



Standard Test Method for Freeze-Thaw Stability of Multicolor Lacquers¹

This standard is issued under the fixed designation D2337; 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 test method covers the determination of the extent to which multicolor lacquers resist coagulation and coalescence when subjected to freezing and subsequent thawing.

1.2 The values stated in SI 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:*²

D562 Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer

3. Summary of Test Method

3.1 Specimens of multicolor lacquers are placed in a chamber maintained at a temperature between -23 and -26°C (-10 and -15°F) and allowed to remain 24 h. The specimens are removed from the chamber and allowed to remain at room temperature for 24 h to reach thermal equilibrium. After the specimens are mixed and the viscosity adjusted, they are then sprayed and allowed to dry before comparing with the control standard sprayed from the original specimen.

4. Significance and Use

4.1 Waterborne coatings, when subjected to cycles of freezing and thawing, can undergo detrimental changes in applica-

tion and performance characteristics. This test method evaluates the ability of multicolor lacquers to resist these changes.

5. Apparatus and Materials

5.1 *Cabinet, Room, or Enclosed Space*, large enough to contain the specimens to be tested and allowing at least 25 mm (1 in.) of air space between the sides of adjacent cans. It should be capable of being maintained at a temperature between -23 and -26°C (-10 and -15°F).

5.2 *Stormer Viscometer*, with paddle-type rotor.

5.3 *Spray Gun*, pressure-feed internal-mix type, tip 0.086 in. (2 mm) in diameter with wide-spray nozzle.

5.4 *White Paper Stock*, minimum size 200 by 280 mm (8 by 11 in.).

6. Preparation of Samples

6.1 For all gloss and semigloss multicolor lacquers, prepare ten 1-L (1-qt) specimens and for flat multicolor lacquers four 1-qt specimens for testing. Mix the sample from which the specimens are filled well by boxing so that it is of a uniform consistency and appearance. After recording the consistency reading as determined with a Stormer viscometer (in accordance with Test Method **D562** fill all samples in baked varnish-lined containers and apply the lids promptly to prevent evaporation loss).

7. Preparation of Control Standard

7.1 Prepare a control standard by spraying from one of the 1-L (1-qt) specimens of each product to be tested. Use a coated white paper stock and spray on a sheet at least 200 by 280 mm (8 by 11 in.) in size. Adjust the fluid and atomizing pressures to give a spreading rate of 3.7 to 4.9 m^2/L (150 to 200 ft^2/gal) for complete covering and 4.9 to 7.35 m^2/L (200 to 300 ft^2/gal) for scatter coat application.

8. Exposure of Samples to Test Conditions

8.1 Place nine specimens of all gloss and semigloss multicolor lacquers and three specimens of all flat multicolor lacquers under test in the chamber that is maintained between -23 and -26°C (-10 and -15°F). Place the specimens on racks in such a manner that they do not touch the walls or bottom of the chamber and so that there is at least 25 mm (1 in.) of air space between adjacent specimens. On each cycle allow all

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.24 on Physical Properties of Liquid Paints and Paint Materials.

Current edition approved Dec. 1, 2014. Published December 2014. Originally approved in 1965. Last previous edition approved in 2010 as D2337 – 01 (2010). DOI: 10.1520/D2337-01R14.

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.

specimens to remain in the chamber for 24 h before removal. Remove from the chamber all specimens of each multicolor lacquer and let them come to thermal equilibrium by allowing them to remain at room temperature (25°C (77°F)) for 24 h. Mix these specimens to a uniform consistency by boxing. Run a minimum of three specimens and all specimens shall pass the test for multicolor to be acceptable.

9. Examination of Samples and Spray After Test

9.1 Check the consistency of all specimens on the Stormer viscometer after each test cycle and adjust if necessary by adding water to the viscosity of the original before testing. Spray three specimens after each cycle on white paper stock using the same equipment and adjustments of the spray gun that were used to spray the control standard. Allow the sprayed panels to dry thoroughly (16 h) and compare with the control standard in each case for color, particle size, and pattern of the background as well as the accent colors.

10. Report

10.1 Report significant change in color, particle size, or tendency to show coalescence or coagulation when compared

with the control standard. To be considered satisfactory for freeze-thaw resistance, all gloss and semigloss multicolor lacquers shall show a satisfactory appearance after three cycles and all flat multicolor lacquers shall show a satisfactory appearance after one cycle.

11. Precision and Bias

11.1 *Precision*—It is recognized that the seller has no control over the conditions under which the purchaser will apply multicolor lacquer finishes and, therefore, meaningful estimates of precision cannot be given.

11.2 *Bias*—No information can be presented on bias in this test method for measuring properties listed in 10.1 since no material having an acceptable reference value is available.

12. Keywords

12.1 freeze-thaw stability; lacquer; multicolor lacquers

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