



Designation: C 1442 – 99

Standard Practice for Conducting Tests on Sealants Using Artificial Weathering Apparatus¹

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1. Scope

1.1 This practice covers three artificial weathering exposure procedures for evaluating the durability of sealants.

1.2 The three procedures are Practices G 152, G 154, and G 155.

1.3 The performance rankings of sealants provided by these procedures may not agree.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information only.

1.5 A related ISO procedure is ISO 11431. The user should compare to determine how procedures differ.

1.6 *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:

C 717 Terminology of Building Seals and Sealants²

G 113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials³

G 151 Practice for Exposing Nonmetallic Materials in Accelerated Test Devices That Use Laboratory Light Sources³

G 152 Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials³

G 154 Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials³

G 155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials³

2.2 ISO Standard:

ISO 11431 Building Construction—Sealants: Determina-

tion of Adhesion/Cohesion Properties After Exposure to Heat and Artificial Light Through Glass and to Moisture⁴

3. Terminology

3.1 *Definitions*—Definitions of the following terms are found in Terminology C 717: *compound, cure, sealant, substrate*. Definitions of the following terms are found in Terminology G 113: *actinic radiation, sample, file specimen, control material, fluorescent ultraviolet lamps, xenon arc, irradiance, radiant exposure, spectral power distribution, solar radiation-ultraviolet, solar radiation-visible*.

4. Summary of Practice

4.1 The test sealant is applied to a variety of substrates or as a free film or other configuration, depending upon the properties that are to be evaluated after the exposure is completed. At least four replicates of each sealant being tested are required. After curing, one replicate of each sealant being tested is retained as a file specimen and three replicates are exposed to actinic radiation, heat, and moisture. At the end of the exposure period, the test sealant is examined for change in comparison to the unexposed file specimen and to change in the control material, if used.

4.2 It is recommended that a similar material of known performance (a control) be exposed simultaneously with the test specimen to provide a basis for comparison.

5. Significance and Use

5.1 This test method is for determining the effects of actinic radiation, elevated temperature, and moisture on sealants and their constituents under controlled laboratory artificial weather test conditions.

5.2 When conducting exposures in devices, which use laboratory light sources, it is important to consider how well the artificial test conditions will reproduce property changes and failure modes associated with end-use environments for the sealant being tested.

¹ This practice is under the jurisdiction of ASTM Committee C-24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.40 on Weathering.

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² *Annual Book of ASTM Standards*, Vol 04.07.

³ *Annual Book of ASTM Standards*, Vol 14.02.

⁴ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor. New York, NY 10036.

NOTE 1—Refer to Practice G 151 for full cautionary guidance regarding laboratory weathering.

5.3 The results obtained may vary between the three procedures because the spectral power distributions of these light sources (open flame carbon arc, fluorescent UV tube, and xenon arc) differ. Sealants should not be compared to each other based on the results obtained in different types of apparatus.

6. Test Specimen

6.1 The size and configuration of the specimens will be determined by the specifications of the test method used to evaluate the effect of exposure on the specimens. Where practical, it is recommended that specimens be sized to fit the sample holders supplied with the apparatus.

6.2 Some common specimen configurations may include slab, tensile bar, H-block aymar samples, patties, sheets, drawdowns, preformed joint sealants, prevulcanized elastomeric joint materials, beads, channels, among others.

6.3 Specimens configured for movement during exposure to artificial weathering conditions also may be used.

7. Apparatus

7.1 *Test Chamber*—Choice of apparatus and exposure conditions selected will be by mutual agreement among the interested parties. Historical convention has established the procedures described in 7.2, 7.3 and 7.4 as commonly used exposure conditions.

7.2 *Procedure for Open Flame Carbon Arc Light Source (Practice G 152)*—Use the exposure conditions described in X1.1, Cycle 1; 102 min light at $63 \pm 2.5^\circ\text{C}$ ($145.4 \pm 4.5^\circ\text{F}$) black panel temperature, 18 min light and water spray (air temperatures not controlled).

7.3 *Procedure Fluorescent Light Apparatus (Practice G 154)*—Use the exposure conditions and lamp described in Practice G 154, X2.1, UVA-340 lamp, Cycle 1; 8 h UV at $60 \pm 3^\circ\text{C}$ ($140 \pm 5.4^\circ\text{F}$) black panel temperature, 4 h Condensation at $50 \pm 3^\circ\text{C}$ ($122 \pm 5.4^\circ\text{F}$) black panel temperature.

7.4 *Procedure Xenon Arc Light Source (Practice G 155)*—Use the exposure conditions, filter, and irradiance described in X3.1, Cycle 1; $0.35 \text{ W/m}^2/\text{mm}$, 340 nm, 102 min light at $63 \pm 2.5^\circ\text{C}$ ($145.4 \pm 4.5^\circ\text{F}$) black panel temperature, 18 min light and water spray (air temperature not controlled).

8. Conditioning

8.1 Condition sufficient sealant in an original closed container for at least 24 h at standard conditions. Standard conditions are a temperature of $23 \pm 2^\circ\text{C}$ ($73 \pm 3.6^\circ\text{F}$) and relative humidity of $50 \pm 5\%$.

9. Procedure

9.1 Prepare at least four sealant test specimens. Unless otherwise agreed upon, cure the test specimens at standard conditions for 21 days. Other conditions for curing are acceptable when specified provided they meet the following require-

ments: the curing period shall not exceed 21 days, and the temperature during the curing period shall not exceed 50°C (122°F). Keep one test specimen as an unexposed file specimen and store at standard conditions and away from light.

9.2 Place at least three of the cured specimens and the control material, if used, in the artificial weathering apparatus with the sealant surface facing the radiation source.

9.3 *Specimen Mounting and Arrangement*—The test specimens shall be mounted so that the plane of the test surface is at a distance from the lamps consistent with the practice for operation of that apparatus. Refer to the appropriate practice for information about proper specimen mounting.

9.4 Apparatus shall be operated continuously; however, if the test needs to be interrupted to perform routine maintenance or inspection, it should be during a dry stage.

9.5 After artificial weathering condition the samples at $23 \pm 2^\circ\text{C}$ ($73 \pm 3.6^\circ\text{F}$) and $50 \pm 5\%$ relative humidity for at least 2 h.

9.6 Use one of the following methods to base the duration of exposure under this procedure.

9.6.1 A mutually agreed upon specified period of exposure, or quantity of radiant energy.

9.6.2 A period of exposure required to produce a mutually agreed upon amount of change in either the test specimen or an agreed upon control material.

10. Report

10.1 At the end of the exposure, evaluate the appropriate properties in accordance with recognized ASTM procedures and report the results in accordance with Practice G 151.

10.2 In addition to the items specified in Practice G 151, the report shall include the following for each sample tested:

10.2.1 Manufacturer and model of artificial weathering apparatus;

10.2.2 Identification of the sealant specimen tested, and control material used, if any. This identification should include a description of the origin of the sealant, that is, laboratory production facility, product code, color code or name, and lot number, if applicable;

10.2.3 Sealant cure conditions employed;

10.2.4 Variations, if any, from the specified test procedure.

11. Precision and Bias

11.1 The repeatability and reproducibility of results obtained in exposures conducted according to this practice will vary with the materials tested, the material property measured, and the specific test conditions and cycles used. It is essential to determine reproducibility of the exposure/property measurement process when using results from exposures conducted according to this practice in product specifications.

12. Keywords

12.1 accelerated weathering; actinic radiation; artificial accelerated weathering; durability; exposure; light; sealant; temperature; ultraviolet; UV-radiation; weathering

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