



Standard Test Methods for Liner Removal at High Speeds from Pressure-Sensitive Label Stock¹

This standard is issued under the fixed designation D5375/D5375M; 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 These test methods cover the measurement of the adherence of the release liner to the adhesive of a pressure-sensitive adhesive label.

1.2 These test methods provide means of assessing the uniformity of the adhesion to the liner of a given type of pressure-sensitive label. The assessment may be within a sheet or roll between sheets or rolls or between production lots.

1.3 Variation in the label backing, liner, liner release coating, adhesive, and adhesive coating weight, affect the response. Therefore, these methods cannot be used to pinpoint the specific cause(s) of nonuniformity.

1.4 These test methods may not be appropriate to test labels having either relatively stiff backings or stiff liners, or backings showing high stretch at low forces. These characteristics will result in a high variability of the test response that is not a true indication of the real nature of the adhesive bond.

1.5 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.

1.6 *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

¹ These test methods are under the jurisdiction of ASTM Committee D10 on Packaging and are 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.

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

3. Terminology

3.1 Definitions:

3.1.1 General definitions for packaging and distribution environments are in accordance with Terminology **D996**.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *pressure-sensitive label*—the combination of face material, pressure-sensitive adhesive, and liner.

3.2.1.1 *Discussion*—The adhesive is permanently tacky and instantly adheres to whatever surface the label is designed for. Also, defined as a self-adhering label.

4. Summary of Test Methods

4.1 *Test Method A*— The label stock is adhered to a rigid platform with double-coated tape with the liner side up. The liner is peeled from the adhesive at a specific rate. The liner is peeled back over itself at 180° angle.

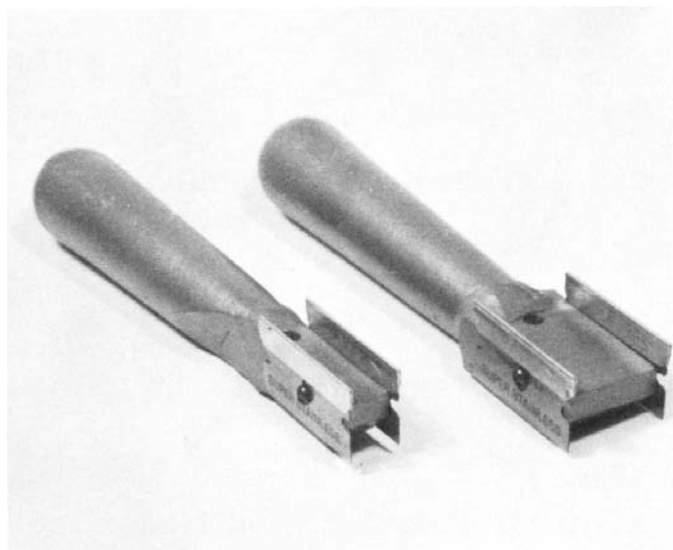
4.2 *Test Method B*— The label stock is adhered to a rigid platform with double-coated tape with the liner side up. The liner is peeled from the adhesive at a specified rate. The liner is peeled from the label stock at an angle of 90° to the stock.

5. Significance and Use

5.1 These test methods are a tool for development and quality assurance use. Given a specific pressure-sensitive label and liner and a requirement in terms of the minimum for maximum peel value expected for this liner removal from the label, the data from the test can be used in conjunction with acceptance criteria.

6. Apparatus

6.1 *Specimen Cutter*— The specimen cutter shall hold two single-edged razor blades in parallel planes, a precise distance apart, to form a cutter of exact specimen widths. Two cutters, 12.7 and 25.4-mm or 0.5 and 1-in. cutting width, shall be available. (See **Fig. 1.**)



SPECIMEN CUTTER

FIG. 1 Specimen Cutter

NOTE 1—The 12.7-mm or 0.5 in. cutter shall consist of a 0.5 in. thick by 200 mm or 8 in. length of aluminum bar stock 12.7-mm or 0.5 in. wide. The edges for about 125 mm or 5 in. from one end shall be rounded slightly to form a handle. The width of the bar for 75 mm or 3 in. from the opposite end shall be narrowed to exactly 12.7 mm or 0.500 in. minus the thickness of a single razor blade (one or two used as cutting edges). The razor blades shall be held in position using side plates. The end of the cutter shall be cut away at a 45° angle to expose the cutting edge at one end of the blades. The edges shall be separated by 12.7 mm \pm 0.127 mm or 0.500 \pm 0.005 in. A 25.4-mm or 1 in. cutter shall follow the same description, except that the barstock width shall be 25.4 mm or 1 in. and shall be narrowed to exactly 25.4 mm or 1.00 in. minus the thickness of a single razor blade.

6.2 Roller,³ mechanically operated:

6.2.1 A steel roller, 82 \pm 2.5 mm or 3.25 \pm 0.1 in. in diameter and 35 \pm 1.5 mm or 1.75 \pm 0.05 in. in width, covered with rubber approximately 6.35 mm or 0.25 in. in thickness, having a Shore Scale A durometer hardness of 80 \pm 5. The surface of the roller shall be a true cylinder void of any concave or convex deviations. The mass of the roller shall be 2040 \pm 45 g or 4.5 \pm 0.1 lb.

6.2.2 No part of the apparatus shall increase the mass of the roller during use. The roller shall move mechanically at the rate of 5.0 \pm 0.2 mm/s or 12.0 \pm 0.5 in./min.

NOTE 2—A simple check to determine if the rubber surface is cylindrical is to wrap the roller in a very thin paper (onion skin) and drag it across a flat glass plate on which is placed a carbon paper, face up. The carbon rubs off onto the thin paper wrapper to reveal high spots or hollows on the rubber surface.

6.3 Adhesion Tester⁴—An adhesion tester that has a movable platform or clamp for holding the test panel specimen and a means of moving the panel parallel with the direction of the stressing clamp so that the specimen is held either in the same plane or perpendicular to the stressing clamp and moved at a

uniform rate of 467 \pm 0.2 mm/s or 300 in./min away from the clamp and a visual readout or an autographic device for recording the load. Calibration should be performed as in the manufacturers instructions in the operating manual.

7. Sampling

7.1 Sampling shall be in accordance with Practice **D3715/D3715M** for rolls and Practice **E122** for sheet stock.

7.2 Use a minimum of five samples for development. This is common practice to use a minimum of five specimens taken from several rolls or sheets, among several production runs of label stock. Strong conclusions about a specific property cannot be based on test results of a single unit of product.

8. Test Specimens

8.1 The specimen shall be 25.4 mm or 1 in. wide. A tolerance of 0.40 mm or \pm 1/64 in. shall be allowed. The length shall be approximately 150 mm or 6 in.

8.2 If the samples are in a roll form discard at least three but no more than six outer wraps of label from the sample roll before taking the specimen for testing.

8.3 Remove one specimen, minimum length of 150 mm or 6 in. per sample roll or sample sheet.

8.4 When the label stock is wider than 25.4 mm or 1 in. specimens of the widest specified width are to be cut from the center strip removed from the roll or sheet.

9. Conditioning

9.1 Condition the sample roles in the standard conditioning atmosphere as described in Practice **D4332** for a period of not less than 24 h. Test at these conditions. If other conditions described within Practice **D4332** are used add that information to the report.

10. Procedure

10.1 Test Method A—180° Liner Removal at High Speed (See Fig. 2):

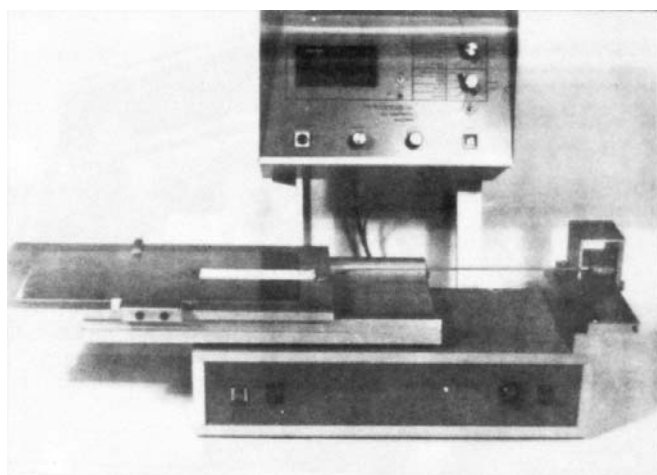


FIG. 2 180° Liner Removal at High Speed

³ Available from Chemsultants International, 9349 Hamilton Drive, Heisley Commerce Park, Mentor, OH 44061-1118.

⁴ One source for an adhesion tester is the TLMi Release and Adhesion Tester available from Testing Machines, Inc., Amityville, NY.



10.1.1 Apply a strip of double-coated tape, as wide as the specimen, the full length of the platform. Remove the liner from the double-coated tape. Superimpose 127 mm or 5 in. of one end of the specimen, backing side down, against the double-coated tape on the platform. Make two passes with the mechanical roller. Separate the liner from the label at the free end and cut away from the free label stock. Do not disturb the liner adhered to the label on the platform.

10.1.2 Individually prepare each specimen and test within 5 min or at a predetermined dwell time.

NOTE 3—Different dwell times may give different results. Peel adhesion changes with dwell time at different rates for various labels. A different dwell time may be chosen purposely.

10.1.3 Clamp the free end of the liner into the stressing clamp. Operate the platform separation speed at 467 mm/s or 300 in./min, or selected rate.

NOTE 4—Record separation speed if not at the prescribed 300 in./min (7.62 m/min) and record dwell time.

10.2 *Test Method B90° Liner Removal at High Speed (See Fig. 3) :*

10.2.1 Apply a strip of double-coated tape, as wide as the specimen, the full length of the platform. Remove the liner from the double-coated tape. Superimpose 127 mm or 5 in. of one end of the specimen, backing side down, against the double-coated tape on the platform. Make two passes with the mechanical roller. Separate the liner from the label at the free end cut away the free label stock. Do not disturb the liner adhered to the label on the platform.

10.2.2 Individually prepare each specimen and test immediately (within 1-min dwell time).

NOTE 5—Various dwell times may give different results. Peel adhesion changes with dwell time. A different dwell time may be chosen purposely.

10.2.3 Position the platform and stressing clamp at the position that maintains a 90° angle of the stressing clamp to the platform.

10.2.4 Clamp the free end of the liner into the stressing clamp. Operate the platform separation at 467 mm/s or 300 in./min or selected rate.

NOTE 6—Record separation speed if not at 467 mm/s or 300 in./min and record dwell time.

11. Calculation

11.1 If observed pull value is not in ounces or newtons, convert to ounces or newtons. Calculate peel adhesion newtons per 100 mm or ounces per inch.

12. Report

12.1 Report the following information:

12.1.1 Statement of which test method was used and indicating any deviations from the test method as written, such as removal speed etc.

12.1.2 Complete identification of each specimen tested, including label source, manufacturer's code number, and form,

12.1.3 Anomalous behavior during the test (that is, adhesive transfer or splitting),

12.1.4 Peel adhesion value in newtons/100 mm of width to the nearest 0.1 N/100 mm, or ounces per inch of width to the nearest 0.1 oz/in.

12.1.5 Dwell time, and

12.1.6 Transparent tape reinforcement, if used and transparent tape thickness.

13. Precision and Bias

13.1 *Precision*—Based upon data from a single laboratory, the repeatability coefficient for Test Method A is approximately 5 %. The standard deviation is approximately 5 % of the average. The coefficient of variation for Test Method B is approximately 10 %. An interlaboratory test program will be conducted to determine between laboratory reproducibility.

13.2 *Bias*—No information can be presented on the bias of the procedure in this test method because no accepted reference value is available.

14. Keywords

14.1 high-speed removal; label stock; liner removal; pressure-sensitive adhesive

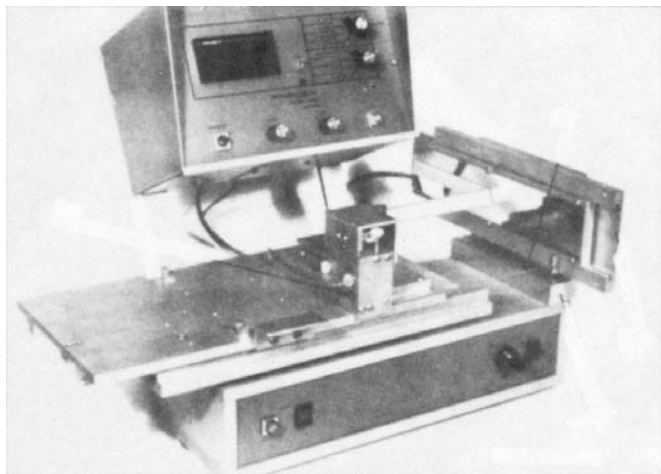


FIG. 3 90° Liner Removal at High Speed



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