Designation: D968 – 22

Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive[1]

This standard is issued under the fixed designation D968; 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 These test methods cover the determination of the resistance of organic coatings to abrasion produced by abrasive falling onto coatings applied to a plane rigid surface, such as a metal or glass panel.

1.2 Two test methods based on different abrasives are covered as follows:

	Sections
Method A—Falling Sand Abrasion Test	6 – 13
Method B—Falling Silicon Carbide Abrasion Test	14 – 21

1.3 These methods should be restricted to testing in only one laboratory when numerical values are used because of the poor reproducibility of the methods (see 13.1.2 and 21.1.2). Interlaboratory agreement is improved significantly when ranking is used in place of numerical values.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses after SI units are for information only and are not considered standard.

1.5 *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.*

1.6 *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:*[2]

D16 Terminology for Paint, Related Coatings, Materials, and Applications

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

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

D7091 Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

2.2 *Other Standards:*

ANSI B74.12 Specification for the Size of Abrasive Grain — Grinding Wheels, Polishing and General Industrial Uses[3]

FEPA Standard 42-2 Grains of Fused Aluminum Oxide, Silicon Carbide and other Abrasive Materials for Bonded Abrasives and for General Applications — Microgrits F230 to F2000[4]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 Abrasion resistance is expressed as the amount of abrasive required to wear through a unit film thickness of the coating.

3.2 For definitions of other terms used in this standard, refer to Terminology D16.

[1] These test methods are under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and are the direct responsibility of Subcommittee D01.23 on Physical Properties of Applied Paint Films.

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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 American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

[4] Available from Federation of European Producers of Abrasives (FEPA), 20 av., Reille, Paris, F-75014, www.fepa-abrasives.com.

***A Summary of Changes section appears at the end of this standard**

4. Summary of Test Method

4.1 Abrasive particles fall from a specified height through a guide tube onto the surface of a coated panel until the film is worn away, exposing a small area of the substrate or previous coating layer if two or more coatings are present. The amount of abrasive per unit film thickness is reported as the abrasion resistance of the coating on the panel. Silica sand or silicon carbide may be used, as specified.

5. Significance and Use

5.1 Silica sand produces a slower rate of abrasion for organic coatings than that provided by silicon carbide. For some types of coatings, it may also provide greater differentiation.

5.2 The abrasion resistance scales produced by the two methods differ, but the methods provide approximately the same rankings of coatings for abrasion resistance.

5.3 Each of the methods has been found useful for rating the abrasion resistance of specific types of coatings. For example Method A (falling sand) has been used for rating floor coatings while Method B (falling silicon carbide) has been used for rating coatings for ship decks.

FIG. 1 Abrasion Test Apparatus

METHOD A—FALLING SAND ABRASION TEST [5]

6. Apparatus and Materials

6.1 *Abrasion Tester,* as illustrated in Fig. 1 and Fig. 2, and consisting of the following elements.

6.1.1 A funnel with an opening of 20 cm (8 in.). The lower part of the funnel shall consist of a wall that converges continuously at a 60° angle until the minimum inside diameter coincides with the outside diameter of the guide tube. The funnel may be continued from this point on as a cylindrical collar that fits snugly over the outside diameter of the guide tube as shown in Fig. 2. The upper part of the funnel may be a 20 cm (8 in.) cylinder.

6.1.2 A straight, smooth-bore metal guide tube with an inner diameter of 19.1 mm (¾ in.) and outer diameter of 22.2 mm (⅞ in.) and length of 91.4 cm (36 in.), with both ends of the guide tube cut square and all burrs removed. The upper end of the guide tube shall coincide with the minimum diameter of the funnel at the area of the juncture. A gate for starting the flow of abrasive may be located near the top of the guide tube, consisting of a metal disk inserted into a slit in the side of the guide tube with a collar that covers the slit when the metal disk is removed. The guide tube shall be firmly supported in a vertical position.

NOTE 1—A guide tube with an inner diameter greater than 19.1 mm (¾ in.) may result in a larger overall abraded area due to the lower concentration of abrasive particles per unit area. Therefore, an increased amount of abrasive particles may be required to wear through to the base material, resulting in lower abrasion values being reported.

NOTE 2—A guide tube with an outer diameter greater than 22.2 mm (⅞ in.) will change the established 25 mm (1 in.) distance between the guide tube and specimen if the measurement is taken from the outer edge of the guide tube (see 8.2 and Fig. 2).

6.1.3 A suitable receptacle, which shall contain a support for holding the coated panel at an angle of 45° ± 1° to the vertical. The opening of the guide tube shall be directly above the area to be abraded and the position of the support from the bottom of the guide tube shall be adjustable.

6.1.4 A base which shall be fitted with adjusting screws for properly aligning the equipment.

6.2 *Container,* to collect the used abrasive particles after they have fallen through the receptacle.

6.3 *Dry Film Thickness Gage,* to measure coating thickness, according to Test Method D1005 or Practice D7091.

6.4 *Standard Abrasive*—Natural silica sand from the St. Peters or Jordan sandstone deposits (located in the central United States) shall be considered standard when graded as follows after 5 min of continuous sieving. Use the sieves described in Specification E11.

[5] Hipkins, C. C., and Phain, R. J., "The Falling Sand Abrasion Tester," *ASTM Bulletin*, No. 143, December 1946, pp. 18–22.