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AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 3580C

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Superseding AMS 3580B

CAST RODS, TUBES, AND SHAPES, METHYL METHACRYLATE PLASTIC

1. SCOPE:

1.1 Form:

This specification covers one grade of methyl methacrylate plastic in the form of cast rods, tubes, and shapes.

1.2 Application:

These products have been used typically for fabricated parts, formed or otherwise, requiring dimensional stability, optical clarity, good electrical properties, and excellent outdoor weatherability, 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 applicable issue of referenced publications shall be the issue in effect on the date of the purchase order.

2.1 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 256 Impact Resistance of Plastics and Electrical Insulating Materials
ASTM D 542 Index of Refraction of Transparent Organic Plastics

Printed in U.S.A.
91-0942/ EG

2.1 ASTM Publications (Continued):

ASTM D 570 Water Absorption of Plastics
ASTM D 635 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D 638 Tensile Properties of Plastics
ASTM D 638M Tensile Properties of Plastics (Metric)
ASTM D 648 Deflection Temperature of Plastics Under Flexural Load
ASTM D 792 Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 1003 Haze and Luminous Transmittance of Transparent Plastics
ASTM E 308 Computing the Colors of Objects by Using the CIE System

2.2 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

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be made from pure methyl methacrylate monomers.

3.2 Color and Condition:

Castings shall be colorless and transparent except that, when so ordered, castings shall be transparent, translucent, or opaque and in the color specified. Castings shall have a highly polished surface finish.

3.3 Properties:

Castings shall conform to the requirements shown in Table 1, 3.3.11, and 3.3.12; tests shall be performed on the castings supplied and in accordance with specified ASTM methods, insofar as practicable.

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Method
3.3.1	Index of Refraction (Applicable to transparent castings only) n 23 °C D (n 73.4 °F) D	1.48 to 1.50	ASTM D 542
3.3.2	Specific Gravity at 23/23 °C (73/73 °F)	1.18 to 1.20	ASTM D 792, Method A
3.3.3	Haze, maximum (Applicable only to transparent sections 1/2 inch (12.7 mm) thick and under)	3.0%	ASTM D 1003, Procedure A
3.3.4	Water Absorption (gain) at 23 °C ± 1 (73 °F ± 2), maximum	0.65%	ASTM D 570
3.3.5	Luminous Transmittance, minimum Nominal Thickness 0.250 inch (6.35 mm) and under	90%	ASTM E 308
3.3.6 (R)	Heat Distortion Temperature at 264 psi (1.82 MPa) fiber stress, minimum Nominal Thickness 0.250 inch (6.35 mm)	93 °C (200 °F)	ASTM D 648; Heating rate, 2 °C (4 °F) per minute
3.3.7 (R)	Tensile Strength, minimum	8000 psi (55 MPa)	ASTM D 638 or ASTM D 638M
3.3.8	Elongation, minimum	2%	ASTM D 638 or ASTM D 638M
3.3.9	Impact Resistance, per unit of notch, minimum	0.3 foot pound per inch (16 J/m)	ASTM D 256, Method C
3.3.10	Flammability, burning rate, maximum (See 8.2)	2.4 inches per minute (1.00 mm/s)	ASTM D 635 Use specimen 1/8 inch (3.2 mm) in nominal thickness

3.3.11 Corrosion: Castings shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service, determined by a procedure agreed upon by purchaser and vendor. Discoloration of metal shall not be considered objectionable.

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

3.4 Quality:

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

3.5 Tolerances:

Shall be as follows:

3.5.1 Rods: See Table 2.

TABLE 2 - Tolerances for Rods

Nominal Diameter Inches	Nominal Diameter Millimeters	Tolerance plus and minus Inch	Tolerance plus and minus Millimeter
0.375 to 0.625, incl	9.52 to 15.88, incl	0.005	0.13
Over 0.625 to 1.250, incl	Over 15.88 to 31.75, incl	0.010	0.25
Over 1.250 to 2.000, incl	Over 31.75 to 50.80, incl	0.015	0.38
Over 2.000 to 3.000, incl	Over 50.80 to 76.20, incl	0.030	0.76

3.5.1.1 Rods 0.375 to 0.625 inch (9.52 to 15.88 mm) in nominal diameter are machined and may have a frosted finish.

3.5.2 Tubes:

3.5.2.1 Outside Diameter: See Table 3.

TABLE 3A - Tolerances for Outside Diameter, Inch/Pound Units

Nominal OD Inches	Tolerance plus Inch	Tolerance minus Inch	Ovality, max (See 3.5.2.1.1) Inch
1.500 to 3.000, incl	0.010	0.020	0.025
Over 3.000 to 3.750, incl	0.015	0.030	0.040
Over 3.750 to 6.094, incl	0.015	0.045	0.060
Over 6.094 to 12.060, incl	0.015	0.065	0.080

TABLE 3B - Tolerances for Outside Diameter, SI Units

Nominal OD Millimeters	Tolerance plus Millimeter	Tolerance minus Millimeters	Ovality, max (See 3.5.2.1.1) Millimeters
38.10 to 76.20, incl	0.25	0.51	0.64
Over 76.20 to 95.25, incl	0.38	0.76	1.02
Over 95.25 to 154.79, incl	0.38	1.14	1.52
Over 154.79 to 306.32, incl	0.38	1.65	2.03

3.5.2.1.1 Ovality shall be the difference between the minor and major diameter measurements taken at the same transverse plane on the tube.

3.5.2.2 Wall Thickness: See Table 4.

TABLE 4 - Tolerances for Wall Thickness

Nominal Thickness Inch	Nominal Thickness Millimeters	Tolerance plus and minus Inch	Tolerance plus and minus Millimeters
Up to 0.125, incl	Up to 3.18, incl	0.015	0.38
Over 0.125 to 0.187, incl	Over 3.18 to 4.75, incl	0.019	0.48
Over 0.187 to 0.250, incl	Over 4.75 to 6.35, incl	0.025	0.64
Over 0.250 to 0.375, incl	Over 6.35 to 9.52, incl	0.035	0.89
Over 0.375 to 0.500, incl	Over 9.52 to 12.70, incl	0.045	1.14

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of castings 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 castings conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 (R) Acceptance Tests: Tests for specific gravity (3.3.2), water absorption (3.3.4), heat distortion temperature (3.3.6), impact resistance (3.3.9), and weathering (3.3.12) when specified are acceptance tests and shall be performed on each lot.

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

4.2.2.1 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 in accordance with the following; a lot shall be all castings produced in a single production run from the same batch of raw materials under the same fixed conditions and presented for vendor's inspection at one time. An inspection lot shall not exceed 200 pounds (91 kg) of castings.

4.3.1 For Acceptance Tests: Sufficient castings shall be selected 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 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 4.5 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 castings shall be approved by purchaser before castings for production use are supplied, unless such approval be waived by purchaser. Results of tests on production castings 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 castings which are essentially the same as those used on the approved sample castings. 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 castings. Production castings made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports:

The vendor of castings shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the castings conform to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3580C, vendor's compound number, form and size or part number, and quantity.

4.6 Resampling and Retesting:

If any specimen used in the above tests fails to meet the specified requirements, disposition of the castings 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 castings represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 Each rod and tube shall be legibly marked, near the outside on one end, with the manufacturer's identification and AMS 3580C. Shapes shall be legibly marked with the same information in an inconspicuous area. The method of marking is optional but shall have no deleterious effect on the castings or their performance. The characters shall be sufficiently stable to withstand normal handling.