Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 3608A
Superseding AMS 3608

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PLASTIC SHEET
Methyl Methacrylate, General Purpose

1. SCOPE:

1.1 Form: This specification covers one grade of cast methyl methacrylate plastic in the form of sheet.

1.2 Application: Primarily for fabricated parts, formed or otherwise, requiring dimensional stability, optical clarity, and excellent outdoor weatherability.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc. 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D256 - Impact Resistance of Plastics and Electrical Insulating Materials
ASTM D542 - Index of Refraction of Transparent Organic Plastics
ASTM D570 - Water Absorption of Plastics
ASTM D635 - Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D637 - Surface Irregularities of Flat Transparent Plastic Sheets
ASTM D638 - Tensile Properties of Plastics
ASTM D648 - Deflection Temperature of Plastics Under Flexural Load
ASTM D792 - Specific Gravity and Density of Plastics by Displacement
ASTM D1003 - Haze and Luminous Transmittance of Transparent Plastics
ASTM E308 - Spectrophotometry and Description of Color in CIE 1931 System

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be made from pure methacrylate monomers.

3.2 Color and Condition: Colorless and transparent with a highly polished surface finish, unless otherwise specified, except that, when so ordered, sheet shall be transparent, translucent, or opaque, in the color specified.

3.3 Properties: The product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with specified ASTM methods:

3.3.1	Index of Refraction: (Applicable only to clear sheet) $n\frac{23°C}{D}$ ($n\frac{73.4°F}{D}$)	1.48 to 1.50	ASTM D542
3.3.2	Specific Gravity, 23°/23°C (73°/73°F)	1.18 to 1.20	ASTM D792, Method A
3.3.3	Haze, max (Applicable only to clear sheet 1/2 in. (13 mm) and under in nominal thickness)	3.0%	ASTM D1003, Procedure A
3.3.4	Water Absorption (gain) at 23°C (73°F), max (specimens 1/8 in. (3.2 mm) in nominal thickness)	0.65%	ASTM D570
3.3.5	Luminous Transmittance, min (Applicable to transparent, colorless sheet only)		ASTM E308

Nominal Thickness		
Inches	(Millimetres)	
Up to 0.187, incl	Up to 4.75, incl	91%
Over 0.187 to 1.000, incl	Over 4.75 to 25.40, incl	89%
Over 1.000 to 2.000, incl	Over 25.40 to 50.80, incl	87%

3.3.6	Displacement Factor (Optical), max (Applicable to flat sheets only)		ASTM D637 (*Measurement made at least 3 in. (76.2 mm) from the edge of sheet)

Nominal Thickness		
Inches	(Millimetres)	
0.060 to 0.250, incl	(1.52 to 6.35, incl)	50
Over 0.250 to 0.500, incl	(Over 6.35 to 12.70, incl)	50*
Over 0.500 to 1.000, incl	(Over 12.70 to 25.40, incl)	80*
Over 1.000 to 2.000, incl	(Over 25.40 to 50.80, incl)	125*

3.3.7	Heat Distortion Temperature, min (264 psi (1.82 MPa) fiber stress)		ASTM D648 (Heating Rate 2°C (3.6°F) per min)

Nominal Thickness		
Inch	(Millimetres)	
Up to 0.06, incl	(Up to 1.5, incl)	61.5°C (143°F)
1.0	(25.4)	70°C (158°F)
2.0 and over	(25.4 and over)	71.5°C (161°F)

(For intermediate thicknesses, use linear interpolation)

3.3.8	Tensile Strength, min	6800 psi (46.9 MPa)	ASTM D638
3.3.9	Elongation, min	2%	ASTM D638
3.3.10	Impact Resistance, per unit of notch, min	0.3 ft-lb per in. (16J/m)	ASTM D256, Method C

3.3.11	Flammability, max (See 8.2)	2.4 in. per min. (1.02 mm/s)	ASTM D635; Use specimens 1/8 in. (3.2 mm) in nominal thickness
3.3.12	Shrinkage, max	1.0%	4.5.1

3.3.13 Weathering: When specified, sheet shall have weather resistance acceptable to the purchaser, determined by a procedure agreed upon by purchaser and vendor.

3.3.14 Corrosion: Sheet shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service. Discoloration of metal shall not be considered objectionable.

3.4 Quality: Sheet shall be uniform in quality and condition, clean, smooth, and free from foreign materials and from internal and external imperfections detrimental to fabrication, appearance, or performance of parts.

3.5 Tolerances: Unless otherwise specified, thickness tolerances shall be as specified in Table I.

TABLE I

Nominal Thickness Inches	Tolerance, Inch Plus and Minus, Except as Indicated		
	Size 1	Size 2 (See 3.5.1)	Size 3
Up to 0.060, incl	+0.020 -0.012	--	--
Over 0.060 to 0.080, incl	-0.018 -0.012	0.030	--
Over 0.080 to 0.100, incl	0.012	0.030	--
Over 0.100 to 0.125, incl	0.015	0.030	0.050
Over 0.125 to 0.150, incl	0.017	0.030	0.050
Over 0.150 to 0.187, incl	0.020	0.030	0.050
Over 0.187 to 0.220, incl	0.025	0.030	0.050
Over 0.220 to 0.250, incl	0.030	0.035	0.050
Over 0.250 to 0.312, incl	0.035	0.040	0.060
Over 0.312 to 0.375, incl	0.045	0.045	0.070
Over 0.375 to 0.500, incl	0.060	0.060	0.080
Over 0.500 to 0.625, incl	0.065	0.065	0.085
Over 0.625 to 0.750, incl	0.070	0.070	0.090
Over 0.750 to 0.875, incl	0.075	0.075	0.095
Over 0.875 to 1.000, incl	0.080	0.080	0.100
Over 1.000 to 1.250, incl	0.100	--	--
Over 1.250 to 1.500, incl	0.120	--	--
Over 1.500 to 1.750, incl	0.140	--	--
Over 1.750 (See 3.5.2)	0.160	--	--

TABLE I (SI)

Nominal Thickness Millimetres	Tolerance, Millimetres Plus and Minus, Except as Indicated		
	Size 1	Size 2	Size 3
Up to 1.52, incl	+0.51 -0.30	--	--
Over 1.52 to 2.03, incl	+0.46 -0.30	0.76	--
Over 2.03 to 2.54, incl	0.30	0.76	
Over 2.54 to 3.18, incl	0.38	0.76	1.27
Over 3.18 to 3.81, incl	0.43	0.76	1.27
Over 3.81 to 4.75, incl	0.51	0.76	1.27
Over 4.75 to 5.59, incl	0.64	0.76	1.27
Over 5.59 to 6.35, incl	0.76	0.88	1.27
Over 6.35 to 7.92, incl	0.88	1.02	1.52
Over 7.92 to 9.23, incl	1.14	1.14	1.78
Over 9.23 to 12.70, incl	1.27	1.29	2.03
Over 12.70 to 15.88, incl	1.65	1.65	2.16
Over 15.88 to 19.05, incl	1.78	1.78	2.29
Over 19.05 to 22.22, incl	1.91	1.91	2.42
Over 22.22 to 25.40, incl	2.03	2.03	2.54
Over 25.40 to 31.75, incl	2.54	--	--
Over 31.75 to 38.10, incl	3.04	--	--
Over 38.10 to 44.45, incl	3.56	--	--
Over 44.45 (See 3.5.2)	4.06	--	--

3.5.1 Sizes 1, 2 and 3 are as follows:

Size 1: Up to and including 36 x 60 in. (910 x 1524 mm) and 40 x 50 in. (1016 x 1270 mm).
Size 2: Larger than size 1 up to and including 53 x 60 in. (1346 x 1524 mm) and 60 x 72 in. (1524 x 1829 mm).
Size 3: Larger than size 2 up to and including 67 x 102 in. (1702 x 2591 mm) and 72 x 72 in. (1829 x 1829 mm).

3.5.2 Sheet 2.000 in. (50.80 mm) and over in nominal thickness is available in 0.250 in. (6.35 mm) increments to a maximum thickness of 4.000 in. (101.60 mm) (unfinished grade) with a tolerance of ± 0.080 in. per in. (±0.080 mm/mm) of nominal thickness.

4. QUALITY ASSURANCE PROVISION

4.1 Responsibility for Inspection: The vendor of sheet shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as ø required by 4.6. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the sheet conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for specific gravity (3.3.2), ø water absorption (3.3.4), heat distortion temperature (3.3.7) and impact resistance (3.3.10) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed on the initial shipment ø of sheet to a purchaser, when a change in material or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

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

4.3 Sampling: 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 tests 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 sheet of the same nominal thickness produced from the same batch of raw material in a single production run under the same fixed conditions and presented for vendor's inspection at one time but shall not exceed 1500 sq ft (140 m^2).

4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) have 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 4.6.1 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 sheet shall be approved by purchaser before sheet for production use is supplied, unless such ø approval be waived. Results of tests on production sheet shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production sheet which are essentially the same as those used on the approved sample sheet. If any ø change is necessary in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in material and processing and, when requested, sample sheet. Production sheet made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

4.5.1 Shrinkage: Using a 12 x 18 in. (300 x 450 mm) test specimen, at one end mark off a 12 x 12 in. (300 x 300 mm) test area and use the remainder of the specimen for supporting attachments during the heating period. Scribe two fine lines at right angles to each other entirely across the test area from the midpoints of opposite sides. Across each of these lines, scribe fine gage marks 2 in. (50 mm) in from the edges of the test area. Measure and average the distances between these pairs of gage marks to the nearest 0.01 in. (0.3 mm). Suspend the specimen from the support end in a circulating-air oven and heat for 30 min. ± 1 at 125°C ± 1 (257°F ± 2). For nominal thicknesses over 0.250 in. (6.35 mm), extend the time in proportion to 1.3 times the direct ratio of the thickness to 0.250 in. (6.35 mm). Remove the specimen from the oven and allow to cool to room temperature while still suspended. Remeasure the distance between the pairs of gage marks and average the results. Calculate the shrinkage as the percentage change in distance between gage marks based upon the original distance.