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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3132F

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Superseding AMS 3132E

Submitted for recognition as an American National Standard

VARNISH, PHENOLIC RESIN
Corrosion-Preventive

1. SCOPE:

1.1 Type:

This specification covers a colored but unpigmented varnish based on a phenolic resin.

1.2 Application:

This varnish has been used typically as a corrosion-preventive coating on interior parts of aircraft engines, 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 2825 Material Safety Data Sheets

2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM B 117 Salt Spray (Fog) Testing
ASTM D 154 Testing Varnishes
ASTM D 445 Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)
ASTM D 471 Rubber Property - Effect of Liquids
ASTM D 1640 Drying, Curing, or Film Formation of Organic Coatings at Room Temperature
ASTM D 1748 Rust Protection by Metal Preservatives in the Humidity Cabinet

2.3 U.S. Government Publications:

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

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

2.4 ANSI Publications:

Available from American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036.

ANSI B46.1 Surface Texture

2.5 AATCC Publications:

Available from American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709.

Color Index, Volume 3, Part 4

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

3.1.1 Varnish (Percentage by Weight): Nonvolatile portion shall be 28 to 32%; volatile portion shall be 68 to 72%.

3.1.1.1 Nonvolatile: Shall consist of a thermosetting phenolic resin plus sufficient blue dye, to provide a 0.09 to 0.11% by weight dye content, determined in accordance with 4.5.2.

3.1.1.1.1 Blue dye shall conform to Victoria Blue B Base, Spirit Soluble, American Association of Textile Chemists and Colorists Color Index No. 729.

3.1.1.2 (R) Volatile: Shall consist of the alcohols and diluents used by the resin manufacturer in preparation of the basis resin solution plus isopropyl alcohol in such proportions as will, when combined with the basis resin solution, produce a varnish meeting all requirements of 3.2 and 3.3.

3.2 Properties:

Varnish shall conform to the following requirements:

3.2.1 Product Properties:

3.2.1.1 Viscosity: Shall be 20 to 50 centipoises (0.02 to 0.05 Pa·s) at 77 °F (25 °C), determined in accordance with ASTM D 445.

3.2.1.2 Stability: Seeding out of resin material shall not occur within 30 days of date of manufacture. Skinning and livering shall be absent in 1/4-filled closed containers at any time up to one week of standing.

3.2.2 Applied Film Properties: Shall be as specified in 3.2.2.1, 3.2.2.2, and 3.2.2.3, determined on panels prepared as in 4.5.1.

3.2.2.1 Appearance: Coating shall be a homogeneous film, free from craters, particles of hardened material, and other imperfections causing discontinuity of the coating.

3.2.2.2 Air Drying: Coating shall have a set-to-touch time not longer than 15 minutes at 77 °F ± 5 (25 °C ± 3), determined in accordance with ASTM D 1640.

3.2.2.3 Hot Oil Resistance: Films exposed to hot oil as in 4.5.3 shall be hard, tough, and free from bubbles, pin holes, and other film irregularities.

3.2.3 Cured Film Properties: Shall be as specified in 3.2.3.1 through 3.2.3.5, determined on panels prepared as in 4.5.1.

3.2.3.1 Color and Appearance: The cured film shall be green in color and sufficiently transparent that underlying metal surfaces will be clearly discernible. It shall be hard, tough, and free from bubbles, craters, pin holes, and other surface irregularities.

3.2.3.1.1 The film shall not be wrinkled or removed by immersion in hot phenol, determined in accordance with 4.5.4; discoloration or slight surface softening of the film is acceptable.

3.2.3.2 Removability: Film shall be completely removed within 10 minutes by immersion in cleaning solution, determined in accordance with 4.5.5.

3.2.3.3 Adhesion: Film shall not crack, chip, or peel when a panel is bent rapidly at room temperature through an angle of 180 degrees around a diameter equal to 18 times the nominal thickness of the panel, except that slight cracking on the bent portion is acceptable. Scratching with a blade or thin metal object shall produce a fine, powdered residue but flaking or peeling is not acceptable. Sand blasting of the film shall result in film wearing away by abrasion without chipping or peeling.

3.2.3.4 Corrosion Resistance: There shall be no more than scattered pin points of corrosion of panels except within 1/8 inch (3.2 mm) of any edge and within 1/16 inch (1.6 mm) of the scratches on panels tested in accordance with 4.5.6; films shall show no softening, peeling, blistering, or other evidence of poor adhesion.

3.2.3.5 Solvent Resistance: Panels shall not change in weight more than 0.2 milligram per square inch (0.031 mg/cm^2) after exposure to fuel, determined in accordance with 4.5.7.

3.3 Quality:

The varnish, as received by purchaser, shall be homogeneous and free from bubbles, grit, and rough particles. It shall be free from ingredients of respiratory toxicity under normal conditions of use. When applied by brushing, spraying, or dipping, varnish shall be free-working, with leveling properties acceptable to purchaser.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:
(R)

The vendor of varnish 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 varnish conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for composition (3.1), viscosity (3.2.1.1), air-drying (3.2.2.2), color and appearance (3.2.3.1), adhesion (3.2.3.3), and solvent resistance (3.2.3.5) 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 varnish 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:
(R)

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient varnish shall be taken at random from each lot to perform the tests shown in Table 1.

TABLE 1 - Acceptance Test Sampling

Property	Reference Paragraph	Number of Tests
Composition	3.1	1
Viscosity	3.2.1.1	1
Air Drying	3.2.2.2	4 (see 4.3.1.1)
Color and Appearance	3.2.3.1	4 (see 4.3.1.1)
Adhesion	3.2.3.3	2
Solvent Resistance	3.2.3.5	2

4.3.1.1 These requirements are to be determined on panels prepared for other tests.

4.3.1.2 A lot shall be all varnish produced in one continuous manufacturing operation from the same lots of raw materials and presented for manufacturer's inspection at one time.

4.3.1.3 When a statistical sampling plan has been agreed upon by purchaser and
(R) vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 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 Varnish shall be approved by purchaser before varnish for production use is supplied, unless such approval be waived by purchaser. Results of tests on production varnish shall be essentially equivalent to those on the approved sample.

4.4.2 Manufacturer shall use the same ingredients and manufacturing procedures for production varnish as for the approved sample. If necessary to make any change in ingredients or in manufacturing procedures, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample varnish. Production varnish made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

4.5.1 (R) Panel Preparation: Panels shall be of low carbon steel buffed to produce a surface texture not rougher than 16 microinches (0.4 μm), determined in accordance with ANSI B46.1. Edges and corners of panels shall be rounded and smooth. Panels shall, immediately after buffing, be degreased, cleaned in water solution containing approximately 1% of trisodium phosphate and 1% of a suitable wetting agent and maintained at 180 °F ± 5 (82 °C ± 3), rinsed successively in cold water, in hot water, and in acetone, and dried. Unless panels are used immediately for testing, they shall be coated with a suitable corrosion-preventive compound, stored in a desiccator until they are to be used, and then cleaned as before. Panels shall be completely coated, by spraying or dipping, with varnish thinned with isopropyl alcohol to 24.5 to 25.5% nonvolatile content to produce, after air-drying and curing, a film thickness of 0.0003 to 0.0005 inch (7.6 to 12.7 μm); air-drying and curing shall be performed as follows:

4.5.1.1 Air-Drying: Films shall be air-dried at room temperature for not less than 15 minutes except that films for determination of hot oil resistance shall be dried for 16 to 24 hours.

4.5.1.2 Curing: Films, air-dried as in 4.5.1.1, shall be heated either at 335 °F ± 5 (168 °C ± 3) for 20 to 25 minutes or at 290 °F ± 5 (143 °C ± 3) for 50 to 60 minutes.

4.5.2 Nonvolatile Content: Shall be determined in accordance with ASTM D 154 except that the sample shall be heated for not less than 1 hour at 295 to 305 °F (146 to 152 °C) instead of 3 hours at 220 to 230 °F (104 to 110 °C).

4.5.3 Hot Oil Resistance: Panels shall be immersed in unused ASTM Oil No. 1 (ASTM D 471) at 350 °F ± 10 (177 °C ± 6) for not less than 15 minutes.

4.5.4 State of Cure: Panels or parts shall be immersed in C.P. phenol at 300 °F ± 10 (149 °C ± 6) for 5 minutes ± 0.2.

4.5.5 Removability: Panels shall be submerged in the cleaning solution described in Table 2, maintained at 200 °F ± 5 (93 °C ± 3). A soft bristle brush may be used, if necessary, to facilitate removal. Cleaning solution shall be prepared by dissolving the mixture shown in Table 2 in the proportions of 8 ounces of mixture per gallon (60 g/L) of water; commercial grades of materials may be used.

TABLE 2 - Cleaning Solution

Ingredients	Parts by Weight
Sodium resinate	1
Sodium metasilicate	3
Trisodium phosphate	1
Sodium carbonate	2
Sodium hydroxide	4

4.5.6 Corrosion Resistance: Films on panels shall be cross-scratched X on one face with a sharp instrument so that the underlying metal is exposed and each leg of the X is approximately 1-1/2 inches (38 mm) long. Separate panels shall then be exposed to the following:

4.5.6.1 Salt spray test in accordance with ASTM B 117 for not less than 250 hours.

4.5.6.2 Cycles of 8 hours ± 0.1 in atmosphere of approximately 100% relative humidity at 120 °F ± 5 (49 °C ± 3) followed by 16 hours ± 0.2 in air at -65 °F ± 5 (-54 °C ± 3) for a total of not less than 168 hours. Test may be interrupted at the end of any 8- or 16-hour period of exposure. Humidity exposure shall be in accordance with ASTM D 1748.

4.5.7 Solvent Resistance: Panels shall be suspended in a flask fitted with a reflux condenser and containing ASTM Reference Fuel B (ASTM D 471) so as to be exposed, either continuously or intermittently, to vapors and condensate of the boiling liquid for not less than 24 hours, removed, and air dried. Weight loss shall be determined by the difference in weight of panel before and after exposure divided by the total surface area.

4.6 Reports:

The vendor of varnish shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the varnish conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3132F, formula number, and quantity.

4.6.1 A material safety data sheet conforming to AMS 2825, or equivalent, shall be supplied to each purchaser prior to, or concurrent with, the report of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of varnish for production use. Each request for modification of varnish formulation shall be accompanied by a revised data sheet for the proposed formulation.