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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-T-21595

Issued SEP 1998

Submitted for recognition as an American National Standard

Tapes, Pressure-Sensitive Adhesive, Masking, Non-Staining - for Aircraft Painting Applications

NOTICE

This document has been taken directly from U.S. Military Specification MIL-T-21595D, Amendment 2 and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace MIL-T-21595D, Amendment 2. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualifications requirements and associated qualified products lists are mandatory to DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this technical report.

1. SCOPE:

1.1 Scope:

This specification covers pressure sensitive adhesive tape designed for masking and color separation application during aircraft painting operations. It is designed for use with all common finishes but is especially designed for use with polyurethane coating systems conforming to MIL-C-83286.

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1.2 Classification:

Tapes shall be of the following types, as specified (see 6.1).

Type I - Paper, Creped
Type II - Paper, Flat
Type III - Plastic

1.2.1 Part number: Specification part numbers for items described in this specification will be formulated as shown in 6.1.4.1.

2. APPLICABLE DOCUMENTS:

The following publications, 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.

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 3330 Peel Adhesion of Pressure-Sensitive Tape at 180 Degree Angle, Test for
ASTM D 3611 Accelerated Aging of Pressure-Sensitive Tapes, Practice for
ASTM D 3652 Thickness of Pressure-Sensitive and Gummed Tapes, Test for
ASTM D 3715 Quality Assurance of Pressure-Sensitive Tapes, Practice for
ASTM D 3759 Tensile Strength and Elongation of Pressure-Sensitive Tapes, Test for

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

CCC-C-440 Cloth, Cheesecloth, Cotton, Bleached and Unbleached

QQ-A-250/5 Aluminum Alloy Alclad 2024, Plate and Sheet

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

MIL-A-9962 Abrasive Mats, Non-Woven, Non-Metallic
MIL-C-81706 Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-C-83286 Coating, Urethane, Aliphatic, Isocyanate, for Aerospace Applications
MIL-P-85582 Primer Coatings, Epoxy, Waterborne

3. REQUIREMENTS:

3.1 First article inspection:

Unless otherwise specified, the contractor shall furnish sample units for first article inspection and approval (see 4.4).

3.2 Materials:

The tape shall consist of a backing coated on one side with a pressure sensitive adhesive requiring no moisture, heat or other special preparation prior to or after application.

3.2.1 Backing: The backing shall be uniform in texture and shall perform satisfactorily as a masking tape. The backing shall have sufficient strength to allow the tape to be unwound from the roll and to be removed from the masked surface after application of finishing materials without breakage or delamination. The finishing materials shall not penetrate the backing.

3.2.1.1 For type III: Surface of backing (not coated with adhesive) shall have a matte finish to prevent paint flaking (flakeoff) during tape removal operation.

3.2.2 Adhesive: The adhesive shall be pressure sensitive, water insoluble, homogeneous, and coated in a smooth and evenly distributed layer on one side of the backing. The adhesive shall cause the tape to adhere immediately and firmly to clean, dry surfaces to which the tape is generally applied during masking in finishing operations without wrinkling, curling, breaking or lifting. There shall be no liner over the adhesive.

3.3 Finished tapes:

3.3.1 Rolls: The tape shall be uniformly and smoothly wound in rolls, with adhesive side in, on suitable cores having an inside diameter of 3 (-0 + 1/16) inches. The cores shall have sufficient rigidity to prevent distortion of the roll under normal conditions of use. The tape shall be in one continuous strip, except that any single roll may contain three splices, provided the percentage of spliced rolls in any shipment does not exceed a reasonable proportion based upon standard manufacturing practice. The length of the tape in rolls shall be not less than 60 yards.

3.3.2 Width: Tape widths shall be 1/2, 3/4, 1, 1-1/2, 2, 3-inches. Width tolerance of ± 1/32 inch applies to all types of tapes.

3.3.3 Color: Tapes shall be opaque and may be any color commercially used by tape manufacturer.

3.3.4 Marking of rolls: Each roll of tape shall be marked in or on the edge of the core with the manufacturer's name and the specification number.

3.4 Performance:

Tapes shall conform to the requirements of Table I.

3.5 Workmanship:

The adhesive shall be a smooth, uniform coating covering the entire area of one side of the tape. Edges of the tape shall be straight, true and unbroken, to provide sharp, distinct boundaries to the finished (painted) areas.

TABLE I. Performance requirements.

Test	Applicable to types	Requirements	Test paragraph
Thickness (max)	I	0.0080 inch	4.6
	II	0.0080 inch	
	III	0.0050 inch	
Tensile breaking strength (dry) (min)	I	16.0 lb/in width	4.6
	II	16.0 lb/in width	
	III	8.0 lb/in width	
Elongation (dry) (min)	I	6%	4.6
	II	5%	
	III	10%	
Adhesion to steel initial (min)	I	30 oz/ in width	4.6
	II	35 oz/in width	
	III	25 oz/in width	
Adhesion after aging (min)	I	25 oz/in width	4.6.1
	II	30 oz/in width	
	III	20 oz/in width	
Edge seepage (per specimen)	I, II	No more than 10 seepage areas greater than 3/64 in. deep. No more than 2 seepage areas greater than 1/6 in. deep.	4.6.2
	III	No more than 5 seepage areas greater than 1/64 in. deep. No more than 1 seepage area greater than 1/16 in. deep.	

TABLE I. Performance requirements. (Continued)

Test	Applicable to types	Requirements	Test paragraph
Compatibility	I, II, III	No edge seepage, no penetration of finish through backing (bleeding), no tape color bleeding/staining of finish caused by adhesive or backing, color line sharp, no tearing of tape from edges, no delamination.	4.6.3
Removability	I, II, III	Tape removal to be a clean, simple operation, no tearing of tape from edges, no delamination	4.6.4
Adhesive Transfer	I, II, III	No adhesive transfer	4.6.5

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by 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 (4.4).

b. Quality conformance inspection (4.5).

4.3 Inspection conditions:

Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in the applicable test methods of paragraph 4.6.

4.4 First article inspection:

First article inspection shall include all examinations and tests of this specification. Unless otherwise specified, no tape shall be submitted for acceptance under any contract or order until the first article samples prescribed in 4.4.1 have been subjected to first article inspection and pronounced satisfactory by the acquiring activity (see 6.2). However, approval of the first article samples shall not relieve the supplier of his obligation to meet the quality conformance inspection (4.5).

4.4.1 First article test samples: Samples for first article inspection shall consist of five rolls of one inch wide tape which have been produced by the contractor using the same production process, procedures and equipment as will be used in fulfilling the contract. Samples shall be forwarded to the Commanding Officer, Naval Air Development Center, Attn: Code 60622, Warminster, PA 18974. Samples shall be plainly marked with the following information:

Tapes, Pressure Sensitive Adhesive,
Masking, Non-Staining for
Aircraft Painting Applications
Samples of material for first article inspection testing
Name of manufacturer (plant in which material is manufactured)
Manufacturer's designation
Date of manufacture
Submitted by (Name) (Date) for Contract No._____

The manufacturer shall submit a copy of test results with the samples showing conformance with the first article inspection requirements of this specification (see 6.4).

4.4.2 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.

4.4.3 First article samples and inspection for a subsequent contract: If a contractor has previously furnished the tape in accordance with the requirements of this specification and his product has been found satisfactory, the requirement for a first article sample and its submittal for any subsequent contract or order may be waived at the discretion of the acquiring activity.

4.5 Quality conformance inspection:

Quality conformance inspection shall consist of all of the requirements of this specification except adhesion after aging (4.6.1), removability (4.6.4) and compatibility testing (4.6.3).

4.5.1 Certification: The manufacturer shall certify that there has been no formulation or process change from that which resulted in the production of the first article inspection sample.

4.5.2 Lot size: Lot size shall be as specified for the applicable inspection (4.5.3).

4.5.3 Sampling and inspection procedures:

4.5.3.1 Visual: The lot size, sampling and inspection procedures for this inspection shall be as specified in the end item examination, paragraph 6.2 of ASTM D 3715. Sample unit shall be one roll of tape. The acceptable quality level (AQL) shall be 4.0 percent.

4.5.3.2 Performance testing: Lot size and sampling for performance testing shall be as specified in end item testing, paragraph 6.3 of ASTM D 3715. Each unit of product shall be tested to the applicable requirements of Table II. The AQL shall be 4.0 percent.

4.5.3.3 Packaging: Lot size, sampling, inspection procedures and AQL shall be in accordance with Section 5 and PPP-T-680.

4.6 End item testing:

End item testing shall be conducted as indicated in Table II.

4.6.1 Aging: The adhesion after aging test shall be accomplished by first aging rolls of tape in accordance with ASTM D 3611 and then testing for adhesion as indicated in Table II.

TABLE II. Test methods.

Property	Test method	Requirement paragraph	First article	Quality conformance
Adhesion to steel	ASTM D 3330	3.4	X	X
Adhesion after aging	ASTM D 3330 & D 3611	3.4	X	
Thickness	ASTM D 3652	3.4	X	X
Tensile & elongation	ASTM D 3759	3.4	X	X
Edge seepage	Para. 4.6.2	3.4	X	X
Compatibility	Para. 4.6.3	3.4	X	
Removability	Para. 4.6.4	3.4	X	
Adhesive transfer	Para. 4.6.5	3.4	X	X

NOTE: X indicates that the test is to be performed.

4.6.2 Edge seepage: Clean, as described in ASTM D 3330, a 6 inch x 12 inch double strength ground edge glass panel. Remove three outer laps of tape from the sample roll. From a freely rotating roll remove a strip of tape at least 14 inches long. Apply the strip to the glass panel along, and 1/2 inch from, the long edge of the panel. Cut off excess tape at each end. Add additional specimens from other sample rolls as above leaving at least 1/2 inch between specimens and from the other edge of the glass panel. Rub all edges of each specimen with firm thumb pressure. Place the panel on edge vertically, with the specimens running horizontally, in an area appropriate for paint spraying. Spray with black acrylic lacquer, Dupli-color Stock #DSGM-1 6956301, holding the nozzle of the spray can about 9 inches from the panel. Direct two wet coats of lacquer (one back-and-forth pass) toward the top edge of the top specimen on the panel. Start and finish each pass about 3 inches beyond the ends of the panel, moving the spray can along the specimen at a rate which applies a smooth coat. Repeat the above for each specimen on the panel. Turn the panel, vertically, end for end and spray toward the top edges of the specimens as described above. These top edges were the bottom edges originally. Air dry for five minutes and examine the adhesive side of the specimens through the glass to determine compliance with the requirements of Table I for edge seepage.

4.6.3 Compatibility:

4.6.3.1 Test panels: Test panels measuring 12x12x0.020 inches shall be cut from aluminum alloy sheets conforming to QQ-A-250/5 and deburred. Each panel shall then be treated as follows:

a. Abrade with abrasive mat (MIL-A-9962, Grade A) which has been soaked with deionized water by manually rubbing the mat back and forth parallel to the one dimension until the entire surface is water break free.

b. Immediately wipe the panel clean and completely dry with cotton cheesecloth (CCC-C-440, Class 1).

c. Within 4 hours, immerse the panel in the MIL-C-81706 conversion coating solution for three minutes, taking care that panels do not touch each other or the sides of the tank.

d. Rinse thoroughly with deionized water (temperature 75° ± 5°F) for one minute.

e. Allow panels to dry in an upright position.

Panels which require painting shall be prepared as follows: Prime each panel MIL-P-85582 epoxy primer to a dry film thickness of .0006 - .0009 inches and allow to cure for 2 hours. MIL-P-85582 shall be mixed and thinned in accordance with the manufacturer's recommendations. Spray each panel with one coat of white polyurethane paint conforming to MIL-C-83286. MIL-C-83286 paint shall be mixed and thinned as specified in MIL-C-83286. Air dry for 15 minutes and apply a second coat of white polyurethane paint to achieve a dry film thickness of .002 inches.

4.6.3.2 Air dry test:

4.6.3.2.1 Types I and III: Air dry panels, painted as specified in 4.6.3.1, for 24 hours at 70°F-80°F. A strip of tape shall be applied to the white finished surface in a radius of seven inches in the following manner: From one corner of the prepared panels measure up one side a distance of 7 inches. Draw an arc having a radius of 7 inches on the panel connecting the two marks. Draw an arc in pencil having a radius of 7 inches connecting the two marks. Apply the tape along the pencilled arc using firm finger pressure especially along the outer segment of the arc. The tape shall be trimmed flush with the edges of the panel insofar as the arc will permit. After application, allow to stand for a minimum of 3 hours. Continue the test with the test procedure specified in 4.6.3.3.

4.6.3.2.2 Type II: For Type II a strip of tape shall be centered in the lengthwise direction of the panels and rolled with the roller described in ASTM D 3330. All edges of tape shall be trimmed with the edges of the panel. Continue the test with the test procedure specified in 4.6.3.3.

4.6.3.3 Types I, II & III (final test phase): Tape and panels shall be overcoated with insignia blue, or other contrasting color of polyurethane paint conforming to MIL-C-83286 to a film thickness of 0.002 inch, using the painting procedure described in 4.6.3.1. The overcoat shall be applied within 3 hours after application of the tape strips as specified in 4.6.3.2.1 and 4.6.3.2.2. Air dry for a minimum of three hours. Remove tape specimens as follows: Begin removal at one corner. Lift up and away from edge selected for evaluation. Pull tape at an angle of 45 degrees from this edge. Remove tape specimen completely. Evaluate panel surface with compatibility requirements of Table I.

4.6.3.4 Extended air dry test: Prepare nine test panels as specified in 4.6.3.1. For each type of tape, follow all procedures and conduct all test specified in 4.6.3.2.1 through 4.6.3.3. Air dry panels for 24, 48 and 72 hours before removal of tapes. Evaluate each panel surface for compliance with compatibility requirements of Table I.

4.6.3.5 Heat Cure test: Prepare panels as specified in 4.6.3.1. Cure panels for 3 hours at 120°F. Cool to ambient temperature and apply the tape specimen as specified in 4.6.3.2.1 and 4.6.3.2.2, as applicable. Apply the final paint overcoat as specified in 4.6.3.3. The test panel shall then be exposed to a temperature of 120°F for three hours prior to the tape removal and evaluation described in 4.6.3.3. Evaluate panel surface for compliance with compatibility requirements of Table I.

4.6.3.5.1 Extended heat cure test: Prepare test panels as specified in 4.6.3.1, cure panels for 24 hours at 120°F and perform all procedures, tests and evaluations as specified in 4.6.3.5 except that the elevated temperature exposure, prior to tape removal, shall be 24 hours.