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AEROSPACE MATERIAL SPECIFICATION

AMS 3110F
Superseding AMS 3110E

Issued 10-15-40
Revised 1-1-84

PRIMER
Zinc Chromate

1. SCOPE:

1.1 Type: This specification covers a zinc chromate primer.

1.2 Application: Primarily as a protective coating for use on metals and on molded or laminated synthetic resins.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2825 - Material Safety Data Sheets
AMS 3180 - Toluene Thinner, Commercial
AMS 4037 - Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate)
AMS 4040 - Aluminum Alloy Sheet and Plate, Alclad, 4.4Cu - 1.5Mg - 0.60Mn (Alclad 2024 and 1-1/2% Alclad 2024-0)

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D185 - Coarse Particles in Pigments, Pastes, and Paints
ASTM D445 - Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D471 - Rubber Property - Effect of Liquids
ASTM D1364 - Water in Volatile Solvents (Fischer Reagent Titration Method)
ASTM D1475 - Density of Paint, Varnish, Lacquer, and Related Products
ASTM D3359 - Measuring Adhesion by Tape Test

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Specifications:

PPP-P-1892 - Paint, Varnish, Lacquer, and Related Materials, Packaging, Packing and Marking of

2.3.2 Federal Standards:

FED-STD-595 - Color

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

3.1.1 Primer (by weight):

	min	max
Nonvolatile	59%	62%
Volatile	38%	41%

3.1.1.2 Nonvolatile:

	min	max
Resin	42%	47%
Pigment	53%	58%

3.1.1.2.1 Resin: Shall consist of 81 - 84% drying-type phthalic anhydride plus 16 - 19% oil-modified phenol-aldehyde resin. It shall be free of rosin and rosin derivatives.

3.1.1.2.2 Pigment: Shall consist of not less than 85% zinc chromate and not more than 15% siliceous extenders. A relatively small amount of other chromates will be permitted.

3.1.1.3 Volatile: The composition of the volatile component shall be optional with the manufacturer and shall meet applicable air pollution control regulations.

3.2 Properties: Primer shall conform to the following requirements:

3.2.1 Product Properties:

3.2.1.1 Color: Shall be yellow, characteristic of zinc chromate, unless a green tinted product is ordered, in which case the color shall match Interior Green, Color No. 34151 of FED-STD-595.

3.2.1.2 Density: Shall be 9.8 - 10.7 lb per gal (1175 - 1285 kg/m^3), determined at 77°F ± 2 (25°C ± 1) in accordance with ASTM D1475.

3.2.1.3 Coarse Particles: Not more than 0.05% by weight, calculated on the basis of total solids, shall be retained on a No. 325 (45 µm) sieve, determined in accordance with ASTM D185.

3.2.1.4 Water Content: Shall not exceed 0.5% by weight, determined in accordance with ASTM D1364.

3.2.1.5 Viscosity: Shall be 12 - 28 centipoises (0.012 - 0.028 Pa·s at 77°F (25°C)), determined in accordance with ASTM D445 on a mixture of one part of primer and one part of AMS 3180 thinner.

3.2.1.6 Stability: Primer, from a full, closed container which has been stored at 120°F ± 5 (50°C ± 3) for 96 hr ± 0.5, shall produce films showing no seediness or clear areas lacking in yellow color when one volume of aged primer is reduced with two volumes of AMS 3180 thinner. After aging, the consistency of the primer shall be such that it is suitable for production use. Slight silking is permissible provided a continuous film is produced.

3.2.1.7 Skinning and Livering: Shall be absent in a 1/4 filled, closed container after standing for 24 hr ± 0.2 at room temperature.

3.2.1.8 Separation: There shall be not more than 10 mL of clear or cloudy supernatant liquid when 70 mL of a mixture of one volume of primer with 2.5 volumes of AMS 3180 thinner is allowed to stand for 4 hr ± 0.25. After standing for 24 hr ± 0.5, all pigment shall be completely replaced in suspension by vigorously shaking the graduate for not more than 60 seconds. A flow-out film on an aluminum alloy panel immediately following the shaking shall show no seediness or clear areas lacking in yellow color. Slight silking is permissible provided a continuous film is produced.

3.2.1.9 Dip Tank Stability: A mixture of one volume of primer and two volumes of AMS 3180 thinner shall be suitable for use in dip tanks, as shown by passing the following test:

3.2.1.9.1 A container of suitable size shall be filled to approximately 80% of capacity with the mixture specified in 3.2.1.9. Air shall be bubbled through the mixture, at a rate of approximately 1L/min. per 100 mL of mixture, for a total of 200 hr ± 0.5. Aeration may be interrupted as necessary to fit working schedules. During aeration, the level of the mixture shall be maintained by additions of AMS 3180 thinner at least every 12 hr ± 0.5 or by bubbling the influent air through AMS 3180 thinner, or both. In addition, the nonvolatile matter shall be maintained in suspension by mechanical agitation or shall be replaced in suspension by stirring with a spatula or other suitable instrument at least once each day. At the end of the 200 hr, there shall be no appreciable oxidation or gelling of the resins and a dipped film of the aerated mixture on an aluminum alloy panel shall be free from seeding. Slight silking is permissible provided a continuous film is produced.

3.2.2 Air-Drying Film Properties: Shall be as specified in 3.2.2.1.1, 3.2.2.1.2, 3.2.2.2, 3.2.2.3, 3.2.2.4, and 3.2.2.5 determined on panels prepared as in 4.5.1.

3.2.2.1 Drying Time:

3.2.2.1.1 A thin, wet, cross-coat showing a semi-transparent film shall air-dry for handling in not more than 5 minutes. After air-drying for 1 hr ± 0.1, stacking the panels at room temperature under a pressure of one psi (0.0069 MPa) for 1 hr ± 0.1 shall not cause the panels to stick to each other.

3.2.2.1.2 The film from 3.2.2.1.1 shall be suitable for recoating, after 30 min. ± 1 air drying, with a high gloss lacquer, without undue absorption of primer by the lacquer or loss of gloss of the lacquer.

3.2.2.2 Lacquer Resistance: The finish shall show no embrittlement, lifting, or excessive loss of gloss after being coated with cellulose nitrate lacquer over the primer on a series of panels on which the primer has been air-dried for 10 min., 1 hr, 6 hr, 16 hr, and 48 hr, respectively.

3.2.2.3 Water Resistance: Flow-out films, air-dried for 48 hr ± 0.5, shall withstand immersion in freshly-boiled, distilled water at room temperature for 24 hr ± 0.5 without checking or blistering of the film. After 2-hr ± 0.1 air drying following immersion, films shall show no evidence of excessive leaching.

3.2.2.4 Non-Aromatic Fuel Resistance: Flow-out films, air-dried for 48 hr ± 0.5 shall withstand total immersion in ASTM Reference Fuel A (ASTM D471) at room temperature for 4 hr ± 0.2; 24 hr ± 0.2 after removal from the fuel, the film shall show no apparent deterioration when compared with a similar panel not immersed in fuel.

3.2.2.5 Weather Resistance (Durability): The primer, with and without top coats, shall have weather resistance acceptable to purchaser, determined by a procedure agreed upon by purchaser and vendor.

3.2.3 Baked Film Properties: Shall be as specified in 3.2.3.1 and 3.2.3.2 determined on panels prepared as in 4.5.1.

3.2.3.1 Flexibility: Flow-out films, air-dried 5 min., baked at 350° - 365°F (175 - 185°C) for 4 hr ± 0.2, and cooled to room temperature, shall not crack when the panel is bent through an angle of 180 deg around a mandrel having a diameter 6 times the nominal thickness of the panel. Panel materials other than as in 4.5.1 may be used when agreed upon by purchaser and vendor.

3.2.3.2 Adhesion: Shall be as follows, determined in accordance with ASTM D3359, Method A:

3.2.3.2.1 Primer to Substrate: The adhesion rating shall be 5A on sprayed film having a film thickness of 0.0005 - 0.00075 in. (12 - 19 μm) baked at 212°F ± 2 (100°C ± 1) for 4 hr ± 0.25.

3.2.3.2.2 Top Coat to Primer: The adhesion rating shall be 4A or better determined on duplicate panels prime-coated and baked as in 3.2.3.2.1 and coated with one coat of cellulose nitrate lacquer. The lacquer coat on one panel shall be air dried for 1 hr ± 1 and baked at 212°F ± 2 (100°C ± 1) for 16 hr ± 0.25. The lacquer coat on the other panel shall be air dried until baking of the first panel is completed.

3.3 Quality: Primer shall be of uniform consistency and free from bubbles, grit, rough particles, floating or caked pigments, and ingredients of respiratory toxicity under normal conditions of use. Component ingredients shall be intimately mixed and processed as required to produce a product which is stable and not subject to abnormal change with age in sealed containers.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of primer shall supply all samples for vendor's tests and shall be responsible for performing all
Ø required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the primer conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), color (3.2.2.1.1), density (3.2.1.2), viscosity
Ø (3.2.1.5), drying time (3.2.1.1), fuel resistance (3.2.2.4), and adhesion (3.2.3.2) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of primer to a purchaser, when a change in material or processing, or both, 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, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient primer shall be taken at random from each lot to perform the following tests:

Requirement	Reference Paragraph	Number of Determinations
Composition	3.1	1
Color	3.2.1.1	2
Density	3.2.1.2	1
Viscosity	3.2.1.5	1
Drying Time	3.2.2.1.1	2 (See 4.3.1.1)
Fuel Resistance	3.2.2.4	2
Adhesion	3.2.3.2	2

4.3.1.1 This requirement shall be determined on the panels prepared for other tests.

4.3.1.2 A lot shall be all primer made from the same batches of ingredients in a continuous series of operations and presented for vendor's inspection at one time.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Primer shall be approved by purchaser before primer for production use is supplied, unless such approval be waived by purchaser. Results of tests on production primer shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use the same ingredients, manufacturing procedures and processes, and methods of inspection on production primer which are essentially the same as those used on the approved sample primer. If necessary to make any change in ingredients or in manufacturing procedures or processing, vendor shall submit for reapproval a statement of the proposed changes in material or processing, or both, and, when requested, sample primer. Production primer made by the revised procedure shall not be shipped prior to receipt of reapproval.