Designation: D 2486 – 96

Standard Test Method for Scrub Resistance of Wall Paints[1]

This standard is issued under the fixed designation D 2486; 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 wall paints to erosion caused by scrubbing.

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

1.3 *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 4213 Test Method for Wet Abrasion Resistance of Interior Paints[2]

3. Summary of Test Method

3.1 The test paint is applied to a black plastic panel. After curing, the coated panel is placed over a ½-in. by 10-mil (12.7 by 0.25-mm) shim and held in place on a glass plate in a washability machine by means of a gasketed frame. It is then scrubbed with a nylon bristle brush and an abrasive scrub medium until failure occurs over the shim.

4. Significance and Use

4.1 Interior wall paints often become soiled especially near doorways, windows, and in work and play areas. This test method covers determination of the relative resistance of different wall paints to erosion when repeatedly scrubbed to remove the stains during the life of the paint.

4.2 Results developed by use of this test method do not necessarily represent the scrub resistance of aged paint films.

4.3 This test method measures scrub resistance by the traditional scrub-to-failure concept. Test Method D 4213 evaluates scrub resistance by a weight-loss technique and reports it as a volumetric film erosion rate.

5. Apparatus

5.1 *Washability Tester.*

5.1.1 *Accessory Apparatus*: (Fig. 1).

5.1.1.1 *Nylon Bristle Brush, Rubber Mat, and Holder* (total weight 454 g).

5.1.1.2 *Glass Plate*, measured to fit, 17⅞ by 6½ by ¼ in. (454 by 165 by 6.3 mm).

5.1.1.3 *Shim*, ½-in. by 10-mils (12.7- by 0.25-mm).

5.1.1.4 *Gasketed Frame and Clamps.*

5.2 *U-Shaped Film Caster*,[3] having 7-mil (0.18-mm) clearance by 5.2-in. (132-mm) width.

6. Reagents and Materials

6.1 *Black Plastic Panels.*[4]

6.2 *Detergent Solution.*[5]

6.3 *Abrasive Scrub Medium*[6] (Note 1), consisting of the following:

	grams
Water, distilled or deionized	49.7[A]
Hydroxyethyl cellulose[7]	1.0
Ammonium hydroxide, 28 %	0.1
Detergent[5]	2.0
Trisodium phosphate, anhydrous	2.0
Silica[8]	45.0
Acetic acid (glacial)	0.2[B]
Preservative[9]	0.1
	100.0

[A] Adjust to achieve viscosity of 110 to 120 Krebs Units before use.
[B] Vary to achieve a pH of 9.5 to 10.0.

NOTE 1—When a referee test is made, prepare fresh medium or use standardized scrub medium[6] from a previously unopened container that is no more than 1 year old.

6.4 Slowly add the hydroxyethyl cellulose to the water while stirring mechanically. Stir until uniform, then continue stirring for an additional 5 min. Then slowly add 3 drops of 28 % ammonium hydroxide while mixing, and continue mixing until solution turns clear. In the order given, add the other ingredients separately, employing mechanical stirring. Be sure that each item is uniformly dispersed before adding the next one. The addition of the silica should take about 5

[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 Finishes.

Current edition approved June 10, 1996. Published August 1996. Originally published as D 2486 – 66 T. Last previous edition D 2486 – 95.

[2] *Annual Book of ASTM Standards*, Vol 06.02.

[3] Dow Latex Film Applicator, Cat. No. AG-3850 from Byk/Gardner U. S. A. has been found satisfactory for this purpose.

[4] Leneta P-121-10N dull black plastic panels 6½ by 17 in. by 10 mils (165 by 432 by 0.25 mm) in size (production tolerance: ±1 mil), obtainable from the Leneta Co., 15 Whitney Rd, Mahwah, NJ 07430, are suitable for the purpose.

[5] Triton X-100, obtainable from Union Carbide, 10235 W. Little Your Road, Suite 300, Houston, TX 77040 has been found satisfactory for this purpose.

[6] Laboratory standardized scrub medium is available from the Leneta Co.

[7] Cellosize QP-4400, obtainable from Union Carbide, Polymer and Product Division, 318–24 Fourth Ave, So. Charleston, WV 25303 is representative of this viscosity grade of HEC.

[8] Silica No. 22, obtainable from Whittaker, Clark, & Daniels, Inc., 1000 Coolidge St., South Plainfield, NJ 07080 has been found satisfactory for this purpose.

[9] 1.3.5-triethyl hexahydro-sym-triazine (Vancide TH) obtainable from R. T. Vanderbilt Co., 30 Winfield St., Norwalk, CT 06855, has been found satisfactory.

min to ensure uniform dispersion. Finally, add the preservative and adjust the pH with glacial acetic acid.

7. Preparation of Apparatus

7.1 *Washability Machine*—The washability machine should be leveled before use and operated at 37 ± 1 counts per minute. Before each test check the tightness of the motor belt or chain drive, alignment of the pulleys and cables in both horizontal and vertical planes, and tautness of the cable.

7.2 *Brush*—The bristles, if new, must be leveled before use to permit uniform wear on the paint surface. Leveling is accomplished by running the brush over 100 or 120-mesh aluminum oxide close grain sandpaper or emery cloth attached lengthwise on the glass plate in the washing machine. The total number of cycles required will vary from 1000 to 5000. Additional weight, up to 454 g, may be used to expedite the procedure. Change the sandpaper or emery cloth if it becomes clogged. Tape down the edges if any tearing is observed. Replace brush when bristles have worn to extend less than ⅝ in. (16 mm) from block.

7.2.1 *Brushes That Are In Constant Use*—Brushes that are in daily use shall be stored in the detergent solution. Each time before starting the first test of the day, remove the brush and rinse in water. The brush should be broken in by running it for about 400 cycles on a scrub resistant coating. when this has been done, the test can be started.

7.2.2 *Brushes That Are Not In Constant Use*—Brushes that will not be in used for a considerable time shall be washed out thoroughly in water after their last use and stored with the bristles side up and ambient conditions. Before being used again, the brushes should be soaked in the detergent solution for at least 24 h. The brush shall be run for about 400 cycles on a scrub resistant coating. When this has been done, the test can be started.

7.3 *Brush Holder*—Screws on the brush holder shall be removed and not used. Instead, insert a ⅛-in. (3.2-mm) thick rubber mat in the holder above the brush block. When in operation, this mat allows the brush to ride evenly on the paint surface without tilting (Fig. 1). The brush must fit loosely in the holder.

8. Procedure

8.1 Clean the top of the glass plate (or preferably suction plate) and both sides of the black plastic panel to be sure they are free of specks. Place the black panel on the plate and tape one end to the plate. Smooth the panel along the plate by rubbing with flannel, creating static electricity which improves adhesion to the plate.

8.2 Stir the test paint thoroughly and strain to remove all skins and particles. Draw down the paint on the panel using the 7.0-mil (0.18-mm) side of the film caster, starting from the taped end of the panel. The time for application should be fairly slow—3 to 4 s from end to end—to prevent formation of pinholes or holidays in the film. Air dry in a horizontal position for 7 days in an open room kept at 73.5 ± 3.5°F (23 ± 2°C) and 50 ± 5 % relative humidity. Make three drawdowns of each coating. Test two and average them, if they are within the 25 % repeatability. If they are not, test the third and average the three, unless one of the results is obviously discrepant, in which case it should be discarded.

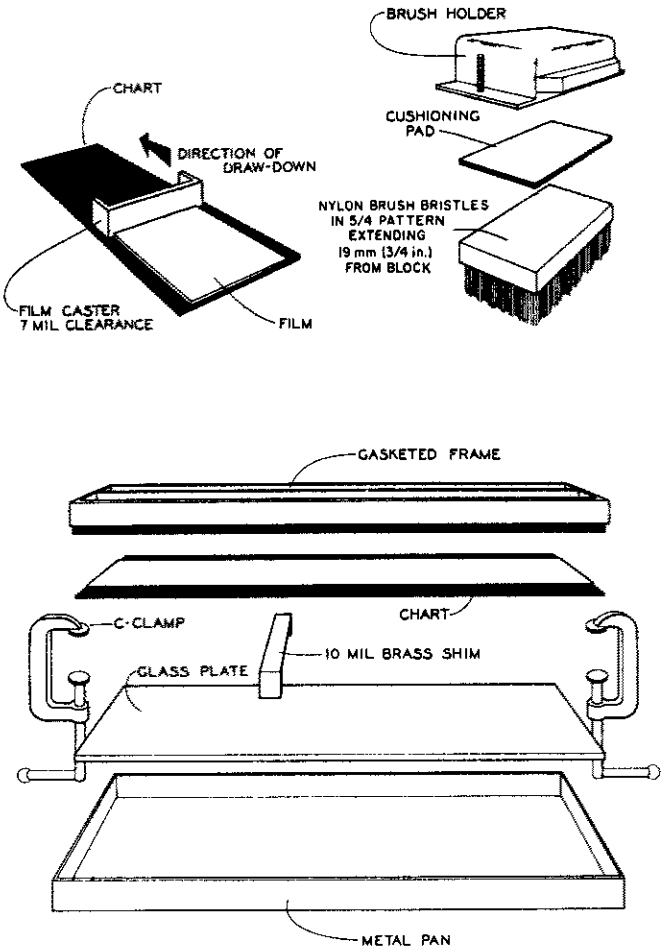

FIG. 1 Accessory Apparatus for Scrub Test

8.3 Clean the plate and set it in the pan of the washability machine. Be sure that the shim is smooth and free of burrs and placed across the center of the plate. Wipe the test panel carefully and place it on top of the shimmed plate with the painted side up. Be sure that there are no defects in the film above the shim and that the test area is level. Prewet the gasket of the frame and wipe it dry before use. Place the frame over one half of the drawdown, being sure that the entire gasket is on the painted surface. (The other half can be used for a second test if desired.) Clamp the gasket in place. The clamps should be tight enough to ensure close contact, but not tight enough to cause warping of the panel.

8.4 Soak the brush in a 1 % solution of detergent[6] overnight. Remove the brush and shake it vigorously to remove any excess. Mount the brush in the holder being sure that the mat is in place above the brush block and that the brush is always in the same position. (Mark both brush and holder beforehand.) Stir the scrub medium and spread 10 g evenly on the brush bristles. Place the brush at one end of the path and attach the guide cables. Wet the panel with 5 mL of reagent water in the path of the brush.

8.5 Set the cycle counter at zero. Start the test. After each 400 cycles before failure remove the brush (do not rinse); add 10 g of stirred scrub medium; replace the brush, being sure that brush and holder are in the same position with relation

to each other and in the machine. Place 5 mL of water on the path before continuing.

8.6 Record the number of cycles to remove the paint film fully in one continuous thin line across the ½-in. (12.7-mm) width of the shim. Stop the machine and wipe off the area to determine the end point.

9. Report

9.1 Report the mean number of cycles to failure (see Section 10).

9.2 Outline any deviations from standard procedure.

10. Precision

10.1 The following criteria should be used for judging the acceptability of results of scrub resistance tests at a 90 % confidence level.

10.1.1 *Repeatability*—Duplicate results by a single operator should be considered suspect if they differ by more than 25 % of their mean value.

10.1.2 *Reproducibility*—Two results (each the mean of duplicate measurements) obtained by operators in different laboratories should be considered suspect if they differ by more than 50 % of their mean.

11. Keywords

11.1 Scrub resistance; abrasion resistance