Designation: D 2967 – 02a

Standard Test Method for Corner Coverage of Powder Coatings[1]

This standard is issued under the fixed designation D 2967; 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 ratio of corner thickness (see 3.1.3) to face thickness (see 3.1.4) of powdered plastic coatings applied to a specific face thickness by dipping preheated square bars into aerated powder and curing the coating using predetermined conditions.

NOTE 1—The property of corner coverage has also been referred to as "edge coverage," though the latter is not recommended. There are widespread misunderstandings and expectations relative to the term "edge coverage." This test is performed on a steel bar having square corners and the results do not necessarily relate to edges that are sharper, that is, burrs. A coating that has measurable corner coverage may still not protect sharper edges from corrosion or provide the electrical insulation needed in some applications.

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 374 Test Methods for Thickness of Solid Electrical Insulation[2]

3. Terminology

3.1 *Definitions:*

3.1.1 *coating powders, n*— finely divided particles of resin, either thermoplastic or thermosetting, generally incorporating pigments, fillers, and additives and remaining finely divided during storage under suitable conditions, which, after fusing and possibly curing, give a continuous film.

3.1.1.1 *Discussion*—The coating powder may contain fillers, colorants, curing agents, etc., consistent with producing the desired coatings. The powder is applied by various methods such as spraying, sprinkling, or dipping. Usually hot parts are used. Heat causes the powder to melt and flow into a dense coating.

3.1.2 *corner coverage, n—of powder coating*, the ratio of the corner thickness to the face thickness of the fused coating expressed in percent.

3.1.3 *corner thickness, n—of powder coating*, the average thickness of the coating on sharp 90° corners of steel bars measured at 45° to the flat surfaces.

3.1.4 *face thickness, n—of powder coating*, the average thickness of the coating on flat surfaces of steel bars measured perpendicular to the surfaces.

3.1.5 *powder coatings, n*—coatings which are protective or decorative, or both, formed by the application of a coating powder to a substrate and fused in a continuous film by the application of heat or radiant energy.

4. Significance and Use

4.1 This test method measures the degree to which different coating powder materials cover sharp corners. Corner coverage is influenced by face thickness, thixotropy, melt viscosity, surface tension, cure rate, and temperature of application and curing.

5. Apparatus

5.1 *Aerated Bed*—Suitable for providing a uniformly suspended dense phase of free–moving powder. Fig. 1 shows a schematic of an aerated bed used for suspending the coating powder. The equipment consists of an open top chamber which has a porous plate for a false bottom. Air is introduced under the plate at a low pressure so that it filters through the porous plate and uniformly suspends the particles contained in the chamber.

5.2 *Micrometer Caliper*—25.4 mm (1 in.), in accordance with Method C of Test Methods D 374.

5.3 *Oven*, with forced convection capable of maintaining the specified temperature within ±3°C.

5.4 *Test Bars*, four, measuring 13 by 13 by 100 mm (½by ½ by 4 in.) in accordance with Fig. 2.

5.4.1 Use bars that are free of rust and dirt, and which have been washed with a clean solvent to remove any traces of oily substances. Bars may be reused if the coating used in a previous test has been completely removed without marring the

[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 D01.51 on Powder Coatings.

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[2] *Annual Book of ASTM Standards*, Vol 10.01.

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

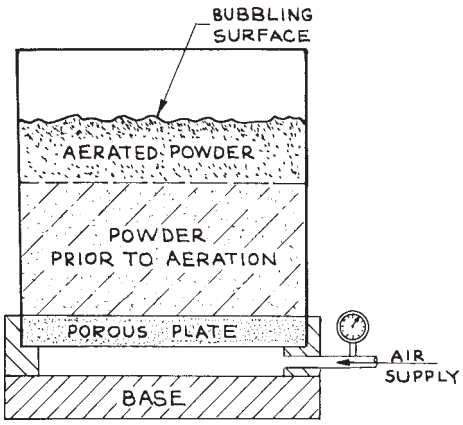
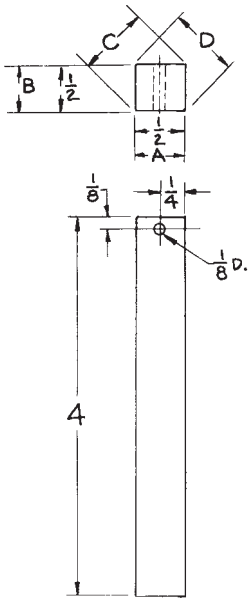


FIG. 1 Aerated Bed



(in.)	mm	(in.)	mm
⅛	3.2	½	12.7
¼	6.4	4	102

NOTE 1—AISI 52100 steel hardened to Rockwell C55 to C60 and ground square to within 0.025 mm (0.001 in.) with sharp (no measurable radius) corners. 813 nm (32 µin.) finish on four long sides. Drawing dimensions are in inches.

FIG. 2 Corner Coverage Test Bar

surfaces or corners of the bars. Appropriate methods of removal include the use of stripping solutions, heat, and careful scraping with a sharp blade, or combinations thereof.

6. Sampling

6.1 The powder sample shall be from one lot and be representative of the lot.

7. Test Specimens

7.1 The test specimens shall be the steel bars in accordance with 5.4, coated with powder to form a smooth, continuous coating of the specified thickness.

8. Procedure

8.1 Measure and record the distance across both flat surfaces and both diagonals (*A*, *B*, *C*, and *D*, Fig. 2) of the four tests bars to the nearest 0.0025 mm (0.0001 in.) at a point 38 mm (1½in.) from the bottom of the bars at 23 ± 1°C in accordance with Method C of Test Methods D 374.

8.2 Preheat the four test bars by hanging them in the oven with a wire through the hole in the bar. Heat at the prescribed temperature for 30 min, or until the bars are at the desired temperature (as agreed upon between the purchaser and seller).

8.3 Fill the bed with fresh, dry coating powder to provide a depth of at least 152 mm (6 in.) of aerated powder. Aerate powder at a rate providing a constant dense phase behaving as a liquid with a minimum of geysering.

8.4 Remove the hot bars from the oven one at a time, and 4 ± ½ s after removal rapidly insert them in the aerated powder for the time required to obtain the specified face thickness. Insertion and removal time from the aerated powder should be at the rate of 0.3 m (1 ft)/s to ensure uniform thickness along the length of the bar. Revolve the axis of the bar in a 50-mm (2-in.) diameter circle at the rate of ½r/s to coat all faces evenly.

NOTE 2—Coating powder materials may have a wide range of characteristics and end uses; thus the thickness and coating conditions used must be mutually agreed upon by the supplier and consumer. Submersion time depends on thickness desired, preheat temperature, and material characteristics.

8.5 Cure the coated bars at the prescribed time and temperature.

8.6 Cool the bars to 23 ± 1°C.

8.7 Repeat 8.1 using the coated bars.

9. Calculation

9.1 Average the distance measurements across the two flat surfaces *A* and *B* and also the two diagonals *C* and *D*. Subtract the average measurements of the uncoated bar from those of the coated bar and divide by 2 to obtain the average face thickness and average corner thickness.

9.2 Calculate the percent corner coverage for each bar as follows:

$$\% \text{ Corner coverage} = \frac{\text{avg corner thickness}}{\text{avg face thickness}} \times 100 \qquad (1)$$

9.3 Calculate the average corner coverage.

9.4 The corner coverage of three of the four bars must agree within ±5 %. If not, discard all results and prepare new specimens. Include measurements of all four bars in the calculations.

10. Report

10.1 Report the following information:

10.1.1 Powder designation,

10.1.2 Preheat temperature, in degrees Celsius,

10.1.3 Cure time and temperature,

10.1.4 Face thickness mm (in.),

10.1.5 Calculated corner coverage to the nearest integer.

11. Precision and Bias

11.1 The precision of this test method has not been determined.

NOTE 3—Operators familiar with this test method estimate that the variation of means of observations within a single laboratory is not expected to exceed 10 % of reported value when the result exceeds 35 %. For lower corner coverage values more erratic results may be obtained.

11.2 This test method has no bias because the value of corner coverage is defined solely in terms of this test method.

12. Keywords

12.1 coating powder; corner coverage; corner thickness; edge coverage; face thickness; powder coating

SUMMARY OF CHANGES

Committee D01 has identified the location of selected changes to this standard since the last issue, D 2967 - 02, that may impact the use of this standard.

(1) Changed the term edge coverage to corner coverage throughout the standard.
(2) Note added to Scope in Section 1.
(3) Reference to Practice D 1898 removed in Sections 2 and 6.
(4) Minor changes for clarity in Section 3.