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400 COMMONWEALTH DRIVE WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 2473E
Superseding AMS 2473D

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CHEMICAL TREATMENT FOR ALUMINUM ALLOYS
General Purpose Coating

1. SCOPE:

1.1 Purpose: This specification establishes the engineering requirements for producing chemical-film coatings on aluminum alloys and the properties of such coatings.

1.2 Application: Primarily for increasing the corrosion resistance of aluminum alloy parts, as a base for paint or other organic finishes, and for improving the corrosion resistance and coating adhesion properties of abraded or discontinuous anodized coatings on aluminum alloy parts.

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 4037 - Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate)

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

ASTM B117 - Salt Spray (Fog) Testing

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

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2.3.1 Federal Standards:

Federal Test Method Standard No. 141 - Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling and Testing

2.3.2 Military Specifications:

MIL-P-23377 - Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant

2.3.3 Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Solution: Shall be an aqueous solution of chemicals which will form a coating of oxide, phosphate, silicate, or chromate meeting the requirements of 3.4.

3.1.1 Only processes which permit adequate solution control by chemical analysis Ø shall be used.

3.1.2 It shall be the responsibility of the vendor of proprietary processing chemicals to supply the purchaser with methods of analysis and directions for maintenance of the solution.

3.2 Preparation:

3.2.1 All heat treatment, machining, forming, brazing, welding, and perforating operations shall, insofar as practicable, be completed before parts are treated, unless otherwise specified.

3.2.2 Parts, prior to being coated, shall have clean surfaces, free from waterbreaks, erosion, or pitting. Cleaning by a process giving a slightly Ø etched surface is desirable. Alkaline residues shall be removed by thorough water rinsing, preferably by spray, after cleaning. This cleaning and etching procedure shall not cause intergranular attack of the base alloy.

3.3 Procedure: Coating shall be applied by immersing parts in the solution of 3.1 for such time and at such temperatures as will produce coatings meeting the requirements of 3.4, followed by rinsing, sealing if required, and drying. If parts are not to be coated all over, the solution may be applied by brushing, swabbing, or spraying the surfaces to be coated.

3.4 Properties: The coating shall conform to the following requirements:

3.4.1 Corrosion Resistance: Samples of AMS 4037 aluminum alloy sheet, nominally 0.040 x 3 x 10 in. (1 x 75 x 250 mm), treated in accordance with 3.3, shall withstand exposure for 168 hr to salt spray without showing more than a total of 15 scattered spots or pits, none larger than 1/32 in. (1 mm) in diameter, in a total of 150 sq in. (1000 cm^2) of test
Ø area, or more than 5 scattered spots or pits, none larger than 1/32 in. (1 mm) in diameter, in a total of 30 sq in. (200 cm^2), except those areas within 1/4 in. (6 mm) from identification markings and fixture contact marks remaining after processing. Salt spray corrosion tests shall be conducted in accordance with ASTM B117 except that the significant surface shall be inclined approximately 6 deg from the vertical.

3.4.1.2 Parts treated by immersion and not subsequently to be painted shall withstand exposure for 168 hr to salt spray test conducted in accordance
Ø with ASTM B117 without showing more than a few scattered corrosion pits visible without magnification. Loss of color shall not be cause for rejection.

3.4.2 Paint Adhesion: A sample of AMS 4037 aluminum alloy sheet shall be treated in accordance with 3.3 and finished with one coat of MIL-P-23377 epoxy primer to a dry film thickness of 0.0006 - 0.0009 in. (15 - 22 µm).
Ø Panels shall be allowed to dry for not less than 72 hr and tested for adhesion in accordance with Federal Test Method Standard No. 141, Method 6301. The painted panels shall show no evidence of paint separation between the primer and the conversion coating or between the conversion coating and the substrate.

3.5 Quality: The coating, as received by purchaser, shall be continuous,
Ø nonpowdery, and free from scratches and other imperfections detrimental to usage of the coating. Color of chromate coatings may range from iridescent yellow to dark olive green.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The coating vendor shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to sample and to perform any
Ø confirmatory testing deemed necessary to ensure that processing conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for
Ø visual appearance and quality (3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for corrosion resistance (3.4.1) and adhesion (3.4.2) and of cleaning and Ø processing solutions to ensure that the deposited coating will conform to the requirements of this specification are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests Ø and shall be performed prior to or on the initial shipment of coated parts 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.

4.2.3.1 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 not less than the following; a lot shall be all parts of Ø the same part number processed in a continuous series of operations and presented for vendor's inspection at one time:

4.3.1 For Acceptance Tests: Shall be in accordance with MIL-STD-105, Normal Ø Inspection Level II, with an acceptance quality level (AQL) of 2.5 on coated parts.

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

4.4 Approval:

4.4.1 Coated parts and specimens shall be approved by purchaser before parts for Ø production use are supplied, unless such approval be waived by purchaser. Results of tests on production parts shall be essentially equivalent to those on the approved sample parts and specimens.

4.4.2 Vendor shall use manufacturing procedures, processes, and methods of inspection on production parts which are essentially the same as those used on the approved sample parts. If necessary to make any change in type of equipment or in established composition limits and operating conditions of process solutions, vendor shall submit for reapproval of the process a statement of the proposed changes in processing and, when requested, sample coated parts, test panels, or both. Production parts coated by the revised procedure shall not be shipped prior to receipt of reapproval.