



# Standard Practice for Detergent Resistance of Organic Finishes<sup>1</sup>

This standard is issued under the fixed designation D2248; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 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 The values stated in SI units are to be regarded as the standard. The values 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:<sup>2</sup>

D523 Test Method for Specular Gloss

D609 Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products

D610 Practice for Evaluating Degree of Rusting on Painted Steel Surfaces

D714 Test Method for Evaluating Degree of Blistering of Paints

D823 Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels

D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers

D1186 Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base (Withdrawn 2006)<sup>3</sup>

D1193 Specification for Reagent Water

D1400 Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base (Withdrawn 2006)<sup>3</sup>

D1474 Test Methods for Indentation Hardness of Organic Coatings

D1654 Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

D1730 Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting

D2092 Guide for Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting (Withdrawn 2008)<sup>3</sup>

D2197 Test Method for Adhesion of Organic Coatings by Scrape Adhesion

D2244 Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

D3359 Test Methods for Measuring Adhesion by Tape Test

## 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  $\pm 5$  mm ( $\frac{3}{16}$  in.). 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 100 by 300 by 0.9 mm (4 by 12 in. by 20 gage) 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 D609, D1730 and D2092.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.27 on Accelerated Testing.

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<sup>2</sup> 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.

<sup>3</sup> The last approved version of this historical standard is referenced on www.astm.org.

## 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: Practices D823, and Test Methods D1005, D1186, and D1400.

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

7.1.1 Unless otherwise specified, use Type 4 deionized water that complies with the requirements of Specification D1193.

7.1.2 Unless otherwise specified, the concentration of the detergent solution shall be 1 % ± 0.05 % by weight.

7.2 A typical solid detergent composition is as follows:

	Parts by Weight
Tetrasodium pyrophosphate (Na <sub>4</sub> P <sub>2</sub> O <sub>7</sub> ), anhydrous	53.0
Sodium sulfate (Na <sub>2</sub> SO <sub>4</sub> ), anhydrous	19.0
Sodium metasilicate (Na <sub>2</sub> SiO <sub>3</sub> ), anhydrous	7.0
Sodium carbonate (Na <sub>2</sub> CO <sub>3</sub> ), anhydrous	1.0
Sodium salt of a linear alkylarylsulfonate (90 % flake grade) <sup>6</sup>	20.0
Total	100.0

NOTE 3—If agreed upon between the purchaser and the seller to use a commercial brand of detergent, both parties should be aware that a commercial brand may have different formulations specific to certain geographic regions and that commercial brand formulations may change from year to year.

7.3 Unless otherwise specified, the temperature of the detergent solution shall be 74 ± 1°C (165 ± 2°F).

NOTE 4—A listing of sources for the detergent chemicals can be found in *McCutcheon's Emulsifiers and Detergents*.<sup>4</sup>

7.4 Record the pH of the solution at the beginning and end of each test.

7.5 Unless otherwise specified, agitate the detergent solution during the test. The agitation shall not cause any bubble formation and shall allow for maintenance of panel spacing minimums.

## 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 25 mm (1 in.) at any point in the bath. Replace the detergent solution with fresh detergent solution every 168 h. Immerse test specimens in Type 4 deionized water when the detergent solution is being changed. Do not keep the

test specimens out of the detergent solution for longer than 30 min. If successive tests are to be correlated, each test shall include control panels. The panel composition and paint formulation used for the control panels shall be the same for each test.

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 5—The following methods of evaluating finish degradation in this practice are applicable: Test Methods D523, D714, D1474, D2197, D610, D1654, D2244, and D3359.

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 D714. 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

<sup>4</sup> *McCutcheon's Emulsifiers and Detergents*, McCutcheons Division, M. C. Publishing Co., 175 Rock Rd., Glen Rock, NJ 07452.

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 resistances

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