



Designation: D6578/D6578M – 13 (Reapproved 2018)

Standard Practice for Determination of Graffiti Resistance¹

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1. Scope

1.1 This practice covers a basic method for evaluating graffiti resistance of coatings, and use of this practice to evaluate graffiti resistance of coatings after outdoor or laboratory accelerated exposure (either prior to or after graffiti is applied). Graffiti resistance is based on how a defined set of markings is removed by a defined set of cleaning agents.

1.2 This practice also defines procedures (optional) to evaluate graffiti removal after re-marking with subsequent re-cleaning. It does not address recoatability after a coating is no longer graffiti resistant.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D523 Test Method for Specular Gloss

D4587 Practice for Fluorescent UV-Condensation Expo-

sure of Paint and Related Coatings

D6695 Practice for Xenon-Arc Exposures of Paint and Related Coatings

E1347 Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry

E1349 Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional (45°:0° or 0°:45°) Geometry

G7 Practice for Atmospheric Environmental Exposure Testing of Nonmetallic Materials

G113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials

3. Terminology

3.1 The definitions given in Terminology G113 are applicable to this practice.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *cleaning agent, n*—a material used to remove a marking material from the coating surface.

3.2.2 *graffiti resistance, n*—the property of coatings to be resistant to the application of graffiti or exhibiting removal of graffiti without surface damage.

3.2.3 *marking material, n*—a material that can be used to produce graffiti.

3.2.4 *re-cleanability, n*—the ability of a coating to withstand multiple cycles of marking with subsequent cleaning while maintaining its original characteristics.

3.2.5 *repellent, n*—the property of coatings that prevents materials commonly used as graffiti markings, from forming a continuous film upon application.

4. Summary of Practice

4.1 A series of materials typically used as graffiti markings is applied to test panels of the surface being evaluated. Test specimens may be exposed to outdoor or accelerated exposures (either before or after markings have been applied). The graffiti markings are removed using a series of procedures that begin with wiping with a dry cloth and end with cleaning the surface with an aggressive cleaner. After the best attempt has been made to remove markings, specimens are evaluated visually, or alternatively, by gloss and color change measurements to determine cleanliness. The graffiti resistance is reported as a

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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.

cleanability level based on the mildest cleaning agent that completely removes the graffiti marking without damaging the coating.

5. Significance and Use

5.1 Graffiti on building and structures is an ongoing and increasing problem. A number of coatings have been produced that are intended to be resistant to the application of a graffiti marking, or to provide a surface from which such markings can be easily removed. The procedures described in this practice provide a standard set of conditions that can be used to evaluate the graffiti resistance of a surface.

5.2 Graffiti resistance determined according to this practice is applicable to smooth surfaces. Graffiti resistance of the same coatings applied to a rough or textured surface may be lower.

5.3 Graffiti resistance of coatings determined after natural or laboratory accelerated weathering, either before or after marking, conducted according to this practice, is considered as having more weight than graffiti resistance of the same coating determined without weathering. Graffiti resistance of coatings determined after natural weathering should be considered as having more weight than graffiti resistance determined after laboratory accelerated weathering.

6. Apparatus

6.1 *15 by 30 cm [6 by 12 in.] panels* representing the intended substrate.

6.2 *Lint-Free Cotton Cloth*.

6.3 *Graffiti Marking Material:*

6.3.1 *Solvent-Based Permanent Ink Marker*, blue,

6.3.2 *Solvent-Based Acrylic Spray Paint*, red,

6.3.3 *Solvent-Based Alkyd Spray Paint*, red,

6.3.4 *Wax Crayon*, blue or black,

6.3.5 *Ballpoint Ink*, <https://standards.sist.ca/24c430-c615-4a>

6.3.6 *Water-based Ink Marker*, black,

6.3.7 Other marking materials based on mutual agreement between all interested parties.

6.4 *15 by 30 cm [6 by 12 in.] Template*, with 25 by 25 mm [1 by 1 in.] square holes used to define area where graffiti marking material will be applied. The number of holes should be equal to the number of marking materials, should be spread apart from each other as much as possible, and should have a 13 mm (0.5 in.) margin along the perimeter.

6.5 *Cleaning Agents:*

6.5.1 *Dry, Lint-Free Cotton Cloth*,

6.5.2 *Mild Detergent*, as agreed upon between purchaser and seller (a solution of 5 % sodium phosphate is recommended),

6.5.3 *Isopropyl Alcohol*,

6.5.4 *Mineral Spirits*,

6.5.5 *Xylene*,

6.5.6 *Methyl Ethyl Ketone (MEK)*.

6.6 *For Outdoor Exposures—Outdoor Exposure Rack*, meeting the requirements of Practice **G7** for open backed exposures.

6.7 *For Laboratory Accelerated Exposures:*

6.7.1 *Fluorescent UV Exposure Device*, equipped with fluorescent UVA lamps with peak emission at 343 nm, and operated in accordance with Practice **D4587**.

6.7.2 *Xenon Arc Exposure Device*, equipped with xenon arc(s) with daylight filter(s) and operated in accordance with Practice **D6695**, cycle 6.

6.8 *Proper Safety Equipment*, as determined from the solvent Material Safety Data Sheets (MSDS), for example, solvent resistant gloves, and respirator.

6.9 *Glossmeter*, 60°, (for Evaluation Method B only).

6.10 *Colormeter*, capable of D65, CIE LAB measurements meeting Test Method **E1347** or Test Method **E1349** (for Evaluation Method B only).

7. Test Specimen

7.1 Apply the coating to be evaluated for graffiti resistance to the 15 by 30 cm [6 by 12 in.] test panels according to the manufacturer's instructions, following any relevant procedures for surface preparation prior to application.

7.2 Prepare at least three specimens of each coating being evaluated.

7.3 Prepare also at least one file specimen that can be used for comparison to the unmarked or unexposed materials.

7.4 Unless otherwise specified, allow the coated test specimens to cure for at least 24 h at room temperature before continuing the test.

NOTE 1—It may be useful to prepare several sets of panels for each coating and allow the different sets to cure for different periods. The purpose would be to determine the point at which optimum graffiti resistance occurs.

7.5 Measure and record initial 60° gloss in accordance with Test Method **D523** and color in accordance with Test Method **E1347** or Test Method **E1349** (using a D65 illuminant, CIE LAB calculations) on coated test specimens (for Evaluation Method B only).

7.6 Place the template described in **6.4** over the prepared test panel and apply the entire complement of marking materials prescribed in **6.3** so that each panel is marked with a 25 by 25 mm [1 by 1 in.] square of all graffiti materials (one marking material for each space in the template).

7.6.1 Be careful not to cross-contaminate one marking material with another. Remove template. Store the marked panels at room temperature for at least 24 h before beginning to evaluate for removal.

7.7 If the graffiti marking material does not uniformly cover the test area of the panel, or resists adhering to it, the test surface is considered “repellent.” In this case, beading of the marking material might occur. In this case, the appearance of the dried marking may be very irregular.

8. Graffiti Removal Procedure

8.1 Attempt to remove each marking material from the panel with a cotton cloth alone, then by using a cotton cloth that has been wetted with the following cleaning agents, working through them in the order listed (increasing strength).

- (a) mild detergent
- (b) isopropyl alcohol (IPA)
- (c) mineral spirits
- (d) xylene
- (e) methyl ethyl ketone (MEK)

The area of the cotton cloth that is wetted should be well saturated, but not dripping.

8.2 Rub each marking vigorously until it is completely cleaned off, or until it is visually evident that no more of the mark can be removed.

8.3 Reposition and re-wet the cotton cloth between markings as necessary, working through the entire panel with one cleaning agent at a time.

8.4 Use a different cotton cloth with each cleaning agent.

NOTE 2—As cleaning agents of increasing strength are used, some of the markings will probably be cleanable, whereas others will not. Exercise care so that areas that have been cleaned are not contaminated with stronger agents that are being used to clean other marks.

9. Evaluation of Cleanability

9.1 Method A, Visual:

9.1.1 After the best attempt has been made to clean a mark, visually examine it and note any trace of the mark, that is, a color change (shadow) or a loss of gloss.

9.1.2 If the spot has returned to its original condition before marking, note which cleaning agent was used to remove the mark. The mark will be considered to be cleanable with this agent.

9.2 Method B, Instrumentally:

9.2.1 *Retention of 60° Gloss*—After the graffiti marking has been removed, measure the 60° gloss. Determine the ratio of the average gloss measured after the marking has been removed to the average gloss measured on the panels prior to marking. The ratio shall be at least 0.90.

9.2.2 *Color Shift*—After the graffiti marking has been removed, measure color in the area where the graffiti was removed. Calculate Delta E CIE LAB based on comparison of the average color coordinates for the cleaned surface, and the average color coordinates for the surface prior to marking, or for an unmarked area of the same specimen. For a graffiti marking to be considered as completely removed, the Delta E shall be less than 2.

9.2.3 Note the cleaning agent. The mark will be considered to be cleanable with this agent if the criteria in 9.2.1 and 9.2.2 are met.

10. Confirmation of Cleanability

10.1 Repeat procedures in Sections 8 and 9 (using either Method A or B for Section 9) on the other two replicates, only begin with the next weakest cleaning agent that removed each mark from the first replicate of each system rather than beginning all removal attempts with a dry cotton cloth. If it does not remove the mark move to the next strongest agent (the one that removed the mark the previous time). Although unlikely, it may be that this does not remove the mark. If this occurs, work up through the cleaning agents in order of

strength. If a particular mark was not removed from the first replicate with MEK, begin with xylene on subsequent replicates.

10.2 If it is not possible to completely remove the spot without adversely affecting the film, it is considered to be not cleanable.

10.3 Based upon the average of the results of the 3 replicate trials, use the following rating scale for cleanability for each coating.

- Cleanable with a dry rag = 10
- Cleanable with detergent = 9
- Cleanable with IPA = 8
- Cleanable with mineral spirits = 7
- Cleanable with xylene = 6
- Cleanable with MEK = 5
- Not cleanable, gloss loss = 4
- Not cleanable, slight shadow = 3
- Not cleanable, heavy shadow = 2
- Not cleanable, shadow and gloss loss = 1

11. Recleanability Procedure (Optional)

11.1 In some cases, it is necessary to evaluate whether a graffiti resistant material will show the same level of cleanability after it has been cleaned and remarked with graffiti.

11.2 Re-mark the areas on the panels in the same locations that they were marked prior to cleaning with the same marking materials and allow the markings to cure for at least 24 hours.

11.3 Attempt to remove the mark using procedures in Sections 8 and 9.

11.4 If the marking is completely removed, repeat steps 11.2 and 11.3 until the marking cannot be completely removed without damaging the coating. The recleanability is classified as the number of cycles performed until the marking is no longer cleanable.

12. Graffiti Removal From Panels That Have Been Subjected To Outdoor Exposure

12.1 *Method A*—Removal of freshly applied graffiti markings from coatings that have been subjected to outdoor exposure:

12.1.1 Prepare a set of specimens to be evaluated in accordance with 7.1 – 7.4.

12.1.2 Engrave or indent each of the panels so that they can be identified upon return from exposure.

12.1.3 Unless otherwise specified, expose this set of panels in accordance with Practice G7 on an open backed rack that faces the Equator and oriented at an angle of 45° to the horizontal for 24 months. Note general atmospheric conditions, geographical location, and dates of exposure.

NOTE 3—Conditions will vary among geographic locations, which could produce different results. South Florida and Arizona desert are commonly used locations.

12.1.4 Remove from exposure and apply graffiti markings in accordance with 7.5 – 7.7.

NOTE 4—The purchaser and seller shall agree upon whether or not the panels should be washed (or to what extent the panels should be washed) before marking.