



Designation: D5330/D5330M – 06 (Reapproved 2020)

Standard Specification for Pressure-Sensitive Tape for Packaging, Filament-Reinforced^{1,2}

This standard is issued under the fixed designation D5330/D5330M; 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 specification covers filament-reinforced, pressure-sensitive adhesive tape.

1.2 The values stated in either inch-pound or SI 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 of the other, without combining values in any way.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 14, of this specification: *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.*

1.4 *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:³

D996 Terminology of Packaging and Distribution Environments

D1974/D1974M Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes

D3330/D3330M Test Method for Peel Adhesion of Pressure-Sensitive Tape

D3611 Practice for Accelerated Aging of Pressure-Sensitive Tapes

D3652/D3652M Test Method for Thickness of Pressure-Sensitive Tapes

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

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

D3759/D3759M Test Method for Breaking Strength and Elongation of Pressure-Sensitive Tape

D3815/D3815M Practice for Accelerated Weathering of Pressure-Sensitive Tapes by Open-Flame Carbon-Arc Exposure Apparatus

D3889/D3889M Test Method for Adherence to Linerboard of Pressure-Sensitive Tape at Low Temperature

D3951 Practice for Commercial Packaging

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

D4727/D4727M Specification for Corrugated and Solid Fiberboard Sheet Stock (Container Grade) and Cut Shapes

2.2 Federal Specifications:

PPP-T-97 Tape, Packaging/Industrial, Filament Reinforced⁴

PPP-T-680 Tape, Pressure-Sensitive Adhesive: Packaging and Packing of⁴

2.3 ISO Standard:

ISO 9000:2000 Quality Management Systems—Fundamentals and Vocabulary⁵

ISO 9001:2000 Quality Management Systems—Requirements⁵

ISO 9004:2000 Quality Management Systems—Guidelines for Performance Improvements⁵

¹ This specification 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, 2020. Published October 2020. Originally approved in 1992. Last previous edition approved in 2012 as D5330/D5330M – 04 (2012)¹. DOI: 10.1520/D5330_D5330M-06R20.

² This specification is intended to replace Federal Specification PPP-T-97. Types are the same in both specifications.

³ 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 definitions for packaging and distribution environments are found in Terminology D996.

⁴ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, Attn: NPODS.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

4. Classification

4.1 Types:

- 4.1.1 *Type I*—Cut-resistant (polyester-reinforced).
- 4.1.2 *Type II*—Medium-tensile strength.
- 4.1.3 *Type III*—High-tensile strength.
- 4.1.4 *Type IV*—High-tensile strength, weather-resistant.

5. Ordering Information

- 5.1 The inquiry or order shall include the following:
 - 5.1.1 Type required (see 4.1);
 - 5.1.2 Roll width and length; unless otherwise specified, direct substitution of SI or inch-pound shall be allowed (see 8.1);
 - 5.1.3 Level of packaging, packing, and marking if other than commercial (see Section 18);
 - 5.1.4 If certification is required (see Section 17); and
 - 5.1.5 ASTM specification designation and date of issue.

6. Materials and Manufacture

6.1 The materials used in the construction of the tapes shall be such that they ensure performance of the tape over the temperature range from -55.5 to 71°C [-65 to 160°F] and shall conform to the requirements of this specification.

6.2 *Backing*—The backing shall serve as the carrier for the adhesive and shall not serve as the reinforcing material.

6.3 *Adhesive*—The adhesive shall be pressure-sensitive and water-insoluble and shall require no moisture, heat, or other preparation prior to or after application to clean, dry surfaces.

6.4 *Reinforcements*—The adhesive shall be reinforced by embedding longitudinal filaments in a smooth layer throughout the length of the roll. The filaments shall be covered by a uniform layer of adhesive forming a smooth adhering surface.

6.5 *Rolls*—The tape shall be wound in rolls, adhesive side in, on paper-fiber or plastic cores. The core shall have sufficient rigidity to prevent distortion of the roll under normal conditions of transportation and use. The inside diameter of the core shall be $76, -0, +1.6$ mm [$3, -0, +1/16$ in.]. When the tape is unwound, the backing shall not tear, the reinforcing filaments shall not ravel, and the adhesive shall not transfer or split from the face of the tape to the backing of the adjacent layer before or after aging (see Section 14).

7. Physical Properties

7.1 The tape shall comply with the physical property requirements listed in Table 1 when tested in accordance with Section 14.

7.2 *Type IV Requirements*—Type IV tape shall meet the following additional requirements when tested in accordance with 14.4.2:

- 7.2.1 No lifting of the tape in the overlap area,
- 7.2.2 No pulling loose from the fiberboard (except in areas in which the fiberboard was buckled),
- 7.2.3 No flaking, cracking, or separation of the backing when the overlap section of the tape is stripped back at 180° at a rate of 100 to 150 mm/s [4 to 6 in./s],
- 7.2.4 No transfer of the adhesive to the lower layer of tape when tested as in 7.2.3, and

TABLE 1 Properties

	Type I	Type II	Type III	Type IV	Test
Adhesion					
before (N/100 mm, min)	27.4	27.4	27.4	27.4	14.4.1
aging (oz/in., min)	25	25	25	25	14.4.1
after (N/100 mm, min)	27.4	27.4	27.4	27.4	14.4.1
aging (oz/in., min)	25	25	25	25	14.4.1
Adhesion at low temperature, No separation of the tape from the Kraft paper					
Elongation, %					
min	12	3	3	3	14.4.1
max	24	8	8	8	14.4.1
Shear adhesion					
max slippage, mm	5	5	5	5	14.4.1
in.	$3/16$	$3/16$	$3/16$	$3/16$	14.4
Break strength, min, N/100					
mm	3500	5250	7440	7000	14.4.1
lb/in.	200	300	425	400	14.4.1
Thickness, max, mm					
in.	0.305	0.305	0.305	0.305	14.4.1
	0.012	0.012	0.012	0.012	14.4.1

7.2.5 No brittleness of the adhesive (excluding adhesive exposed by buckling of the fiberboard). An embrittled adhesive will crack, flake, or powder when flexed manually.

8. Dimensions, Mass, and Permissible Variations

8.1 *Width*—The width of the roll shall be 12, 18, or 24 mm [$1/2$, $3/4$, or 1 in.], or any other commercially available width, as specified (see 5.1.2). A tolerance of ± 1.5 mm [$\pm 1/16$ in.] shall be allowed on all widths.

NOTE 1—Uses of pressure-sensitive tape in closure, sealing, and reinforcing methods call for their commonly available commercial widths. The widths common in the inch-pound system are not identical to the available SI replacement widths. The most frequent width conversions are as follows:

SI, mm	Inch-pound, in.
12	$1/2$
18	$3/4$
24	1
48	2
72	3

NOTE 2—The effect of this width difference on package performance is not significant.⁶

8.2 *Length*—The length of the rolls shall be 55 m [60 yd], as specified (see 5.1.2).

8.3 *Splices*—The tape shall consist of a single length of tape, except that any single roll may contain a maximum of one splice. The splices shall have a minimum overlap of 100 mm [4 in.] and shall not separate when the roll is unwound by hand or machine.

9. Workmanship, Finish, and Appearance

9.1 The tape shall be constructed uniformly and free of defects that impair its usefulness for the purposes intended (see 10.1). The adhesive coating shall be a uniform coating covering the entire side of the tape. The edges shall be clean,

⁶ Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D10-1004. Contact ASTM Customer Service at service@astm.org.

straight, and unbroken. The rolls shall be wound evenly. The finished product shall conform to the levels of quality established herein.

10. Significance and Use

10.1 The pressure-sensitive, filament-reinforced tapes covered by this specification are intended for use in closing and reinforcing fiberboard boxes and for bundling items for shipment.

10.2 Type I is an impact and cut-resistant low-tensile strength tape, usually with polyester fiber reinforcement. It is intended for bundling and similar applications and used where a greater amount of stretch before break provides an improvement in impact resistance over glass filament reinforcement.

10.3 Types II and III are intended for reinforcement of RSC's and similar fiberboard boxes, and for bundling where a snug bundle must be maintained and other similar applications.

10.4 Type IV is intended for applications in which weather-resistance high-tensile strength tape is required.

10.5 See Practice [D1974/D1974M](#) for details on applications.

11. Color and Transparency

11.1 *Color*—The color of Types I and II shall be as manufactured, except that in no case shall it be black. Type IV shall be black.

11.2 *Transparency*—Type II tape shall be sufficiently transparent to permit easy reading of 10-point type through one layer of the tape when applied directly over the type and pressed down.

12. Sampling

12.1 *End-Item Examination*—The lot size for visual inspection shall be in accordance with end-item inspection (see section 6.3 of Practice [D3715/D3715M](#)). The sample unit shall be one roll.

12.2 *End-Item Testing*—Lot size and sampling for end-item testing shall be in accordance with end-item testing (see section 6.4 of Practice [D3715/D3715M](#)). The Acceptable Quality Level (AQL) shall be 4.0 %.

13. Specimen Preparation and Number of Tests

13.1 Specimen preparation shall be as specified in the appropriate test method.

13.2 The number of tests per unit of product shall be as specified in the appropriate test method.

14. Test Methods

14.1 *Responsibility for Inspection*—Unless otherwise specified in the purchase order or contract, the manufacturer is responsible for the performance of all inspection requirements as specified herein.

14.2 *Responsibility for Compliance*—All items must meet all requirements of Sections 6 through 18. The inspections set forth in this specification shall become a part of the manufac-

turer's overall inspection system or quality program for the purchase order or contract. The absence of any inspection requirements in the specification shall not relieve the manufacturer of the responsibility of assuring that all products or supplies submitted for acceptance comply with all the requirements of the purchase order or contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the buyer to acceptance of defective material.

14.3 Classification of Inspections:

14.3.1 *First Article of Manufacture*—When a product is first manufactured in a plant, it shall be tested and inspected to determine compliance with all examinations and tests of this specification by an independent laboratory. First article of manufacture examinations need only be repeated when there is a change in materials, processes, or plant of manufacture.

14.3.2 *Quality Conformance Inspections*—Quality conformance inspections shall consist of the following: adhesion, as received; shear adhesion, as received; and break strength and elongation.

14.4 Test Methods:

14.4.1 Conduct the tests according to the following methods, as specified:

Test	ASTM Test Method
Accelerated aging (heat and humidity) Adhesion (initial and after aging)	Practice D3611 Test Method D3330/D3330M , Procedure A
Adhesion at low temperature Shear adhesion	Test Method D3889/D3889M Test Method D3654/D3654M , Procedure F
Break strength and elongation Thickness	Test Method D3759/D3759M Test Method D3652/D3652M

14.4.2 *Weathering (Type IV Only)*—Prepare the specimen by applying 12 by 250-mm [$\frac{1}{2}$ by 9-in.] strips of tape to 75 by 250-mm [3 by 9-in.] pieces of fiberboard conforming to Specification [D4727/D4727M](#), Type SF, Class Weather-Resistant, Grade V2S. Four strips of tape shall be removed from each sample roll and placed lengthwise on the fiberboard so that two strips begin 62 mm [2.5 in.] on one side and extend parallel to each other 162 mm [6.5 in.] onto the backside of the fiberboard. Expose the specimens as described in Practice [D3815/D3815M](#). The uppermost tape of the overlap area shall be at the upper end of the test panel. After 100 h of exposure, remove the panel with the tape applied and allow to condition at standard conditions, as described in Practice [D4332](#) for at least 24 h (see [7.2](#)).

15. Rejection and Rehearing

15.1 Materials that fail to conform to the requirements of this specification may be rejected. Rejections should be reported to the producer or supplier promptly and in writing. The producer or supplier may make claim for rehearing in cases of dissatisfaction with the results of any of the tests.

16. Environmental Considerations

16.1 *Toxic Content*—The use of potentially toxic packaging material is a concern for their potential presence in emissions when packaging is incinerated, or leachate when packaging is