Designation: D6463 – 99

Standard Test Method for Time to Failure of Pressure Sensitive Articles Under Sustained Shear Loading[1]

This standard is issued under the fixed designation D6463; 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 ability of a pressure sensitive article (for example, tape, label, sticker, etc.) to remain adhered to a stainless steel panel under a constant load applied parallel to the bonding surface of the pressure sensitive article.

1.2 The values stated in inch-pound units are to be regarded as 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:*[2]

A666 Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

D898 Test Method for Applied Weight Per Unit Area of Dried Adhesive Solids[3]

D907 Terminology of Adhesives

D2651 Guide for Preparation of Metal Surfaces for Adhesive Bonding

D3654/D3654M Test Methods for Shear Adhesion of Pressure-Sensitive Tapes

E171 Specification for Atmospheres for Conditioning and Testing Flexible Barrier Materials

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Terminology

3.1 *Definitions of Terms Specific to This Standard*—Many of the terms found in this test method are defined in Terminology D907.

4. Summary of Test Method

4.1 This test method consists of bonding a standard area of a pressure sensitive article to a stainless steel panel. The bonded construction is allowed to dwell in a constant temperature and humidity environment for 30 min. The construction is then mounted vertically. A standard mass of 1.1 lb (500 g) is attached to the pressure sensitive article and allowed to act until the construction separates or until 3000 min elapse. If there is no separation after 3000 min, the test is repeated on a fresh specimen with a mass of 2.2 lb (1000 g) and allowed to act until separation occurs or until 3000 min elapse. If no separation occurs, perform Procedure C of Test Method D3654/D3654M for shear holding power to stainless steel at 120°F (49°C). The test result is the time in minutes to separation.

5. Significance and Use

5.1 This test method measures the cohesive strength of the adhesive on a pressure sensitive article. The time to failure can predict end use properties of pressure sensitive articles such as edge ooze from cold flow; trimming, slitting and die cutting quality; telescoping in tapes; ability to seal packages; and vertical holding power.

5.2 This test method is suitable for quality control, development and applications testing.

5.3 If the adhesive is not already coated, the adhesive can be coated on smooth, clear polyester (PET) film backing 2 mil (0.05 mm) thick. The recommended dry adhesive thickness is 1.0 mil (0.025 mm).

5.4 Humidity has a strong effect on time to failure for many pressure sensitive articles. Therefore, humidity must be controlled in accordance with 7.1.

[1] This test method is under the jurisdiction of ASTM Committee D14 on Adhesives and is the direct responsibility of Subcommittee D14.50 on Hot Melts, Pressure Sensitives, and Archival Adhesives.

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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] Withdrawn. The last approved version of this historical standard is referenced on www.astm.org.

6. Apparatus

6.1 *Test Stand and Auxiliary Equipment*:

6.1.1 *Test Stand*, unit to hold test specimen bonded to stainless steel panel at an angle of 1.0 ± 0.5° to the vertical (Fig. 1). The stand also includes a timing device to measure the time to separation of the specimen from the panel.

6.1.1.1 The test stand must be isolated from external forces such as vibrations and air currents. Vibrations and air currents cause the mass to oscillate imparting a peel force on the adhesive. Use vibration dampening rubber feet under the test stand, if necessary. Place the stand on a wooden table or shelf away from doors or circulating air vents. Isolate the table or shelf from room vibrations with vibration dampening materials.

6.1.2 *Standard Mass*, 1.10 ± 0.01 lb. (500 ± 5 g) and 2.20 ± 0.01 lb. (1000± 5 g). When the mass is correctly attached to the specimen, no peel forces are exerted on the adhesive because of the angle in the test stand holder (Fig. 1). The load is also equally distributed across the width of the specimen by a metal clip or piece of cardboard.

6.1.3 *Test Panel*—No. 302 or No. 304 stainless steel in accordance with Specification A666 having a bright annealed finish. The panel dimensions are 1.0 by 1.0 in. (25.4 by 25.4 mm) or larger as best suited to the test stand. Panels must be free of scratches, stains or discoloration.

6.1.4 *Rubber Covered Roller*, used to adhere the specimen to the test panel. The roller has a mass of 4.5 ± 0.1 lb (2.04 kg) and a Shore A durometer hardness of 80 ± 5. The roller is constructed so that only the mass of the roller acts on the specimen to panel combination. Hand-held or mechanically driven rollers are acceptable.

6.1.5 *Sample Cutter*, die cutter, razor slitter or paper cutter capable of producing a cut width of 0.50 ± 0.01 in. (12.7 ± 0.2 mm).

6.1.6 *Absorbent, Lint-free Cleaning Material*, such as surgical gauze or tissue for solvent washing of test panels. The cleaning material should contain less than 0.25 % by weight of solvent extractable materials.

6.2 *Cleaning Solvents*, recommended cleaning solvents are acetone, diacetone alcohol, n-heptane, 99 % ethanol, reagent or analytical grade.

7. Conditioning

7.1 *Testing Room*—Condition and test samples in a controlled temperature and humidity room is described below:

7.1.1 Control the temperature to 73.4 ± 3.6°F (23.0 ± 2.0°C) as specified in Specification E171.

7.1.2 Control the relative humidity to 50 % RH± 2 % RH. The humidity range specified in Specification E171, 50 % ± 5 % RH, is too large for this test.

7.1.2.1 Two independent studies were conducted on the effect of relative humidity on time to failure of pressure sensitive articles under sustained shear loading. For four acrylate adhesive tapes, the time to failure decreased by 5.8, 5.5, 8.4 and 6.1 % for each 1 % increase in relative humidity. For each sample, the rate of humidity decrease was determined at 50 % RH. This high sensitivity to small humidity changes requires that humidity be controlled during the test.

7.2 Condition samples in a controlled temperature and humidity room, as described in 7.1, for at least 24 h before cutting the samples into test specimens (Sample Preparation, See Section 8).

8. Sample Preparation

8.1 Cut sample into 0.5 in. (12.7 mm) wide strips with the long dimension in the machine direction of the pressure sensitive article. The dimensions of the shear stand will dictate the specimen length. The mass drop distance (the distance between the bottom of the mass and the timer stop plate) must be a minimum of 0.5 in. (12.7 mm) and should be such that the shear stand does not transmit shock forces to the specimens that remain hanging when the mass drops. Cut at least three specimens for each pressure sensitive article to be tested (Fig. 2).

NOTE 1—If the sample to be tested incorporates PVC (or any other type of facestock with a tendency to elongate under load) as a facestock, the sample may be reinforced by overlaminating it with a non-elastic film, such as PET, prior to sample cutting. This minimizes the influence of the facestock on the time to failure.

9. Procedure

9.1 Clean the test panel three times by washing it with a cleaning solvent as described in 6.2 and the absorbent cleaning

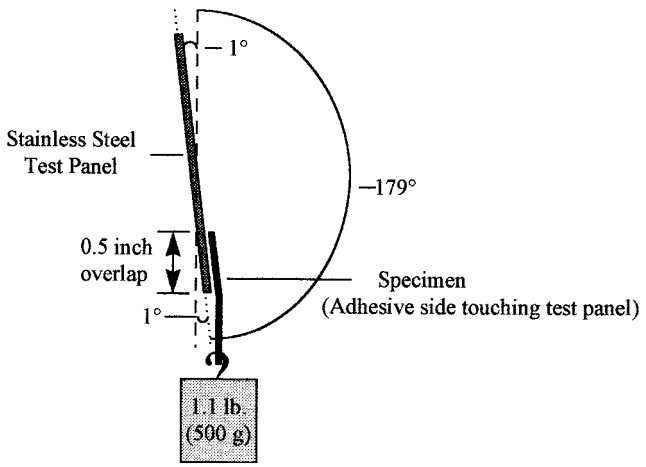

FIG. 1 Test Panel with Specimen and Mass (Side View)