating glass unit.

NOTE 1—The temperature as indicated by the temperature indicator of frost point apparatus when constructed and used in accordance with test procedures described in Test Method E 546.

3.2 *fogging*—persistent deposits visible after testing in accordance with Section 13.

3.3 *frost point*—the temperature (Note 1) below freezing point of water (0°C (32°F)) at which visible frost begins to deposit on the interior glass surface of a sealed insulating glass unit.

4. Significance and Use

4.1 These test methods are intended to provide a means

for evaluating the durability of the sealing system of sealed insulating glass units. A round-robin test has been conducted, and additional data are being collected. The suitability of these test methods will be further evaluated as the analysis of test results is completed.

5. Test Specimens

5.1 Test specimen design and construction shall be established by Specification E 774.

ACCELERATED WEATHERING TEST

6. Apparatus

6.1 For High Humidity Testing:

6.1.1 *High-Humidity Test Chamber*—A chamber of convenient dimensions capable of maintaining $60 \pm 3^\circ\text{C}$ ($140 \pm 5^\circ\text{F}$) and $95 \pm 5\%$ relative humidity.

6.2 For Accelerated Weather Cycle Test:

6.2.1 *Accelerated Weather Cycle Test Apparatus*³—The accelerated weather cycle test apparatus shall be essentially that shown in Figs. 1, 2, and 3 to provide the cycle conditions and time frame indicated in Section 8.

6.2.2 Ultraviolet Light Source:

NOTE 2: **Warning**—Ultraviolet light sources used in this test method are harmful, especially to the eyes. Appropriate protective measures must be observed.

6.2.2.1 The source shall consist of two fluorescent black light lamps, Type F72T12BL/HO⁴ (Note 3), for each test specimen located as shown in Fig. 3.

6.2.2.2 Each lamp must be replaced when its ultraviolet light intensity falls below $1000 \mu\text{W}/\text{cm}^2$ when measured with a long-wave ultraviolet meter⁵ in direct contact with the lamp.

NOTE 3—Rated average life at 3 h per start: 12 000 h. Rated average life at 12 h per start: 18 000 h. Useful length: 1625 mm (64 in.). Wattage: 85 W. Relative black light energy output is 190 % that of F40BL lamp.

7. Preparation of Test Specimen

7.1 Uncleanable stain or scum may remain on the exterior glass surface of the specimen after the accelerated weathering test. Measures should be taken to have a clear view of the interior glass surface for detection of frost. For

¹ This method is under the jurisdiction of ASTM Committee E-6 on Performance of Building Constructions and is the direct responsibility of Subcommittee E06.22 on Durability Performance of Building Constructions.

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² Annual Book of ASTM Standards, Vol 04.07.

³ The apparatus is a modification of the device developed by the Division of Building Research of the National Research Council of Canada. The modifications include two black light lamps for each test specimen. Construction details are available from SIGMA (Sealed Insulating Glass Manufacturer's Association), 111 E. Wacker Drive, Chicago, IL 60601.

⁴ Available from General Electric Co., Nela Park, Cleveland, OH 44112.

⁵ A suitable meter is the Black-Ray UV Meter with J221 sensor cell. Available from Ultra-Violet Products, Inc., 5100 Walnut Grove Ave., San Gabriel, CA 91778.



Documents

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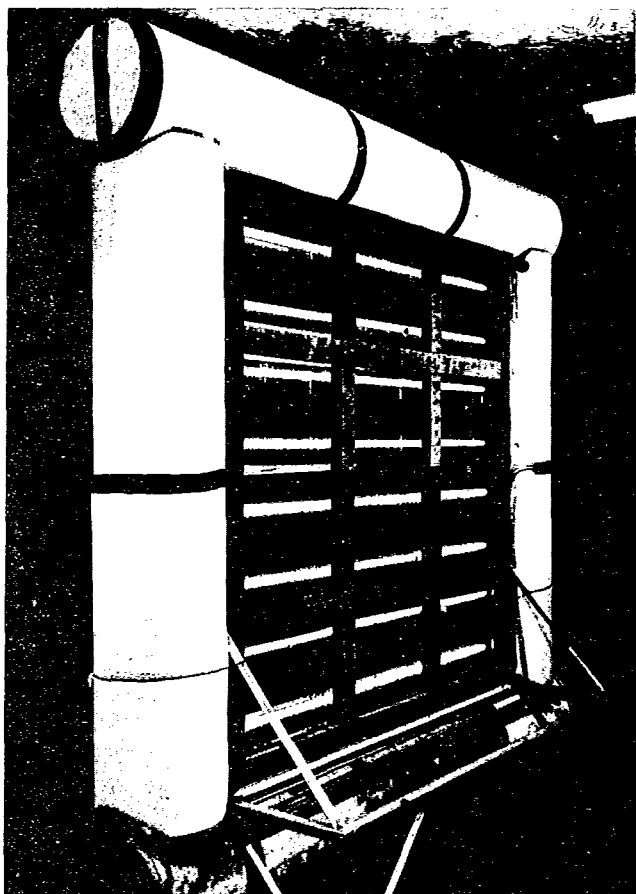


FIG. 1 Typical Accelerated Weather Cycle Test Apparatus

example, place a mask of plastic tape⁶ 50 by 50 mm (2 by 2 in.) or larger, on the central region of both exterior glass surfaces. Remove the mask for frost point measurement.

7.2 The sealed insulating glass units shall be sealed a minimum of 4 weeks to allow for stabilization before the high humidity exposure in accordance with 8.1 begins. The manufacturer has the option to waive this requirement.

8. Procedure

8.1 High Humidity Test:

8.1.1 Expose the number of specimens prescribed in Specification E 774 in the high-humidity test chamber at $60 \pm 3^\circ\text{C}$ ($140 \pm 5^\circ\text{F}$) and $95 \pm 5\%$ relative humidity. Arrange the specimens so that each specimen has at least 6-mm ($1/4$ -in.) clearance all around the four sides. Protect the high humidity chamber from overheating with a protective device.

8.1.1.1 Equip the high humidity chamber with a continuous temperature recording device placed in an area that gives the average temperature in the chamber.

8.1.2 When the time period has been attained, remove the test specimens and determine the frost point in accordance with Test Method E 546. Observe for chemical dew point.

⁶ Scotch Plastic Tape # 471, available from 3M Co., 3M Center, Commercial Office Supply Div., Bldg. 230-3 South-17, St. Paul, MN 55101, has been found suitable for this purpose.

8.2 Accelerated Weather Cycle Test:

8.2.1 Place the test specimens that were tested in accordance with 8.1 in the accelerated weather cycle test apparatus. Mount the specimens so that one exterior surface of the specimen is exposed to weathering cycles and the other to room temperature (Note 4). Install all specimens as shown in Fig. 2, taking care that no stress is induced in the test specimens by the method of fastening.

NOTE 4—A temperature in the range from 15 to 30°C (60 to 85°F).

8.2.2 *Cycling*—Each cycle shall be $6\text{ h} \pm 5\text{ min}$ and composed of the following test condition (see Fig. 4):

8.2.2.1 During the first $1\text{ h} \pm 5\text{ min}$, decrease the temperature from room temperature to $-30 \pm 3^\circ\text{C}$ ($-20 \pm 5^\circ\text{F}$).

8.2.2.2 Maintain temperature at $-30 \pm 3^\circ\text{C}$ ($-20 \pm 5^\circ\text{F}$) for $1\text{ h} \pm 5\text{ min}$.

8.2.2.3 Turn on heat and allow temperature to rise from $-30 \pm 3^\circ\text{C}$ ($-20 \pm 5^\circ\text{F}$) to room temperature over a period of $1\text{ h} \pm 5\text{ min}$.

8.2.2.4 Over a time period of $1\text{ h} \pm 5\text{ min}$, start water spray and ultraviolet lamps and control the temperature rise from room temperature to $57 \pm 3^\circ\text{C}$ ($135 \pm 5^\circ\text{F}$). Turn off water spray after 30 min to allow temperature to continue to rise to $57 \pm 3^\circ\text{C}$.

8.2.2.5 Maintain temperature at $57 \pm 3^\circ\text{C}$ ($135 \pm 5^\circ\text{F}$) and continue ultraviolet exposure for a period of $1\text{ h} \pm 5\text{ min}$. Humidity remains very high during this hour; consequently, additional water spray is not necessary.

8.2.2.6 Over a period of $1\text{ h} \pm 5\text{ min}$, decrease temperature from $57 \pm 3^\circ\text{C}$ ($135 \pm 5^\circ\text{F}$) to room temperature, and continue ultraviolet exposure. At the end of this period, turn off ultraviolet exposure.

8.2.2.7 Protect the accelerated weathering chamber from overheating and from overcooling with protective devices.

8.2.2.8 Equip the accelerated weather cycle chamber with a continuous temperature recording device placed in an area that gives the average temperature inside the chamber.

8.2.3 When the number of cycles prescribed in Specification E 774 has been attained, remove the specimens and determine the frost point in accordance with Test Method E 546.

9. Observations

9.1 Observe for the following:

9.1.1 Specimen breakage.

9.1.2 Specimen failure, which is indicated by visible water in the cavity.

10. Report

10.1 Report the following data:

10.1.1 *Complete Description of Specimen Tested:*

10.1.1.1 Dimensions of the test specimen (width by height).

10.1.1.2 Thickness of the glass panes and air space thickness.

10.1.1.3 Desiccant type and quantity if known, and sealant type.

10.1.1.4 Manufacturer and manufactured date (month if known, and year).

10.1.2 *Duration of Test:*