

AEROSPACE MATERIAL SPECIFICATION



AMS-C-83445A

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Coating System, Polyurethane, Nonyellowing, White, Rain Erosion Resistant, Thermally Reflective

1. SCOPE:

1.1 Form:

This specification covers the requirements for one type of thermally reflective non-yellowing white rain erosion resistant polyurethane coating system.

1.2 Application:

These products have been used typically for protecting glass fabric reinforced plastic laminates and other plastic parts used for exterior surfaces of aircraft and missiles, but usage is not limited to such applications. (See 8.1)

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 issue of the following documents in effect on the date of the purchase order form a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

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Documents
Document Sharing Hub

2.1 SAE Publications:

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

AS5505	Requirements for Accreditation of Testing Laboratories for Organic Coatings
AS9100	Quality Systems - Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing
PD2000	Procedures for an Industry Qualified Product Management Process

2.2 ASTM Publications:

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

ASTM D 471	Rubber Property - Effect of Liquids
ASTM D 4420	Aromatics in Finished Gasoline by Gas Chromatography

2.3 U.S. Government Publications:

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

MIL-PRF-5425	Plastic Sheet, Acrylic, Heat Resistant
MIL-R-7705	Radome, General Specification for (Canceled, no superseding document)
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-PRF-25134	Remover, Paint and Lacquer, Solvent Type
MIL-P-25421	Plastic Materials, Glass Fiber Based-Epoxy Resin Low Pressure Laminated

Federal Test Method Std. 141	Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling and Testing
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3. REQUIREMENTS:

3.1 Qualification:

- 3.1.1 All products sold to this specification shall be listed, or approved for listing on the qualified products list. PRI QPL AMS-C-83445. To qualify, the product shall meet the tests specified in section 4.4.
- 3.1.2 Qualification testing, review of test results, approval, reapproval and recertification of qualification for QPL listing shall be in accordance with PD2000.

3.1.3 Recertification of qualification is required every five years. Recertification consists of a letter certifying that there have been no changes in the material ingredients, manufacturing processes, or site of production since qualification and that the product meets all of the requirements of this specification. In addition a test report shall be provided from a lab of the manufacturer's choosing, showing compliance with all of the qualification tests.

3.2 Materials:

3.2.1 The coating materials shall be either an aliphatic or cycloaliphatic isocyanate polyurethane prepolymer and shall be a chemically curing composition of such ingredients to produce high quality non-yellowing rain erosion resistant coatings. The mix ratio of components, if applicable, shall be as specified by the manufacturer.

3.2.2 The materials shall have no adverse effect on the health of personnel when used for their intended purposes with adequate environmental controls and safety equipment. Questions pertinent to this effect shall be referred by the procuring activity to the appropriate department medical service who will act as an advisor to the procuring agency.

3.3 Components:

Unless otherwise specified, the coating system shall consist of the following: primer plus activator; non-yellowing aliphatic or cycloaliphatic isocyanate polyurethane prepolymer solution, which may be moisture curable and accelerated by a catalyst, or may be reacted with a curing agent; and a diluent solvent to be used in the application of the coating. Coatings shall be applied by brush or spray techniques.

3.4 Quantitative Requirements:

The quantitative requirements of the coatings shall be as specified in Table 1.

TABLE 1 - Quantative Requirements

Material	Nonvolatile Solids Content, Percent by Weight, min	Density, kg/l (lb/gal), min	Viscosity, Centipoises	Flash Point °C (°F), min
Primer (Mixed components, if applicable)	10.0	0.839 (7.0)	50 to 250	21 (70)
Aliphatic and cycloaliphatic polyurethane prepolymer	45	0.959 (8.0)	100 to 800	10 (50)

3.4.1 Free Aliphatic Isocyanates: The free aliphatic isocyanate content of either the mixed components or single component moisture cure coating systems shall be not greater than 1%. When the prepolymer contains an aliphatic isocyanate, the free isocyanate content shall be determined by a test method approved by the issuing activity.

3.4.2 Free Cycloaliphatic Isocyanate: The free cycloaliphatic isocyanate content of either the mixed components or single component moisture cure coating systems shall not be greater than 1%. When the prepolymer contains cycloaliphatic methylene bis (4-cyclohexylene isocyanate), the free isocyanate content shall be determined in accordance with Appendix. When the prepolymer is based on any cycloaliphatic isocyanate other than methylene bis (4-cyclohexylene isocyanate), the issuing activity shall be consulted for appropriate analytical procedures for determination of free isocyanate.

3.5 Component Requirements:

3.5.1 Mixing: Components shall be individually mixed in accordance with the manufacturer's instructions. The resulting individual mixtures shall be smooth, homogeneous materials free from lumps, gelling, seeding, separation or other objectionable characteristics.

3.5.2 Odor: The odor of the wet coatings shall not be obnoxious when tested as specified in 4.9.

3.5.3 Color: Base coatings and/or topcoatings shall be pigmented white. The color shall be sufficiently intense to completely hide the surface and provide the thermal reflectance properties specified herein.

- 3.5.4 Accelerated Storage Stability: Coating shall be subjected to 4 days of accelerated storage in accordance with 4.9.6. At the end of the 4-day storage period the component materials shall be free of lumps, skins and gels, and shall disperse readily to a smooth homogeneous mixture.
- 3.5.5 Storage Stability: The previously unopened packaged components, including the primer and primer accelerator, shall meet all the requirements specified herein after a storage period of one year, provided that the daily mean temperature of the ambient conditions at the storage locations falls within the range of 70 to 100 °F (21 to 38 °C) (see 4.9.7).
- 3.5.6 Pot Life: Base coating and topcoating solutions shall have a minimum pot life of 4 hours after catalyzation. At the end of the 4-hour period, the coatings shall show no signs of lumping, seeding, separation, or an increase in viscosity of more than 20% from the initial viscosity when tested in accordance with 4.9.8 and Table 1.
- 3.5.7 Application and Drying Time: The coatings shall be applied in accordance with the manufacturer's instructions to a total dry film thickness of 0.31 to 0.36 mm (0.012 to 0.014 inch) (12 to 14 mils). The total application time, including intervals between coatings shall not exceed 8 hours and the tack free drying time shall not exceed 10 hours after final application of the coatings when tested in accordance with 4.9.9.
- 3.5.7.1 Rate-of-Cure: The coatings shall have a maximum set-to-touch or recoat time of one hour. The manufacturer shall furnish instructions for catalyzing or accelerating the polyurethane base materials for a temperature range from 65 to 95 °F (18 to 35 °C) and a relative humidity range from 40 to 75%.
- 3.5.8 Peel Strength: Coatings shall have a peel strength of not less than 1050 N/m (6 pounds per inch) when tested in accordance with 4.9.10.
- 3.5.9 Flexibility: A film of the coating shall show no cracking or loss of adhesion in the bend area when tested in accordance with 4.9.13.
- 3.5.10 Fluid Immersion Resistance: When tested as specified in 4.9.11 and 4.9.12, panels prepared in accordance with 4.6 and coated in accordance with 4.7.1 and exposed to fluids as specified below shall show no pigment leaching, loss of adhesion, blistering or discoloration. Panels shall be inspected immediately upon removal from the test fluid for any observable defects. The exposed panels shall then be cleaned and all specified tests performed within an hour after removal from the test fluids. Cleaning of the panels shall be by wiping with lint free paper toweling or with lint free cloth.
- a. Distilled Water Resistance: Distilled water at ambient conditions (24 °C ± 1) for 24 hours.
- b. Hydrocarbon Resistance: ASTM D 471 Ref. Fuel B for 1 hour at standard conditions.
- 3.5.11 Rain Erosion Resistance: Coatings shall have a minimum average erosion resistance of 100 minutes when tested as specified in 4.9.14.

- 3.5.12 Electrical Transmission: Coatings shall have a minimum electrical transmission of 90 or 95%, when tested as specified in 4.9.16.
- 3.5.13 Thermal Reflectivity: The coating shall be exposed to a total fluence of 60 at flux rate of 30 cal/cm²-sec without burning or charring when tested in accordance with 4.9.20. Discoloration is permitted.
- 3.5.14 Weather Resistance: Coatings, when exposed to outdoor weathering for 6 months, shall show no film deterioration such as checking, chalking, cracking, embrittlement, loss of adhesion or loss of resiliency. After weathering, the coatings shall meet the erosion resistance requirements as specified in Table 2.

TABLE 2 - Rain Erosion Resistance and Electrical Transmission Requirements

Property	After Drying and Normal 5 Day Cure	After Normal Cure and Aging 7 Days at 95% RH and 38 °C ± 2 (100 °F ± 2)	After Normal Cure and Aging 24 Hours at 108 °C ± 2 (225 °F ± 5)	After Normal Cure and 6 Months Exterior Weathering
Rain erosion resistance (erosion through 0.31 to 0.36 mm (0.012 to 0.014 inch) of erosion coating at 805 km/h (500 mi/hour) and 25.4 mm/hour (1 inch/hour) rainfall, time in minutes, minimum)	100	100	100	100
Electrical transmission <u>1</u> /	95	90	---	95
Uncoated control panel	87	84	---	87

1/ The percentage of electrical transmission of a coating is equal to 100 times the electrical transmission of the coated panel divided by the electrical transmission of the uncoated panel.

- 3.5.15 Strippability: Newly applied, fully cured and weathered coatings shall be completely removed when tested in accordance with 4.9.19.
- 3.5.16 Repairability: The cured coatings shall be repairable by the same procedure specified by the manufacturer for original application.