Designation: ~~F1515 – 03 (Reapproved 2008)~~ F1515 – 15

Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change[1]

This standard is issued under the fixed designation F1515; 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 test method covers a procedure for determining the resistance of resilient floor covering to color change from exposure to light over a specified period of time.

1.2 *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]

D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

~~D2565 Practice for Xenon-Arc Exposure of Plastics Intended for Outdoor Applications~~

D4459 Practice for Xenon-Arc Exposure of Plastics Intended for Indoor Applications

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

G151 Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources

G155 Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

G177 Tables for Reference Solar Ultraviolet Spectral Distributions: Hemispherical on 37° Tilted Surface

~~2.2 *DIN Standard:*~~

~~DIN 53384 Artificial Weathering and Aging of Plastics by Exposure to Laboratory UV Radiation Sources, April 1989~~

3. Summary of Practice

3.1 Specimens are exposed continuously at a controlled temperature and humidity to a properly filtered xenon-arc radiant-energy source. The filters selected are to simulate indoor exposure conditions behind window glass. See Practice D4459.

3.2 To ensure uniform exposure, ~~the specimens are mounted on a cylindrical framework that rotates around the xenon lamp suspended in the center.~~periodic specimen repositioning is a good practice to reduce the variability in exposure stresses experienced during the test interval.

NOTE 1—See Practice G151 for guidance on repositioning of specimens.

3.3 The effect of radiation (actinic and thermal) on the specimen shall be the color difference between the specimen before and after exposure.

4. Significance and Use

4.1 Resilient floor covering is made by fusing polymer materials under heat or pressure, or both, in various manufacturing and decorating processes. The polymer material may be compounded with plasticizers, stabilizers, fillers, and other ingredients for processability and product performance characteristics. The formulation of the compound can be varied considerably depending on the desired performance characteristics and methods of processing.

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[1] This test method is under the jurisdiction of ASTM Committee F06 on Resilient Floor Coverings and is the direct responsibility of Subcommittee F06.30 on Test Methods - Performance.

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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.

4.2 Light stability, which is resistance to discoloration from light, is a basic requirement for functional use.

4.3 This test method provides a means of measuring the amount of color change in flooring products when subjected to accelerated light exposure over a period of time (functional use of the flooring product).

4.4 This test method specifies that a sample is measured by a spectrophotometer and expressed in ΔE* units before and after accelerated light exposure.

NOTE 2—It is the intent that this test method be used for testing light stability performance properties to be referenced in resilient flooring specifications.

5. Apparatus

5.1 The apparatus employed shall utilize either a water-cooled or air-cooled xenon-arc lamp as the source of radiation ~~and should be of Type AH, BH, or E~~ as described in Practices ~~D2565~~D4459 or G155.

~~5.1.1 *Type AH*—An exposure apparatus in which the source of radiant energy shall be a water-cooled xenon-arc vertically located at the central axis of either a 20-in. (508-mm) diameter vertical specimen rack, or of a 25.5-in. (648-mm) diameter inclined rack. Means shall be provided to control temperature, relative humidity, and spectral irradiance. The specimen rack shall rotate at approximately 1 rpm.~~

~~5.1.2 *Type BH*—An exposure apparatus in which the source of radiant energy shall be a water-cooled xenon-arc vertically located at the central axis of a 37.75-in. (960-mm) diameter inclined or vertical specimen rack. Means shall be provided to control temperature, relative humidity and spectral irradiance. The specimen rack shall rotate at approximately 1 rpm.~~

~~5.1.3 *Type E*—An exposure apparatus in which the source of radiant energy shall be three air-cooled xenon-arc lamps operating simultaneously at a nominal 4500 watts each. The lamps shall be located within a central core, which shall be positioned at the center of a 610-mm (24.1-in.) diameter specimen rack. Means shall be provided to control temperature, relative humidity, and irradiance intensity. The specimen rack shall rotate around the light source.~~

~~NOTE 2—Type AH, Type BH, and Type E may not yield equivalent results.~~

5.2 *Xenon Light Source*—The xenon light source consists of a quartz-jacketed burner tube charged with xenon gas.

5.3 *Glass Filters*—Table 1 shows the relative spectral power distribution limits of xenon-arcs filtered for simulating a behind window-glass exposure. ~~For water-cooled xenon, an inner borosilicate-glass cylinder is used in combination with a soda-lime-glass outer cylinder to selectively screen radiation output. For air-cooled xenon, the filters shall be an infrared (IR) reflecting inner glass filter, quartz middle filter, and a soda-lime-glass outer filter.~~

TABLE 1 Sunlight Behind Window Glass Simulation Relative Spectral Irradiance for Xenon-Arc Output as Percentage of Irradiance at ~~300~~ nm

Bandpass (nm)	~~All Xenon-Arcs[A]~~
~~290–300~~	~~<0.1~~
~~300–320~~	~~<2.7~~
~~320–340~~	~~10.0 ± 4.5~~
~~340–360~~	~~23.0 ± 1.5~~
~~360–380~~	~~33.0 ± 2.5~~
~~380–400~~	~~40.3 ± 4.8~~

TABLE 1 Sunlight Behind Window Glass Simulation Relative Spectral Irradiance for Xenon-Arc Output as Percentage of Irradiance at 300–400 nm[A]

Bandpass (nm)	Minimum Percent[A]	Window Glass Filtered Solar Radiation Percent[B]	Maximum Percent[A]
Λ <300		0.0	0.29
300 ≤ λ ≤ 320	0.1	≤ 0.5	2.8
320 ≤ λ ≤ 360	23.8	34.2	35.5
360 ≤ λ ≤ 400	62.5	65.3	76.1

[A] Table 1 is copied from Practice G155.

[B] ~~Xenon-Arc data presented is based on filter systems currently available. If filter systems are developed~~ The window glass filtered solar data is for a solar spectrum with atmospheric conditions and altitude chosen to maximize the fraction of short wavelength solar UV (defined in Practice G177~~that produce a closer simulation of daylight behind window glass, this table will be revised to consider these developments.~~) that has been filtered by window glass. The glass transmission is the average for a series of single strength window glasses tested as part of a research study for ASTM Subcommittee G3.02.9. While this data is provided for comparison purposes only, it is desirable for a xenon-arc with window glass filters to provide a spectrum that is a close match to this window glass filtered solar spectrum.