



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 SI 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

D 523 Test Method for Specular Gloss

D 4587 Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings

E 1347 Test Method for Color and Color-Difference Measurement by Tristimulus Colorimetry

E 1349 Test Method for Reflectance Factor and Color by Spectrophotometry Using Bidirectional (45°:0° or 0°:45°) Geometry

G 7 Practice for Atmospheric Environmental Exposure Testing of Nonmetallic Materials

G 113 Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials

3. Terminology

3.1 The definitions given in Terminology G 113 are applicable to this practice.

3.2 Definitions of Terms Specific to This Practice:

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 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

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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.

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*,

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 G 7 for open backed exposures.

6.7 *For Laboratory Accelerated Exposures—Fluorescent UV Exposure Device*, equipped with fluorescent UVA lamps with peak emission at 343 nm, and operated in accordance with Practice D 4587.

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 *Colorimeter*, capable of D65, CIE LAB measurements meeting Test Method E 1347 or Test Method E 1349 (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 D 523 and color in accordance with Test Method E 1347 or Test Method E 1349 (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