



Designation: D 2243 – 95 (Reapproved 2003)

Standard Test Method for Freeze-Thaw Resistance of Water-Borne Coatings¹

This standard is issued under the fixed designation D 2243; 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 Department of Defense.

1. Scope

1.1 This test method covers a procedure for evaluating the effect of freeze/thaw cycling on the viscosity and visual film properties of water-borne coatings.

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:

D 562 Test Method for Consistency of Paints Measuring the Krebs Units (KU) Viscosity Using a Stormer-Type Viscometer²

D 2196 Test Methods for Rheological Properties of Non-Newtonian Materials By Rotational (Brookfield type) Viscometer²

3. Summary of Test Method

3.1 The water-borne coating is put into two pint-size (500-mL) resin-lined cans. One can is stored at room temperature, while the other can is subjected to cycles of freezing and thawing. After cycling, the coating is examined for changes in viscosity and visual film properties.

4. Significance and Use

4.1 When water-borne coatings are shipped during cold weather, they may experience cycles of freezing and thawing. Cycles of freezing and thawing cause more damage to water-borne coatings than when the coatings are subjected to steady freezing.

5. Apparatus

5.1 *Test Chamber*—A suitable cabinet, room, or enclosure space large enough to contain the specimens to be tested permitting at least 1 in. (25 mm) of air space between the sides of adjacent cans and capable of being maintained continuously at a temperature of -18°C (0°F).

NOTE 1—Although a variation of the test chamber temperature of $\pm 2^{\circ}\text{C}$ ($\pm 3.5^{\circ}\text{F}$) is allowed, the test chamber temperature should be maintained as near -18°C (0°F) as practicable and the amount of variation should be recorded and reported.

5.2 *Viscometer*—A Stormer viscometer with paddle type rotor as described in Test Method D 562 or a Brookfield viscometer as described in Test Methods D 2196.

5.3 *Test Charts*—Smooth surface paper charts having adjacent black and white areas, and coated with a suitable varnish or lacquer to render the surface impermeable to paint liquids.

5.4 *Paint Brush*, 25 mm (1 in.).

5.5 *Bar Applicator*, with a 0.18-mm (7-mil) clearance.

6. Preparation of Sample and Specimens

6.1 Prepare specimens for testing by filling 500 mL (1-pt) resin-lined, friction-top cans two thirds full. Ensure that the bulk sample from which the cans are filled is well stirred and uniform, that the containers used are clean, and that the lids are applied promptly to the cans to prevent evaporation losses. Two such specimens are required for each test.

7. Exposure to Test Conditions

7.1 Store one can at room temperature and identify this as the control specimen.

7.2 Place the second can, the paint under test, identified as the “test specimen”, in the chamber maintained at -18°C (0°F) in such a manner that it does not touch the walls or bottom of the chamber and so that free circulation of air around it is permitted. The placing of cans on racks that raise them off the bottom of the chamber or upon pieces of insulating board resting on the bottom is suggested. In the case of several test specimens, maintain a minimum of 25 mm (1 in.) of air space between adjacent cans and between cans and the chamber walls. Keep the test specimen in the chamber for 17 h and then remove and allow to stand for 7 h undisturbed at room

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 D01.42 on Architectural Coatings.

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² *Annual Book of ASTM Standards*, Vol 06.01.