



Designation: ~~E2188~~—~~10~~ E2188 – 19

Standard Test Method for Insulating Glass Unit Performance¹

This standard is issued under the fixed designation E2188; 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 test method covers procedures for testing the performance of preassembled permanently sealed insulating glass units or insulating glass units with capillary tubes intentionally left open.

1.2 This test method is applicable only to ~~sealed~~ insulating glass units that are constructed with glass.

1.3 This test method 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 the inner lite is either glass or a suspended film.

1.4 The unit construction used in this test method contains dimensions that are an essential component of the test. Different types of glass, different glass thicknesses, and different ~~air space~~ cavity sizes may affect the test results.

1.5 This test method is not applicable to ~~sealed~~ insulating glass units containing a spandrel glass coating due to testing limitations.

1.6 The values stated in SI units are to be regarded as standard. ~~No other units of measurement are included in this~~ The values given in parentheses after SI units are provided for information only and are not considered standard.

1.7 *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~~ safety, health, and ~~health~~ environmental practices and determine the applicability of regulatory limitations prior to use.*

1.8 *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](#)

[E631 Terminology of Building Constructions](#)

[E546 Test Method for Frost/Dew Point of Sealed Insulating Glass Units](#)

[E2190 Specification for Insulating Glass Unit Performance and Evaluation](#)

3. Terminology

3.1 *Definition of Terms:*

3.1.1 For definitions of terms found in this standard, refer to Terminologies [C162](#), [C717](#), and [E631](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *frost/dew point, n*—the temperature at which water, organic vapor, or other chemicals begin to appear on the interior glass surface of a ~~sealed~~ an insulating glass unit.

¹ This test method 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~~ standard's Document Summary page on the ASTM website.

4. Significance and Use

4.1 This test method is intended to provide a means for testing the performance of the sealing system and construction of sealed insulating glass units.

4.1.1 ~~Sealed insulating~~ Insulating glass units tested in accordance with this method may be suitable for structurally glazed applications. However, 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.

4.1.2 ~~Sealed insulating~~ Insulating glass units tested in accordance with this method are not intended for continuous exposure to high relative humidity conditions or long-term immersion in water.

5. Test Specimens

5.1 Each test specimen shall measure 355 ± 6 mm by 505 ± 6 mm ($14 \pm \frac{1}{4}$ in. by $20 \pm \frac{1}{4}$ in.) and shall be composed of two or three lites of clear, ~~tinted or coated~~ tinted, coated, annealed, heat-strengthened, tempered, or laminated glass.

5.1.1 The double-glazed test samples shall be fabricated with at least one lite of clear, uncoated glass. The triple-glazed test samples shall be fabricated with at least one outer lite of clear, uncoated glass. The other outer lite shall be fabricated with a glass which allows easy viewing of the frost point.

5.1.2 The thickness of the glass lites shall be between nominal ~~3.0 mm~~ 3.0 mm ($\frac{1}{8}$ in.) and a maximum of 6.0 mm ~~nominal~~ ($\frac{1}{4}$ in.) nominal.

5.1.3 The ~~airspace~~ cavity for ~~units~~ specimens with either two or three lites of glass shall be a minimum of ~~6.0 ± 0.8 mm~~ 6.0 ± 0.8 mm ($\frac{1}{4} \pm \frac{1}{32}$ in.).

5.1.4 When testing to Specification **E2190** the specimen construction shall be as defined in that document.

5.1.5 Triple-pane units where the intermediate ~~airspace~~ cavity divider is a plastic film are acceptable.

NOTE 1—Overall unit thickness has some limits. Testing laboratories are usually able to accommodate 30 mm overall thickness. If testing thicker units, contact the testing laboratory ~~prior to manufacturing~~ to ascertain their capabilities for testing thicker units.

5.2 The thickness tolerance of the glass shall conform to Specification **C1036**.

5.3 Each specimen shall be ~~permanently and legibly~~ marked with the designation of the manufacturer, the date of fabrication (month or quarter and year) and orientation intended in the field (for units constructed with coated glass). This marking is recommended to be positioned on the glass surface that will be oriented on the room temperature side during the weather cycle phase (see 8.3).

5.4 At least nine specimens of identical component materials and construction shall be submitted for testing.

5.5 During all stages of exposure and storage, the units shall be held in a vertical position with equal support to all panes and no compression loading.

5.6 Selection of six specimens for testing shall be made at random from the submitted specimens except for specimens damaged in transit. Damaged specimens shall not be tested.

5.7 Test specimens representing insulating glass units that will be gas filled shall be fabricated using the same hole sealing and gas filling techniques as those used for manufacturing. For example, if a gas-filling plug is used in manufacturing then it must be used in the test units. ~~The samples do not need to be filled with gas providing that the gas is classified as inert. Test samples representing products that are normally filled with an inert gas in production, may be submitted air filled for this testing as long as they have been manufactured with the same techniques as used in production.~~

5.8 Test specimens representing insulating glass units that include tubes intended to be left open shall be fabricated with one tube. These tubes shall be left open during testing. Test samples representing units that include tubes intended to be closed off after shipping shall be fabricated with one tube. These tubes shall be closed at the exterior end prior to testing.

6. Apparatus

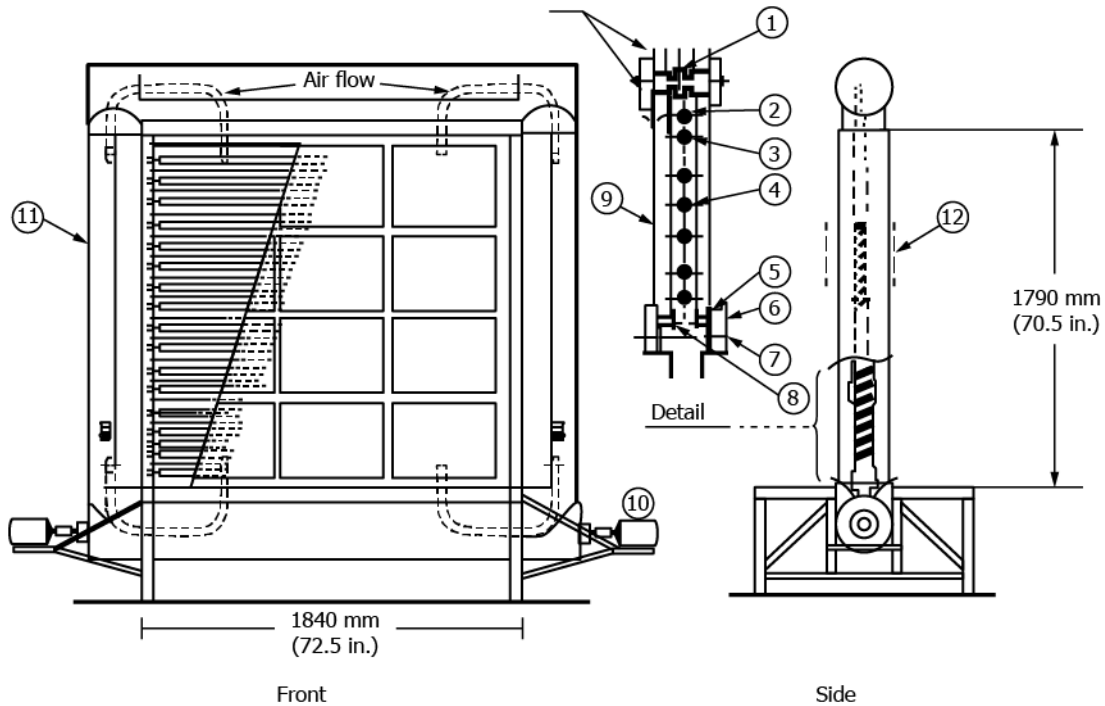
6.1 *For Weather Cycle Phase:*

6.1.1 *Weather Cycle Test Apparatus Chamber*³—The weather cycle test apparatus chamber shall be essentially that shown in **Figs. 1 and 2** to provide the required test conditions indicated in Section 8. Modifications to this test apparatus chamber are acceptable providing that the required test conditions are met.

6.1.1.1 *Ultraviolet Light Source—Source*—~~(Warning—Ultraviolet light sources used in this test method are harmful, especially to the eyes. Appropriate protective measures must be observed.)~~

6.1.1.2 The source shall consist of ~~two~~ fluorescent ultraviolet lamps, Type F72T12BL/HOF72T12BL/HO. This (designation-Note 2), for defines an 1829 mm (72 in.) long lamp, but a different length is acceptable as long as the UV output matches that defined in 6.1.1.3 each test specimen located as shown in. Two lamps shall span either the long or short leg of each specimen to expose the edge seals of each specimen in four locations. See **Fig. 1**.

³ The apparatus chamber is a modification of the device developed by the Institute for Research in Construction (IRC) of the National Research Council of Canada. One modification was to expose each test specimen to two ultraviolet lamps.



Description: (1) Fog or mist spray; (2) Cooling coil; (3) Fluorescent ultraviolet lamp, F72T12BL/HO; (4) Heating coil; (5) Rubber pad; (6) Polystyrene insulation; (7) Rubber washer; (8) Clamping device; (9) Test specimen; (10) Fan motor; (11) Air duct; (12) Insulation

FIG. 1 Schematic Drawing of Typical Accelerated Weathering Apparatus Chamber

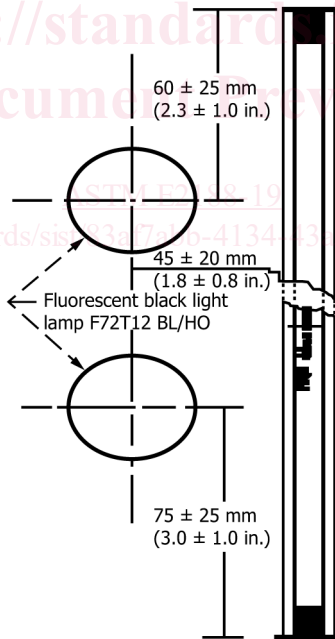


FIG. 2 Location of Fluorescent Ultraviolet Lamp Relative to the Test Specimen

NOTE 2—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. Wattage: 85 W. Relative ultraviolet energy output is 190 % that of F40BL lamp (not high output), when measured at 340 nm.

6.1.1.3 Each lamp shall be replaced when its ultraviolet light intensity falls below 10 W/m² (1000 μW/cm²) when measured with a long-waveUVA ultraviolet meterradiometer in direct contact with the lamp. The radiometer shall be calibrated with results traceable to a national or international physical standards body (for example, National Institute of Standards and Technology (NIST)).

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