

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

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Superseding AMS 2473E

(R) CHEMICAL FILM 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:

This process has been used typically for increasing the corrosion resistance of aluminum alloy parts, as a base for paint or other organic finishes, and for repair of abraded surfaces or discontinuous anodized coatings on aluminum alloy parts, but usage is not limited to such applications. AMS 2474 should be specified when parts are used in assemblies which have electrical bonding requirements.

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.

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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 2474 Chemical Treatment for Aluminum Alloys, Low Electrical Resistance Coating

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

2.2 ASTM Publications:

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

ASTM B 117 Salt Spray (Fog) Testing

2.3 U.S. Government Publications:

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

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

MIL-P-85582 Primer Coatings, Epoxy, VOC Compliant, Chemical and Solvent Resistant

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

FED-STD-141 Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling and Testing

3. TECHNICAL REQUIREMENTS:

3.1 Solution:

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

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

3.2 Preparation:

3.2.1 All fabrication type operations, such as heat treatment, machining, forming, brazing, welding, and perforating, shall, insofar as practicable, be completed before parts are treated.

3.2.2 Parts, prior to immersion in the coating solution, shall have clean surfaces, free from waterbreaks, erosion, or pitting. Cleaning by a process giving a slightly etched surface is desirable, but should not be used on parts with tight tolerances. Alkaline residues shall be removed by 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 using a solution in accordance with 3.1 for a time and at a temperature which will produce coatings meeting the requirements of 3.4, followed by rinsing and drying. If parts are not to be coated all over, areas which are to be free of coating may be masked or 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: Specimens of AMS 4037 aluminum alloy sheet, nominally 0.040 x 3 x 10 inches (1.02 x 76 x 254 mm), cleaned as in 3.2.2 and coated in accordance with 3.3, shall withstand exposure for 168 hours to salt spray without showing more than a total of 15 scattered spots or pits, none larger than 1/32 inch (0.8 mm) in diameter, in a total of 150 square inches (968 cm²) of test area nor more than 5 scattered spots or pits, none larger than 1/32 inch (0.8 mm) in diameter, in a total of 30 square inches (194 cm²), except those areas within 1/4 inch (6.4 mm) from identification markings and fixture contact marks remaining after processing. Salt spray corrosion tests shall be conducted in accordance with ASTM B 117 except that the significant surface shall be inclined approximately 6 degrees from the vertical.
- 3.4.2 Paint Adhesion: Specimens as in 3.4.1 shall be cleaned as in 3.2.2, treated in accordance with 3.3, and finished with one coat of MIL-P-23377 or MIL-P-85582 epoxy primer to a dry film thickness of 0.0006 to 0.0009 inch (15 to 23 μm). Coated panels shall be allowed to dry for not less than 72 hours and tested for adhesion in accordance with FED-STD-141, Method 6301. The painted panels shall show no evidence of paint separation between primer and conversion coating or between conversion coating and substrate.

3.5 Quality:

The coating, as received by purchaser, shall be continuous, nonpowdery, and free from scratches and other imperfections detrimental to usage of the coating. Coatings may be transparent or range from iridescent yellow to olive green.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The coating processor shall supply all samples for processor's tests and shall be responsible for the performance of all required tests. Parts, if required for tests, shall be supplied by purchaser. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Quality (3.5) is an acceptance test and shall be performed on each lot.

4.2.2 Periodic Tests: Corrosion resistance (3.4.1), paint adhesion (3.4.2), and tests of cleaning and processing solutions to ensure that the coatings will conform to specified requirements are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser except for corrosion test which shall be performed not less than monthly.

4.2.3 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of coated parts to a purchaser, when a change in material and/or processing requires approval of the cognizant engineering organization (See 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, contracting officer, or request for procurement.

4.3 Sampling and Testing:

Shall be not less than the following; a lot shall be all parts of the same part number, made of the same basis materials, processed in the same solution(s) in not longer than eight consecutive hours, and presented for processor's inspection at one time:

4.3.1 For Acceptance Tests: Shall be as shown in Table 1. Examination shall be made with the unaided eye.

TABLE 1 - Sampling for Acceptance Testing

Number of Parts In Lot		Quality
5 or less		All
6 to	50	5
51 to	90	7
91 to	150	11
151 to	280	13
281 to	500	16
501 to	1200	19
1201 to	3200	23

4.3.2 For Periodic Tests and Preproduction Tests: Shall be acceptable to purchaser.

4.4 Approval:

- 4.4.1 The process and control factors, a preproduction sample part, or both, whichever is specified, shall be approved by the cognizant engineering organization before production parts are supplied.
- 4.4.2 The processor shall make no significant change to materials, processes, or control factors from those on which approval was based, unless the change is approved by the cognizant engineering organization. A significant change is one which, in the judgment of the cognizant engineering organization, would affect the properties or performance of the parts.
- 4.4.3 Control factors for the process shall include, but not be limited to, the following:
- Surface preparation
 - Type of bath used
 - Composition limits for coating solution
 - Processing temperature limits
 - Drying temperature
 - Frequency of processing solution analysis
 - Periodic test plan

4.5 Reports:

The processor of coated parts shall furnish with each shipment a report stating that the parts have been processed and tested in accordance with specified requirements and that they conform to the acceptance test requirements. This report shall include the purchase order number, lot number, AMS 2473F, part number, and quantity.

4.6 Resampling and Retesting:

- 4.6.1 If results of any acceptance test fail to meet specified requirements, parts in that lot may be stripped by a method acceptable to purchaser that does not roughen or pit the basis metal or affect dimensional tolerances, pretreated, coated as defined herein, and tested. Alternatively, all parts in the lot may be inspected for the nonconforming attribute and the nonconforming parts may be stripped by a method acceptable to purchaser that does not roughen, pit the basis metal, or affect dimensional tolerances, pretreated, coated as defined herein, and tested.
- 4.6.2 If results of any periodic test fail to meet specified test requirements, the process is nonconforming. No additional parts shall be coated until the process is corrected and new specimens are coated and tested. Results of all tests shall be recorded and, when requested, reported. Purchaser shall be notified of all parts coated since the last acceptable test.

5. PREPARATION FOR DELIVERY:

- 5.1 Coated parts shall be handled and packaged to ensure that the required physical characteristics and properties of the coating are preserved.