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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Practice for Determination of Resistance of Factory-Applied Coatings on Wood Products to Stains and Reagents[1]

This standard is issued under the fixed designation D 3023; 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 practice covers evaluation of clear factory-applied coating systems on wood substrates.

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 235 Specification for Mineral Spirits (Petroleum Spirits) (Hydrocarbon Dry Cleaning Solvent)[2]

D 333 Test Methods for Clear and Pigmented Lacquers[3]

D 2571 Guide for Testing Wood Furniture Lacquers[3]

3. Significance and Use

3.1 When used in conjunction with Test Methods D 333, this practice will provide a comprehensive evaluation of resistance to stains caused by chemical reagents and household chemicals.

3.2 This practice applies only to coatings applied in sufficient quantity to form a continuous film. It is recommended that the dry film thickness of the coating under test be reported.

3.3 Results from stain tests conducted in accordance with this practice distinguish differences between coatings.

4. Reagents

4.1 *Code for Applicability of Reagents*—V = Vertical, any surface that may be vertical as on a dresser front. H = Horizontal, any surface that may be horizontal as on a table top. L = Laboratory, any surface that may be used for laboratory furniture (Section 9).

4.2 *Water*:

4.2.1 *Tap Water*, V, H, L

4.2.2 *Boiling Water* (test in accordance with the Boiling Water Resistance section of Guide D 2571)*:* H, L

4.3 *Alcohol*:

4.3.1 *Ethyl Alcohol* (test in accordance with the Alcohol Resistance section of Guide D 2571): V, H, L

4.4 *Aliphatic*:

4.4.1 *Mineral Spirits:* L (Specification D 235, Type III)

4.4.2 *Perchloroethylene:* V, H, L

4.5 *Ketone*:

4.5.1 *Methyl Ethyl Ketone:* L

4.6 *Acetate*:

4.6.1 *Amyl Acetate:* H, L

4.7 *Inorganic Acid*:

4.7.1 *Hydrochloric Acid (3 N)*—Dilute 258 mL of 12 *N* (36 %) HCl to 1 L: L

4.8 *Organic Acid*:

4.8.1 *Acetic Acid (3 N)*—Dilute 172 mL of 99 % acetic acid to 1 L: V, H, L

4.8.2 *Grape Juice* (unsweetened): V, H

4.8.3 *Lactic Acid* (5 % solution): V, H

4.9 *Bases*:

4.9.1 *Unscented Mild Soap* (saturated solution): V, H, L

4.9.2 *Potassium Tripolyphosphate* (saturated solution containing 0.5 % sodium *N*-methyl-*N*-oleyl laurate (Igepon T-73): V, H, L

4.9.3 *Ammonium Hydroxide* (3 % solution): L

4.9.4 *Trisodium Phosphate* (saturated solution): V, H, L

4.9.5 *Urea* (6.6 % solution): V, H, L

4.10 *Disinfectant*:

4.10.1 *Cresols* (5 % solution): V, H, L

4.11 *Ink*:

4.11.1 *Washable Ink:* V, H, L

4.11.2 *Permanent Ink:* V, H, L

4.11.3 *Ball-Point Ink:* V, H, L

4.12 *Dye*:

4.12.1 *Coffee* (test in accordance with the Coffee Stain Resistance section of Guide D 2571): V, H

4.13 *Wax*:

4.13.1 *Wax Crayons, Red, Blue, and Yellow:* V, H

4.13.2 *Lipstick* (test in accordance with the Cosmetic Stain section of Guide D 2571): V, H

4.14 *Shoe Polish*:

4.14.1 *Liquid Shoe Polish*, tan: V, H

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[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 D01.52 on Factory-Coated Wood Products.

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[2] *Annual Book of ASTM Standards*, Vol 06.04.

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

4.15 *Oil*:
4.15.1 *Corn Oil* or equivalent: V, H
4.15.2 *Hair Oil:* V, H
4.16 *Miscellaneous*:
4.16.1 *Mustard:* V, H
4.16.2 *Tincture of Merthiolate* (1 + 1000): V, H (see Section 5)
4.16.3 *Sodium Hypochlorite* (6 % solution): V, H, L
4.16.4 *Tincture of Iodine*—Wet 50 g of potassium iodide (KI) with water, weigh into the wet KI 70 g of iodine, let stand 1 h to dissolve the iodine, and make up to 1 L with alcohol: V, H, L
4.17 *Staining Solutions*, unless otherwise specified, are water solutions.

5. Selection of Staining Agents for Testing Stain Resistance of Coatings

5.1 The producer and the user shall select staining agents from the reagents in Section 4. Selection of staining agents should depend on end use, such as wall, ceiling, horizontal surface, or floor.
5.2 In the absence of agreement between the producer and the user, the suggested staining reagents for each intended use are indicated in Section 4 by V, H and L.
5.3 It is not necessary that all finishes pass all tests.

6. Test Specimen

6.1 Test panels shall be of regular production finish.
6.2 If regular production finished panels are not available, the producer and the user shall agree upon the following variables: face veneer or wood surface, filler or filler stain, primer coat, topcoat, and dry film thickness for each coating material.

7. Panel Conditioning

7.1 Before testing, panels must be aged for a time and by a method agreed upon between the producer and the user.

8. Procedure

8.1 Conduct the test with panel surfaces horizontal at room temperature unless a different temperature is specified.
8.2 Place 0.017 oz (0.5 mL) of each staining agent on the finish surface and allow to stand uncovered for 18 h (or a time agreeable to the producer and the user) except for staining agents 4.3 to 4.6. On these put a 1-in. (25-mm) square of double-acid-washed quantitative filter paper. The purpose of the filter paper is to maintain a longer wet contact of volatile reagents with the surface of the finish.
8.3 After 18 h exposure, or other time period agreed to by the producer and the user, wash the surface with water, rinse with ethanol (1 + 1), or other reagent as agreed upon between the producer and user, and dry with a paper towel. Place the panel in a vertical position with a diffuse light source and view (Note) from a distance of 2 to 3 ft (0.6 to 0.9 m). Examine the surface for graying, spotting, wrinkling, discoloration, or other film defects and report.

NOTE 1—This method of viewing panels gives the best correlation of staining damage between laboratories. However, the following information should be noted: (*1*) When viewing panels across the grain at a low angle that is being varied, many more stains will appear visible than would appear visible perpendicular to the surface. These additional stains are superficial stains only. (*2*) When viewing with and against the grain, there appears to be an even greater number of superficial stains than would appear when viewing perpendicular to the surface or across the grain.

9. Interpretation of Results

9.1 Each product finish differs greatly in stain resistance requirements. The key, in general, is that the resistance to staining must be adequate for that finish's end use when first used in place and throughout the expected life span of the specific product.
9.2 The end use choice of resistance to staining should be agreed upon between the producer and the user.

10. Report

10.1 Report the following information:
10.1.1 Reagents and concentrations used,
10.1.2 Substrate tested,
10.1.3 Coating tested,
10.1.4 Rinsing reagent,
10.1.5 Film thickness of coating and thickness method, and
10.1.6 Stain or film defect observations.

11. Precision and Bias

11.1 *Precision*—Agreement between laboratories by visual comparison varied according to how samples were viewed.
11.1.1 Stains viewed perpendicular with a diffused light source at a distance of 2 to 3 ft (0.6 to 0.9 m) for graying, spotting, wrinkling, discoloration, or other film defects gave complete agreement between laboratories.
11.1.2 The same test stains viewed both with and across the grain at a low angle resulted in many more superficial stains being evident, depending upon the eyesight and judgment of the observer.
11.2 *Bias*—Bias cannot be determined since there is no accepted reference material.

12. Keywords

12.1 coating, factory-applied; coating, wood; household chemicals; stain tests