



Standard Test Method for Adherence to Linerboard of Pressure-Sensitive Tape at Low Temperature¹

This standard is issued under the fixed designation D3889/D3889M; 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 Department of Defense.

1. Scope

1.1 This test method covers one procedure for determining the adherence of pressure-sensitive tapes to a standard linerboard or other similar surface.

1.2 This test method provides for an attribute response (pass or fail) and does not yield numerical data on a variable or continuous scale.

1.3 The values stated in either SI or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system must be used independently without combining values in any way.

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

2. Referenced Documents

2.1 ASTM Standards:²

D996 Terminology of Packaging and Distribution Environments

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

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

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.

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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. Terminology

3.1 *Definitions*—General terms in this test method are defined in Terminology **D996**.

4. Summary of Test Method

4.1 The pressure-sensitive tape to be tested is adhered to the standard linerboard or other material of interest. Following a dwell period at an elevated temperature, the specimen assembly is cooled to a specific temperature. After a specified time at the low temperature the specimen assembly is flexed around a small mandrel and observed for indications of bond failure.

5. Significance and Use

5.1 Satisfactory tape performance at the test temperature implies satisfactory cold-temperature performance at or above the test temperature.

5.2 This procedure would be applicable for questions of adherence to 100 % kraft fiberboards similar to the standard linerboard surface without substitution but for direct information on any board or surface, the actual surface in question should be substituted.

6. Apparatus

6.1 *Standard Reference Material 1810A*,³ length approximately 280 mm [11 in.], width approximately 13 mm [$\frac{1}{2}$ in.] wider than the specimen width. See Section 8.

NOTE 1—When agreed upon between the parties involved or when called for by the material specification, other flexible material may be substituted for the 1810 linerboard.

6.2 *Rubber-Covered Steel Roller*,⁴ 82.5 ± 1.3 mm [3.25 ± 0.1 in.] in diameter and 44.5 ± 1.3 mm [1.75 ± 0.05 in.] wide, covered with rubber approximately 6 mm [0.25 in.] thick

³ Standard Reference Material 1810A is available from the U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

⁴ The sole source of supply of the apparatus known to the committee at this time is Chemsultants International, 9349 Hamilton Dr., 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 you may attend.

having a Shore A durometer hardness of 80 ± 5 . The surface of the rubber shall form a true cylinder devoid of any convex or concave deviations. The mass of the roller shall be 2040 ± 45 g [4.5 ± 0.1 lb]. The mass of the handle shall not add to the mass of the roller during use.

6.3 *Oven*, air circulating, maintained at $66 \pm 1^\circ\text{C}$ [$150 \pm 2^\circ\text{F}$].

6.4 *Cold Chamber*, maintained at a specified temperature $-54 \pm 1^\circ\text{C}$ [$-65 \pm 2^\circ\text{F}$] if no other temperature is specified.

6.5 *Nonrotating, Smooth Surface, Metal Cylinder*, having a diameter of 40 ± 6 mm [1.5 ± 0.25 in.] and minimum length of 50 mm [2 in.] fixed to a base or support for use as a mandrel around which to flex the tape specimen assembly.

7. Sampling

7.1 *Acceptance Sampling*—Sampling shall be in accordance with Practice **D3715/D3715M**.

7.2 *Sampling for Other Purposes*—The sampling and the number of specimens depends on the purpose of the testing. Practice **E122** is recommended. It is common to test at least five specimens of a particular tape. Test specimens should be taken from several rolls of tape and wherever possible, among several production runs of tape. Strong conclusions about a specific property of a tape cannot be based on test results of a single unit (roll) of a product.

8. Test Specimens

8.1 The specimens shall be 12 to 24 mm [0.5 to 1.0 in.] wide. The length shall be a maximum of 6.0 in. [150 mm].

8.2 Unwind and discard at least three, but no more than six, outer wraps of tape from the sample roll before taking specimens for testing.

8.3 Remove specimens from a freely rotating roll at the rate of 500 to 750 mm [20 to 30 in.]/s. Wherever width or other factors causing high adherence to backing make it impossible to remove the specimen at the prescribed rate, remove it at a rate as close to 500 mm [20 in.]/s as possible.

9. Conditioning

9.1 Except when stated elsewhere in this test method, prepare and condition the sample materials in the standard conditioning atmosphere as described in Practice **D4332** for a period not less than 24 h.

10. Procedure

10.1 Apply the specimen centrally to the linerboard strip. Roll over the tape against a flat smooth surface using the rubber-covered roller. Make two passes, one in each lengthwise direction at the rate of 5 mm/s [12 in./min].

10.2 Expose the specimen assembly to a temperature of $66 \pm 1^\circ\text{C}$ [$150 \pm 2^\circ\text{F}$] for 24 h. Within the next 24 h expose the specimen assembly together with the 40-mm [1.5-in.] mandrel, to the specified temperature for 2 h. If no temperature is specified, the specimen should be conditioned at -54°C [-65°F] in the cold chamber for 2 h.

10.3 Without removing the specimen assembly from the cold environment nor effecting any change in that temperature, hold an extreme end (linerboard only) in each hand. With the linerboard side of the assembly against the mandrel draw first one end and then the other forward so that both ends of tape on the linerboard will have been formed into the curve of the mandrel. Draw the ends forward in turn at the rate of 0.8 m [24 in.]/s. Keep the ends of the assembly taut and parallel forming a 180° bend. End the drawing with the assembly in the same position as when starting having completed one complete cycle.

10.4 Observe the tape and linerboard during and following the drawing for any evidence of release of tape from the linerboard.

11. Report

11.1 The report shall include the following:

11.1.1 Statement that this test method was used. Indicate any deviations from the test method as written,

11.1.2 Temperature at which the test was conducted,

11.1.3 Manufacturer's name and designation for the tape, and

11.1.4 The observation made in **10.4**, that is, whether the tape did or did not release from the linerboard.

12. Precision and Bias

12.1 No statement is made about either the precision or bias of this test method since the results merely state whether there is conformance to the criteria for success specified in the procedure.

13. Keywords

13.1 adherence; linerboard; low temperature; pressure-sensitive tape

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