Designation: D6695 – 16

Standard Practice for Xenon-Arc Exposures of Paint and Related Coatings[1]

This standard is issued under the fixed designation D6695; 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 covers the selection of test conditions for accelerated exposure testing of coatings and related products in xenon arc devices conducted according to Practices G151 and G155. This practice also covers the preparation of test specimens, the test conditions suited for coatings, and the evaluation of test results.

NOTE 1—This practice and ISO 16474-2 address the same subject matter but differ in technical content.

1.2 The values SI units are to be regarded as 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 and health practices and determine the applicability of regulatory limitations prior to use.*

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D358 Specification for Wood to Be Used as Panels in Weathering Tests of Coatings (Withdrawn 2014)[3]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D659 Method for Evaluating Degree of Chalking of Exterior Paints (Withdrawn 1990)[3]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, Varnish, 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Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base (Withdrawn 2006)[3]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 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 Measuring 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

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

[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.

Current edition approved May 1, 2016. Published May 2016. Originally approved in 2001. Last previous edition approved in 2008 as D6695 – 08. DOI: 10.1520/D6695-16.

[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.

G155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials
G169 Guide for Application of Basic Statistical Methods to Weathering Tests

2.2 *ISO Standards:*
ISO 16474-2 Paints and Varnishes—Methods of exposure to laboratory light sources—Part 2: Xenon-arc lamps[4]

2.3 *Society of Automotive Engineers Standards:*
SAE J2412 Accelerated Exposure of Automotive Interior Trim Components using a Controlled Irradiance Xenon-Arc Apparatus[5]
SAE J2527 Performance Based Standard for Accelerated Exposure of Automotive Exterior Materials using a Controlled Irradiance Xenon-Arc Apparatus[5]

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 daylight, 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 salt water exposure.

4.2 *Caution*—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 a report prepared according to Section 9 that describes the specific operating conditions used. Refer to Practice G151 for detailed information on the caveats applicable to use of results obtained according to this practice.

NOTE 2—Additional information on sources of variability and on strategies for addressing variability in the design, execution and data analysis of laboratory accelerated exposure tests is found in Guide G141.

4.2.1 The spectral power distribution of light from a xenon-arc is significantly different from that produced in light and water exposure devices using carbon-arc or other light sources. The type and rate of degradation and the performance rankings produced by exposures to xenon-arcs can be much different from those produced by exposures to other types of laboratory light sources.

4.2.2 Interlaboratory comparisons are valid only when all laboratories use the same light source, filter type, and exposure conditions.

4.3 Reproducibility of test results between laboratories has been shown to be good when the stability of materials is evaluated in terms of performance ranking compared to other materials or to a control.[6,7] Therefore, exposure of a similar material of known performance (a control) at the same time as the test materials is strongly recommended. It is recommended that at least three replicates of each material be exposed to allow for statistical evaluation of results.

4.4 Test results will depend upon the care that is taken to operate the equipment according to Practice G155. Significant factors include regulation of line voltage, freedom from salts or other deposits from water, temperature and humidity control, and condition and age of the lamp and filters.

4.5 *All references to exposures in accordance with this practice must include a complete description of the test cycle used.*

5. Apparatus

5.1 Use xenon-arc apparatus that conforms to the requirements defined in Practices G151 and G155.

5.2 Unless otherwise specified, the spectral power distribution of the xenon-arc shall conform to the requirements in Practice G155 for xenon-arc with daylight filters.

6. Test Specimens

6.1 Apply the coating to flat (plane) panels with the substrate, method of preparation, method of application, coating system, film thickness, and method of drying consistent with the anticipated end use, or as mutually agreed upon between the producer and user.

6.2 Panel specifications and methods of preparation include but are not limited to Practices D609, D1730, or Specification D358. Select panel sizes suitable for use with the exposure apparatus.

6.3 Coat test panels in accordance with Practices D823 and then measure the film thickness in accordance with an appropriate procedure selected from Test Methods D1005, D1186, or D1400. Nondestructive methods are preferred because panels so measured need not be repaired.

6.4 Prior to exposing coated panels in the apparatus, condition them at 23 ± 2°C (73 ± 3°F) and 50 ± 10 % relative humidity for one of the following periods in accordance with the type of coating:

Baked coatings	24 h
Radiation-cured coatings	24 h
All other coatings	7 days min

6.4.1 Other procedures for preparation of test specimens may be used if agreed upon between all interested parties.

6.5 Mount specimens in holders so that only the minimum specimen area required for support by the holder is covered. This unexposed surface must not be used as part of the test

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[5] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, http://www.sae.org.

[6] Fischer, R., "Results of Round Robin Studies of Light- and Water-Exposure Standard Practices," *Accelerated and Outdoor Durability Testing of Organic Materials, ASTM STP 1202*, Warren D. Ketola and Douglas Grossman, Eds, ASTM, 1993.

[7] Ketola, W., and Fischer, R. "Characterization and Use of Reference Materials in Accelerated Durability Tests," *VAMAS Technical Report No. 30*, available from NIST, June 1997.

area. In cases where it is necessary to support flexible specimens during exposure, attach the flexible specimens to a thin supporting panel.

NOTE 3—For supporting flexible specimens, aluminum panels that are 0.025 in. (0.64 mm) which have been found to be acceptable for many applications.

6.6 Unless otherwise specified, expose at least three replicate specimens of each test and control material.

6.6.1 If performance comparisons are not being made between the test materials themselves, it is recommended that a control material be exposed simultaneously with experimental materials for determination of relative performance. All concerned parties must agree on the control material, if any is used.

6.7 Follow the procedures described in Practice G147 for identification and conditioning and handling of specimens of test, control, and reference materials prior to, during, and after exposure.

6.8 Do not mask the face of a specimen for the purpose of showing on one panel the effects of various exposure times. Misleading results may be obtained by this method, since the masked portion of the specimen is still exposed to temperature and humidity cycles that in many cases will affect results.

6.9 Retain a supply of unexposed file specimens of all materials evaluated.

6.9.1 When destructive tests are run, it is recommended that a sufficient number of file specimens be retained so that the property of interest can be determined on unexposed file specimens each time exposed materials are evaluated.

NOTE 4—Since the stability of the file specimen may also be time-dependent, users are cautioned that over prolonged exposure periods, or where small differences in the order of acceptable limits are anticipated, comparison of exposed specimens with the file specimen may not be valid. Nondestructive instrumental measurements are recommended whenever possible.

6.10 Specimens should not be removed from the exposure apparatus for more than 24 h then returned for additional tests, since this may not produce the same results on all materials as tests run without this type of interruption. When specimens are removed from the exposure apparatus for 24 h or more then returned for additional exposure, report the elapsed time as noted under Section 9.

7. Procedure

7.1 Table 1 lists several exposure cycles that are used for xenon-arc exposures of paints and coatings. Obtain agreement between all concerned parties for the specific exposure cycle used. Additional intervals and methods of wetting, by spray, condensation, immersion, or combination of these, may be substituted upon agreement among the concerned parties.

NOTE 5—Each setpoint and its tolerances found in Table 1 represent an operational control point for equilibrium conditions at a single location in the cabinet that may not necessarily represent the uniformity of those conditions throughout the cabinet.

NOTE 6—Spray, condensation, and immersion are different kinds of moisture exposures and frequently produce different results.

7.1.1 Unless otherwise specified, maintain relative humidity at 50 ± 10 % equilibrium during the light-only interval.

7.2 If no other cycle is specified, use Cycle No. 1.

7.3 Mount test specimens in the device following the placement and specimen repositioning procedures described in Practice G155. It is recommended that all unused spaces in the specimen exposure area be filled with blank metal panels that are not highly reflective. The blanks used shall be resistant to corrosion and shall not contaminate the specimens being exposed.

7.4 If the irradiance uniformity does not meet the requirements of Practice G151, reposition specimens in devices preferably using the procedure described or, at a minimum, one of the procedures described in Practice G155.

Repositioning of specimens throughout the exposure period can minimize variations in test results for materials that are especially sensitive to small variations in temperature, humidity, or irradiance. As such, repositioning is always a good idea and is recommended even if a device meets the irradiance uniformity requirements in Practice G151.

It is also recommended to randomly position multiple specimens of each material throughout the specimen rack or tray. By randomly positioning multiple replicate specimens of one material, the effects of uniformity variations can be reduced.

7.4.1 If specimen repositioning is used, and no other repositioning schedule is specified, the following procedure for specimen repositioning is recommended:

7.4.1.1 Once per week move all holders in the top half of the specimen exposure area to the bottom half, and move all holders in the bottom half of the exposure area to the top half. Do not reposition the specimens within the holder.

NOTE 7—In older devices, incident energy at the top and bottom of the specimen rack is often only 70 % of that at the center. This condition requires that the procedures described in 7.4 be followed to ensure uniformity of radiant exposure.

7.4.1.2 For devices with a planar exposure area, reposition specimens by moving specimens or holders in the half of the exposure area farthest from the door, one position to the right. The rightmost specimen or holder in this area is moved to the rightmost position in the half of the area closest to the door. Other specimens in this area are moved one position left with the leftmost specimen or holder moved to the leftmost position in the half farthest from the door. This repositioning schedule is illustrated in Fig. 1.

7.5 *Water Purity:*

7.5.1 The purity of water used for specimen spray is very important. Without proper treatment to remove cations, anions, organics, and particularly silica, exposed panels will develop spots or stains that may not occur in exterior exposures.

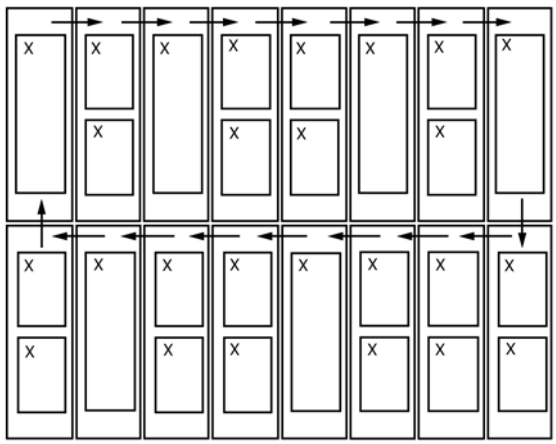
7.5.2 Follow the requirements for water purity described in Practice G151.

7.5.3 If specimens are found to have deposits or stains after exposure in the apparatus, the water purity must be checked to determine if it meets the requirements of 7.5.2. On some occasions, exposed specimens can be contaminated by deposits from bacteria that can grow in the purified water used for specimen spray. If bacterial contamination is detected, the

TABLE 1 Test Cycles Commonly Used for Xenon-Arc Exposure Testing of Paints and Related Coatings[A]

Cycle Number	Cycle Description[B]	Uninsulated Black Panel, Temperature[C]	Typical Irradiance[D]	Typical Uses[E]
1	Continuous light 102 min light only at 50 % ± 5 % RH 18 min light and water spray/[F] Repeat continuously	63 ± 2°C 145 ± 4°F	0.35 ± 0.02 W/(m^2·nm) at 340 nm 41.5 ± 2.5 W/m^2 from 300-400 nm	General coatings and historical convention[G]
2	18 h continuous light using: 102 min light only at 50 % ± 5 % RH 18 min light and water spray 6 h dark using: 95 % relative humidity (no water spray) Repeat continuously	63 ± 2°C 145 ± 4°F 24 ± 1.5°C 43 ± 3°F	0.35 ± 0.02 W/(m^2·nm) at 340 nm 41.5 ± 2.5 W/m^2 from 300-400 nm	General coatings
3	4 h light at 50 % ± 5 % RH 4 h dark with water spray Repeat continuously	63 ± 2°C 145 ± 4°F	0.35 ± 0.02 W/(m^2·nm) at 340 nm 41.5 ± 2.5 W/m^2 from 300-400 nm	Exterior pigmented stains
4	12 h light at 50 % ± 5 % RH 12 h dark with water spray Repeat continuously	63 ± 2°C 145 ± 4°F	0.35 ± 0.02 W/(m^2·nm) at 340 nm 41.5 ± 2.5 W/m^2 from 300-400 nm	Exterior wood stains and clears
5	8 h light at 50 % ± 5 % RH 10 h light and water spray 6 h dark with water spray Repeat continuously	63 ± 2°C 145 ± 4°F	0.35 ± 0.02 W/(m^2·nm) at 340 nm 41.5 ± 2.5 W/m^2 from 300-400 nm	Marine enamels
6	40 min light at 50 % ± 5 % RH 20 min light and water spray 60 min light at 50 % ± 5 % RH 60 min dark at 95 % ± 5 % RH (water spray on front and back of specimens) Repeat continuously	70 ± 2 °C (158 ± 4 °F) 70 ± 2 °C (158 ± 4 °F) 38 ± 2 °C (100 ± 4 °F)	0.55 ± 0.02 W/(m^2·nm) at 340 nm 65.5 ± 2.5 W/m^2 from 300-400 nm	Automotive exterior[H]
7	3.8 h light at 50 % ± 5 % RH 1.0 h dark at 95 % ± 5 % RH Repeat continuously	89 ± 3 °C (192 ± 5 °F) 38 ± 2 °C (100 ± 4 °F)	0.55 ± 0.02 W/(m^2·nm) at 340 nm 65.5 ± 2.5 W/m^2 from 300-400 nm	Automotive interior[I]

[A] The cycles described are not listed in any order indicating importance, and are not necessarily recommended for the applications shown.
[B] As stated in 5.2, the spectral power distribution (SPD) of the xenon lamp shall conform to the requirements of Practice G155 for a xenon lamp with daylight filters.
[C] Unless otherwise indicated, black panel temperatures apply during light-only portion of the cycle. The equilibrium black panel temperature is obtained without a spray period. For light intervals shorter than 30 min, the black panel temperature might not reach equilibrium. Unless otherwise specified, add 6°C (11°F) to the temperature given for the uninsulated black panel when an insulated black panel is used. Practice G151 provides more information on the temperatures indicated by insulated and uninsulated black panels, which can depend on irradiance level, and the type of xenon-arc filter used.
[D] The irradiance values given are those that have historically been used. In devices capable of producing higher irradiance, the actual irradiance used may be higher than the stated values. For example, Japanese auto industry specifications allow use of exposures according to Cycle 1 with 300 to 400 nm irradiance of up to 180 W/m^2.
[E] Typical uses does not imply that results from exposures of these materials according to the cycle described will correlate to those from actual use conditions.
[F] Unless otherwise specified, water spray refers to water sprayed on the exposed surface of the test specimens.
[G] This cycle has been used for coatings by historical convention and may not adequately simulate the effects of outdoor exposure.
[H] This cycle is based on the conditions of SAE J2527, but there may be additional requirements in the SAE standard not shown here.
[I] This cycle is based on the conditions of SAE J2412, but there may be additional requirements in the SAE standard not shown here.



NOTE 1—"X" denotes specimen orientation. If multiple specimens are in a single holder, they do not need to be repositioned within the holder.

FIG. 1 Specimen or Specimen Holder Repositioning for a Xenon-Arc Device With a Planar Exposure Area

entire system used for specimen water spray must be flushed with chlorine and thoroughly rinsed prior to resuming exposures.

7.5.4 The typical temperature of water used for specimen spray is 21 ± 5°C (70 ± 9°F). However, if ambient water temperature is low and a holding tank is not used to store purified water, the temperature of water used for specimen spray may be below the typical range given.

7.5.5 When the water purity requirements are met and there is disagreement between parties on the extent of problems caused by stain or deposit, run referee tests in at least one other laboratory that can meet the water quality requirements described in 7.4.

7.5.6 For devices with humidity control, it is recommended that deionized water be used when generating water vapor to control humidity.

7.6 Some tests for lightfastness are run without any specimen wetting. When this type of test is required, omit the period where water is sprayed on specimens.

7.7 Identification of any control specimen used shall accompany the report.

8. Periods of Exposure and Evaluation of Test Results

8.1 In most cases, periodic evaluation of test and control materials is necessary to determine the variation in magnitude and direction of property change as a function of exposure time or radiant exposure.

8.2 The time or radiant exposure necessary to produce a defined change in a material property can be used to evaluate or rank the stability of materials. This method is preferred over evaluating materials after an arbitrary exposure time or radiant exposure.

8.2.1 Exposure to an arbitrary time or radiant exposure may be used for the purpose of a specific test if agreed upon between the parties concerned or if required for conformance to a particular specification. When a single exposure period is used, select a time or radiant exposure that will produce the largest performance differences between the test materials or between the test material and the control material.

8.2.2 The minimum exposure time used shall be that necessary to produce a substantial change in the property of interest for the least stable material being evaluated. An exposure time that produces a significant change in one type of material cannot be assumed to be applicable to other types of materials.

8.2.3 The relation between time to failure in an exposure conducted according to this practice and service life in an outdoor environment requires determination of a valid acceleration factor. Do not use arbitrary acceleration factors relating time in an exposure conducted according to this practice and time in an outdoor environment because they can give erroneous information. The acceleration factor is material dependent and is only valid if it is based on data from a sufficient number of separate exterior and laboratory accelerated exposures so that results used to relate times to failure in each exposure can be analyzed using statistical methods.

NOTE 8—An example of a statistical analysis using multiple laboratory and exterior exposures to calculate an acceleration factor is described by J.A. Simms[8]. See Practice G151 for more information and additional cautions about the use of acceleration factors.

8.3 After each exposure increment, determine the changes in exposed specimens. Test Methods D523, D610, D659, D660, D662, D714, D772, D2244, D2616, D3359, D4214, E1347 and Practice D1729 are common methods used to evaluate paints and coatings. Consider product use requirements when selecting appropriate methods.

8.3.1 Other methods for evaluating test specimens may be used if agreed upon between all interested parties.

NOTE 9—For some materials, changes may continue after the specimen has been removed from the exposure apparatus. Measurements (visual or instrumental) should be made within a standardized time period or as agreed upon between interested parties. The standardized time period needs to consider conditioning prior to testing.

8.4 It is recommended that the following procedure be followed when results from exposures conducted according to this practice are used in specifications.

8.4.1 If a standard or specification for *general use* requires a defined property level after a specific time or radiant exposure in an exposure test conducted according to this practice, base the specified property level on results from round-robin experiments run to determine the test reproducibility for the exposure and property measurement procedures. Conduct these round-robins according to Practice E691 or Practice D3980 and include a statistically representative sample of all laboratories or organizations who would normally conduct the exposure and property measurement.

8.4.2 If a standard or specification for *use between two or three parties* requires a defined property level after a specific time or radiant exposure in an exposure test conducted according to this practice, base the specified property level on at least two independent experiments run in each laboratory to determine the reproducibility for the exposure and property measurement process. The reproducibility of the exposure/property measurement process is then used to determine the maximum or minimum level of property after the exposure that is mutually agreeable to all parties.

8.4.3 When reproducibility in results from an exposure test conducted according to this practice has not been established through round-robin testing, specify performance requirements for materials in terms of comparison (ranked) to a control material. All specimens shall be exposed simultaneously in the same device. All concerned parties must agree on the specific control material used.

8.4.3.1 Conduct analysis of variance to determine whether the differences between test materials and any control materials used are statistically significant. Expose replicates of the test specimen and the control specimen so that statistically significant performance differences can be determined.

NOTE 10—Fischer illustrates use of rank comparison between test and control materials in specifications.[9]

[8] Simms, J.A., *Journal of Coatings Technology*, Vol 50, 1987, pp. 45-53.

[9] Fischer, R., Ketola, W., "Impact of Research on Development of ASTM Durability Testing Standards," *Durability Testing of Non-Metallic Materials, ASTM STP 1294*, Robert Herling, Editor, ASTM, Philadelphia, 1995.

NOTE 11—Guide G169 includes examples showing use of analysis of variance to compare materials.

9. Report

9.1 Report the following information. Report any deviations from this practice.

9.1.1 Material description and specimen dimensions.

9.1.2 Specimen mounting procedure.

9.1.3 Type and model of exposure device.

9.1.4 Type of light source.

9.1.5 If the exposed face of a specimen does not fall within the exposure device's specimen plane, report the distance from specimens to light source. For three-dimensional specimens extending beyond the specimen plane (in front of or behind the specimen plane, or both), report the minimum and maximum distance from the exposed face of the specimen to the light source.

9.1.6 Type and age of filters at the beginning of the exposure, and whether any of the filters were replaced during the period of exposure.

9.1.7 Type of black panel (uninsulated or insulated) used.

9.1.8 If required, report irradiance measured at a single wavelength in W/(m^2·nm) and radiant energy for a single wavelength in J/(m^2·nm). Report irradiance measured in a broad band, such as 300 to 400 nm, in W/m^2 with the spectral region specified. Report radiant energy measured in a broad band as J/m^2 with the spectral region specified.

9.1.8.1 Do not report irradiance or radiant exposure unless direct measurement of irradiance was made during the exposure.

9.1.9 Elapsed exposure time.

9.1.9.1 When required, report any test interruptions greater than 24 h in accordance with 6.10.

9.1.10 Light and dark-water-humidity cycle employed.

9.1.11 Black panel set point and set point tolerance. If light and dark periods are employed, report the set point and set point tolerance for each period.

9.1.12 If relative humidity is controlled, report relative humidity set point and set point tolerance. If light and dark periods are employed, report the relative humidity set point and set point tolerance for each period.

9.1.13 If controlled, set point and tolerance limits for chamber air temperature. If light and dark periods are employed, report the chamber air temperature set point and tolerance limits for each period.

9.1.14 Type of spray water.

9.1.14.1 Total solids and silica level of water used for specimen spray, (if above limits specified in 7.5).

9.1.15 Type of spray nozzle.

9.1.16 If used, specimen repositioning procedure.

9.1.17 Date, results of physical property tests, identification of laboratory conducting the exposure and property tests, (if different labs conduct the exposures and property tests, identify both). Where retention of a characteristic property is reported, Practice D5870 contains examples of these calculations.

NOTE 12—In some cases, exposures are conducted by a contracting agency but property tests are conducted by the contracting party. In these cases, the agency that conducts the exposures cannot report results from property tests.

10. Precision and Bias

10.1 *Precision*—The repeatability and reproducibility of results obtained in exposures conducted according to this practice will vary with the materials being tested, the material property being measured, and the specific test conditions and cycles that are used.

10.2 *Bias*—Bias can not be determined because no acceptable standard weathering reference materials are available.

11. Keywords

11.1 degradation; exposure; light exposure; ultraviolet; weathering; xenon-arc