



Designation: D3654/D3654M – 06 (Reapproved 2024)

Standard Test Methods for Shear Adhesion of Pressure-Sensitive Tapes¹

This standard is issued under the fixed designation D3654/D3654M; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers procedures for determining the ability of pressure-sensitive tapes and labels to remain adhered under constant load applied parallel to the surface of the tape and substrate.

1.1.1 Procedure A measures the shear adhesion when applied to a vertical standard steel panel.

1.1.2 Procedure B measures the shear adhesion when applied to vertical panel covered with NIST SRM 1810A standard fiberboard.

1.1.3 Procedure C measures the shear adhesion when applied to a vertical panel covered with a fiberboard as defined by Comite Europeen de Normalisation (CEN).

1.1.4 Procedure D measures shear adhesion when applied to a vertical panel covered with a fiberboard agreed upon by the buyer and seller.

1.1.5 Procedure E measures shear adhesion of filament reinforced tape when applied to a horizontal standard steel panel.

1.1.6 Procedure F measures shear adhesion of a filament reinforced tape when applied to a horizontal panel covered with NIST SRM 1810A standard fiberboard.

1.1.7 Procedure G measures the shear adhesion of a filament reinforced tape when applied to a horizontal panel covered with a standard fiberboard defined by CEN.

1.1.8 Procedure H measures the shear adhesion the same as Procedure A except the test is conducted at an elevated temperature and after a 10-min dwell time at the elevated temperature.

1.2 These procedures provide a means of assessing the uniformity of the adhesive of a given type of pressure-sensitive tape, usually tapes used for packaging applications. The assessment may be within a roll of tape, between rolls or production lots.

1.2.1 Variations in the tape backing and adhesive affect the response; therefore, these procedures cannot be used to pinpoint the specific cause(s) of nonuniformity.

1.2.2 This test method is intended to replace AFERA 4012, CEN 1943, and PSTC (see 7.2).

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems will result in non-conformance with the standard.

1.4 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

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

D3715/D3715M Practice for Quality Assurance of Pressure-Sensitive Tapes

D4332 Practice for Conditioning Containers, Packages, or Packaging Components for Testing

D5750/D5750M Guide for Width and Length of Pressure-Sensitive Tape

E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process

¹ This test method is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.14 on Tape and Labels.

Current edition approved Oct. 1, 2024. Published October 2024. Originally approved in 1978. Last previous edition approved in 2019 as D3654/D3654M – 06 (2019). DOI: 10.1520/D3654_D3654M-06R24.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

2.2 AFERA Standard:

AFERA 4012 Self-Adhesive Tapes—Measurement of Static Shear Adhesion³

2.3 CEN Standard:

EN 1943 Self-Adhesive Tapes—Measurement of Static Shear Adhesion⁴

2.4 PSTC Standard:

PSTC-7 Holding Power of Pressure-Sensitive Tapes⁵

3. Summary of Test Method

3.1 Procedure A, Shear Adhesion to Standard Steel Panel—A strip of tape is applied to a standard steel panel under controlled roll down. The panel is mounted vertically, a standard mass is attached to the free end of the tape and the time to failure is determined.

3.2 Procedure B, Shear Adhesion to a Standard (NIST) Fiberboard—A strip of tape is applied to a panel covered with NIST SRM 1810A fiberboard under controlled roll down. The panel is mounted vertically, a standard mass is attached to the free end of the tape and the time to failure determined.

3.3 Procedure C, Shear Adhesion to a Standard CEN Fiberboard—A strip of tape is applied to a panel covered with the CEN standard fiberboard under controlled roll down. The panel is mounted vertically, a standard mass is attached to the free end of the tape and the time to failure is determined.

3.4 Procedure D, Shear Adhesion to a Fiberboard with Controlled Roll Down—The panel is mounted vertically, a standard mass is attached to the free end of the tape and the time to failure is determined.

3.5 Procedure E, Shear Adhesion to a Standard Steel Panel—A strip of filament reinforced tape is applied to a standard steel panel with a 120° bend at one end with controlled roll down. The panel is mounted horizontally, tape side up, with the free end of the tape allowed to hang vertically over the rounded end. A standard mass is attached to the free end of the tape and allowed to act for the specified time.

3.6 Procedure F, Shear Adhesion of Filament Reinforced Tape to a Standard (NIST) Fiberboard—A strip of filament reinforced tape is applied to a panel with a 120° bend, covered with NIST SRM 1810A standard fiberboard under controlled roll down. The panel is mounted horizontally, tape side up, with the free end of the tape allowed to hang vertically over the round end of the panel. A standard mass is attached to the free end of the tape and allowed to act for a specified time.

3.7 Procedure G, Shear Adhesion of a Filament Reinforced Tape to a CEN Standard Fiberboard—A strip of filament reinforced tape is applied to a panel covered with CEN standard fiberboard under controlled roll down. The panel is mounted horizontally, tape side up, with the free end of the tape allowed to hang vertically over the round end of the panel. A

standard mass is attached to the free end of the tape and allowed to act for the specified time.

3.8 Procedure H—This procedure is conducted as described in Procedure A except the test is conducted at an elevated temperature after a 10-min dwell time at the elevated temperature.

3.9 For Procedures A, B, C, D, and H the preferred specimen size is 12 mm by 12 mm [0.5 in. by 0.5 in.]. A specimen size of 24 mm by 24 mm [1 in. by 1 in.] may be specified.

3.10 For Procedures E, F and G the specimen width shall be 12 mm [0.5 in.]. For testing reinforced filament by Procedure H, the width shall be 12 mm [0.5 in.].

4. Significance and Use

4.1 Procedure A measures the ability of a pressure-sensitive tape to adhere to a standard steel panel under constant stress. This may or may not relate to the ability of the tape to adhere to other surfaces.

4.2 Procedures B, C, and D may be used to determine the shear adhesion of the tapes generally used to close fiberboard boxes in packaging applications.

4.3 Procedure D measures the shear adhesion of a pressure-sensitive tape to a nonstandard fiberboard, liner board, corrugated board, or other surfaces which is agreed upon for testing. This may be used to compare the shear adhesion of a tape to a particular fiberboard surface or to compare the shear adhesion of a tape to a variety of fiberboard surfaces.

4.3.1 The surfaces of similar fiberboards may exhibit considerable variation between mills, between batches from one mill, and within batches. Take care in the choice of samples and when comparing results between fiberboard surfaces which may not be exactly the same.

4.3.2 The precision of tests conducted on nonstandard surfaces may be different than that described in Section 13.

4.4 Procedures E, F, and G may be used to determine the ability of a filament reinforced tape to hold when placed under constant stress.

4.5 Procedure H may be used to compare the shear adhesion of tape applied to a standard steel surface and tested at an elevated temperature. The use of an elevated temperature during test tends to reduce the duration of the test.

5. Apparatus

5.1 Specimen Cutter^{5,6,7}—The specimen cutter shall hold two single-edge razor blades in parallel planes, a precise

³ AFERA (Association des Fabricants Europeen de Rubans Auto-Adhesifs), LAM, Iaan Copes van Cattenburch 79, NL-2858 EW., the Hague, the Netherlands.

⁴ EN (European Norm), available from COMITE Europeen de Normalisation, CEN Rue de Stassart, 36, B-1050, Brussels, Belgium.

⁵ Available from PSTC (Pressure Sensitive Tape Council), 400 N. Michigan Ave., No. 2200, Chicago, IL 60611-4267.

⁶ These widths correspond to the primary metric (SI) units described in Guide D5750/D5750M. These so-called “modular metric” units generally are used throughout the world. If it is desirable to test slightly different widths (for example, 25 mm of 50 mm) of specimens per 8.4, this should be noted per 12.1.6 and calculations per 11.1 must account for the difference.

⁷ The sole source of supply of the apparatus known to the committee at this time is Chemsultants International, 9349 Hamilton Drive, Mentor, OH 44061-1118. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,¹ which will also consider any