



Designation: D4587 – 11 (Reapproved 2019)^{ε1}

Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings¹

This standard is issued under the fixed designation D4587; 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.

^{ε1} NOTE—Section 4.2 was updated editorially in December 2019.

1. Scope

1.1 This practice covers the selection of test conditions for accelerated exposure testing of coatings and related products in fluorescent UV and condensation devices conducted according to Practices **G151** and **G154**. This practice also covers the preparation of test specimens, and the evaluation of test results. **Table 1** describes commonly used test conditions.

NOTE 1—Previous versions of this practice referenced fluorescent UV devices described by Practice **G53**, which described very specific equipment designs. Practice **G53** has been withdrawn and replaced by Practice **G151**, which describes performance criteria for all exposure devices that use laboratory light sources, and by Practice **G154**, which gives requirements for exposing nonmetallic materials in fluorescent UV devices.

NOTE 2—ISO 11507:1997 also describes fluorescent UV-condensation exposures of paints and coatings.

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

1.3 *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.*

1.4 *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.*

¹ This practice is under the jurisdiction of ASTM Committee **D01** on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee **D01.27** on Accelerated Testing.

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2. Referenced Documents

2.1 ASTM Standards:²

- D358** Specification for Wood to Be Used as Panels in Weathering Tests of Coatings (Withdrawn 2014)³
- D523** Test Method for Specular Gloss
- D609** Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products
- D610** Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
- D659** Method for Evaluating Degree of Chalking of Exterior Paints (Withdrawn 1990)³
- D660** Test Method for Evaluating Degree of Checking of Exterior Paints
- D662** Test Method for Evaluating Degree of Erosion of Exterior Paints
- D714** Test Method for Evaluating Degree of Blistering of Paints
- D772** Test Method for Evaluating Degree of Flaking (Scaling) of Exterior Paints
- D823** Practices for Producing Films of Uniform Thickness of Paint, Coatings and Related Products on Test Panels
- D1005** Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers
- D1186** Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base (Withdrawn 2006)³
- D1400** Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a

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 The last approved version of this historical standard is referenced on www.astm.org.

TABLE 1 Test Cycles Commonly Used for Fluorescent UV–Condensation Exposure Testing of Paints and Related Coatings^A

Cycle Number	Cycle Description	340 nm Irradiance ^{B,C}	Black Panel Temperature ^D	Typical Uses ^E
1	8 h UV 4 h condensation Repeated continuously	0.83 W/(m ² ·nm) dark period	70 ± 2.5°C (158 ± 5°F) 50 ± 2. °C (122 ± 5°F)	Automotive coatings ^F
2	4 h UV 4 h condensation Repeated continuously	0.89 W/(m ² ·nm) dark period	60 ± 2.5 (140 ± 5°F) 50 ± 2.5 (122 ± 5°F)	Industrial maintenance coatings ^G
3	4 h UV 20 h condensation Repeated continuously	0.89 W/(m ² ·nm) dark period	60 ± 2.5 (140 ± 5°F) 50 ± 2.5 (122 ± 5°F)	Exterior wood coatings
4	8 h UV 4 h condensation Repeated continuously	0.89 W/(m ² ·nm) dark period	60 ± 2.5 (140 ± 5°F) 50 ± 2.5 (122 ± 5°F)	General metal coatings

^A The cycles described are not listed in any order indicating importance, and are not necessarily recommended for the applications listed. Additional exposure cycles are described in Practice [G154](#).

^B The irradiance set point given is typical for devices operated without irradiance control. Other irradiance levels may be used, but must be described in the report.

^C Previous editions of Practice D4587 contained non-mandatory irradiance set points in [Table 1](#) that were commonly used in the industry. The previous set points were 0.72 and 0.77 W/(m² · nm) at 340 nm for UVA 340 lamps. The measurement data used to establish these set points was inaccurate, due to an error in calibration on the part of one manufacturer. It has been found that, for most users, the actual irradiance when running at the previous set points was 11 to 15 % higher than the indicated set point. The set points shown in this edition of D4587 do not change the actual irradiances that have been historically used by these users. However, for users of equipment made by another manufacturer, the irradiance control system did not have the measurement inaccuracies described above, so running at the new set points will represent a change in the actual irradiance of the test. If in doubt, users should consult the manufacturer of their device for clarification.

^D Temperature is at equilibrium for either an uninsulated or insulated black panel, although the response of the insulated black panel might be slower than that for the uninsulated black panel. Refer to Practice [G151](#) for more information about the construction and differences between uninsulated and insulated black panels.

^E Typical uses do not imply that results from exposures of these materials according to the cycle described will correlate to those from actual use conditions.

^F SAE J2020 describes the test used in many automotive specifications and requires use of a FS40 fluorescent UVB lamp.

^G Historical convention has established this as a very commonly used test cycle. This cycle may not adequately simulate the effects of outdoor exposure.

- [Nonferrous Metal Base \(Withdrawn 2006\)³](#)
- [D1729 Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials](#)
- [D1730 Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting](#)
- [D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates](#)
- [D2616 Test Method for Evaluation of Visual Color Difference With a Gray Scale](#)
- [D3359 Test Methods for Rating Adhesion by Tape Test](#)
- [D3980 Practice for Interlaboratory Testing of Paint and Related Materials \(Withdrawn 1998\)³](#)
- [D4214 Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films](#)
- [D5870 Practice for Calculating Property Retention Index of Plastics](#)
- [E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)
- [E1347 Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry](#)
- [G53 Practice for Operating Light-and Water-Exposure Apparatus \(Fluorescent UV-Condensation Type\) for Exposure of Nonmetallic Materials \(Withdrawn 2000\)³](#)
- [G113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials](#)
- [G141 Guide for Addressing Variability in Exposure Testing of Nonmetallic Materials](#)
- [G147 Practice for Conditioning and Handling of Nonmetallic Materials for Natural and Artificial Weathering Tests](#)
- [G151 Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources](#)
- [G154 Practice for Operating Fluorescent Ultraviolet \(UV\) Lamp Apparatus for Exposure of Nonmetallic Materials](#)

[G169 Guide for Application of Basic Statistical Methods to Weathering Tests](#)

[2.2 ISO Standard:⁴](#)

[ISO 11507:1997 Paints and Varnishes—Exposure of Coatings to Artificial Weathering—Exposure to Fluorescent UV and Water](#)

[2.3 SAE Standard:⁵](#)

[SAE J2020 Accelerated Exposure of Automotive Exterior Materials Using a Fluorescent UV Condensation Apparatus](#)

3. Terminology

3.1 The definitions given in Terminology [G113](#) are applicable to this practice.

4. Significance and Use

4.1 The ability of a paint or coating to resist deterioration of its physical and optical properties caused by exposure to light, heat, and water can be very significant for many applications. This practice is intended to induce property changes associated with end-use conditions, including the effects of sunlight, moisture, and heat. The exposure used in this practice is not intended to simulate the deterioration caused by localized weather phenomena such as atmospheric pollution, biological attack, and saltwater exposure.

4.2 **Warning**—Variation in results may be expected when different operating conditions are used. Therefore, no reference to the use of this practice shall be made unless accompanied by

⁴ 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>.

⁵ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.