

**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: Primarily for fabricated parts, formed or otherwise, requiring dimensional stability, optical clarity, good electrical properties, and excellent outdoor weatherability.

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

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

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2.1 (Continued):

- 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 19111-5094.2.2.1 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 methyl methacrylate monomers.

3.2 Color and Condition: Castings shall be colorless and transparent except that, when so stipulated, 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 following requirements; tests shall be performed on the castings supplied and in accordance with specified ASTM methods, insofar as practicable.

3.3.1	Index of Refraction (Applicable to clear castings only)	$n_{23^{\circ}\text{C}}$ D	$(n_{73.4^{\circ}\text{F}})$ 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 clear 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	Heat Distortion Temperature at 264 psi (1.82 MPa) fiber stress, minimum Nominal Thickness 0.250 inch (6.35 mm)			64°C (147°F)	ASTM D 648; Heating rate, 2°C (4°F) per minute

- 3.3.7 Tensile Strength, minimum 6800 psi (47 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 D256, 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:

TABLE I

Nominal Diameter (See 3.5.1.1)		Tolerance, plus and minus	
Inches	Millimeters	Inch	Millimeters
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:

TABLE II

Nominal OD Inches	OD Tolerance, Inch		Ovality, max (See 3.5.2.1.1) Inch
	plus	minus	
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 II (SI)

Nominal OD Millimeters	OD Tolerance, Millimeters		Ovality, max (See 3.5.2.1.1) Millimeters
	plus	minus	
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:

TABLE III

Nominal Wall Thickness		Tolerance, plus and minus	
Inch	Millimeters	Inch	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 Acceptance Tests: Tests for specific gravity (3.3.2), water absorption (3.3.4), heat distortion temperature (3.3.6), and impact resistance (3.3.9) 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
Ø 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 but may be packaged in smaller quantities and delivered under the basic lot approval provided lot identification is maintained.
- 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
Ø 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 3580B, vendor's compound number, form and size or part number, and quantity.