



Designation: C1900 – 20

Standard Practice for Weathering and Evaluation of Laminated Glass¹

This standard is issued under the fixed designation C1900; 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 practice is intended to cover procedures for the exposure of laminated glass materials to natural and accelerated weather.

1.2 This practice is limited to the method by which the material is to be exposed and the general procedure to be followed. It is intended for use with finished articles of commerce as well as with all sizes and shapes of test specimens.

1.3 Means of evaluation of the effects of weathering will depend on the intended use for the test material.

1.4 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.

1.5 *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.*

1.6 *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

C1036 Specification for Flat Glass

C1048 Specification for Heat-Strengthened and Fully Tempered Flat Glass

C1172 Specification for Laminated Architectural Flat Glass

D1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics

D1435 Practice for Outdoor Weathering of Plastics

D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

D2565 Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications

D4459 Practice for Xenon-Arc Exposure of Plastics Intended for Indoor Applications

E308 Practice for Computing the Colors of Objects by Using the CIE System

E313 Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates

G7 Practice for Atmospheric Environmental Exposure Testing of Nonmetallic Materials

G84 Practice for Measurement of Time-of-Wetness on Surfaces Exposed to Wetting Conditions as in Atmospheric Corrosion Testing

G141 Guide for Addressing Variability in Exposure Testing of Nonmetallic Materials

G155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

2.2 *ISO Standard:*³

ISO 4892-2 Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of technical terms pertaining to glazing used in this practice, see Terminology C1036, C1048, and C1172.

4. Significance and Use

4.1 Tests conducted in accordance with this practice are used to evaluate the stability of laminated glazing materials when they are exposed outdoors or used indoors. The relative durability of glazing in outdoor use can be very different depending on the location of the exposure because of differences in ultraviolet (UV) radiation, time of wetness, temperature, pollutants, and other factors. It cannot be assumed, therefore, that results from one exposure in a single

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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 Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

location will be useful for determining relative durability in a different location. When comparing exposure results, at a minimum, the locations of exposure are to be as similar as possible with regard to critical factors such as the amount and rate of solar radiation deposited on the specimens, temperature and humidity levels during exposure. Exposures in several locations with different climates that represent a broad range of anticipated service conditions may be necessary.

4.2 Because of year-to-year climatological variations, results from a single exposure test cannot be used to predict the absolute rate at which a material degrades. Several years of repeat exposures are needed to get an average test result for a given location.

4.3 The results of short-term natural and accelerated exposure tests can provide an indication of relative outdoor performance, but they should not be used to predict the absolute long-term performance of a material. The results of tests conducted under natural exposure for less than twelve months will depend on the particular season of the year in which they begin.

5. Test Sites and Apparatus

5.1 Natural Weathering Exposure:

5.1.1 The natural test site shall conform to the requirements of Practice **G7**.

5.1.2 Unless otherwise specified, position exposure racks so that they face the equator. The angle of the exposure rack shall be positioned relative to the horizontal conditions that are being evaluated.

NOTE 1—Test sites at latitudes less than 23°27'8" from the equator in either hemisphere will have a period during the year when the declination of the sun will exceed the latitude of the site.

5.1.3 *Natural Weather Racks*—These racks shall be in accordance with Practice **D1435**.

5.1.3.1 *At-latitude Racks*—These racks shall be adjusted such that the exposed surfaces are at an angle from the horizontal corresponding exactly to the site latitude angle (**Note 2**).

NOTE 2—At-latitude exposure provides maximum annual total solar radiant exposure at most nonsubtropical sites. In most non-desert areas, however, maximum annual ultraviolet-radiant exposure is provided by exposure at an angle of the latitude angle minus 10°.

5.1.3.2 *45° Racks*—These racks shall be adjusted such that the exposed surfaces of specimens are at an angle of 45° to the horizontal.

5.1.3.3 *90° Racks*—These racks shall be adjusted such that the exposed surfaces of specimens are at an angle of 90° to the horizontal.

5.1.3.4 *Horizontal Racks*—These racks shall be positioned such that the exposed surfaces of the specimens are horizontal (**Note 3**).

NOTE 3—To provide moisture runoff for most horizontal-type testing of plastics, 5° south exposure is usually preferred. However, plastic roofing membranes, artificial turf, and other plastics that may be exposed at horizontal in their end-use condition should be exposed at 0° horizontal.

5.1.4 *Materials and Manner of Construction*—Test racks and hardware shall conform to the requirements of Practices **G7** and **D1435**.

5.1.5 *Specimen Holders*—Specimen holders shall be in accordance with Practice **D1435**.

5.2 Accelerated Weathering Exposure:

5.2.1 *Accelerated Chamber*—Chamber shall comply with Practice **G155** and shall be operated in accordance with the conditions specified in **10.3**.

5.2.2 *Accelerated Weathering Racks*—These racks shall be in accordance with Practice **G155** with all portions of a specimen being equidistant from the light source.

5.3 Instruments for Measuring Climatological Data:

5.3.1 *Instruments Used to Measure Ambient Temperature and Relative Humidity*—Instruments and procedures used for measurement of ambient temperature and relative humidity shall be in accordance with Practice **G7**.

5.3.2 *Instruments Used to Measure Solar Radiation*—Instruments and calibration procedures used for measurement of total solar radiation, total solar ultraviolet radiation, or narrow band solar ultraviolet radiation shall be in accordance with Practice **G7**.

6. Sampling

6.1 For natural weathering, sampling shall be in accordance with the pertinent considerations outlined in Guide **G141** with a minimum of three specimens per interval.

6.2 For accelerated weathering a minimum of three specimens per interval shall be used.

7. Test Specimens

7.1 Exposure test specimens shall be a minimum size of 152 × 152 mm for natural exposure and a minimum size of 76 × 127 mm for accelerated exposure. They must be capable of being mounted in a holder or applied directly to the racks. Exposure test specimens should be large enough that mounting edges may be removed where evaluation test results would otherwise be affected but small enough to ensure consistent exposure.

7.2 As far as practical, exposure test specimens shall simulate service conditions of an end-use application or shall have prescribed evaluation procedures to allow comparison of products.

7.3 The total number of specimens will be determined by the removal schedule and number of replicates plus file specimens. These file specimens shall be retained at conditions of 23.0 ± 2 °C and 50 ± 20 % relative humidity. They shall be covered with inert wrapping to exclude light exposure during the exposure and retain period.

8. Exposure Stages

8.1 Use one of the following methods to specify the exposure stages at which changes in properties of test specimens are determined.

NOTE 4—The same exposure stage (by whichever method issued) will not necessarily give the same changes in properties of the test specimen at different exposure sites. The exposure states must be regarded as providing only a general indication of the degrees of exposure, and the results should always be considered in terms of characteristics of the exposure site as well.