



AEROSPACE MATERIAL SPECIFICATION

AMS3811™**REV. C**

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Superseding AMS3811B

Rods, Aramid Fiber, Polyester Resin Coated
Pultrusion

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 coated round rods fabricated by the pultrusion process from aramid fibers and a weather-resistant polyester resin binder in the form of straight lengths or in coils.

1.2 Application:

These rods have been used typically for nonconductive tension elements in antenna supports where superior long-term weather resistance and extremely light weight are required, 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.

2.1 SAE Publications:

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

AMS 3901/4 Yarn, Organic Fiber, (Para-Aramid), High Modulus, OY 390,000 (2690) Tensile Strength, 16,500,000 (115) Tensile Modulus, 1420 Denier, 0.6% Finish

2.2 ASTM Publications:

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

ASTM D 149	Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D 638	Tensile Properties of Plastics
ASTM D 638M	Tensile Properties of Plastics (Metric)
ASTM D 695	Compressive Properties of Rigid Plastics
ASTM D 695M	Compressive Properties of Rigid Plastics (Metric)
ASTM D 785	Rockwell Hardness of Plastics and Electrical Insulating Materials
ASTM D 790	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 790M	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials (Metric)
ASTM D 792	Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 2289	Tensile Properties of Plastics at High Speeds (Discontinued 1992)
ASTM D 2344	Apparent Interlaminar Shear Strength of Parallel Fiber Composites by Short Beam Method
ASTM D 2990	Tensile, Compressive, and Flexural Creep and Creep Rupture of Plastics

2.3 U.S. Government Publications:

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

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-2073-1	DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material:

Shall be rods of circular cross section, fabricated by the pultrusion process from the necessary number of unidirectional, continuous, aramid rovings and a high-quality, weather-resistant, thermosetting polyester resin binder. The rods shall be coated for enhanced weatherability and resistance to handling damage.

- 3.1.1 Roving: Each roving shall have a denier of not less than 14,200, formed by gathering continuous-filament, aramid-fiber yarns together into approximately a parallel arrangement without twist. The yarns shall conform to AMS 3901/4 and shall be free of splices.
- 3.1.2 Resin Binder: Shall be a high-quality, weather-resistant, thermosetting polyester resin, cross-linked with styrene. The resin formulation may contain a catalyst, a die lubricant, and additives for enhanced weather resistance, flame retardance, and anti-tracking qualities, but it shall not contain a wetting agent or a coupling agent, and shall be free of grease, oil, dirt, and other foreign matter.

3.1.3 Coating: Shall be primarily organic, but may contain inorganic ingredients. Coating shall be applied uniformly over the cylindrical surfaces of the rods to a thickness of 0.010 inch $\pm$ 0.005 (0.25 mm $\pm$ 0.13).

3.1.3.1 The surfaces of coated rods shall be smooth, nonporous, and free of cracks. The coating shall not contain scratches, gouges, or other handling damage. Scuff marks and occasional blisters not exceeding one in any 5 feet (1.5 m), pits, and other manufacturing imperfections will be acceptable provided that they neither penetrate to the substrate nor protrude above the surface by more than 3% of the finished rod diameter.

3.1.3.2 The coating shall be flexible and adherent to the substrate, determined in accordance with 4.5.1 and 4.5.2.

3.2 Fabrication:

3.2.1 Roving Preparation: The roving shall be dried for not less than eight hours at 250 °F $\pm$ 10 (121 °C $\pm$ 6), immediately prior to impregnation, and shall be maintained in the dry condition by passing through a suitable heating chamber until immersed in the resin trough.

3.2.2 Pultrusion: Pultrusion of the rods shall be performed in accordance with best practices of the pultrusion industry.

3.2.3 Coiling: Coiling of rods shall not be attempted until the rods have cooled to below 100 °F (38 °C). Coiling shall be accomplished with care to ensure that no portion of the rod is bent, even momentarily, to a radius of curvature less than one-half the coil diameter. The coil diameter shall be not less than 300 times the rod diameter, unless rods have passed the coiled storage test in accordance with 4.5.12 utilizing a smaller coil diameter.

3.2.3.1 Rods furnished in straight lengths shall not be cut from coils.

3.2.4 Post Curing: When specified by purchaser, straight rods not exceeding 10 feet (3 m) in length shall be post-cured for not less than 15 hours at 275 °F $\pm$ 10 (135 °C $\pm$ 6). The rods shall be fully supported during post curing to avoid warping.

3.3 Properties:

Rods shall conform to requirements shown in Table 1; tests shall be performed on the rods supplied and in accordance with specified test methods, insofar as practicable.