Designation: G 24 – 97

Standard Practice for Conducting Exposures to Daylight Filtered Through Glass[1]

This standard is issued under the fixed designation G 24; 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 evaluates the resistance of nonmetallic materials to solar radiation filtered through glass.

1.2 This practice is limited to the method of conducting the exposures. The preparation of test specimens and evaluation of results are covered in various standards for the specific materials.

1.3 Exposure conducted according to this practice can use two types of exposure cabinets.

1.3.1 *Type A*—A cabinet that allows passive ventilation of specimens being exposed behind glass.

1.3.2 *Type B*—Enclosed cabinet with exterior painted black that allows no ventilation of specimens exposed behind glass. Exposures conducted using a Type B cabinet are typically referred to as "black box under glass exposures".

1.4 This practice is technically similar to Method B of ISO 877.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 782 Practice for Exposure of Cover Materials for Solar Collectors to Natural Weathering under Conditions Simulating Operational Mode[2]

E 824 Method for Transfer of Calibration from Reference to Field Pyranometers[2]

E 903 Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres[2]

G 84 Practice for Measurement of Time-of-Wetness on Surfaces Exposed to Wetting Conditions as in Atmospheric Corrosion Testing[3]

G 113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials[4]

2.2 *Other Documents:*

WMO Guide to Meteorological Instruments and Methods of Observation WMO No. 8, Fifth Edition.[5]

ISO 105 B01 Textiles—Tests for Colour Fastness, International Standards Organization, Geneva, Switzerland.[6]

ISO 877 Plastics—Methods of Exposure to Direct Weathering, to Weathering Using Glass-Filtered Daylight, and to Intensified Weathering by Daylight Using Fresnel Mirrors, International Standards Organization, Geneva, Switzerland[6]

AATCC 16C Colorfastness to Light, Daylight[7]

3. Terminology

3.1 *Definitions:*

3.1.1 The definitions contained in Terminology G 113 are applicable to this practice.

4. Significance and Use

4.1 Since solar irradiance, air temperature, relative humidity, and the amount and kind of atmospheric contaminants vary continuously, results from exposures based on time may differ. The variations in the results may be minimized by timing the exposures in terms of one or more environmental parameters such as solar radiant exposure, or in terms of a predetermined property change of a reference specimen with known performance.

4.2 Moisture combined with atmospheric contaminants may produce degradation effects as great as those produced by solar irradiance. This may explain differences in rankings of specimens exposed to equivalent solar radiant exposure when other environmental conditions vary.

[1] This practice is under the jurisdiction of ASTM Committee G-3 on Durability of Nonmetallic Materials and is the direct responsibility of Subcommittee G 03.02 on Natural Environmental Testing.

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[2] *Annual Book of ASTM Standards*, Vol 12.02.

[3] *Annual Book of ASTM Standards*, Vol 03.02.

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] Available from World Meteorological Organization, Geneva, Switzerland.

[6] Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

[7] American Association of Textile Chemists and Colorists, Research Triangle Park, PO Box 12215, NC 27709-2215.

4.3 Since the method of mounting may influence the temperature and other parameters of the specimen during exposure, there should be a mutual understanding as to the method of mounting the specimen for the particular exposure test under consideration.

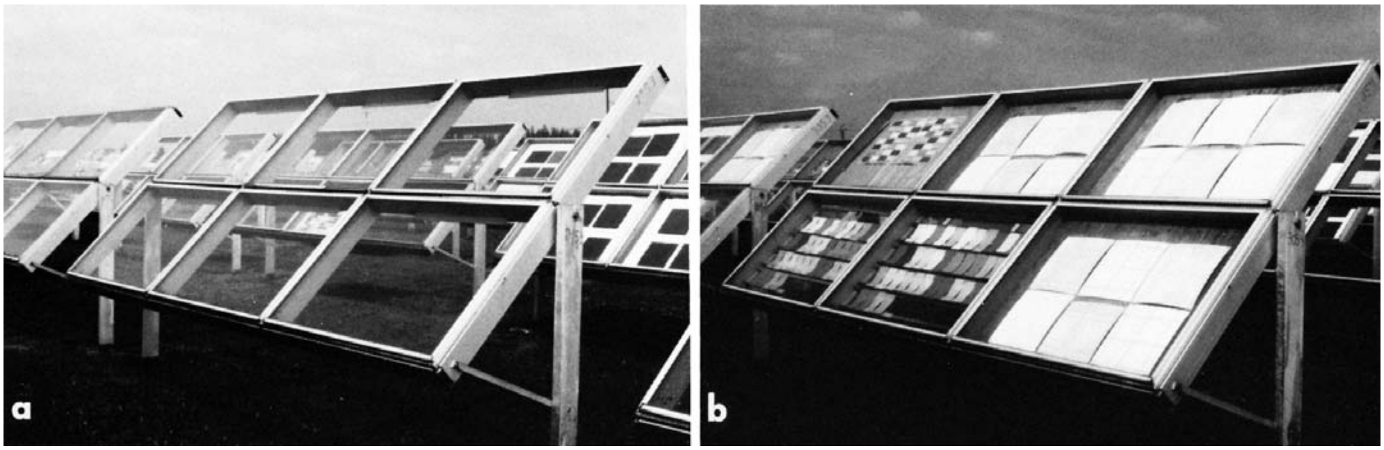

FIG. 1 a and 1b Typical Well-Ventilated Under Glass Exposure Cabinet, Type A

FIG. 2 Typical Enclosed Under Glass Exposure Cabinet, Type B (Black Box Under Glass)

4.4 There can be large differences in 300 to 350 nm UV transmission of single strength window glass. For example, at 320 nm, the percent transmission for seven different lots of single strength window glass ranged from 8.4 to 26.8 %. For this range of transmission, the rate of degradation for materials sensitive to short wavelength UV from 300 to 320 nm could vary by as much as 300 %.[8] In addition, exposures conducted at different times of the year can cause large differences in rate of degradation.[9]

4.5 In order to minimize differences in 300 to 340 nm UV transmission caused by rapid solarization of new glass, this practice requires that glass be pre-aged for three months prior to use in exposure cabinets.

4.6 Differences in UV transmission between different lots of glass persist after solarization.[8] The largest differences in UV transmission of glass are between 300 and 320 nm. Use of radiant exposure based on total solar radiation or total solar UV radiation to determine exposure periods is not sensitive to these differences. For materials very sensitive to differences in short wavelength UV radiation, monitoring UVB radiation behind glass may be the best approach for use when radiant energy is used to determine the length of exposures. However, for materials sensitive to long wavelength UV or visible radiation, monitoring UVB radiation or using reference materials that are very sensitive to short wavelength solar ultraviolet radiation to determine exposure periods may produce inconsistent results.

4.7 This practice is best used to compare the relative performance of materials tested at the same time behind the same lot of glass. Because of variability between lots of glass and between exposures conducted at different times of the year, comparing the amount of degradation in materials exposed for the same duration or radiant exposure at separate times, or in separate fixtures using different lots of glass is not recommended. This practice should not be used to establish "pass/fail" approval of materials after a specific period of exposure

[8] Ketola, W. D., and Robbins, J. S. "UV Transmission of Single Strength Window Glass", *Accelerated and Outdoor Durability Testing of Organic Materials, ASTM STP 1202*, Warren D. Ketola and Douglass Grossman, Eds, American Society for Testing and Materials, Philadelphia, 1993.

[9] Crewdson, L. F., and Bahadur-Singh, C., "A Review of the Variability Encountered When Exposure Materials to Glass Filtered Sunlight", *Accelerated and Outdoor Durability Testing of Organic Materials, ASTM STP 1202*, Warren D. Ketola and Douglass Grossman, Eds, American Society for Testing and Materials, Philadelphia, 1993.