Designation: G24 – 21

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

This standard is issued under the fixed designation G24; 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 describes procedures for conducting exposures of various materials to daylight filtered through glass in passively ventilated and non-vented enclosures. For exposures in under glass enclosures with forced air circulation, refer to Practice G201.

1.1.1 This practice is not intended for corrosion testing of bare metals.

1.2 For direct exposures, refer to Practice G7.

1.3 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.

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

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

1.4.2 *Type B*—Enclosed cabinet with exterior painted black that does not provide for ventilation of specimens exposed behind glass. Exposures conducted using a Type B cabinet are typically referred to as "black box under glass exposures."

1.5 Type A exposures of this practice are technically similar to Method B of ISO 877-2.

1.6 *Units*—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.

1.7 *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, health, and 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]

C1036 Specification for Flat Glass

D4303 Test Methods for Lightfastness of Colorants Used in Artists' Materials

D6901 Specification for Artists' Colored Pencils

E824 Test Method for Transfer of Calibration From Reference to Field Radiometers

E903 Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres

G7 Practice for Natural Weathering of Materials

G113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials

G147 Practice for Conditioning and Handling of Nonmetallic Materials for Natural and Artificial Weathering Tests

G201 Practice for Conducting Exposures in Outdoor Glass-Covered Exposure Apparatus with Air Circulation

2.2 *ISO Standards:*[3]

ISO 877-2 Plastics – Methods of Exposure to Solar Radiation – Part 2: Direct Weathering and Exposure Behind Window Glass

ISO 9060:2018 Solar Energy – Specification and Classification of Instruments for Measuring Hemispherical Solar and Direct Solar Radiation

2.3 *Other Document:*[4]

WMO Guide to Meteorological Instruments and Methods of Observation WMO No. 8, 2014 Edition (2017).

3. Terminology

3.1 *Definitions:*

3.1.1 The definitions contained in Terminology G113 are applicable to this practice.

[1] This practice is under the jurisdiction of ASTM Committee G03 on Weathering and Durability and is the direct responsibility of Subcommittee G03.02 on Natural and Environmental Exposure Tests.

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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, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, https://www.iso.org.

[4] Available from World Meteorological Organization (WMO), 7bis, avenue de la Paix, Case Postale No. 2300, CH-1211 Geneva 2, Switzerland, http://www.wmo.int.

***A Summary of Changes section appears at the end of this standard**

4. Significance and Use

4.1 Since solar radiation, air temperature, relative humidity, and the amount and kind of atmospheric contaminants vary continuously, results from exposures based on elapsed time will sometimes differ. The variations in the results will usually be reduced by timing the exposures in terms of:

4.1.1 One or more environmental parameters such as solar radiant exposure, or

4.1.2 A predefined property change of a weathering reference specimen with known performance.

4.2 Variations in temperature, moisture, and atmospheric contaminants can have a significant effect on the degradation caused by solar radiation. In addition, exposures conducted at different times of the year can cause large differences in the rate of degradation. Different materials generally have different sensitivities to heat, moisture, and atmospheric contaminants, and this could explain differences in rankings of specimens exposed to equivalent solar radiant exposure when other environmental conditions vary.

4.3 Since the method of mounting has an influence on the temperature and other parameters during exposure of the specimen, there shall be agreement between contractual parties as to the method of mounting the specimen for the particular exposure test under consideration.

4.4 There are differences among various single strength window glasses in their transmittance in the 300 to 350 nm region. For example, at 320 nm, the percent transmittance for seven different lots of single strength window glass ranged from 8.4 to 26.8 %. At 380 nm, the percent transmittance ranged from 84.9 % to 88.1 %.[5]

4.5 Differences in UV transmittance between different lots of glass generally continue even after solarization. The largest differences among window glasses in UV transmittance are in the spectral range of 300 to 320 nm.

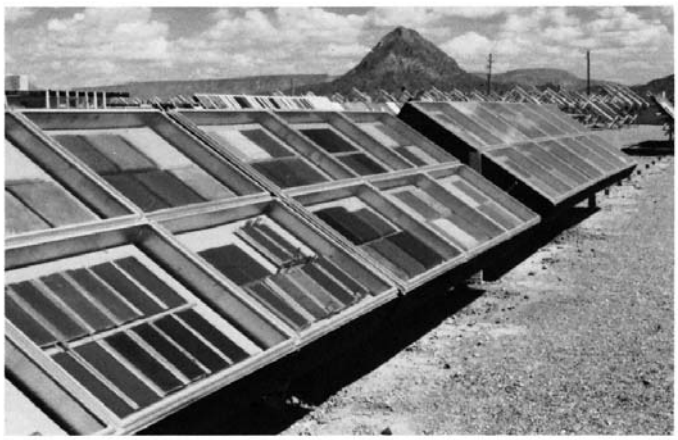

FIG. 2 Typical Non-Ventilated Enclosed Under Glass Exposure Cabinet, Type B (Black Box Under Glass)

4.6 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.

4.7 It is recommended that at least one control material with known performance be exposed with each test. The control material should be of similar composition and construction as the test specimen, and be chosen so that its failure modes are the same as that of the material being tested. It is preferable to use two control materials, one with relatively good durability, and one with relatively poor durability. When control materials are included as part of the test, they shall be used for the purpose of comparing the performance of the test materials relative to the controls.

4.8 Because of the possibility that certain materials will outgas during exposure and potentially contaminate other specimens, it is recommended that only similar materials be exposed in the same under glass cabinet at the same time.

[5] Ketola, W. D., and Robbins, J.S., III, "UV Transmission of Single Strength Window Glass," *Accelerated and Outdoor Durability Testing of Organic Materials, ASTM STP 1202*, Warren D. Ketola and Douglas Grossman, Eds., American Society for Testing and Materials, Philadelphia, 1994.

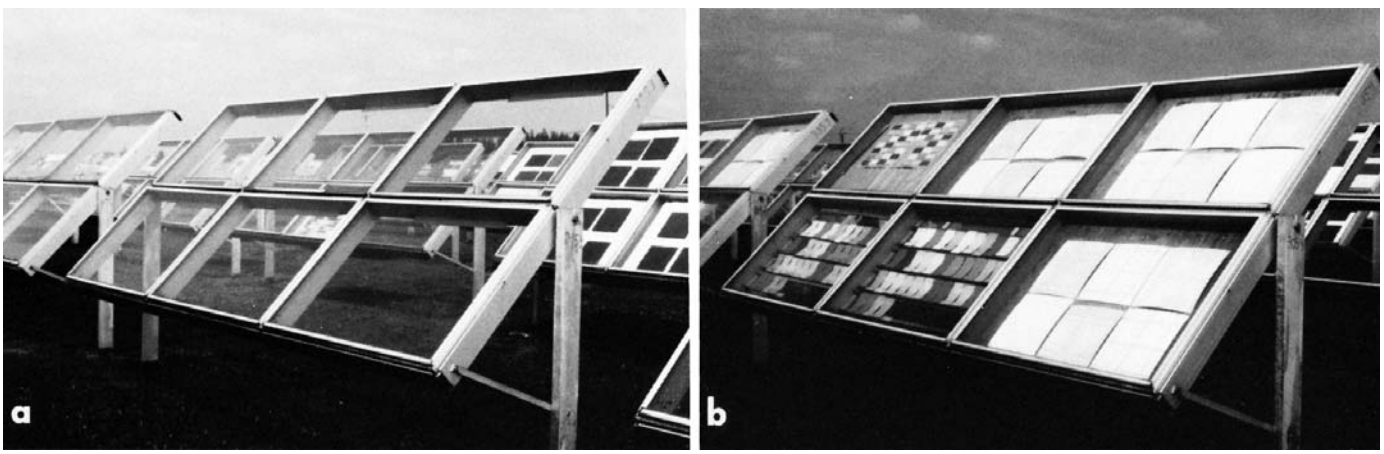

FIG. 1 a and 1b Typical Passively-Ventilated Under Glass Exposure Cabinet, Type A