



AEROSPACE MATERIAL SPECIFICATION	AMS3529	REV. B
	Issued 1984-04 Revised 1993-01 Reaffirmed 1998-08 Stabilized 2015-05 Superseding AMS3529A	
Plastic Sheet and Film, Vinyl Copolymers Unplasticized		

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

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1. SCOPE:

1.1 Form:

This specification covers an unpigmented grade of vinyl plastic, unfilled and not containing plasticizer, in the form of sheet and film.

1.2 Application:

These products have been used typically as a backing material for sound-proofing blankets and thermal insulation in aircraft, but usage is not limited to such applications.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

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2.1 SAE Publications :

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2400	Plating, Cadmium
AMS 4037	Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn, (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated
AMS 4377	Magnesium Alloy Sheet and Plate, 3.0Al - 1.0Zn - 0.20Mn (AZ31B-H24) Cold Rolled, Partially Annealed
AMS 4507	Brass Sheet, Strip, and Plate, 70Cu - 30Zn, Half Hard (HO2)
AMS 5062	Steel, Low Carbon

2.2 ASTM Publications:

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

ASTM D 568	Rate of Burning and/or Extent and Time of Burning of Flexible Plastics in a Vertical Position
ASTM D 638	Tensile Properties of Plastics
ASTM D 638M	Tensile Properties of Plastics (Metric)
ASTM D 1004	Initial Tear Resistance of Plastic Film and Sheeting

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1	DOD Materiel, Procedures for Development and Application of Packaging Requirements
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3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be a flexible, unsupported plastic made from copolymers of vinyl chloride-vinyl acetate, vinyl chloride-propylene, or vinyl chloride-acetyl vinyl ether and shall not incorporate pigments, fillers, or plasticizers.

3.2 Color:

Shall be natural and translucent.

3.3 Properties:

The product shall conform to the requirements shown in Table 1, 3.3.8, 3.3.9, and 3.3.10; tests shall be performed on the product supplied and in accordance with specified test methods, insofar as practicable:

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Method
3.3.1	Tensile Strength at 23 °C ± 1 (73 °F ± 2), minimum	3000 psi (20.7 MPa)	ASTM D 638 or ASTM D 638M, Testing Speed B, Specimen I
3.3.2	Elongation at 23 °C ± 1 (73 °F ± 2), minimum	175%	ASTM D 638 or ASTM D 638M Testing Speed B, Specimen I
3.3.3	Tensile Strength Change, maximum after 7 days in dry circulating air at 70 °C ± 1 (158 °F ± 2)	10%	ASTM D 638 or ASTM D 638M Testing Speed B, Specimen I
3.3.4	Elongation Change, maximum after 7 days in dry circulating air at 70 °C ± 1 (158 °F ± 2)	10%	ASTM D 638 or ASTM D 638M Testing Speed B, Specimen I
3.3.5	Tear Resistance, weakest direction, minimum	0.55 pound mass (250 g)	ASTM D 1004
3.3.6	Flammability, time to cease burning, maximum	10 seconds	ASTM D 568
3.3.7	Creep Resistance, maximum	10%	4.5.1

3.3.8 Blocking Resistance: Specimens, prepared and tested in accordance with 4.5.2, shall not produce blocking requiring more than 5 grams per 0.18 ounces per inch (25 mm), of width to effect a minimum specimen separation rate of 2 inches (50 mm) per minute and there shall be no evidence of cracking in the area of the fold when the test is complete.

3.3.9 Low-Temperature Flexibility: The product, tested in accordance with 4.5.3, shall not crack.

3.3.10 Corrosion: The product, tested in accordance with 4.5.4, shall not cause corrosion of metal surfaces.

3.4 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, and free from foreign materials and from imperfections detrimental to usage of the product.

3.5 Tolerances:

The tolerances shown in Table 2 shall apply; measurements shall be made at 20 to 30 °C (68 to 86 °F):

TABLE 2A - Thickness, Inch/Pound Units

Nominal Thickness Inch	Tolerance, Inch Plus Only
0.0015	0.0004
0.0030	0.0004
0.0070	0.0004

TABLE 2B - Thickness, SI Units

Nominal Thickness Millimeter	Tolerance, Millimeter Plus Only
0.038	0.010
0.076	0.010
0.178	0.010

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

Tests for all technical requirements are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of the product to a purchaser, on each lot, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing:

Shall be as follows:

- 4.3.1 For Acceptance Tests: Sufficient product shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.
- 4.3.1.1 A lot shall be all product produced in a single production run from the same batches of raw materials under the same fixed conditions and presented for vendor's inspection at one time. An inspection lot shall not exceed 1000 pounds (454 kg).
- 4.3.1.2 When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1, and the report of 4.6 shall state that such plan was used.
- 4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

- 4.4.1 Sample product shall be approved by purchaser before product for production use is supplied, unless approval be waived by purchaser. Results of tests on production product shall be essentially equivalent to those of the approved sample.
- 4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product which are essentially the same as those used on the approved sample. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample product. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

Shall be as follows:

- 4.5.1 Creep Resistance: Prepare three specimens, nominally 1 x 6 inches (25 x 152 mm), from product randomly selected from the lot. Place two parallel gage marks 3.0 inches (76 mm) apart on the flat surface of each specimen. Place specimens in a fixture which uniformly clamps and suspends the test strips in a vertical position. Attach a weight at the bottom of each strip in a manner which applies uniform loading on the specimen. The weight shall be the equivalent of 1 gram for each 0.0001 inch (2.5 μm) of specimen thickness. Place in a circulating air oven for 168 hours \pm 0.5 at 70 $^{\circ}\text{C} \pm 1$ (158 $^{\circ}\text{F} \pm 2$). Without removing the specimens from the oven, measure the distance between the gage marks to the nearest 0.001 inch (25 μm), calculate, and report percent of creep.

- 4.5.2 **Blocking Resistance:** Cut three specimens, nominally 2 x 4 inches (51 x 102 mm), from product randomly selected from the lot. Fold the material 180 degrees across the 2-inch (51-mm) dimension to produce a 2 x 2 inch (51 x 51 mm) test specimen. Place the specimens between flat metal plates and apply a weight which will produce a uniform pressure of 1 psi (6.9 kPa). Place the specimens in a circulating air oven which has been preheated to $100\text{ }^{\circ}\text{C} \pm 2$ ($212\text{ }^{\circ}\text{F} \pm 4$). Hold at temperature for $168\text{ hours} \pm 1$. Remove the specimens from the oven, allow the fixture and specimens to return to room temperature, and hold for $4\text{ hours} \pm 0.25$. Carefully remove the weight and metal plates. Across the width, uniformly hold one of the edges opposite the fold in the specimen and attach a 0.63 ounce (10 g) weight to the other edge, being careful not to separate the faying surfaces beyond the point necessary to mount the specimen in the fixture and to attach the weight. The specimen shall be held in a position which, when the weight is released, will tend to separate the surfaces. Measure the time required for separation when the weight is released.
- 4.5.3 **Low-Temperature Resistance:** Cut three specimens, nominally 1 x 6 inches (25 x 152 mm), from product randomly selected from the lot. Place the specimens and a 0.125 inch (3.18 mm) metal rod in a chamber which has been cooled to $-55\text{ }^{\circ}\text{C} \pm 1$ ($-67\text{ }^{\circ}\text{F} \pm 2$) and hold at $-55\text{ }^{\circ}\text{C} \pm 1$ ($-67\text{ }^{\circ}\text{F} \pm 2$) for $72\text{ hours} \pm 0.5$. After conditioning, while the mandrel and specimens are at temperature, bend each specimen 180 degrees around the mandrel, taking precaution to prevent warming of specimens and mandrel. Observe the area of the bend for cracking or splitting.
- 4.5.4 **Corrosion:**
- 4.5.4.1 **Preparation of Specimen:** Metal specimens (two each), nominally 0.125 inch (3.18 mm) thick by 2 inches (51 mm) square, shall be square cut from the following metals: AMS 4377 magnesium alloy, AMS 4037 aluminum alloy, AMS 4507 brass, and AMS 5062 low-carbon steel. Remove the burrs from all cut edges. Using 240 grit (60 μm) silicon carbide paper, remove all imperfections from the plane surfaces of the specimens and produce a uniformly abraded surface. Cadmium plate the low-carbon steel specimens in accordance with AMS 2400. Clean the surfaces of the specimens by swabbing with 1,1,1-trichloroethane followed by immersion in boiling methanol. After cleaning, handling of the metal plates shall be carried out using filter paper or metal tongs. Allow the specimens to cool and store in desiccator until used.
- 4.5.4.2 **Test Procedure:** Prepare eight 1/2 x 2 inch (12.7 x 51 mm) strips of randomly selected product cleaned with surgical gauze and methanol. After drying, place two test strips between the surfaces of each pair of like metal plates. Spring load the plates to 20 to 30 pounds (9 to 14 kg). Place the specimens in a humidity chamber maintained at $38\text{ }^{\circ}\text{C} \pm 1$ ($100\text{ }^{\circ}\text{F} \pm 2$) and $95\% \pm 2$ relative humidity for $14\text{ days} \pm 1\text{ hour}$. Remove the test fixtures from the chamber, disassemble the metal plates and vinyl film strips, and examine the metal surfaces for corrosion using the unaided eye, corrected to 20/20 acuity.

4.6 Reports:

The vendor of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3529B, vendor's product number, and quantity.

4.7 Resampling and Retesting:

If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging:

Shall be accomplished to ensure that the product, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to weather or any other normal hazard.

5.1.1 A lot may be packaged in small quantities and delivered under the basic lot approval provided lot identification is maintained.

5.1.2 Film shall be wound on cores meeting the following requirements:

5.1.2.1 Cores: Shall have sufficient strength to prevent collapsing during handling and shall have either a 3 inch (76 mm) or 6 inch (152 mm) ID, as ordered.

5.1.2.2 Rolls: The OD of the split roll and core shall be as shown in Table 3.

TABLE 3 - Core ID and Roll OD

Core ID Inches	Core ID Millimeters	OD of Roll Inches	OD of Roll Millimeters
3	76	9-1/2 ± 1/4	241 ± 6
6	152	11 ± 1/4	279 ± 6
6	152	14 ± 1/4	356 ± 6