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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 2475D
Superseding AMS 2475C

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PROTECTIVE TREATMENTS
Magnesium Alloys

1. SCOPE:

1.1 Purpose: This specification establishes the engineering requirements for producing chromate conversion coatings on magnesium alloys and the properties of the coatings.

1.2 Application: Primarily to increase corrosion resistance and provide surfaces which will ensure maximum paint adherence. The dichromate treatment is used on finished parts made from either cast or wrought alloys, except those with high manganese content. The chrome pickle treatment is used primarily on unmachined products, as touch-up of previously dichromate treated parts, and on machined surfaces where dimensional tolerances permit.

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

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

2.2.1 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

REAFFIRMED
10-91

Printed in U.S.A.

3. TECHNICAL REQUIREMENTS:

3.1 Solutions:

3.1.1 Dichromate Treatment:

3.1.1.1 Acid Solution: An aqueous solution containing 15 - 20% by weight of hydrofluoric acid (HF).

3.1.1.2 Sodium Dichromate Solution: An aqueous solution containing 10 - 15% of sodium dichromate ($Na_2Cr_2O_7.2H_2O$) and 0.25% of either magnesium fluoride (MgF_2) or calcium fluoride (CaF_2) by weight. The solution shall be maintained in a saturated condition with respect to the alkaline earth fluoride by continuous immersion of a cloth bag or equivalent containing the compound.

3.1.1.3 Temperature: The hydrofluoric acid solution shall be operated at room temperature. The sodium dichromate solution shall be operated at not lower than 200°F (95°C) and preferably at its boiling point.

3.1.2 Chrome Pickle Treatment: Shall be as follows:

Sodium dichromate ($Na_2Cr_2O_7.2H_2O$)	1.5 lb	(180 g)
Nitric acid (HNO_3, sp gr 1.42)	1.5 pt	(188 mL)
Water, to make	1 gal	(1 L)

3.2 Preparation:

3.2.1 Machined and fabricated parts shall be thoroughly cleaned to remove dirt, grease, and oil before treatment. Such contamination may be removed by vapor degreasing or equivalent methods or by alkaline cleaners. Alkaline cleaners will produce a more uniform color.

3.2.2 If rough castings show oxidation, they shall be dipped for 10 sec in a solution at room temperature containing by volume 90 parts of water, 8 parts of concentrated nitric acid (HNO_3, sp gr 1.42) and 2 parts of concentrated sulfuric acid (H_2SO_4, sp gr 1.84), washed thoroughly in cold, running water, dipped in hot water, and dried rapidly.

3.2.3 Die lubricant and/or oxide film on stampings, forgings, or die castings, or on finished parts where close dimensional tolerances are required, shall be removed by immersing for 1 to 15 min. in an aqueous solution containing approximately 1.5 lb per gal (180 g/L) of chromic acid (CrO_3) and operated at 190° - 212°F (90° - 100°C), washing thoroughly in cold, running water, dipping in hot water, and drying rapidly.

3.3 Procedure:

3.3.1 Dichromate Treatment: Parts shall be treated after all external and internal machining operations and before assembly with aluminum, aluminum alloy, or cadmium plated parts, unless otherwise specified. Parts machined or marred after the dichromate treatment shall be chrome pickled or treated by a proprietary process as in 3.3.2.2.

3.3.1.1 The cleaned parts shall be immersed in the hydrofluoric acid solution for not less than 5 min. and rinsed thoroughly in cold, running water.

3.3.1.2 The wet parts shall be immersed in the sodium dichromate solution for not less than 30 min., thoroughly rinsed in cold, running water, dipped in hot water, and dried rapidly with a clean, dry air blast. Properly applied finish will vary from dark brown to black depending upon the alloy composition, condition of the solution, and length of time of treatment.

3.3.2 Chrome-Pickle Treatment: Shall be used for local touch-up of previously dichromate-treated parts where additional finishing has been necessary after painting or where surfaces have been marred during other operations. It may be used for finished parts where dimensional tolerances permit.

3.3.2.1 The surfaces or local areas to be treated shall be flooded continuously with freshly prepared chrome pickle solution by flowing, brushing, or swabbing, or parts shall be immersed in the solution at room temperature. Time of treatment shall, when dimensional tolerances permit, be 1/2 to 2 min.; in other cases, time of treatment shall be as long as practicable without removing metal in excess of dimensional tolerances. Parts shall then be rinsed thoroughly with clean, running water and dried with a clean, dry air blast.

3.3.2.2 Proprietary solutions may be used for touch-up provided they perform the same function as the touch-up solution in 3.1.2.

3.4 Quality: Surfaces of coated parts shall be substantially uniform in texture and appearance. There shall be no bare or definite light-colored areas, powdery areas, and darkening of the corners and edges.

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. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that processing conforms to the requirements of this specification.

4.2 Classification of Tests: Tests to determine conformance to requirements for Ø quality (3.4) are classified as acceptance tests and as preproduction tests and shall be performed prior to or on the initial shipment of processed parts to a purchaser, on each lot of processed parts, when a change in material, part design, or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.1 For direct U.S. Military procurement, substantiating test data and, when Ø 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: Each part shall be inspected. A lot shall be all parts of the Ø same part number processed in a continuous series of operations and presented for vendor's inspection at one time.

4.4 Approval:

4.4.1 Sample coated parts 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 coated parts.

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.

4.5 Reports: The vendor of coated parts shall furnish with each shipment three copies of a report stating that the parts have been processed and tested in accordance with the requirements of this specification and that the parts conform to the technical requirements. This report shall include the purchase order number, AMS 2475D, part number, lot number, and quantity.

5. PREPARATION FOR DELIVERY:

5.1 Coated parts shall be handled and packaged in such a manner as will ensure Ø that the required physical characteristics and properties of the coating are preserved.

5.2 Packages of parts shall be prepared for shipment in accordance with Ø commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the coated parts to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.