



Designation: **D6279–03 (Reapproved 2013) D6279 – 15**

Standard Test Method for Rub Abrasion Mar Resistance of High Gloss Coatings¹

This standard is issued under the fixed designation D6279; 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 procedures for evaluating the relative mar resistance of a series of high gloss coatings applied to a flat, rigid surface. Wet rub and dry rub abrasion tests are described. To fully characterize a coating's mar resistance, both tests should be run.

NOTE 1—Dry abrasion mar resistance can also be evaluated by using Test Methods **D6037**. If a series of very highly mar resistant coatings is being evaluated, Test Methods **D6037** will generally provide the better performance discrimination than the dry rub test described here. However, if the equipment described in Test Methods **D6037** is not available, the dry rub test described in this test method affords a reasonable alternative. The dry rub test is also useful for evaluating coatings that are not highly mar resistant.

1.2 Mar resistance is assessed by measuring the gloss of the abraded and unabraded areas. Mar resistance is directly related to the coating's ability to retain gloss in abraded areas.

NOTE 2—The mar resistance values obtained by this test method have no absolute significance. They should only be used to derive relative performance rankings for test panels that have been prepared from the series of coatings that are currently being evaluated. If mar resistance values are quoted between laboratories, it is essential that a common standard be measured and that the values be compared to that standard. Even then, the values should be used with caution.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

1.4 *This standard does not purport to address 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

D523 Test Method for Specular Gloss

D823 Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels

D1005 Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers

D1186 Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base (Withdrawn 2006)³

D1400 Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base (Withdrawn 2006)³

D3924 Specification for Environment for Conditioning and Testing Paint, Varnish, Lacquer, and Related Materials

D6037 Test Methods for Dry Abrasion Mar Resistance of High Gloss Coatings

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *mar resistance, n*—the ability of a coating to resist permanent deformation or fracture, resulting from the application of a dynamic mechanical force.

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 **D01.55** on Factory Applied Coatings on Preformed Products.

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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~~ standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

3.1.1.1 Discussion—

This test method measures resistance to visible damage caused by mild abrasion.

4. Summary of Test Method

4.1 The coatings that are being evaluated are applied at uniform dry film thickness to planar panels of uniform surface texture. After drying or curing, or both, panels are marred by the action of dry abrasion media or wet abrasion media, or both, under a reciprocating weighted pad. Mar resistance is assessed by measuring the coating's gloss within the abraded and unabraded areas of test panels. Mar resistance is directly related to the coating's ability to retain gloss in abraded areas.

5. Significance and Use

5.1 Coatings, particularly the high gloss coatings used on automobiles, boats, toys, etc., are subject of a wide variety of conditions (for example, wiping, cleaning and exposure) during manufacture and service that can mar their surface. The ability of high gloss coatings to maintain their appearance is an important product attribute. This test method provides a way to estimate the ability of high gloss coatings to resist mar damage.

6. Apparatus

6.1 *Application Equipment*, as described in Practices **D823**.

6.2 *Film Thickness Measuring Apparatus*, as described in Test Methods **D1005**, **D1186** or **D1400**.

6.3 *Abrader*—The mar tester⁴ is so designed that the 16 mm, ± 1 mm diameter, friction element with a downward force of 9 N, ± 10 %, moves back and forth in a straight line over a 100 mm ± 10 mm (4 in ± 0.4 in.) track on the test panel. It has a uniform stroke rate of 60 r/min. One revolution is a complete back and forth motion.

6.4 *Friction Pad*—Cover the instrument's friction element with a pad made of felt or paper. Felt pads can be attached by wrapping the felt around the friction element and holding it in place with a suitable spring clip or clamp. Paper pads must be cut to fit to cover the area of the friction element that contacts the coating. They can be attached to the friction element with two-sided tape or paper pads that can be purchased with an adhesive backing. The type of pad affects the abrasion and so must be defined for the test. It has been found that generally a thicker felt pad works best for dry abrasion and a thinner pad is best for wet abrasion.

6.5 *Dry Abrasion Media*—Feldspar/calcite, non-silicate cleaning powder.

6.6 *Wet Abrasion Media*—Prepare an aluminum oxide (grit) slurry as follows:

aluminum oxide (220 mesh)	10.0 (by weight)
polyacrylic acid	6.0
distilled water	83.3
2-aminopropanol	0.7
Total	100.0

6.6.1 The slurry ingredients can be combined by using a mixer or spatula. The slurry gets very thick, but is easy to mix.

6.6.2 The slurry prepared by this formula should have a pH of 7.9 to 8.0 and a viscosity of 190 to 210 P (as measured on a Brookfield Viscometer, No. 4 spindle, rotational viscometer with a spindle that is a right circular cylinder 3.2 mm in diameter and 31.0 mm in length, 10 r/min). If the pH and viscosity are low, add 2-aminopropanol until the pH is 7.9 to 8.0. If the pH is on target but the viscosity is low, add more polyacrylic acid.

7. Preparation of Specimens

7.1 Prepare a minimum of two (2) 101.6 by 152.4-mm (4 by 6-in.) panels for each coating that is being tested. Alternatively, if the abrasion apparatus can accommodate them, 101.6 by 304.8-mm (4 by 12-in.) panels may be used. Prepare the coated panels as described in Practices **D823**.

7.2 Gloss measurements are color dependent. Abraded areas on dark colored panels tend to give lower gloss readings than similarly abraded areas on light colored panels. For consistent results, it is recommended that testing be done using black coatings. Clearcoats can be applied over a black basecoat. If it is necessary to use other colors, a black panel should be included as a control.

8. Conditioning

8.1 Condition the test specimens at $23 \pm 2^\circ\text{C}$ ($74 \pm 4^\circ\text{F}$) and 50 ± 5 % relative humidity in accordance with Specification **D3924** unless otherwise specified in the test methods or the standard.

9. Procedure

9.1 Securely fasten the friction element to the reciprocating arm.

9.2 Set the number of cycles at 10, unless otherwise specified. Set fewer cycles for easily marred panels and more cycles for more mar resistant materials.

⁴ A list of machines suitable for this purpose is found in Research Report RR:D01-1117. Contact ASTM Customer Service at service@astm.org.