Designation: D5105 – 05 (Reapproved 2011)

Standard Practice for Performing Accelerated Outdoor Weathering of Pressure-Sensitive Tapes Using Concentrated Natural Sunlight[1]

This standard is issued under the fixed designation D5105; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice covers one procedure for the exposure of pressure-sensitive tapes to an accelerated outdoor weathering environment.

1.2 This practice describes sample preparation and an accelerated outdoor environment to which it shall be exposed. It does not specify what observations or tests are to be performed on the material following exposure.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *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]

D3715/D3715M Practice for Quality Assurance of Pressure-Sensitive Tapes

G90 Practice for Performing Accelerated Outdoor Weathering of Nonmetallic Materials Using Concentrated Natural Sunlight

2.2 *Federal Specifications:*

QQ-A-250/5 Aluminum Alloy Alclad 2024, Plate and Sheet[3]

2.3 *SAE Document:*

SAE J576 Plastic Materials for Use in Optical Parts Such as Lenses and Reflectors of Motor Vehicle Lighting Devices—Recommended Practice[4]

3. Summary of Practice

3.1 The pressure-sensitive tapes are exposed to concentrated solar radiation in accordance with the conditions provided by the apparatus described in Practice G90, using spray Cycle 3. Following this exposure, the specimen is ready for any prescribed examination of appearance and physical characteristics by other standards as determined by the applicable material specification or other documents.

4. Significance and Use

4.1 This practice provides a means of qualitative assessments of outdoor weathering effects on pressure-sensitive tapes. The resistance of tapes to outdoor weathering is determined relative to the resistance of a control tape with known stability.

4.2 If tests described in this practice produce the same type of degradation as found in real-time exposures of the same materials, it is possible to use the results from these short-term tests to determine the quantitative effects of natural weathering.

4.3 The timing of exposure testing covering both outdoor conventional and outdoor accelerated exposure of this practice, using levels of ultraviolet solar radiation exposure (MJ/m^2) of UV (295 to 385 nm) is an improvement in the timing of exposure testing. Testing specific levels of solar radiant exposure (MJ/m^2) may be used to establish relative equivalent exposure, but the use of (MJ/m^2 of UV (295 to 385 nm)) is the preferred method.[4,5,6]

4.4 The radiant exposure (308 or 616 MJ/m^2) suggested in this practice approximates one and two years, respectively, of

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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 Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

[4] Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, http://www.sae.org.

[5] G. A. Zerlaut, M. W. Rupp, and T. E. Anderson, DEST Laboratories, Inc., Phoenix, AZ, "Ultraviolet Radiation Timing Technique of Outdoor Weathering of Materials," SAE Technical Paper Series #850348 presented at the International Congress and Exposition, Detroit, MI, Feb. 25–March 1, 1985. Available from SAE.

[6] Bauer, D. R., Paputa Peck, M. C., and Carter III, R. O.," Evaluation of Accelerated Spectroscopy," *Journal of Coatings Technology*, Vol 59, No. 755, pp 103–109.

exposure in the Southwest and Florida. Since all materials "weather" at different rates in different environments, results obtained using this practice should not be represented as equivalent to natural weathering until the degree of quantitative correlation has been established for the material tested in the environment of its use.

NOTE 1—The ultraviolet content of natural sunshine is time-of-year dependent, both qualitatively and quantitatively. Thus, wintertime testing requires longer exposure periods on the Flesnel-reflector test machines described to achieve equal ultraviolet energy deposition and a quantitative equal level of degradation concomitant with summertime testing.

5. Apparatus

5.1 *Exposure Apparatus,* conforming to all of the parameters of Practice G90.

5.2 *Panels,* for mounting specimens, approximately 3 by 5 by 0.040 in.

5.2.1 The material shall be 2024 Alclad conforming to Federal Specification QQ-A-250/5.

5.2.2 A panel or frame of the dimensions required by the exposure apparatus may be used to support the specimen panel when it is more convenient to do so, as long as the light and water paths are not interrupted or shortened by doing so.

5.3 *Rubber-Covered Roller,* at least as wide as the specimen with any diameter and rubber hardness.

6. Sampling

6.1 Sampling shall be in accordance with the requirements of the subsequent test standard or applicable material or commodity specification.

6.2 Lacking the previously mentioned documents, sampling shall be in accordance with Practice D3715/D3715M.

7. Test Specimens

7.1 Unless otherwise specified, prepare and expose at least two replicate specimens of each tape to be tested. The test specimen dimensions shall be in accordance with any test standard to be used subsequent to this exposure or the applicable material or commodity specification.

7.2 Lacking the previously mentioned documents, the sample shall consist of two 2 by 3-in. (50 by 75-mm) strips of tape.

7.3 Unwind and discard at least three, but no more than six, outer wraps of tape from the sample roll before taking specimens for testing.

7.4 Remove specimens from a freely rotating roll at the rate of 20 to 30 in./s (500 to 750 mm/s). Where width or other factors causing high adherence to backing make it impossible to remove the specimens at the prescribed rate, remove at a rate as close to 20 in./s (500 mm/s) as possible.

8. Procedure

8.1 Apply the specimens as directed by the standard to be used subsequent to this exposure. If there are none, apply one of the 2 by 3-in. (50 by 75-mm) specimens, centered lengthwise, to the 3 by 5-in. (75 by 125-mm) panel starting at one end using the rubber-covered roller (see 5.3), holding the specimen so that the roller causes first contact of the specimen with the panel. Apply the second 2 by 3-in. specimen as described, starting at the opposite end of the panel. The end result should be a continuous 2-in. (50-mm) wide specimen covering the panel from one end to the other with a 1-in. (25-mm) overlap at the center of the panel.

8.2 The backside or nonadhesive side of the specimen is generally exposed to the sunlight. Any deviation from this would be expressed by the test standard or commodity specification. If using specimens prepared as described in this practice, mount the specimens in the exposure rack, oriented so that the overlap edge of the tape is pointed away from the flow of cooling air.

8.3 Expose the panels, with specimens applied, according to spray Cycle 3 of Practice G90 for the amount of solar energy, expressed in Megajoules per square metre (MJ/m^2), specified in the subsequent test standard or commodity specification. Unless otherwise specified, expose to 616 MJ/m^2 total solar ultraviolet energy (295 to 385-nm wavelength).

8.4 Follow the instructions of the subsequent test standard or commodity specification relative to observations or physical tests, or both, to be performed on the specimens following exposure. Determine the average of the result for physical property tests performed on the specimens.

9. Report

9.1 In reporting data, including observations obtained by any examination following exposure, make reference to this practice by designation. Provide the following information:

9.1.1 Any deviation from this practice.

9.1.2 Include all items referenced in the Report section of Practice G90,

9.1.3 Whether specimen size and preparation was other than that specified in 8.1, and

9.1.4 The information required by the subsequent test standard or commodity specification.

10. Keywords

10.1 accelerated outdoor weathering; natural sunlight; pressure-sensitive tape