



AEROSPACE MATERIAL SPECIFICATION	AMS3143™	REV. D
	Issued 1999-03 Revised 2025-05	
	Superseding AMS3143C	
Powder Coating Material		

RATIONALE

Update performance requirements based on recent test data.

1. SCOPE

1.1 Form

This specification establishes requirements for thermoset protective coatings in powder form.

1.2 Application

The powder coating materials covered by this specification are typically used, without a primer, on metallic or electrically conductive substrates as a protective coating to provide corrosion protection and functional fluid resistance, but usage is not limited to such applications. Type 1 and Type 2 are suitable for use in a service temperature range from -65 to 275 °F (-54 to 135 °C). Type 3 is suitable for use in a service temperature range of -65 to 1200 °F (-54 to 649 °C).

1.3 Classification

The powder coating materials covered by this specification are classified as follows:

- Type 1 Applicable for interior surfaces.
- Type 2 Applicable for interior and exterior surfaces.
- Type 3 Applicable for interior and exterior high-temperature surfaces (1200 °F [649 °C] maximum).

- Class 1 No restrictions on maximum temperature reached by substrate during coating cure.
- Class 2 275 °F (135 °C) maximum temperature reached by substrate during coating cure.

- Grade 1 No Skydrol resistance required.
- Grade 2 Skydrol resistance required.

NOTE: If Type is not specified, Type 2 shall be assumed. If Class is not specified, Class 2 shall be assumed. If Grade is not specified, Grade 1 shall be assumed.

1.4 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 that 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.

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2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms 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.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2629	Fluid, Jet Reference
AMS3721	Tape for Organic Coatings Adhesion Testing
AMS3819	Cloths, Cleaning, For Aircraft Primary and Secondary, Structural Surfaces
AMS4037	Aluminum Alloy, Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated
AMS-STD-595	Colors Used in Government Procurement
AS9100	Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A1008/A1008M	Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM D522	Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings
ASTM D523	Standard Test Method for Specular Gloss
ASTM D740	Standard Specification for Methyl Ethyl Ketone
ASTM D1654	Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
ASTM D1729	Standard Practice for Visual Appraisal of Colors and Color Differences of Diffusely-Illuminated Opaque Materials
ASTM D1974	Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes
ASTM D2197	Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion
ASTM D2244	Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates

ASTM D3359	Standard Test Methods for Rating Adhesion by Tape Test
ASTM D3363	Standard Test Method for Film Hardness by Pencil Test
ASTM D5402	Standard Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs
ASTM D6905	Standard Practice for Impact Flexibility of Organic Coatings
ASTM E308	Standard Practice for Computing the Colors of Objects by Using the CIE System
ASTM G155	Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials

2.3 U.S. Government Publications

Copies of these documents are available online at <https://quicksearch.dla.mil>.

MIL-DTL-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-DTL-53022	Primer , Epoxy Coating, Corrosion Inhibiting, Lead and Chromate Free
MIL-DTL-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-PRF-23377	Primer Coatings: Epoxy, High-Solids
MIL-PRF-23699	Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Numbers: O-152, O-154, O-156, and O-167
MIL-PRF-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Metric, NATO Code Number H-537
MIL-PRF-85285	Coating: Polyurethane, Aircraft and Support Equipment
MIL-PRF-85570	Cleaning Compounds, Exterior Aircraft
MIL-PRF-87937	Cleaning Compound, Aerospace Equipment
TO 1-1-8	Application and Removal of Organic Coatings, Aerospace and Non-Aerospace Equipment
TT-C-490	Chemical Conversion Coatings and Pretreatments for Metallic Substrates (Base for Organic Coatings)

2.4 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.p-r-i.org.

PD2000	PRI-QPL Program Requirements
PRI-QPL-AMS3143	Products Qualified Under AMS3143

2.5 ISO/ANSI Accredited Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ANSI Z400.1/Z129.1	Hazardous Workplace Chemicals - Hazard Evaluation and Safety Data Sheet and Precautionary Labeling Preparation
ISO/IEC 17025	General Requirements for the Competence of Testing and Calibration Laboratories

3. TECHNICAL REQUIREMENTS

3.1 Materials

The powder coating material shall typically consist of resins, curing agents, catalysts, fillers, pigments, and flow control agents. The powder coating material shall be capable of application by electrostatic means. The applied material shall melt, fuse, and chemically react at elevated temperatures. When applied to a substrate in ambient application conditions and cured in accordance with the appropriate heating/fusing procedures specified by the manufacturer, the powder coating material shall form a coating that meets or exceeds all requirements of this specification.

3.1.1 Prohibited Materials

The powder coating material shall contain no cadmium or cadmium compounds, lead or lead compounds, or hexavalent chromium or hexavalent chromium compounds as formulary ingredients.

3.1.2 Toxicity

The powder coating material shall have no adverse effect on the health of personnel when used for its intended purpose in accordance with the manufacturer's instructions and with appropriate handling procedures and precautions per the safety data sheet (see 4.8.2).

3.2 Quality

The powder coating material, as received by the purchaser, shall be a free-flowing blended powder of uniform color and free of lumps, agglomerates, foreign particles, or other defects that could affect the application, storage properties, or film performance of the coating material.

3.3 Properties

The powder coating material, when applied in accordance with the manufacturer's instructions, shall produce a cured coating that conforms to the requirements shown in Table 1, determined in accordance with the specified test methods.

Table 1 - Properties

Paragraph	Property	Requirement	Test Method Paragraph						
3.3.1	Coating Appearance	Shall be uniform and free of visual defects. Shall exhibit no greater orange peel than that displayed on Ford Orange Peel Standards 4 through 10.	4.7.5.1						
3.3.2	Color	Shall have good visual match and exhibit a color difference (ΔE) of less than 1.5 when compared to the specified color chip.	4.7.5.2						
3.3.3	Specular Gloss	Shall meet the following 60-degree specular gloss requirements: <table><tr><td>Gloss</td><td>85 min</td></tr><tr><td>Semi-Gloss</td><td>15 min, 45 max</td></tr><tr><td>Flat</td><td>5 max</td></tr></table>	Gloss	85 min	Semi-Gloss	15 min, 45 max	Flat	5 max	4.7.5.3
Gloss	85 min								
Semi-Gloss	15 min, 45 max								
Flat	5 max								
3.3.4	Corrosion Resistance - Accelerated	<u>Class 1 Coatings</u> - Mean creepage rating of 6 (1/16 to 1/8 inch, 1.6 to 3.2 mm) or higher on steel <u>Class 2 Coatings</u> - Mean creepage rating of 6 (1/16 to 1/8 inch, 1.6 to 3.2 mm) or higher on steel and a mean creepage rating of 8 (1/64 to 1/32 inch, 0.4 to 0.8 mm) or higher on aluminum	4.7.5.4.1						
	Corrosion Resistance - Outdoor (Type 2 Only)	<u>Class 1 Coatings</u> - Mean creepage rating of 6 (1/16 to 1/8 inch, 1.6 to 3.2 mm) or higher on steel <u>Class 2 Coatings</u> - Mean creepage rating of 6 (1/16 to 1/8 inch, 1.6 to 3.2 mm) or higher on steel and a mean creepage rating of 8 (1/64 to 1/32 inch, 0.4 to 0.8 mm) or higher on aluminum	4.7.5.4.2						
3.3.5	Adhesion - Scrape	Shall exhibit no removal from substrate.	4.7.5.5.1						
	Adhesion - Tape	Shall exhibit a minimum adhesion rating of 4A.	4.7.5.5.2						
3.3.6	Solvent Resistance	Shall not expose the metal substrate or pretreatment. A slight discoloration on the cloth and/or a slight marring of the paint surface (reduction of gloss) shall not be considered grounds for rejection.	4.7.5.6						
3.3.7	Flexibility	Shall exhibit no cracking, peeling, or loss of adhesion. Cracks occurring at either edge extending less than 0.25 inch (6.4 mm) shall not be considered grounds for rejection.	4.7.5.7						
3.3.8	Hardness	Shall exhibit a pencil gouge hardness of not less than H.	4.7.5.8						
3.3.9	Fluid Resistance	Shall exhibit no evidence of wrinkling, blistering, or any other coating deficiency. After 2-hour recovery period, coating shall exhibit no softening by more than two pencil gouge hardness units. Slight staining of the coating is acceptable.	4.7.5.9						
3.3.10	Aromatic Fuel Resistance	Shall exhibit no evidence of wrinkling, blistering, or any other coating deficiency. After 2-hour recovery period, coating shall exhibit no softening by more than two pencil gouge hardness units. Slight staining of the coating is acceptable.	4.7.5.10						
3.3.11	Water Resistance	Shall exhibit no evidence of wrinkling, blistering, or any other coating deficiency. After 2-hour recovery period, coating shall exhibit no softening by more than two pencil gouge hardness units. Coating shall exhibit a minimum adhesion rating of 4A. Slight discoloration of the coating is acceptable.	4.7.5.11						

Paragraph	Property	Requirement	Test Method Paragraph
3.3.12	Impact Flexibility	Shall have a minimum impact flexibility of 5%.	4.7.5.12
3.3.13	Weathering Resistance (Type 2 Only)	Shall meet the following 60-degree specular gloss requirements:	4.7.5.13
		Gloss 70 min Semi-gloss 15 min, 45 max Flat 5 max	
		Shall have good visual match and exhibit a color difference (ΔE) of less than 1.5 when compared to the specified color chip.	
3.3.14	Skydrol Resistance (Grade 2 Only)	Shall exhibit no wrinkling, blistering, coating delamination, adhesion loss, or any other coating deficiency and shall exhibit no less than an HB pencil gouge hardness. Coating shall exhibit a minimum adhesion rating of 4A. Slight staining of the coating will not be considered grounds for rejection.	4.7.5.14
3.3.15	Cleaning Efficiency	Shall maintain a minimum cleaning efficiency of 75%.	4.7.5.15
3.3.16	Strippability	Shall exhibit a minimum of 90% removal.	4.7.5.16
3.3.17	Repairability (Type 1 and 2 Only)	Shall exhibit a minimum adhesion rating of 4A with no inter-coat adhesion loss or substrate adhesion loss.	4.7.5.17
3.3.18	High-Temperature Resistance (Type 3 Only)	Shall exhibit no cracking, flaking, or chipping. Shall be visually comparable to the unexposed panel.	4.7.5.18
3.3.19	Storage Stability	Shall meet all acceptance test requirements of Table 2 for a period of at least 6 months from the date of manufacture when stored in unopened, original containers at or below 80 °F (26.7 °C) and at a relative humidity not exceeding 60%.	4.7.5.19

3.4 Shelf Life

The powder coating material shall meet all acceptance test requirements of Table 2 (see 4.4.2) for a period of at least 6 months from the date of manufacture when stored in the unopened original containers at or below 80 °F (26.7 °C) and at a relative humidity not exceeding 60%.

4. QUALITY ASSURANCE PROVISIONS

4.1 Qualification of Coating Material

Qualification is the process by which material properties of a powder coating material are verified through testing at a certified laboratory prior to inclusion on a qualified product list (QPL). All powder coating materials sold to this specification shall be listed, or approved for listing, on an approved QPL in accordance with PD2000.

4.1.1 Qualified Products Lists

PRI-QPL-AMS3143 is the approved QPL managed by the Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616. Information pertaining to qualification of powder coating material may be obtained from PRI.

4.1.2 Contract Awards

Awards will be made only for powder coating materials that are, prior to the award of contract, QPL approved.