



Designation: D 3281 – 84 (Reapproved 1989)

Standard Test Method for Formability of Attached Organic Coatings with Impact-Wedge Bend Apparatus¹

This standard is issued under the fixed designation D 3281; 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 describes a method of evaluating the formability of organic coatings intended for application to strip metal substrates by coil-coating or other factory application methods.

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. Significance and Use

2.1 This test method is designed to provide a uniform procedure for determining the degree of flexibility and adhesion of factory-applied organic coatings on strip metal.

2.2 It should be recognized that some metal substrates will crack during forming and that the organic coating may crack accordingly.

3. Apparatus

3.1 *Impact-Type Wedge Bend*, assembly illustrated in Fig. 1.² The instrument contains a 4-lb (1.82-kg) impactor rod with one flat end that slides in a vertical slotted guide and serves as a falling weight to hammer the wedge mandrel with the flat end. A knurled cover inserted in the wedge mandrel impact test hole serves as the impact point. When positioned properly the lifting knob on the impactor coincides with the zero mark on the guide tube. The spacer block is removed from the front edge of the wedge mandrel so that the taper is 0 to $\frac{1}{8}$ in. (0 to 3.2 mm) front to back.

3.2 *Cellulose Adhesive Tape*, $\frac{3}{4}$ in. (20 mm) wide.

4. Test Specimens

4.1 Suitable substrates for the test specimen (including thickness) shall be employed and agreed upon between the purchaser and the seller (Note 1). The dimensions of the base metal panel shall be 4 in. (100 mm) in width with a maximum length of 12 in. (300 mm). The surface preparation of the base metal shall be agreed upon between the

purchaser and the seller. Prior to application of the coating, edges of the specimens that will be bent in the test shall be rounded slightly to remove burrs in order to eliminate effects associated with cracking of a sharp metallic edge when bent.

NOTE 1—When metal thickness exceeds 0.025 in. (0.64 mm), complete compression of the bend may not occur with a single impact.

4.2 The coating under test shall be applied to the clean base metal after the agreed-to surface preparation of the metal substrate has been completed. The coating shall be applied to one or both sides of the metal (as specified) in a manner that will provide a uniform coating thickness. The dry film thickness shall not vary more than 0.1 mil ($\pm 2.5 \mu\text{m}$) from the specified thickness agreed upon between the purchaser and the seller. The method of application, the cure of the film, the time between the application of the coating and the testing of the specimen, as well as the temperature and humidity environment used for aging the film during this period, shall be agreed upon between the purchaser and the seller.

5. Conditioning and Number of Tests

5.1 Test at least three replicate specimens under the conditions of temperature and humidity mutually agreed upon between the purchaser and the seller. Unless otherwise specified by the purchaser and the seller, make measurements at $73.5 \pm 3.5^\circ\text{F}$ ($23 \pm 2^\circ\text{C}$) and $50 \pm 5\%$ relative humidity after equilibrating at these conditions for at least 24 h.

6. Procedure

6.1 Place the specimen, coated side down, under the $\frac{1}{8}$ -in. (3.2-mm) cylindrical mandrel. Slide the specimen to the rear of the mandrel platform until the edge is flush with the two studs located at the rear of the platform.

NOTE 2—Since the test is usually more severe if the panel is bent parallel to the original rolling direction of the base metal, the direction of the bend with respect to the "grain" of the base metal should be agreed upon between the purchaser and the seller and reported.

6.2 Raise the remainder of the panel at a uniform velocity to bend the specimen 170 to 180° in a time not to exceed 5 s.

6.3 Slide the spacer located under the impact platform to the extreme front of the tester and tighten it in place with the adjustment screws provided. This allows the impact platform to create a wedge that provides stress angles between 170 and 180° .

NOTE 3—The end of the specimen with the 180° stress angle is defined as having a zero T (OT) bend.

6.4 Center the bent specimen under the impact platform. Place the longest segment of the specimen downward.

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 D01.53 on Coil Coated Metal.

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² The Gardner Coverall Impact Tester available from Pacific Scientific Co., 1100 East West Hwy, Silver Spring, MD 20910, has been found satisfactory for this purpose. Use of other equipment should be agreed upon by the purchaser and seller.