Designation: F502 – 08 (Reapproved 2013)

Standard Test Method for Effects of Cleaning and Chemical Maintenance Materials on Painted Aircraft Surfaces[1]

This standard is issued under the fixed designation F502; 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.

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

1. Scope

1.1 This test method covers determination of the effects of cleaning solutions and liquid cleaner concentrates on painted aircraft surfaces (Note 1). Streaking, discoloration, and blistering may be determined visually. Softening is determined with a series of specially prepared pencils wherein determination of the softest pencil to rupture the paint film is made.

NOTE 1—This test method is applicable to any paint film that is exposed to cleaning materials. MIL-PRF-85285 has been selected as a basic example. When other paint finishes are used, refer to the applicable material specification for panel preparation and system curing prior to testing.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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:*[2]
D329 Specification for Acetone
D1193 Specification for Reagent Water
2.2 *Military Standards:*[3]
MIL-PRF-85285 Coating: Polyurethane, Aircraft and Support Equipment
A-A-58054 Abrasive Mats, Non-Woven Non-Metallic
MIL-PRF-23377 Primer Coatings: Epoxy, High Solids
MIL-DTL-81706 Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
2.3 *Federal Standards:*[3]
FED-STD-595 Colors Used in Government Procurement
2.4 *Industry Standards:*[4]
SAE-AMS-QQ-A-250/13 Aluminum Alloy Alclad 7075, Plate and Sheet

3. Materials

3.1 *Drawing Pencils* (Note 2)—6B, 5B, 4B, 3B, 2B, B, HB, F, H, 2H, 4H, 5H, and 6H.

3.2 *Fine Sand Paper,* 180 to 320 grit.

3.3 *Abrasive Mats,* A-A-58054, aluminum oxide, fine or very fine.

3.4 *Acetone,* in accordance with Specification D329.

3.5 *MIL-PRF-85285 Coating,* polyurethane, Aircraft and Support Equipment, FED-STD-595 Color No. 17875, insignia white.

3.6 *MIL-PRF-23377 Primer Coating,* epoxy polyamide, chemical- and solvent-resistant.

3.7 *Chemical Conversion Materials,* MIL-DTL-81706, Class 1A, for coating aluminum and aluminum alloys.

3.8 *Distilled or Deionized Water,* in accordance with Specification D1193, Type IV.

NOTE 2—All pencils in a set must be from one manufacturer (for example, Venus, Eagle, and so forth).

4. Safety Precautions

4.1 All safety regulations prescribed for spray application of polyurethane paints shall be strictly adhered to in the use of this test method.

4.2 The testing procedure shall be conducted in a well-ventilated area.

[1] This test method is under the jurisdiction of ASTM Committee F07 on Aerospace and Aircraft and is the direct responsibility of Subcommittee F07.07 on Qualification Testing of Aircraft Cleaning Materials.

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[2] 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.

[3] Available from Department of Defense Single Stock Point (DODSSP) Web Server at http://dodssp.daps.dla.mil using ASSIST Quick Search.

[4] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

5. Test Specimens

5.1 SAE-AMS-QQ-A-250/13 Aluminum Alloy Alclad 7075-T6, Plate and Sheet.

6. Test Solutions

6.1 Concentrated (as received, if a liquid).

6.2 In use dilution, if diluent is water, see 3.8.

7. Procedure

7.1 *Preparation of Pencils*—Prepare a set of drawing pencils for testing the painted panels by stripping the wood away from the end approximately ⅜ in. (9.5 mm) without damaging the lead (as shown in Fig. 1). Then square the tip of the lead by holding the pencil in a vertical position and moving the lead back and forth over a very fine (180- to 320-grit) sandpaper. Square the tip of the lead after each trial.

7.2 *Preparation of Panels*—Wipe 3- by 6- by 0.02-in. (76- by 152- by 0.5-mm) aluminum panels with acetone, dry and abrade lightly with a fine aluminum oxide mat. Rinse the surface with distilled water and coat with a conversion coating material conforming to MIL-DTL-81706, Class 1A. Apply one coat of MIL-PRF-23377 epoxy primer, 0.6 to 0.8 mil (0.015 to 0.020 mm) and allow to dry 1 h at room temperature. Apply a mist coat of the designated polyurethane and allow to dry 30 min at room temperature. Apply the finish coat in three applications of 0.4 to 0.6 mil (0.010 to 0.015 mm), allowing a 1-h drying time at room temperature between each coat. Allow the painted panels to dry four days at room temperature; then bake for 24 h at 180°F (82°C) or allow panels to air dry an additional three to ten days at room temperature. No greater than one pencil hardness difference between coated panels prepared from the same batch of paint at the same time shall be permitted.

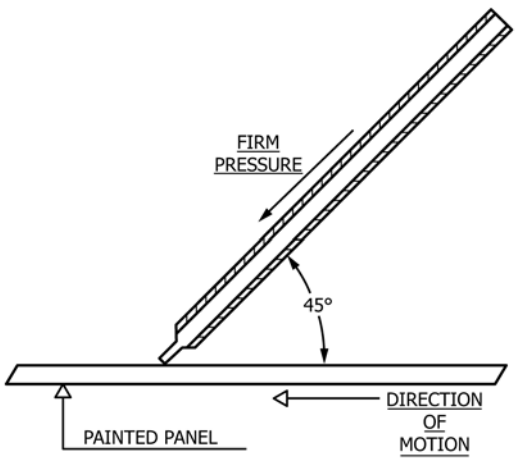

FIG. 1 Test for Hardness of Painted Surface

7.3 *Procedure:*

7.3.1 Place the test panels in a horizontal position in an oven maintained at 100 ± 5°F (38 ± 2°C). Apply the test solution to approximately one half the area of each panel and allow to remain on the panels for 30 min. Then remove the panels from the oven and rinse with distilled or deionized water and allow to air dry for 24 h. Examine for streaking, discoloration, or blistering of the finish.

7.3.2 Determine the hardness of the treated and untreated areas in the following manner: Hold pencils of decreasing hardness by hand at a 45° angle (see Fig. 1) and push across the paint film with a firm uniform pressure until a pencil is found that will not cut the film but will leave a black mark on the surface, whereas the next hardest pencil will cut through the film without leaving a black mark. The hardness number of the pencil that cuts the film shall express film hardness. Make at least three determinations on both exposed and unexposed portions of the coated panel.

8. Report

8.1 The report shall include the following:

8.1.1 The appearance of the panels after exposure,

8.1.2 The pencil hardness required to rupture the paint film on the unexposed portion of the panel, and

8.1.3 The pencil hardness required to rupture the paint film on the exposed portion of the panel.

9. Precision and Bias

9.1 No statement as to precision and bias can be made as standard materials do not exist for comparative tabulation purposes.

10. Keywords

10.1 aircraft; effect; painted surfaces