



Designation: D 3170 – 87 (Reapproved 1996)^{€1}

Standard Test Method for Chipping Resistance of Coatings¹

This standard is issued under the fixed designation D 3170; 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 (€) 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 NOTE—Unit of measurement statement added editorially in June 1996.

1. Scope

1.1 This test method covers the determination of the resistance of coatings to chipping damage by stones or other flying objects.

NOTE 1—This test method is similar to SAE J-400.

1.2 The values stated in inch-pound 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 609 Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products²
- D 823 Practices for Producing Films of Uniform Thickness of Paint, Varnish, and Related Products on Test Panels²
- D 1005 Test Methods for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers²
- D 1186 Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base²
- D 1400 Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base²
- D 1733 Method of Preparation of Aluminum-Alloy Panels for Testing Paint, Varnish, Lacquer, and Related Products³
- D 2201 Practice for Preparation of Zinc-Coated and Zinc-Alloy-Coated Steel Panels for Testing Paint and Related Products²

¹ This test method is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D 01.55 on Factory-Applied Coatings on Preformed Products.

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

³ Discontinued, see 1980 *Annual Book of ASTM Standards*, Part 27.

2.2 Other Documents:

Test for Chip Resistance of Surface Coatings (J-400)⁴
*New Pictorial Standards Coating Defects*⁵

3. Summary of Test Method

3.1 Standardized road gravel is projected by means of a controlled air blast at the coated specimens. Generally the test conditions are made more severe by performing the test at low ambient temperatures. The resultant chipping effect is evaluated by comparison with a set of photographic standards that appear in the *Pictorial Standards Coating Defects*.

4. Significance and Use

4.1 Chipping of coatings, particularly on the leading faces and edges of automobile surfaces, is considered unacceptable by owners. In formulating a coating or coating system to meet service requirements, the resistance to chipping damage by flying objects such as gravel is one of the properties of importance since it can vary considerably as other properties are adjusted. Since resistance to chipping decreases at lower temperatures partly as the result of decreased flexibility, the test may be more directly related to service conditions by performing it at a low temperature. This test method is designed to produce a controlled amount of impact by the media on the coated panel in order to enhance reproducibility.

5. Apparatus

5.1 *Gravel-Projecting Machine*, constructed according to the design specifications shown in Fig. 1.⁶

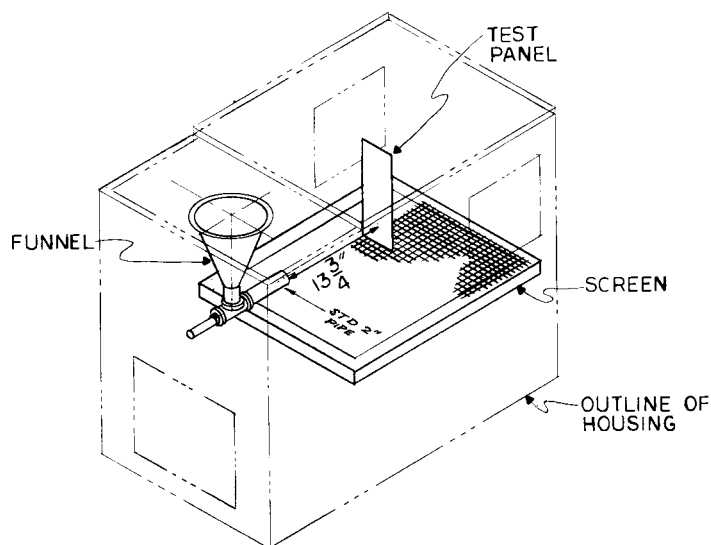
5.2 *Gravel*—Water-eroded alluvial road gravel⁷ passing through a 5/8-in. (16-mm) space screen but retained on a 3/8-in. (9.5-mm) space screen. Note that mesh screen is not a substitute for a space screen. It is important to remove the small pieces of gravel before reusing the gravel.

⁴ Available from the Society of Automotive Engineers, 400 Commonwealth Dr., Warrendale, PA 15096.

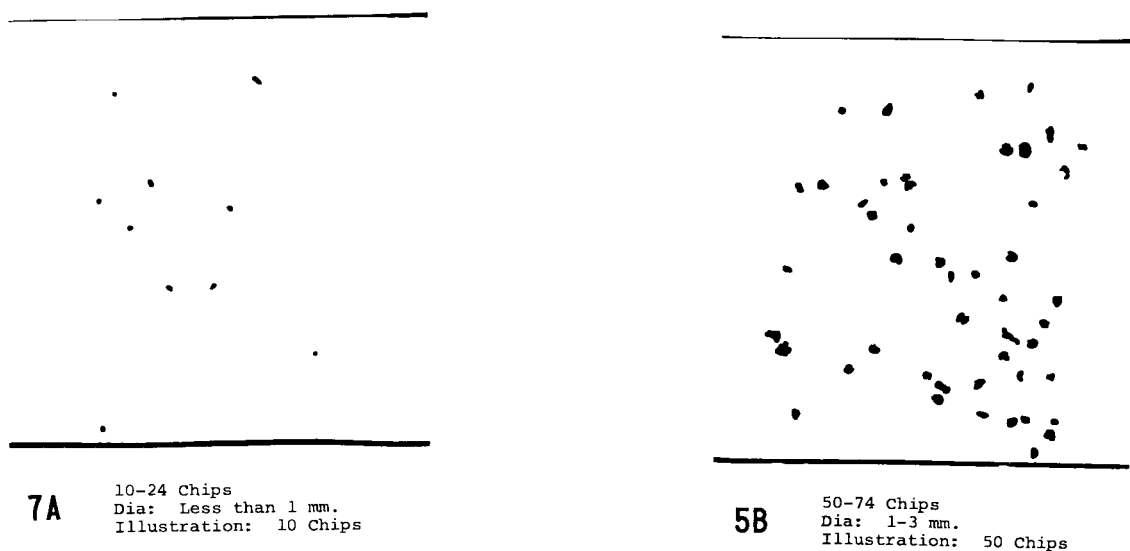
⁵ Available from the Federation of Societies for Coatings Technology, 492 Norristown Rd., Blue Bell, PA 19422-2350.

⁶ A suitable apparatus meeting these specifications can be obtained from Q-Panel Co., 26200 First St., Westlake, OH 44135.

⁷ Gravel meeting these specifications can be obtained from Q-Panel Co., 26200 First St., Westlake, OH 44135.

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**ISOMETRIC - COMPONENTS**

SCALE 1"=1'-0"

FIG. 1 Gravel-Projecting Machine**FIG. 2 Reference Photographs (Illustration Purpose Only)**

5.3 *Masking Tape*, 4 in. (100 mm) wide.⁸

5.4 *Temperature-Conditioning Equipment*—(alternatives):

5.4.1 A cold room or freezer of sufficient size in which the gravel-projecting machine and test specimens can be maintained at the specified temperature of testing.

5.4.2 A freezer or cooler in which the test panels can be cooled 10°F (5°C) below the specified test temperature.

5.5 *Chipping Rating Standards*—A set of photographic standards depicting size and number of chips in each category (see 2.2). The photographs in Fig. 2 are for illustration purposes only and should not be used for evaluation(s).

6. Test Specimens

6.1 The composition, surface preparation, and size of speci-

mens shall be agreed upon between the purchaser and the seller. Test panels of 4 by 12 in. (102 by 305 mm) are most suitable for this test.

6.2 The number, type, method of application, and aging of coatings shall be agreed upon between the purchaser and the seller.

NOTE 2—Application, metal preparation, and film thickness measurement methods are given in the following ASTM Practices: D609, D823 and D2201, and Test Methods D 1005, D 1186, D 1400, and D 1733.

7. Procedure

7.1 Condition the specimens for a minimum of 1 h at the specified test temperature in the equipment specified in 5.4. Make certain the test specimens are separated and have free access to the conditioning environment so that optimum heat transfer occurs.

⁸ No. 202-2 masking tape manufactured by the 3M Co., St. Paul MN 55101, has been found satisfactory for this purpose.