Designation: D 5749 – 01

Standard Specification for Reinforced and Plain Gummed Tape for Sealing and Securing[1]

This standard is issued under the fixed designation D 5749; 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 This specification covers plain and reinforced paper gummed adhesive tapes suitable for securing and banding paper products and closing fiberboard boxes.

1.2 This specification is intended to replace Fed. Specs. CID A-A-1492, CID A-A-1671, and PPP-T-45 in part.

1.3 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

1.4 The following safety hazards caveat pertains only to the test methods portion, Section 11, 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 685 Practice for Conditioning Paper and Paper Products for Testing[2]

D 828 Test Method for Tensile Properties of Paper and Paperboarad Using Constant-Rate-of-Elongation Apparatus[2]

D 996 Terminology of Packaging and Distribution Environments[2]

D 1974 Practice for Methods of Closing, Sealing and Reinforcing Fiberboard Boxes[2]

D 3951 Practice for Commercial Packaging[2]

2.2 *TAPPI Standards:*

T 401 Fiber Analysis of Paper and Paperboard[3]

T 410 Weight per Unit Area (Basis Weight or Substance)[3]

T 414 Internal Tearing Resistance of Paper (Elmendorf-Type Method)[3]

UM 575 Water Resistance of Adhesive Bond in Laminated Paper and Paperboard[3]

2.3 *ANSI/ASQC Standards:*

ANSI/ASQC Z 1.4 Sampling Procedures and Tables for Inspection by Attributes[4]

ANSI/ASQC Z 1.9 Sampling Procedures and Tables for Inspection by Variables for Percent Defective[4]

2.4 *Federal Specifications:*

PPP-T-45 Tape, Gummed, Paper, Reinforced and Plain, for Sealing and Securing[5]

PPP-T-681 Tape, Gummed, Packaging and Packing of[5]

CID A-A-1492 Commercial Item Description Tape, Gummed, Paper, Plain[5]

CID A-A-1671 Commercial Item Description Tape, Gummed, (Paper, Reinforced, Laminated)[5]

2.5 *ISO Standard:*

ISO 9002 Quality Systems Model for Quality Assurance in Production and Installations[4]

3. Terminology

3.1 *Definitions*—General definitions for packaging and distribution environments are found in Terminology D 996.

4. Classification

4.1 *Type I Reinforced, Laminated*:

4.1.1 *Class 1*—Strippable.

4.1.2 *Class 2*—Nonstrippable.

4.2 *Type II Plain, Single Ply, Strippable*:

4.2.1 *Grade A*—Light duty, for lightweight packages.

4.2.2 *Grade B*—Medium duty, for medium-sized packages.

4.2.3 *Grade C*—Heavy duty, for heavy-duty packages.

5. Significance and Use

5.1 Type I is a reinforced gummed tape which may be strippable (Class 1) or nonstrippable (Class 2). It is intended for use in Methods 2C2, 2C3, and any other methods in Practice D 1974.

5.2 Type II is a plain paper-backed nonstrippable gummed tape. It is intended for use in Methods 2C4, 2C5, and other methods in Practice D 1974.

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[2] *Annual Book of ASTM Standards*, Vol 15.09.

[3] Available from the Technical Association of the Pulp and Paper Industry, P.O. Box 105113, Atlanta, GA 30348.

[4] Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

[5] Available from Superintendent of Documents, U.S Government Printing Office, Washington, DC 20402.

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, class, and grade required (5.1),

6.1.3 When core plugs are required (7.7),

6.1.4 If tape is to be wound gummed side out (7.7),

6.1.5 Roll width and length (9.1 and 9.2),

6.1.6 Acceptance sampling plan and desired acceptance quality level (Section 12),

6.1.7 When backing certification is required (15.1),

6.1.8 When testing and inspection certification is required (15.1),

6.1.9 Level of packaging and packing if other than commercial (Section 17), and

6.1.10 When packaging for shipments to the U.S. Government (17.2).

7. Materials and Manufacture

7.1 The materials used in the construction of the tape shall be such as to ensure performance of the tape over the range of −55 to +71°C (−65 to +160°F) and shall conform to the requirements of this specification.

7.2 *Paper*:

7.2.1 *Stock*—The paper used in the fabrication of the tape shall be a kraft paper. The use of recycled pulp in the paper is encouraged.

7.2.2 *Weight*—The weight of the paper prior to gumming shall conform to the requirement of Table 1, when tested as described in TAPPI T 410.

7.3 *Adhesives*—The adhesives used shall not have an offensive odor (dry or wet) and shall meet the environmental considerations of 16.1.

7.3.1 Type I, Class 1 adhesive shall be capable of being quickly activated with water. The wetted adhesive shall show pronounced tackiness and shall cause the tape to remain so firmly affixed that it cannot be removed without leaving a thin film of paper from the tape on the test paper, when tested in accordance with 13.6.1.

7.3.2 Type I, Class 2, and Type II adhesive shall be capable of being quickly activated with water. The wetted adhesive shall show pronounced tackiness and shall cause the tape to remain so firmly affixed that it cannot be removed without failure of either the tape or paper when tested in accordance with 13.6.1.

7.4 *Reinforcing Materials*—The reinforcing fibers used in fabricating Type I tapes shall be composed of glass of such size as to permit the reinforced tape to meet the requirements set forth in Table 2 when tested as described in 13.5.

7.5 *Laminating Materials*—The laminating material for Type I tape shall be non-asphaltic, water resistant, flexible, and non-staining. Water resistance of the finished tape shall be tested in accordance with TAPPI UM 575.

TABLE 1 Weight of Ungummed Paper

	Minimum Weight	
(24 × 36 — 5500 sheets)	g/m2	lb
Type I, Classes 1 and 2	49	55
Type II		
Grade A	57	35
Grade B	98	60
Grade C	146	90

TABLE 2 Physical Properties

Type	Tensile Strength, kN/m width (lb/in.) min		Tearing Resistance, grams force mN min[A]	
	Machine direction	Cross direction[B]	Machine direction	Cross direction
Type I	11 (63)	5.25 (30)		
Type II				
Grade A	4.5 (26)		540(55)	647 (66)
Grade B	8 (45)		1109 (113)	1315 (134)
Grade C	12 (68)		1991 (203)	2197 (224)

[A] This requirement does not apply to tapes less than 63 mm (2 ½ in.) in width.
[B] This requirement does not apply to tapes less than 76 mm (3 in.) in width.

7.6 *Construction*—Type I tape shall consist of two strips of paper in roll form, securely laminated together with reinforcing fibers embedded in the laminate. The reinforcing laminated tape shall be completely and uniformly coated on one side with an adhesive.

7.6.1 The tape shall be reinforced by crosswise reinforcing fibers spaced not less than 2 fibers/50 mm (1 in.) on average and by lengthwise fibers spaced not more than an average of 25 mm (½ in.) apart. If a diamond pattern is employed for crosswise reinforcement, the spacing between the parallel sides of the diamond shall not be more than 32 mm (1¼ in.). The three-way tape shall be reinforced in both the machine direction and cross direction with reinforcing fibers spaced not less than 2 fibers/50 mm (1 in.) on average, in addition to the diamond-patterned reinforcement.

7.6.2 Type II tapes, all grades, shall consist of one strip of paper in roll form of the applicable grade, completely and uniformly coated on one side with an adhesive.

7.7 *Rolls*—Unless otherwise specified, the tape shall be evenly wound and tightly wound in rolls with the gummed side in (6.1.4). Type II shall be wound on a core having sufficient rigidity to prevent distortion of the roll under normal conditions of transportation and use. The inside diameter of the core shall be not less than 13 mm (½ in.). When specified, Type II tape shall have the core secure with a plug (6.1.3). Type I tape shall not be required to have a core. The end of the outer leaf of the tape shall be adhered to the next layer to prevent unwinding. The tape in each roll shall be furnished in one continuous length and have no more than three splices per roll. All splices shall be neatly and evenly made with glue and shall not separate upon unwinding.

8. Physical Properties

8.1 The tape shall meet the physical property requirements in Table 2.

9. Dimensions, Mass, and Permissible Variations

9.1 The width of the roll for Type I shall be 38.5, 50, and 75 mm (1½, 2, and 3 in.); For Type II 25, 38.5, 50, and 75 mm (1, 1½, 2, and 3 in.).

9.1.1 A width tolerance of ±1.5 mm (±1⁄16 in.) shall be allowed on all widths.

9.2 *Length*:

9.2.1 *Type I*—The length of the roll shall be 115 or 140 m (375 or 450 ft) or other commercially available lengths, as specified (6.1.5).

9.2.2 *Type II*—The length of the Class A roll shall be 245 m (800 ft) when wound gummed side out, 150 m (500 ft) when wound gummed side in, or other commercially available length (6.1.5). The length of the Class B roll shall be 185 or 300 m (600 or 800 ft), or other commercially available length (6.1.5). The length of the Class C roll shall be 115 m (375 ft), or other commercially available length (6.1.5).

10. Workmanship, Finish, and Appearance

10.1 The tape shall be clean and free of folds, sharp creases, tears, cuts, and holes. The adhesive coating shall cover the entire area of one side of the tape. The tape shall be cleanly cut without nicks or ragged edges and shall conform to the levels of quality established in this specification.

11. Specimen Preparation and Number of Tests

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

11.2 The number of tests per unit of product shall be as specified in the appropriate test method or Table 2.

12. Sampling

12.1 *Inspection Levels*—The acceptance sampling plan inspection level shall be as specified in the purchase order or contract. If not otherwise specified (6.1.9), ANSI/ASQC 1.4 and ANSI/ASQC 1.9 shall be used with an acceptable quality limit (AQL) of 4 %.

13. Test Methods

13.1 *Responsibility for Inspection*—Unless otherwise specified in the contract or order, the manufacturer is responsible for the performance of all inspection requirements in this specification.

13.2 *Responsibility for Compliance*—All items must meet all requirements of Sections 7 through 17. 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 specification shall not relieve the manufacturer of the responsibility of ensuring that all rolls of tape submitted for acceptance comply with all the requirements of the contract or order. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the buyer to accept defective material.

13.3 *Test of Component Materials*:

13.3.1 *Paper*—The paper component shall be tested for the stock requirements in 7.2.1 as described in TAPPI T 401 and for basis weight requirements in 7.2.2 as described in TAPPI T 410. The lot shall consist of all paper received at one time from one source of supply for use in fabrication of one type and grade of tape. The lot size shall be expressed in units of kilograms (pounds). The sample unit shall be 0.65 m (1000 $in.^2$) of paper. The sample size shall be as described in 12.1. The test reports shall include all values upon which results are based. There shall be no failures to meet the composite or lot average requirements. A composite shall consist of small portions taken from all sample units and combined into a single sample.

13.3.2 *Reinforcing Material*—The manufacturer shall submit a certification of compliance stating that the composition of the reinforcing material used in Type I tape is in conformance with the requirements of 7.4.

13.3.3 *Laminating Material*—The manufacturer shall submit a certification of conformance stating that the laminate of Type I conforms to the requirements of 7.5 as applicable.

13.4 *Inspection for the End Item*—The end item shall be examined for defects at the inspection levels and acceptable quality levels set forth in 13.4.1. Random samples shall be drawn from each lot of the end item for inspection for examination of visual, roll construction, and dimensions. The lot size shall be expressed in units of rolls for examination in 13.4.1, 13.4.2, and 13.4.3.

13.4.1 *Examination for Visual Defects*—The sample unit for this examination shall be (1 yd) of tape from the roll. Only one sample unit shall be taken from any roll. The sample shall be positioned randomly in all rolls examined, and the rolls shall be randomly selected from the lot. (See Table 3.)

13.4.2 *Examination for Defects in Roll Construction*— The sample unit for this examination shall be one roll. (See Table 4.)

13.4.3 *Examination of Defects in Dimensions*—The sample unit for this examination shall be one roll. (See Table 5.)

13.5 *Testing End Item*—The end item shall be tested for the applicable characteristics in Table 6. The lot size for purposes of determining the sample size shall be expressed in units of rolls of one type, grade, class, and size. The sample unit shall consist of a sufficient length of tape to perform all of the tests. The first three layers of tape shall be removed from the rolls before taking any specimens for test. The sample size shall be determined in 12.1. Test results shall include all values upon which results are based. There shall be no failure to meet the sample unit or lot average requirements. The tape shall be conditioned in accordance with Practice D 685 for all test except adhesiveness.

13.6 *Test Procedures*:

13.6.1 *Testing Conditions*—All tests shall be conducted in an atmosphere maintained at standard conditions as described in Practice D 685. Materials shall be conditioned to equilibrium at these conditions prior to testing.

13.6.2 *Adhesiveness—Apparatus, Supplies, and Testing Procedure*:

13.6.2.1 *Standard Test Paper*—The test paper shall be

TABLE 3 Examination for Visual Defects

Examine	Defect
Form	Type, class, or grade not as specified
Adhesive coating	Not coated on one side only
	Not uniform; bare spots or lumps
	Does not cover entire area
	Has offensive odor (dry or wet)
Construction (Type I)	Tape not securely laminated, any blister or ply separation
Workmanship	Any dirt, foreign matter, or slime spot
	Any hole, tear, cut, fold, or sharp crease

TABLE 4 Examination for Defects in Roll Construction

Examine	Defects
Assembly of roll	Adhesive side of tape does not face in (unless otherwise specified)
	Outer end of tape not glued to adjacent layer
	Material not evenly and tightly wound, causing soft edges or telescoping of the roll
	Edges not clean cut, ragged, nicked, or uneven
Core	Core missing, broken, crushed, collapsed, or mutilated
Unwinding of roll	Roll not wound evenly, causing sharp creases or fold within roll
	While being unwound, tape sticks together, to the extent that unwinding causes injury to surface or adhesive separates from backing
	Roll not continuous, any tear or break within roll
	More than three splices per roll
	Splices not neatly and evenly made with glue
	Splices adhere to adjacent layer of tape

TABLE 5 Examination for Defects in Dimensions

Examine	Defect
Roll:	
Width	Varies from width specified by more than 1.6 mm (+1/16 in.)
Length	Varies from length specified
Core:	
Inside	Less than 13 mm (½ in.) in diameter
Reinforcing fibers (Type I)	Machine direction fibers more than average of 13 mm (½ in.) apart
	Cross-direction fibers less than average of 25 mm (1 in.) or parallel side of diamond average more than 25 mm (1 in.)

TABLE 6 Instruction for Testing End Item

Characteristic	Requirement	Test Method	Sample Unit
Adhesiveness:			
		13.6.1	1
Tackiness in 5 s	7.3		
Adhesion after 24 h	7.3	13.6.2	1
Tensile Strength:		13.6.3	
Type I:			
Machines direction	8.1		10
Cross direction	8.1		10
Type II:			
Machine direction	8.1		10
Tearing resistance:		TAPPI T 414	
Type II, Grades A, B, C:			
Machine direction	8.1		10
Cross direction	8.1		10

Standard Reference Material 1810A7.[6]

13.6.2.2 *Rubber Roller*— A soft rubber-covered hinged iron roller weighing 7.25 + 1.25 kg (16 + ½ lb), 87 + 6 mm (3¼ + ⅛ in.) wide having an overall diameter of 125 + 6 mm (5 + ⅛ in.).

13.6.2.3 *Testing Procedure*—Cut four 200 by 150 mm (8 by 6 in.) specimens of standard reference material, two each in machine direction (MD) and cross direction (CD). Cut and completely moisten four randomly selected tape specimens 300 mm (12 in.) long by the full tape width, utilizing an automatic gummed tape dispenser. Fold over 25 mm (1 in.) of the tape to facilitate tape removal efforts. At the end of 15 s, apply each tape specimen to the test paper, two in the MD and two in the CD of the standard reference material. Roll them once in each direction with the roller (13.6.2.2) at a rate of 305 mm/s (12 in./min). Within 5 s after the tape is applied on the paper, gently lift the tab to expose not more than 75 mm (3 in.) on the tape (one MD and one CD) and observe the tackiness of the gum. The adhesive shall show a pronounced tackiness. (The portion of the specimens lifted to observe tackiness shall not be reapplied.) After 24 h elapsed time, determine the ease of removal of the specimens (two MD and two CD). The adhesive shall be considered satisfactory for Class 1 if the tape cannot be removed from the test paper without leaving a thin layer of paper from the tape on the test paper over 75 % of the taped area. For Class 2, the adhesive cannot be considered satisfactory if the tape cannot be removed without separation of either the tape or the test paper over 90 % of the taped area.

13.6.3 *Tensile Strength and Elongation*—Tensile strength test shall be performed at standard conditions (13.6.1) and in accordance with Test Method D 828. For Type I tapes, the specimen used for the determination of both machine and cross direction tensile strength shall be 76 mm (3 in.) in length. The jaw separation on the tensile machine shall be 76 mm (3 in.) for the machine direction test and 25 mm (1 in.) for the cross-direction test. Jaws 76 mm (3 in.) wide shall be used for testing Type I.

14. Rejection and Rehearing

14.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection should be reported to the producer or supplier promptly in writing. In case of dissatisfaction with results of any tests, the producer or supplier may make claim for rehearing.

15. Certification

15.1 When specified (6.1.6) in the purchase order or contract, the manufacturer shall certify that the backing of the tape is as specified (7.2).

15.2 When specified (6.1.7) in the purchase order or contract, the purchaser shall be furnished a certification stating that the samples representing each lot of tape have been tested and inspected as directed in this specification, that the requirements have been met, and that the tape has been produced in a manufacturing facility certified under ISO 9002.

16. Environmental Considerations

16.1 *Toxic Content*—The use of potentially toxic packaging materials is a concern, due to their potential presence in emissions when packaging is incinerated, or leachate when packaging is landfilled. Materials used in the manufacture of gummed tapes covered by this specification shall not have any lead, cadmium, mercury, or hexavalent chromium intentionally introduced as a component during manufacture, as opposed to the incidental presence of any of these elements.

17. Preparation for Delivery

17.1 Unless otherwise specified (6.1.8) in the purchase order or contract, rolls of tape shall be packaged in accordance

[6] Standard Reference Material 1810A is available from the Office of Standard Reference Materials, National Institute of Standards and Technology, 100 Bureau Dr., Stop 3460, Gaithersburg, MD 20899–3460.

with Practice D 3951. Such packaging shall ensure arrival at the destination in satisfactory condition and shall be acceptable to the carrier used at the lowest rate.

17.2 When specified (6.1.9), shipments to the U.S. Government shall be packaged in accordance with PPP-T-681 at the levels specified in the purchase order or contract (6.1.9).

18. Keywords

18.1 banding; closure; gummed; reinforced; sealing; tape