



Designation: F2109 – 01 (Reapproved 2022)

# Standard Test Method to Determine Color Change and Staining Caused by Aircraft Maintenance Chemicals upon Aircraft Cabin Interior Hard Surfaces<sup>1</sup>

This standard is issued under the fixed designation F2109; 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.

## 1. Scope

1.1 This test method covers the determination of color change and staining from liquid solutions, such as cleaning or disinfecting chemicals or both, on painted metallic surfaces and nonmetallic surfaces of materials being used inside the aircraft cabin. The effects upon the exposed specimens are measured with the AATCC Gray Scale for Color Change and AATCC Gray Color Scale for Staining.

NOTE 1—This test method is applicable to any colored nonmetallic hard surface in contact with liquids. The selected test specimens are chosen because these materials are present in the majority of aircraft cabin interiors.

1.2 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

**D1193 Specification for Reagent Water**

2.2 *Industry Standard:*

**AMS QQ-A-250/13 Aluminum Alloy Plate and Sheet**<sup>3</sup>

<sup>1</sup> 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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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto: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> Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, <http://www.sae.org>.

## 3. Significance and Use

3.1 The findings generated by this test method shall be part of the approval of maintenance chemicals to be used on, or to come in contact with, airplane interior surfaces during routine operations. The test method screens these chemicals to ensure that no discoloration or staining or both is liable to occur by use of the liquid chemical product.

## 4. Apparatus

4.1 *AATCC Gray Scale for Color Rating*<sup>4</sup>

4.2 *AATCC Gray Color Scale for Staining*<sup>4</sup>

4.3 *Tungsten Filament Lamps*, operating at a color temperature of 2854, 4800, and 6500 K.<sup>5</sup>

4.4 *The Macbeth Daylight*, a tungsten filament lamp operating at a color temperature of 7500 K.<sup>6</sup>

## 5. Materials

5.1 *Bottles*, polyethylene with spray applicator.

5.2 *Bottles*, polyethylene, wash bottle type with nozzle.

5.3 *Leather*, PO-8-XXXX series.<sup>7</sup>

5.4 *Naugahyde*, Uniroyal Spirit of 76 pattern, Flammability treated.<sup>8</sup>

5.5 *Paper Towels*, white, reinforced.

5.6 *Sponges*, cellulose.

5.7 *AMS QQ-A-250/13 Aluminum Alloy Plate and Sheet*, Alclad 7075-T6 coated.

<sup>4</sup> Available from American Association of Textile Chemists and Colorists (AATCC), P.O. Box 12215, Research Triangle Park, NC 27709, <http://www.aatcc.org>.

<sup>5</sup> Available from SDL, 1900 Center Park Dr., Suite 1000, Charlotte, NC 28217-2956.

<sup>6</sup> Available from GretagMacbeth, 617 Little Britain Rd., New Windsor, NY 12553.

<sup>7</sup> Available from Lackawanna Leather Company, P. O. Box 1008, Canover, NC 28613.

<sup>8</sup> Available from Van Waters and Rogers, 8201 212th Street, Kent, WA 98031.

5.8 *Wipers*, cheesecloth, gauze or cotton cloths.<sup>9</sup>

## 6. Test Specimens

6.1 Prepare two 200- by 200-mm (8- by 8-in.) test panels of each of the following materials:

6.1.1 Aluminum QQ-A-250/13 Aluminum Alloy Plate and Sheet, Alclad 7075-T6 coated, covered with a paint system as required by the customer.

6.1.2 Tedlar-covered surfaces in accordance with the requirements of the customer.

6.1.3 Vinyl-covered surfaces in accordance with the requirements of the customer.

6.1.4 Leather surfaces.

6.1.5 Naugahyde surfaces.

## 7. Preparation of Test Specimens

7.1 Test specimens shall be prepared from new materials. Freshly painted panels are used. Care shall be taken to keep the surface clean and dust free.

## 8. Test Solution

8.1 *Solution Concentration:*

8.1.1 Unless otherwise specified, the specimens shall be tested with the maintenance chemical at the recommended use dilution, using water that conforms to Specification **D1193**, Type IV.

8.1.2 If water is not used as the diluent, record the type and specification of the diluent used in the test.

8.2 *Temperature*—Shall be room temperature.

## 9. Procedure

9.1 *For Painted, Tedlar, and Vinyl Surfaces:*

9.1.1 Leave one of the two test specimens of each material unexposed as a control.

9.1.2 When evaluating a water-based chemical:

9.1.2.1 Apply the chemical by spray or sponge to the whole surface of the test specimen to be tested.

9.1.2.2 Allow the chemical to remain on the horizontal panel for  $120 \pm 10$  s.

9.1.2.3 Rinse with a clean wiper saturated with water conforming to Specification **D1193**, Type IV.

9.1.3 When evaluating a solvent-based chemical:

9.1.3.1 Apply the chemical to a clean wiper.

9.1.3.2 Blot with wiper 25 times in the same location, covering a surface as large as possible. Keep wiper wet with the chemical.

9.1.3.3 Remove chemical residue by cleaning the surface with a clean wiper saturated with water conforming to Specification **D1193**, Type IV.

9.1.4 Allow specimens to dry thoroughly by air at room temperature.

9.1.5 Determination of changes of the exposed test specimen:

9.1.5.1 Determine the color change of the exposed specimen by comparing it with the control specimen and the AATCC Gray Scale for Color Change.

9.1.5.2 Determine staining of the exposed specimen by comparing it with the control specimen and the AATCC Gray Color Scale for Staining.

9.1.5.3 Examine the exposed specimen for scratches.

9.1.5.4 Determination of **9.1.5.1 – 9.1.5.3** shall be conducted under a standard light source as given in **4.3 and 4.4**.

9.1.6 Report the gray scale ratings if other than 5.

9.2 *For Leather and Naugahyde Surfaces:*

9.2.1 Leave one of the two test specimens of each material unexposed as a control.

9.2.2 When evaluating a water-based chemical:

9.2.2.1 Prepare the specified dilution. In case foaming agents are present, work it into a thick foamy lather.

9.2.2.2 Apply the mixture with a soft cloth to a 75- by 75-mm (3- by 3-in.) area in the center of the specimen.

9.2.2.3 Rub the mixture into the specimen using 25 circular motions, overlapping each circle. Keep the wiper wet with the chemical.

9.2.2.4 Rinse with a soft cloth saturated with water conforming to Specification **D1193**, Type IV.

9.2.3 When evaluating a solvent-based chemical:

9.2.3.1 Apply the chemical to a soft cloth.

9.2.3.2 Rub the chemical gently into a 75- by 75-mm (3- by 3-in.) area in the center of the specimen using 25 circular motions, overlapping each circle. Keep the wiper wet with the chemical.

9.2.3.3 Remove chemical residue by cleaning the surface with a cloth dampened with water conforming to Specification **D1193**, Type IV. Do not leave any residue film.

9.2.3.4 Rub the surface briskly with a dry soft cloth.

9.2.4 Allow specimens to dry by air at room temperature for 18 h minimum.

9.2.5 Determination of changes of the exposed test specimen is as given in **9.1.5 and 9.1.6**. Examine also for cracks or brittleness.

## 10. Interpretation of Results

10.1 A numerical rating system is assigned by visually comparing the differences represented by the chip pairs of the original and tested specimens. The scale runs from 1 to 5, progressing by half steps. A rating of 5 means that there is no difference in color between the original material and the tested specimen.

10.1.1 Since any material deterioration is unacceptable, each rating other than 5 on the AATCC Gray Scales for Color Change and Staining is cause for rejection.

10.2 Scratching or brittleness of exposed specimens shall also be cause for rejection.

## 11. Report

11.1 Report the following data for each test performed:

11.1.1 Name and type of maintenance chemical tested.

11.1.2 Concentration and diluent used.

11.1.3 Type of surface material tested.

11.1.4 Presence of visual color change and staining.

<sup>9</sup> These materials should be washed before use since new unwashed wipers, in contact with the chemicals under test, may leave deposits on the surface of the test specimens.