

MIL-T-43036B
9 January 1981
SUPERSEDING
MIL-T-43036A
29 March 1963

MILITARY SPECIFICATION

TAPE, PRESSURE-SENSITIVE ADHESIVE, PLASTIC FILM, (FOR SEALING FIBER CONTAINERS AND CANS)

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers waterproof, water-vaporproof, plastic film, pressure sensitive adhesive tapes designed primarily for the sealing of fiber ammunition containers meeting MIL-C-2439, fiber cans meeting MIL-C-3955, plastic containers and similar applications requiring a tough sealing medium having the properties of the tapes meeting this specification.

1.2 Classification. The tapes covered by this specification shall be of the following types:

- Type I - Reinforced polyester film
- Type II - Non-reinforced polypropylene film

NOTE: Type II may be used in place of Type I tape.

2. APPLICABLE DOCUMENTS

2.1 Issue of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-T-680

-Tape, Pressure Sensitive Adhesive:
Packaging and Packing of

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research and Development Command, Attn. DRDAR-QA, Dover, New Jersey 07801 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC: 7510

MILITARY

MIL-C-2439 -Container, Ammunition, Fiber Spirally Wound
 MIL-C-3955 Cans, Fiber, Spirally Wound

STANDARDS

MILITARY

MIL-STD-1168 -Lot Numbering of Ammunition

(Copies of specifications, standards and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM-D3330 -Peel Adhesion of Pressure-Sensitive Tape at 180-Deg Angle, Standard Test Methods for
 ASTM-D3611 -Accelerated Aging of Pressure-Sensitive Tapes, Standard Practice For
 ASTM-D3652 -Thickness of Pressure-Sensitive and Gummed Tapes, Standard Test Method For
 ASTM-D3654 -Holding Power of Pressure-Sensitive Tapes, Standard Test Method For
 ASTM-D3715 -Quality Assurance of Pressure-Sensitive Tapes, Standard Practice For
 ASTM-D3759 -Tensile Strength and Elongation of Pressure-Sensitive Tapes, Standard Test Method For
 ASTM-D3811 -Unwind Force of Pressure-Sensitive Tapes, Standard Test Method For
 ASTM-D3816 -Water Penetration Rate of Pressure-Sensitive Tapes, Standard Test Method For
 ASTM-D3833 -Water Vapor Transmission of Pressure-Sensitive Tapes, Standard Test Method For

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.).

3. REQUIREMENTS

3.1 Construction.

3.1.1 Type I tape shall consist of a polyester film, coated on one side with a homogeneous pressure-sensitive tape adhesive containing longitudinal reinforcing filaments. The reinforcing filaments shall be imbedded in the adhesive in a uniform layer throughout the length of the tape. The tape shall require no heat, solvent, or other preparation prior to or after application, and shall remove from the fiber containers or cans without breaking, over a temperature range of -66° to 155°F (-53.3° to 68.3°C).

3.1.2 Type II tape shall consist of a biaxially oriented polypropylene film coated on one side with a homogeneous pressure-sensitive adhesive in a uniform layer throughout the length of the tape. The tape shall not require any preparation prior to or after application, and shall remove from the fiber containers or cans without breaking over the temperature range of -66° to 155°F (-53.3° to 68.3°C).

3.2 Rolls. The tape shall be uniformly and evenly wound in rolls, adhesive side in, on a core of sufficient rigidity to prevent distortion of the roll under conditions of testing, transportation, storage and use. The inside diameter of the core shall be $3 (-0, + 1/16)$ inches.

3.2.1 Length. Type I shall be furnished in 60 or 240 yard rolls as specified. Type II tape shall be furnished in 60 or 500 yards rolls, as specified. Each roll shall consist of a continuous length of tape, except that any single 60 yard roll shall contain no more than three splices, and 240 and 500 yard rolls shall contain no more than eight splices. The splices shall be made in such a manner that they will not separate when the roll is unwound for inspection or during machine or hand application.

3.2.2 Width. The width of the rolls shall be 1, 1 1/2 inches, or other commercially available width as specified. A tolerance of $+ 1/32$ inch shall be allowed.

3.2.3 Color. The color of Type I tape shall be black. The color of Type II tape shall be transparent.

3.3 Physical properties. When tested as specified in Section 4 of this specification, the tape shall conform to the applicable requirements of Table I and Paragraphs 3.4 through 3.11.

3.4 Adhesion. The tape shall meet the applicable requirements of Table I, when applied and tested as specified in 4.5.5. In addition, the tape shall show no visual evidence of curling, buckling or lifting. There shall be no visual evidence of stringiness of the adhesive nor of separation of any of the tape components when unwound during inspection or application. The adhesive shall cause the tape to adhere immediately, uniformly, and firmly to clean, dry surfaces when applied at any temperature within the range of 50° to 155°F (10° to 68.3°C).

3.5 Holding power. The tape specimens with a one-inch area and a 1000 gram load adhered to a steel test panel, shall show no visual evidence of creepage in excess of 1/8 inch with the time interval specified in Table I, when tested as specified in 4.5.6.

3.6 Unwind properties. When tested as specified in 4.5.7, the tape shall meet the applicable requirements of Table I, in the as received condition and after accelerated aging. The tape shall not break, nor shall the adhesive transfer to the back of the adjacent layer of tape so as to be visually evident during unwinding of the tape as received, or after accelerated aging.

3.7 Stability. The tape shall pass the accelerated aging tests as described in 4.5.4. The tape shall show no visual evidence of deterioration, separation of components or change in adhesive or breaking when examined after the aging procedure. The tape shall not exhibit sufficient adhesive flow to the sides of the rolls as to cause edge bond to be visually evident between the successive layers of the tape rolls. (Such edge bond would be discernible in unwinding of the rolls (see 4.5.7)).

3.7.1 Stability on a fiber containers or cans. The tape, when tested as specified in 4.5.11, shall show no evidence of buckling, curling or lifting extending toward the center of the tape plies more than 1/4 of the width of the tape from either side, and shall remove from the container without breaking. Adhesive transfer to the container or can shall not be cause for rejection.

3.8 Low temperature removal. The tape shall be removable from the container or can without breaking the tape backing, when tested as specified in 4.5.12.

3.9 Waterproof on metal cans. The tape shall prevent the penetration of liquid water into the test cans for a period of 15 minutes when tested as specified in 4.5.13.

3.10 Roll distortion. The tape rolls shall show no more distortion than listed in Table I, nor shall there be any visual evidence of distortion of the core when subjected to the accelerated aging procedure as specified in 4.5.10.

3.11 Marking of rolls. Each roll of tape shall be marked in or at the edge of the core with the manufacturer's name and code designation and (full or coded) date of manufacture.

3.12 First article inspection. This specification contains provisions for first article inspection. Requirements for the submission of first article samples by the contractor shall be as specified in the contract (see 6.2).

3.13 Workmanship. The tape shall be fabricated in a thorough, workmanlike manner. It shall be free of foreign matter and defects that detract from its appearance or that may impair its serviceability. The adhesive shall be a smooth uniform coating, evenly applied, covering the entire area of the backing without any bare spots or lumps. The tape shall be securely laminated, have no layer separation nor presence of blisters (applicable to reinforced tapes only). There shall be no holes, tears, cuts, cracks, or sharp creases. The edges of the tape shall be straight, clean cut, unbroken and not sticky. There shall not be any telescoping of the roll.

TABLE I. Properties of Tapes.

<u>Test</u>	<u>Type I</u>		<u>Type II</u>		<u>Method</u>
	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>	
Thickness, inches	--	0.0075	--	0.0035	4.5.1
Tensile breaking strength, lbs/in					4.5.2
Machine Direction	50	--	25	--	
Cross Direction	--	--	40	--	
Elongation, percent	20	35	120	--	4.5.3
Adhesion, oz/in width					4.5.5
Initial	30	--	50	--	4.5.5.1

TABLE I. Properties of Tapes.

<u>Test</u>	<u>Type I</u>		<u>Type II</u>		<u>Method</u>
	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>	
After accelerated aging	24	--	40	--	4.5.5.2
Holding power, minutes					4.5.6
At 73.5°F (23°C)	1440	--	3000	--	
At 150°F (68.3°C)	1440	--	2000	--	
Unwind, lbs/in					4.5.7
Initial	--	3.0	--	1.5	4.5.7.1
After accelerating aging	--	4.0	--	3.0	4.5.7.2
Water vapor transmission rate, g/100 sq in/24 h	--	2.0	--	1.0	4.5.8
Water penetration rate, g/100 sq in/24 h	--	1.0	--	0.50	4.5.9
Roll distortion, inches					4.5.10
Radius	--	0.75	--	0.75	4.5.10.1
Width	--	0.75	--	0.75	4.5.10.2

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3).
- b. Quality conformance (regular production) inspection (see 4.4).

4.3 First article inspection.

4.3.1 Submission. The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with provisions of 4.3.2. The first article shall consist of five (5) rolls of tape which have been produced by the contractor using the same production processes, procedures and equipment as will be used in fulfilling the contract. All materials shall be obtained from the same sources of supply as will be used in regular production.

4.3.2 Inspection to be performed. Samples may be subjected by the Government to any or all of the examinations or tests specified in this specification.

4.3.3 Rejection. If any sample fails to comply with any of the applicable requirements, the first article sample shall be rejected. The Government reserves the right to terminate its inspection upon any failure of the sample to comply with any of the stated requirements.

4.4 Quality conformance inspection.

4.4.1 Inspection lot formation. Lotting criteria and lot size shall be as specified in ASTM-D3715. Units of product selected for inspection shall represent only the inspection lot from which drawn and shall not be construed to represent any prior or subsequent quantities presented for inspection. Lot numbering, as required, shall be in accordance with MIL-STD-1168.

4.4.2 Examination. Sampling and examination for the end item shall be as specified in ASTM-D3715.

4.4.3 Sampling and testing. The sampling and testing for end item testing shall be as specified in ASTM-D3715 at an Acceptable Quality Level (AQL) of 4 percent.

4.4.4 Inspection equipment. The government reserves the right to inspect the contractor's equipment and determine that he has available and utilizes correctly, measuring and test

equipment of the required accuracy and precision and that the instruments are of the required accuracy. Commercial inspection equipment shall be employed where applicable for all tests and examinations specified in 4.5. The contractor is responsible for assuring that proper calibration procedures are followed.

4.5 Test methods and procedures.

4.5.1 Thickness. The thickness of the tape shall be determined as specified in ASTM-D3652.

4.5.2 Tensile breaking strength. The tensile breaking strength shall be performed in accordance with ASTM-D3759.

4.5.3 Elongation. The elongation of the tape shall be determined in accordance with ASTM-D3759.

4.5.4 Accelerated aging. The accelerated aging of the tape shall be determined in accordance with ASTM-D3611.

4.5.5 Adhesion.

4.5.5.1 Initial adhesion. The initial adhesion of the tape shall be determined in accordance with ASTM-D3330.

4.5.5.2 Adhesion after accelerated aging. The accelerated aging of the tape shall be performed in accordance with 4.5.4. Then, the adhesion of this tape shall be determined in accordance with ASTM-D3330.

4.5.6 Holding power. The holding power of the tape shall be determined in accordance with ASTM-D3654.

4.5.7 Unwind properties.

4.5.7.1 Initial unwind properties. The initial unwind properties of the tape shall be determined in accordance with ASTM-D3811.

4.5.7.2 Unwind properties after accelerated aging. Accelerated aging shall be performed on the tape in accordance with 4.5.4. Then, the unwind properties of the tape shall be determined in accordance with ASTM-D3811.

4.5.8 Water vapor transmission rate. The water vapor transmission rate shall be performed in accordance with ASTM-D3833.

4.5.9 Water penetration rate. The water penetration rate shall be performed in accordance with ASTM-D3816.

4.5.10 Roll distortion. The determination shall be made by comparing the two principal dimensions of the sample rolls of tape obtained in as received condition and after accelerated aging (as performed in accordance with 4.5.4). Measurements shall be made to the nearest 1/32 of an inch, by means of a ruler graduated to that dimension. The values obtained as received and after accelerated aging on the same rolls will be recorded and the difference between the initial values and those obtained after aging will be roll distortion. The individual values are averaged and reported to the nearest 1/32 of an inch.

4.5.10.1 Radius distortion. Radius distortion shall be measured by placing each of the rolls flat on its side on a sheet of paper. The circumference (periphery) is traced and the greatest radius (distance from the center to the farthest point on the circumference) of the outline is measured to the nearest 1/32 of an inch.

4.5.10.2 Width distortion. The width of the test rolls shall be determined to the same accuracy as in 4.5.10.1 by placing each roll flat on its side and measuring the vertical distance from the base to the uppermost ply of the tape to the nearest 1/32 of an inch.

4.5.11 Determination of stability on fiber containers or cans. Stability of the tape on fiber containers or cans shall be determined as follows: Specimens of one inch wide tape shall be applied to a fiber container (meeting MIL-C-2439) or a fiber can (meeting MIL-C-3955), two to six inches in diameter, so that it extends once around the container perpendicular to the main axis of the container and onto itself a distance of approximately two inches. A tape release tab, at least six inches in length, shall be provided by folding the extending tape back upon itself. This assembly shall then be placed in a temperature cabinet maintained at $160^{\circ}\text{F} + 3.5^{\circ}\text{F}$ ($71.7^{\circ}\text{C} + 2^{\circ}\text{C}$) for ten days. At the end of that time, the assembly shall be removed from the cabinet, conditioned at 73.5°F (23°C) for a minimum of two hours and the tape removed at a rate of approximately three feet per second as roughly represented by a sharp yank or pull. One test shall be made per sample roll selected.

4.5.12 Determination of low temperature removal. Specimens of the tape shall be applied to a MIL-C-2439 ammunition fiber container or a MIL-C-3955 fiber can as described in 4.5.11. Place this assembly in an air circulating oven maintained at

155°F + 3.5°F (68.3 + 2°C) for a period of 24 hours. Then transfer the assembly to a compartment maintained at -66°F + 3.5°F (-54.3°C + 2°C) for two (2) hours. At the end of this conditioning period, remove the tape from the table at any angle at a rate of about three feet per second (as roughly represented by a sharp yank). Care shall be taken to keep the assembly at the low temperature during removal of the tape. One test shall be made for each sample roll.

4.5.13 Determination of waterproofness of tape on metal cans. Apply a one-inch wide specimen of tape to a closed four ounce seamless metal box with a slip cover (see 6.3) containing 40 grams of clean, dry calcium chloride, so that it extends around the container once and onto itself for a distance of approximately one inch. The tape positioned so that it is centered along the lip of the slip cover and approximately one half of the width extends on either side of that lip. Submerge the sealed container under a one inch head of water, maintained at approximately 40°F + 3.5°F (4.4°C + 2°C), for a period of 15 minutes. Remove the container and carefully dry the exterior with a paper towel or other suitable means. Then, remove the tape and container cover and visually examine the calcium chloride for evidence of wetting. Three determinations shall be made. Wetting of the calcium chloride in any container shall be cause for rejection of the tape.

5. PACKAGING. The inspection level and acceptance quality level for the packaging, packing and marking of the tape shall be as specified in PPP-T-680.

5.1 Packaging and packing. Unless otherwise specified, the rolls of tape shall be bulk packed in accordance with the requirements of PPP-T-680 at the level specified in the contract or order.

5.2 Marking. Containers of tape shall be marked in accordance with the requirements of PPP-T-680 and those documents forming a part of that specification.

6. NOTES

6.1 Intended use. The pressure sensitive tapes covered by this specification are designed primarily for sealing fiber containers meeting MIL-C-2439 and cans meeting MIL-C-3955 and for slip cover metal containers. It may be used in other applications where waterproof, watervaporproof, medium tensile strength tape possessing good low temperature removal properties is required. Type I tape is equivalent to the tape covered in Revision A of this specification. Type II tape is intended for use as an alternate for Type I tape. Its use is contingent upon supply, cost, and other considerations.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Quantity required and delivery schedules.
- c. Quality conformance inspection, if other than specified in Section 4 of this specification.
- d. First article sample requirements, if other than specified in Section 4 of this specification.
- e. Packaging requirements, if other than specified in Section 5 of this specification.
- f. Certificates of conformance for each lot of shipment of product.
- g. Level of packaging and packing.
- h. Width of tape required.
- i. Length of roll required.

6.3 Seamless tin metal boxes to be used for the determination of waterproofness (see 4.5.13) are commonly known as ointment boxes and are available from Fisher Scientific Company Catalog #61 lists them as Boxes, Metal Seamless Tin #3-490.

6.4 Application. The following steps are recommended in applying these types of tape to telescope tubes, slip cover cans and similar circular containers to ensure a moisture-vapor-tight seal:

Step 1. Press the cap of the tube onto the body and hold under tension until the pressure inside equalizes with pressure outside the tube. This can be checked by releasing the cap and if it does not tend to come off, pressures have equalized.

Step 2. With the cap still firmly pressed in place, apply a short length of the tape placed so that one-half of the width falls on each side of the joint between the cap and the body.

Press the tape firmly into place and continue to apply the tape around the tube maintaining approximately a 10 pound tension on the tape until 1 1/4 laps have been applied. Release tension, cut the tape from the roll leaving a free end of approximately 1/2 inch which is folded adhesive to adhesive to form a tab to aid in removing the tape.

Step 3. After application of the tape, the tube and tape should be allowed to condition under standard conditions for approximately 24 hours before testing of any type is begun.

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6.5 Storage. The tape should be stored in the original containers in a cool location. It should not be stored close to steam pipes, radiators or other sources of heat, or in locations where it may be exposed to the direct rays of the sun.

Custodians:

Army-AR
Navy-AS
Air Force-99

Preparing Activity:

Army-AR

Review Activities:

Army-AR, GL
Navy-OS
Air Force-69

Project No.: 7510-0324

User Activities:

Army-MI
Navy-SH, SA, OS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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DOCUMENT IDENTIFIER (Number) AND TITLE

MIL-T-43036B Tape, Pressure-Sensitive Achesive, Plastic Film.

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

VENDOR USER MANUFACTURER

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