



Designation: D5486/D5486M – 06 (Reapproved 2020)

## Standard Specification for Pressure-Sensitive Tape for Packaging, Box Closure, and Sealing<sup>1,2</sup>

This standard is issued under the fixed designation D5486/D5486M; 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 ( $\epsilon$ ) 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 film, paper, and cloth pressure-sensitive tapes used for box closure and sealing.

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, without combining values in any way.

1.3 The following safety hazards 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:<sup>3</sup>

D996 Terminology of Packaging and Distribution Environments

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

D2860/D2860M Test Method for Adhesion of Pressure-

Sensitive Tape to Fiberboard at 90° Angle and Constant Stress

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

D3811/D3811M Test Method for Unwind Force of Pressure-Sensitive Tapes

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

D3816/D3816M Test Method for Water Penetration Rate of Pressure-Sensitive Tapes

D3833/D3833M Test Method for Water Vapor Transmission of Pressure-Sensitive Tapes

D3951 Practice for Commercial Packaging

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

D5570 Test Method for Water Resistance of Tape and Adhesives Used as Box Closure

#### 2.2 TAPPI Standard:

T 414 Internal Tear Resistance of Paper (Elmendorf-Type Method)<sup>4</sup>

#### 2.3 Federal Specifications:

PPP-T-60 Tape: Packaging, Waterproof<sup>5</sup>

PPP-T-76 Tape, Packaging, Paper (for Carton Sealing)<sup>5</sup>

PPP-T-680 Tape, Pressure-Sensitive Adhesion: Packaging and Packing of<sup>5</sup>

<sup>1</sup> 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.

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<sup>2</sup> This specification is intended to replace Federal Specifications PPP-T-60 and PPP-T-76.

<sup>3</sup> 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.

<sup>4</sup> Available from Technical Association of the Pulp and Paper Industry (TAPPI), 15 Technology Parkway South, Norcross, GA 30092, http://www.tappi.org.

<sup>5</sup> Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

**FED-STD-595 Colors<sup>5</sup>**
**2.4 ISO Standard:**
**ISO 9000:2000 Quality Management Systems—Fundamentals and Vocabulary<sup>6</sup>**
**ISO 9001:2000 Quality Management Systems—Requirements<sup>6</sup>**
**ISO 9004:2000 Quality Management Systems—Guidelines for Performance Improvements<sup>6</sup>**

NOTE 1—The following is a comparison of types and classes of this specification compared with PPP-T-60 and PPP-T-76:

D5486/D5486M	PPP-T-60	PPP-T-76
Type I	Type III	N/A
Class 1	Class 1	
Class 2	Class 2	
Type II	N/A	N/A
Type III	N/A	N/A
Type IV	Type IV	N/A
Type V	N/A	Same

**3. Terminology**
**3.1 Definitions:**

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

**4. Significance and Use**

4.1 Type I is a polyester film-backed pressure-sensitive tape intended for box closure and sealing applications where strength and resistance to sunlight, rain, and other deteriorating elements are required. It is usually used on weather-resistant fiberboard (Class WR or WWVR of Specification **D4727/D4727M**). The tape is intended for H-type closure or sealing of regular slotted boxes (Closure Method 2B3 and 2B4 of Practice **D1974**), and other applications where the tape will be overlapped onto itself. Type I, Class 2 transparent tape can also be used for label attachment and covering applications where weather resistance is needed.

4.2 Type II is a polyester film-backed pressure-sensitive tape intended for box closure applications where strength and water-resistance are required. It is usually used on domestic grade fiberboard (Class D of Specification **D4727/D4727M**). The tape is most suited for center seam closure of regular or regular slatted boxes (Closure Method 2B4 of Practice **D1974**) and other applications where the tape will not be overlapped onto itself. Type II, Class 2 tape is also used for label attachment and covering applications where water resistance is desired.

4.3 Type III is a polypropylene film-backed pressure-sensitive tape intended for box closure applications where a general purpose water-resistant tape is desired. It is used on domestic grade fiberboard (Class D of Specification **D4727/D4727M**). The tape is suited for center seam closure of regular slotted boxes (Closure Method 2B4 of Practice **D1974**).

4.4 Type IV is a woven cloth-backed pressure-sensitive tape for less critical packaging applications where a cloth-backed tape is desired.

4.5 Type V is a paper-backed weather-resistant, water-resistant pressure-sensitive tape for box closure and sealing applications where weather resistance and water resistance are required. It may be used on weather-resistant or domestic fiberboard (Classes WR, WWVR, and D of Specification **D4727/D4727M**). The tape is suited for center seam and H-type closures or sealing of regular slotted boxes (Closure Methods 2B3, 2B4, and 2B7 of Practice **D1974**) and other applications where it may be overlapped onto itself.

**5. Classification**
**5.1 Types and Classes:**

5.1.1 *Type I*—Waterproof, weather-resistant, polyester-backed:

5.1.1.1 *Class 1*—Colored.

5.1.1.2 *Class 2*—Transparent.

5.1.2 *Type II*—Water-resistant polyester backed.

5.1.2.1 *Class 1*—Tan.

5.1.2.2 *Class 2*—Transparent.

5.1.3 *Type III*—Water-resistant polypropylene.

5.1.4 *Type IV*—Water-resistant woven cloth backed.

5.1.5 *Type V*—Weather-resistant paper backed.

**6. Ordering Information**

6.1 The inquiry or order shall include the following:

6.1.1 ASTM Designation and date of issue;

6.1.2 Type and Class required (see **5.1**);

6.1.3 Roll width and length (see **9.1**);

6.1.4 Color where applicable (see **10.1**);

6.1.5 When backing certification is required (see **17.1**);

6.1.6 When testing and inspection certification is required (see **17.2**);

6.1.7 Level of packaging and packing if other than commercial (see Section **18**);

6.1.8 For packaging and packing for shipments to the U.S. Government (see **18.2**); and

6.1.9 When core marking is required (see **18.3**).

**7. Materials and Manufacture**

7.1 The materials used in the construction of the tape shall be such as to assure performance of the tape over the temperature range from  $-65$  to  $160^{\circ}\text{F}$  [ $-55$  to  $71^{\circ}\text{C}$ ] and shall conform to the requirements of this specification.

**7.2 Backing:**

7.2.1 Type I backing shall be polyester film.

7.2.2 Type II backing shall be a polyester film.

7.2.3 Type III backing shall be a polypropylene film.

7.2.4 Type IV backing shall be a woven cloth.

7.2.5 Type V backing shall be a treated paper.

7.3 *Adhesive*—The adhesive shall be pressure-sensitive water-insoluble and shall require no moisture heat or other preparation prior to or after application to clean, dry surfaces. The adhesive shall be coated in a smooth and evenly distributed layer on one side of the backing.

7.4 *Rolls*—The tape shall be evenly wound in rolls, adhesive side in, on cores made of paper-fiber or plastic. The core shall have sufficient rigidity to prevent distortion of the roll under

<sup>6</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

normal conditions of transportation and use. The inside diameter of the core shall be 7.6, – 0, + 1.6 mm [3, – 0, + 1/16 in.]. When the roll is unwound, the backing shall not tear, the adhesive shall not transfer nor split from the face of the tape backing to the adjacent layer before or after aging (see [Table 1](#)).

## 8. Physical Properties

8.1 The tape shall comply with the physical property requirements listed in [Table 2](#) and the water-solubility requirement of Test Method [D5570](#).

## 9. Dimensions, Mass, and Permissible Variations

9.1 The width of the roll shall be 48 or 72 mm [2 or 3 in.] or other commercially available widths, as specified (see [6.1.3](#)).

9.1.1 A width tolerance of 1.5 mm [ $\pm 1/16$  in.] shall be allowed on all widths.

NOTE 2—Uses of pressure-sensitive tapes in closure and sealing applications call for 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:

Inch-Pound, in.	SI, mm
1	24
1.5	36
2	48
3	72
4	96

NOTE 3—The effect of this width difference on packaging performance is not considered significant.<sup>7</sup>

### 9.2 Length:

9.2.1 *Types I, II, III, and IV*—The length of the roll shall be 50 or 55 m [55 or 60 yd], or other commercially available lengths, as specified (see [6.1.3](#)).

9.2.2 *Type V*—The length of the roll shall be 100 m [120 yd], or other commercially available length, as specified (see [6.1.3](#)).

9.3 *Splices*—The roll shall consist of a single length of tape, except any single roll of Types I, II, III, and IV may contain a maximum of one splice. Any single roll of Type V may contain a maximum of four splices.

<sup>7</sup> 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](mailto:service@astm.org).

**TABLE 1 Test Methods**

Test Method	Designation
Adhesion, as Received and Aged Adhesion to Fiberboard at 90°	<a href="#">D3330/D3330M</a> Procedure A
Angle and Constant Stress	<a href="#">D2860/D2860M</a> Procedure A
Shear Adhesion	<a href="#">D3654/D3654M</a> Procedure A
Break Strength	<a href="#">D3759/D3759M</a>
Tear Resistance	TAPPI T414
Thickness	<a href="#">D3652/D3652M</a>
Unwind, As-Received and Aged	<a href="#">D3811/D3811M</a>
Water-Penetration Rate	<a href="#">D3816/D3816M</a>
Water-Solubility	<a href="#">D5570</a>
Water-Vapor Transmission Rate	<a href="#">D3833/D3833M</a>
Weathering, Types I and IV	<a href="#">D3815/D3815M</a>

9.3.1 Splices shall be such that they will not separate when the roll is unwound by hand or machine (see [Table 1](#)).

## 10. Color

10.1 Type I, Class 1 tape shall correspond reasonably in shade to the colors following gloss cards of FED-STD-595: red 11136, olive drab 14087, dark green 14110, black 17038, and tan (no color card available for tan).

10.2 Type II, Class 1 tape shall be tan in color.

10.3 Type III color shall be as ordered in commercially available colors and transparent.

10.4 Type IV tape shall correspond reasonably in shade to the following lusterless color cards of FED-STD-595: red 31116, olive drab X34087, dark green 34108, black 37038, white 37875 and tan 30450.

10.5 Type V color shall be as manufactured.

10.6 Types I and II, Class 2 tapes shall be sufficiently clear and transparent to allow easy reading of 10-point type when tape is applied directly over printed matter.

## 11. Workmanship, Finish, and Appearance

11.1 The tape shall be uniformly constructed and free from defects that impair the usefulness of the tape for the purpose intended (see Section 5). The tape adhesive coating shall be uniform, covering entirely one side of the tape. The edges shall be clean, straight, and unbroken. The rolls shall be evenly wound. The finished product shall conform to the levels of quality established herein.

## 12. Sampling

12.1 *End Item Examination*—The lot size for visual inspection shall be in accordance with Practice [D3715/D3715M](#). Sample size shall be one roll.

12.2 *End-Item Testing*—The lot size for end-item testing shall be in accordance with 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 Number of tests per unit of product shall be as specified in the appropriate test method.

13.3 First article of manufacture specimens shall consist of at least five rolls of tape.

## 14. Test Methods

14.1 *Responsibility for Inspection*—Unless otherwise specified in the contract or order, 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 7 – 18. The inspections set forth in this specification shall become part of the manufacturer's overall inspection system or quality program for the contract or order. The absence of any inspection requirement in the

**TABLE 2 Physical Property Requirements**

NOTE 1—N/A = not applicable.

Property		Type I		Type II		Type III	Type IV	Type V	Reference Test
		Class 1	Class 2	Class 1	Class 2				
Adhesion, min									
As received	(N/100 mm)	55	55	55	55	49	44	38	Table 1
	(oz/in.)	50	50	50	50	45	40	35	
Aged	(N/100 mm)	49	49	49	49	49	33	38	Table 1 and
	(oz/in.)	45	45	45	45	45	30	35	14.4.2
Weathered	(N/100 mm)	49 <sup>A</sup>	27 <sup>A</sup>	N/A	N/A	N/A	27 <sup>A</sup>	N/A	14.4.4
	(oz/in.)	45 <sup>A</sup>	25 <sup>A</sup>	N/A	N/A	N/A	25 <sup>A</sup>	N/A	
To own backing									
As received	(N/100 mm)	16	N/A	N/A	N/A	N/A	16	11	14.4.5
	(oz/in.)	15	N/A	N/A	N/A	N/A	15	10	
Aged	(N/100 mm)	16	N/A	N/A	N/A	N/A	16	11	14.4.2 and 14.4.5
	(oz/in.)	15	N/A	N/A	N/A	N/A	15	10	
Adhesion to Fiberboard at 90°	(SI)	N/A	N/A	N/A	N/A	N/A	N/A	26	Table 1
Angle and Constant Stress,	(inch pound)	N/A	N/A	N/A	N/A	N/A	N/A	30	
minutes, min									
Shear adhesion, minutes, min <sup>B</sup>									
To fiberboard at 73°F (23°C)									
As received	(SI)	1680	1680	1680	1680	1680	38	1680	
	(inch-pound)	2000	2000	2000	2000	2000	45	2000	14.4.3.1
Aged	(SI)	1680	1680	1680	1680	1680	38	1638	
	(inch-pound)	2000	2000	2000	2000	2000	45	2000	14.4.3.1, 14.4.2, and 14.4.3.2
To fiberboard at 150°F (65.5°C)									
As received	(SI)	4860	4860	4860	4860	4860	38	4860	
	(inch-pound)	5760	5760	5760	5760	5760	45	5760	14.4.3.3
Aged	(SI)	4860	4860	4860	4860	4860	N/A	4860	
	(inch-pound)	5760	5760	5760	5760	5760	N/A	5760	14.4.3.3 and 14.4.2
To steel at 150°F (65.5°C)									
As received	(SI)	N/A	N/A	N/A	N/A	N/A	1215	N/A	
	(inch-pound)	N/A	N/A	N/A	N/A	N/A	1440	N/A	14.4.3.4
Aged	(SI)	N/A	N/A	N/A	N/A	N/A	1215	N/A	
	(inch-pound)	N/A	N/A	N/A	N/A	N/A	1440	N/A	14.4.3.4 and 14.4.2
Break strength, min									
Longitudinal									
Dry	(N/100 mm)	615	615	790	790	435	700	790	Table 1
	(lb/in.)	35	35	45	45	25	40	45	
Wet	(N/100 mm)	N/A	N/A	N/A	N/A	N/A	N/A	350	14.4.7
	(lb/in.)	N/A	N/A	N/A	N/A	N/A	N/A	20	
Transverse									
Dry	(N/100 mm)	615	615	790	790	1055	N/A	385	Table 1
	(lb/in.)	35	35	45	45	60	N/A	22	
Wet	(N/100 mm)	N/A	N/A	N/A	N/A	N/A	N/A	210	14.4.7
	(lb/in.)	N/A	N/A	N/A	N/A	N/A	N/A	12	
Backing thickness, min	(mm)	0.033	0.033	0.045	0.045	0.045	N/A	N/A	
	(mils)	1.30	1.30	1.75	1.75	1.75	N/A	N/A	
Total thickness, max	(mm)	0.102	0.102	0.102	0.102	0.102	0.381	0.254	
	(mils)	4.0	4.0	4.0	4.0	4.0	15.0	10.0	
Tearing resistance, weaker direction, min, gf or mN									Table 1
As received		N/A	N/A	N/A	N/A	N/A	350	100	
Aged		N/A	N/A	N/A	N/A	N/A	N/A	75	14.4.2
Weathered		N/A	N/A	N/A	N/A	N/A	N/A	75	14.4.4
Unwind, max									Table 1
As received	(N/100 mm)	70	70	70	70	70	70	53	Table 1
	(lb/in.)	4	4	4	4	4	4	3	
Aged	(N/100 mm)	70	70	70	70	70	70	53	14.4.2
	(lb/in.)	4	4	4	4	4	4	3	
Water penetration rate, max									Table 1
g/m <sup>2</sup> /24 h		15.5	15.5	15.5	15.5	15.5	15.5	N/A	
g/100 in. <sup>2</sup> /24 h		1.0	1.0	1.0	1.0	1.0	1.0	N/A	
Water vapor transmission rate, max									Table 1
g/m <sup>2</sup> /24 h		15.5	15.5	N/A	N/A	N/A	N/A	N/A	
g/100 in. <sup>2</sup> /24 h		1.0	1.0	N/A	N/A	N/A	N/A	N/A	

<sup>A</sup> After weathering exposure the color of Type I, Class 1 and Type IV tape shall not fade to the extent that the color is not similar to the original color. Type I, Class 2 tape shall meet the transparency requirements of 10.4.

<sup>B</sup> The shear adhesion test at 73°F [23°C] and at 150°F [65.5°C], both as received and aged, shall show no creeping or slippage in excess of 1/8 in. or 3 mm.

specification shall not relieve the manufacturer of the respon-