



Designation: D 3450 – 00

Standard Test Method for Washability Properties of Interior Architectural Coatings¹

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1. Scope

1.1 This test method covers the determination of the relative ease of removing soilant discolorations from the dried film of an interior coating by washing with either an abrasive or nonabrasive cleaner.

1.2 This test method is limited to coatings having a CIE-Y reflectance of 60 % or more, as measured in accordance with Test Method E 1347.

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:

D 562 Test Method for Consistency of Paints Using the Stormer Viscometer²

D 1193 Specification for Reagent Water³

D 1210 Test Method for Fineness of Dispersion of Pigment-Vehicle Systems²

E 70 Test Method for pH of Aqueous Solutions with the Glass Electrode⁴

E 1347 Test Method for Color and Color-Difference Measurement by Tristimulus (Filter) Colorimetry²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *soilant*—a discoloring substance that clings to the surface of a coating, whose dispersed color component is not in solution and therefore does not penetrate into the film.

3.1.1.1 *Discussion*—oilant differs from stain in that the colorant of a stain is in solution and, therefore, can penetrate into the film.

4. Summary of Test Method

4.1 The test material is applied to a black plastic panel and allowed to dry for 7 days. The reflectance of the film is measured (R_1) and then a soilant consisting of carbon black dispersed in mineral oil is applied on the film. The panel is placed on a glass plate in a washability machine and the film is washed with either an abrasive or nonabrasive scrub medium for 100 cycles. The panel is rinsed and dried and the reflectance in the stained area is read (R_2). The ratio of the reflectance, R_2/R_1 , is a measure of the degree to which the soilant has been removed.

5. Significance and Use

5.1 Interior architectural paints are often discolored by dirt and other soilant materials. This test method covers the relative ease and completeness of removal of a specific soilant from such a surface by scrubbing. The greater the ease of soil removal with a minimum of film erosion, the greater the useful service life is expected to be.

5.2 Results obtained by this test method do not necessarily correlate with all types of soilants.

5.3 Semigloss finishes generally require only the nonabrasive type cleaner for good soilant removal, whereas flat paints may require the abrasive type.

6. Apparatus

6.1 *Washability Tester*;⁵ also referred to as a straight line washability machine.

6.1.1 Accessory Apparatus:

6.1.1.1 *Glass Plate*, measured to fit, 454 by 165 by 6.3 mm (17 in. $\frac{7}{8}$ by 6 $\frac{1}{2}$ by $\frac{1}{4}$).

6.1.1.2 *Stainless Steel Pan*.

6.1.1.3 *“C” Clamps*.

¹ This test method is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.42 on Architectural Coatings.

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² *Annual Book of ASTM Standards*, Vol 06.01.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ *Annual Book of ASTM Standards*, Vol 15.05.

⁵ Model AG 8100 from BYK-Gardner, Inc., Gardner Laboratory, 2435 Linden Lane, Silver Spring, MD 20910 and Model “D” from Paul N. Gardner Co., Inc., 316 N. E. First St., Pompano Beach, FL 33060 were used originally in this test method. See RR D01-1065. Straight-line washability testers may be adapted to meet the requirements of this method.

6.1.1.4 *Scale*, standard.

6.1.1.5 *White Blotter*.

6.1.1.6 *Holder*, brass, measuring 95 by 76 by 25.4 mm (3 3/4 by 3 by 1 in.) .

6.2 *U-Shaped Film Caster*,⁶ having both a 0.18-mm (7-mil) clearance by 132 mm width and a 0.25-mm (10-mil) clearance by 138 mm width.

6.3 *Film Applicator*, 76 mm (3 in.) width with 76- μ m (3-mil) clearance.

6.4 *Suction Plate* for drawdowns (large size).

6.5 45°, 0° *Reflectometer*, with green filter, as specified in Test Method E 1347.

6.6 *Balance*, with 0.1-g scale graduation.

6.7 *Fineness of Dispersion Gage*, as specified in Test Method D 1210.

7. Reagents and Materials

7.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁷ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.2 *Purity of Water*—Unless otherwise indicated, reference to water shall be understood to mean reagent water conforming to Type IV of Specification D 1193.

7.3 *Black Plastic Panels*.⁸

7.4 *Sponge*.^{9,10}

7.5 *Masking Tape*.

7.6 *Soilant Medium*,^{11,10} consisting of the following:

	grams
Mineral oil, USP heavy	60
Odorless mineral spirits	32
Carbon black ^{12,10}	8
	100

7.6.1 Mix components and disperse to a Hegman fineness of 7 (0.5 mils or 13 μ m) or when measured in accordance with Test Method D 1210.

⁶ The Dow film caster from BYK-Gardner, was used originally in this test method.

⁷ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.

⁸ Dull black plastic panels, P-121-10N, 432 by 165 by 0.25 mm (6 1/2 by 17 in. by 10 mils) in size, manufactured by the Leneta Co., 15 Whitney Rd., Mahwah, NJ 07430 were used in the original development of this standard in order to get the results in this test method.

⁹ The sole source of supply of a sponge, cellulosic type, coarse pore grade, 95 by 76 by 38 mm (3 3/4 by 3 by 1 1/2 in.) meeting Federal Spec. L-S-626, Type II, known to the committee at this time is the O'Cel-O Div., General Mills, Inc., 305 Sawyer Ave., Tonawanda, NY 14150.

¹⁰ If you are aware of alternative suppliers, please provide this information to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

¹¹ The sole source of supply of laboratory standardized stain and scrub media, known to the committee at this time is the Leneta Co.

¹² The sole source of supply of Printex U Beads, known to the committee at this time is the DeGussa Corp., 65 Challenger Road, Ridgefield Park, NJ 07660.

7.7 *Scrub Media* (Note 1).

7.7.1 *Nonabrasive Medium*^{11,10} consisting of the following:

	grams
Water	89.6 ^A
Hydroxyethyl cellulose ¹³	2.0
Detergent ^{14,10}	4.0
Trisodium phosphate, anhydrous	4.0
Acetic acid glacial	0.3 ^B
Preservative ^{15,10}	0.1
	100.0

^AVary to achieve a final consistency of 165 to 220 g (75 to 85 Krebs Units) with a Stormer Viscometer in accordance with Test Method D 562.

^BVary to achieve a final pH from 9.5 to 10.0 in accordance with Test Method E 70.

7.7.2 *Abrasive Medium*,^{11,10} consisting of the following:

	grams
Water	49.4 ^A
Hydroxyethyl cellulose ¹³	0.8
Ammonium hydroxide 28 %	---
Detergent ^{14,10}	2.0
Trisodium phosphate, anhydrous	2.0
Silica ^{16,10}	45.0
Acetic acid, glacial	0.7 ^B
Preservative ^{15,10}	0.1
	100.0

^AVary to achieve a final consistency of 475 to 600 g (110 to 120 Krebs Units) with the Stormer Viscometer in accordance with Test Method D 562.

^BVary to achieve a final pH of 9.5 to 10.0 in accordance with Test Method E 70.

7.8 Slowly add the hydroxyethyl cellulose to the water while stirring mechanically. Stir until uniform and then slowly add 2 to 3 drops of 28 % ammonium hydroxide solution while mixing and continue mixing until the solution turns clear. In the order shown, add the other ingredients separately, stirring continuously. Be sure each item is uniformly dispersed before adding the next one. Add the silica slowly to ensure uniform dispersion. Finally, add the preservative and adjust the pH with glacial acetic acid.

NOTE 1—When a referee test is made, prepare fresh medium or use standardized scrub medium⁹ from a previously unopened container that is no more than 1 year old.

8. Preparation of Apparatus

8.1 *Washability Machine*—The washability machine should be leveled before use and operated at 37 ± 1 cpm; each cycle consisting of a complete forward and reverse stroke. Adjust tautness of the cables with a spring scale to approximately 5 lb.

8.2 *Sponge and Holder*—Add sufficient weight to the holder in the form of lead sheets or other flat weights to give a combined weight of 1500 g, including the dry sponge.

NOTE 2—Check the compression of the damp sponge under the 1500-g weight to ensure that the holder does not drag along the panel and tear the film.

¹³ Hydroxyethyl cellulose having a molar substitution (MS) value from 1.8 to 2.5 and a viscosity of a 2 % solution in the range from 4400 to 6500 cps.

¹⁴ The sole source of supply of octyl phenoxy polyethoxyethanol, Triton X-100, known to the committee at this time is Union Carbide, 10235 W. Little York Rd., Suite 300, Houston, TX 77040.

¹⁵ The sole source of supply of 1,3,5-triethyl hexahydro-sym-triazine (Vancide TH), known to the committee at this time is the R. T. Vanderbilt Co., 30 Winfield St., Norwalk, CT 06855.

¹⁶ The sole source of supply of Tamsil 45, known to the committee at this time is Unimin Specialty Minerals, Inc., 258 Elm St., New Canaan, CT 06840.