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Standard Test Method for Finishes on Primed Metallic Substrates for Humidity-Thermal Cycle Cracking¹

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1. Scope

1.1 This test method describes conditions for testing an organic coating on a primed metallic substrate for cracking from humidity-thermal cycling or from loss of plasticizer, or both.

1.2 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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 Document

2.1 ASTM Standard:

D 609 Test Methods for Preparation of Steel Panels for Testing Paint, Varnish, Lacquer, and Related Products³

3. Summary of Test Method

3.1 The tendency of an organic coating to develop cracking from humidity-thermal cycling or from loss of plasticizer, or both, is measured by alternate exposure in the humidity cabinet and in the cold box. At the end of the exposure period, the panels are rated for their degree of cracking.

4. Significance and Use

4.1 This test method provides an accelerated means of determining the tendency of an organic coating to fail by cracking when exposed to humidity-thermal cycling.

5. Apparatus

5.1 *Humidity Cabinet*, of such design and construction as to maintain a relative humidity of 100 % with condensation on the test specimens at all times and a temperature of 100 ± 1°F (38 ± 0.5°C).

5.2 *Cold Box*, of such design and construction that a temperature of -10 ± 3°F (-23 ± 1.5°C) can be maintained.

NOTE—Most commercial household freezers are capable of maintaining this temperature.

5.3 *Rack*, as shown in Fig. 1, for supporting test specimens at an angle of 0 to 30° from the vertical position in

such a manner as to prevent contact between them during the test procedure.

5.4 *Grid*, of thin wires 3 by 8½ in. (75 by 215 mm) constituting one hundred and two ½-in. (13-mm) squares, held in a frame ½ in. wide, with outside dimensions 4 by 9½ in. (100 by 240 mm).

6. Test Specimens

6.1 The test specimens shall be either samples of metallic products, prepared and coated in accordance with the specified production schedule, or coated metallic panels. The recommended panel size is 4 by 12 in. (100 by 305 mm).

7. Preparation of Test Specimens

7.1 The test specimens shall consist of steel meeting the requirements of Test Methods D 609, cleaned and prepared for coating in accordance with Procedure A of D 609. If desired, the metal panels selected for coating with organic coatings may be of any selected composition and may be cleaned and prepared according to commercial practice or by any procedure that is mutually agreed upon.

7.2 After coating, the specimens shall not be cleaned, and they shall be handled only by the edges.

8. Procedure

8.1 Support panels or specimens so that they will be held in a position 0 to 30° from the vertical in such a manner as to prevent contact between the panels during the test.

8.2 Place the panels in a humidity cabinet at 100°F (38°C) and 100 % relative humidity for a period of 24 ± ½ h. Then transfer them to the cold box at -10 ± 3°F (-23 ± 1.5°C) allowing a maximum of 30 s for the transfer. Leave the panels in the cold box for a period of 20 ± ½ h. Remove the panels and allow to remain at room temperature for a period of 4 ± ½ h, during which time rate them. This constitutes one cycle. Run the test for 15 cycles or as mutually agreed upon. During any interruption of the normal cycling, as on weekends, always leave the panels in the cold box.

9. Evaluation of Test Specimens

9.1 Lay the specimen upon a horizontal surface, finish side up, with the framed grid (5.4) placed upon it so that the bottom 8½ in. (225 mm) is covered by mesh. (The frame itself excludes the first ½ in. (13 mm) from edges of the specimen which may have been handled, or which may otherwise not be representative of the general area.) Make an evaluation by counting the number of grid squares within which one or more cracks is visible. This number shall constitute the rating.

¹ This test method is under the jurisdiction of ASTM Committee D-1 on Paint and Related Coatings and Materials and is the direct responsibility of Subcommittee D01.27 on Accelerated Testing.

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³ Annual Book of ASTM Standards, Vol 06.01.