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AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428

Standard Practice for Detergent Resistance of Organic Finishes[1]

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1. Scope

1.1 This practice covers the determination of the resistance to failure, in an accelerated manner, of organic finishes when immersed in a detergent solution.

1.2 *This standard does not purport to address all of the safety problems, 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 523 Test Method for Specular Gloss[2]

D 609 Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products[2]

D 610 Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces[3]

D 714 Test Method for Evaluating Degree of Blistering of Paints[2]

D 823 Test Methods for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels[2]

D 1005 Test Methods for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers[2]

D 1186 Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base[2]

D 1400 Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base[2]

D 1474 Test Methods for Indentation Hardness of Organic Coatings[2]

D 1654 Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments[2]

D 1730 Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting[4]

D 2092 Practices for Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting[3]

D 2197 Test Methods for Adhesion of Organic Coatings by Scrape Adhesion[2]

D 2244 Test Method for Calculation of Color Differences From Instrumentally Measured Color Coordinates[2]

3. Significance and Use

3.1 Any effects such as color change, blistering. loss of adhesion, softening, or embrittlement are observed and noted.

4. Apparatus

4.1 *Container*—A corrosion-resistant container equipped with the means to control the solution temperature within the range specified and to control the liquid level at ±3⁄16 in. (5 mm). Agitation may be required to maintain temperature uniformity.

4.2 *Cover*—The container shall be provided with a cover to retard evaporation and to contain the test specimens completely.

5. Test Specimens

5.1 Unless otherwise specified, the test specimens shall be 4 by 12 in. by 20 gage (100 by 300 by 0.9 mm) in size. The test specimen composition, surface preparation, and number of test specimens shall be agreed upon by the purchaser and the seller.

NOTE 1—Applicable test panel description and surface preparation methods are as follows:
Practices D 609, D 1730 and D 2092.

6. Coating of Test Specimens

6.1 The method of application, film thickness, curing, and conditioning of the test surface shall be agreed upon between the purchaser and the seller.

NOTE 2—Application and film thickness measurement methods are given as follows:
Test Methods D 823, D 1005, D 1186, and D 1400.

6.2 The backs, cut edges, and those areas containing identification marks or in contact with the supports, shall be

[1] This practice is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.27 on Accelerated Testing.

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

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

[4] *Annual Book of ASTM Standards*, Vol 02.05.

protected with a suitable coating that is stable under the conditions of test.

7. Detergent Solution

7.1 Composition, concentration, and temperature of detergent solution shall be agreed upon by the purchaser and the seller.

7.2 A typical solid detergent composition is as follows:[5]

	Parts by Weight
Tetrasodium pyrophosphate ($Na_4P_2O_7$), anhydrous	53.0
Sodium sulfate (Na_2SO_4), anhydrous	19.0
Sodium metasilicate (Na_2SiO_3), anhydrous	7.0
Sodium carbonate (Na_2CO_3), anhydrous	1.0
Sodium salt of a linear alkylarylsulfonate (90 % flake grade)[5]	20.0
Total	100.0

7.3 A suggested temperature of the detergent solution is 165 ± 2°F (74 ± 1°C).

NOTE 3—A listing of sources for the detergent chemicals can be found in *McCutcheon's Emulsifiers and Detergents*.[6]

8. Procedure

8.1 *Immersion*—Suspend the test specimens vertically in the container so that at least one half of the surface area is submerged in the detergent solution. Separate the test specimens so that they are not in contact with any metal and are no closer together than 1 in. (25 mm) at any point in the bath. Replace the detergent solution with fresh detergent solution every 168 h. If successive tests are to be correlated, use reference panels coated with a control paint.

8.2 *Examination of Specimens*—When the specimens are ready for examination, carefully remove, gently wash or dip in clean running water not warmer than the temperature of the detergent solution to remove the detergent from the surface, and then carefully dry by blowing with air or blotting with absorbent paper. During the progress of the test, examine for deterioration of the film immediately. If reimmersion is necessary, do not allow the specimens to remain out of the liquid in excess of ½ h, unless otherwise specified. Examine the test coating for the failures specifically agreed upon by the purchaser and the seller.

NOTE 4—The following methods of evaluating finish degradation in this practice are applicable:

Test Methods D 523, D 714, D 1474, D 2197, D 610, D 1654, and D 2244.

8.3 *Length of Test*—The length of test and the intermediate examination periods shall be as designated by the specification covering the organic finish being tested or as mutually agreed upon by the purchaser and the seller.

9. Precision and Bias

9.1 Precision data are based on a round robin in which three finishes applied to two substrates were tested in six laboratories with each laboratory making two runs of five replicates of each variation. Blister failure was reported by all cooperators using Test Method D 714. To simplify the evaluation of blistering data the blister ratings were converted to single numerical values by the formula Frequency Number × Size ÷ 10 = Numerical Value. The Frequency Numbers assigned were as follows:

No blistering	10
Very few	9
Few	8
Few medium	6
Medium	5
Medium dense	4
Dense	2

By this system, few Size 8 blistering would have a numerical value of 6.4. The adequacy of precision depends upon the purpose of the test and should be determined by the user from the data supplied.

9.1.1 Using these numerical values the standard deviations for the three finishes were as follows (rounded to nearest-tenth):

Finish	Within Laboratory	Between-Laboratory
1	0.8	1.4
2	0.4	0.6
3	1.3	2.6

9.1.2 *Repeatability:*

Finish	Difference
1	2.8
2	1.5
3	4.5

9.1.3 *Reproducibility*:

Finish	Difference
1	4.9
2	2.2
3	9.0

10. Keywords

10.1 degradation—paints/related coatings/materials; detergent resistance

[5] Calsoft F-90 available from Pilot Chemical Co., 11756 Burke St., Santa Fe Springs, CA 90670 has been found satisfactory.

[6] *McCutcheon's Emulsifiers and Detergents*, McCutcheons Division, M. C. Publishing Co., 175 Rock Rd., Glen Rock, NJ 07452.