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SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
400 Commonwealth Dr., Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 2414D

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Superseding AMS 2414C

LEAD PLATING

1. SCOPE:

1.1 Purpose: This specification covers the engineering requirements for electrodeposition of lead on metal parts and the properties of the deposit.

1.2 Application: To prevent galling of metal parts and to improve the performance of bearings.

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 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 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM B487 - Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section
ASTM B499 - Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals
ASTM B504 - Measurement of Thickness of Metallic Coatings by the Coulometric Method
ASTM B567 - Measurement of Coating Thickness by the Beta Backscatter Method
ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials

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

2.3.1 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Preparation:

3.1.1 All forming, machining, heat treating, brazing, and welding shall be completed before parts are plated.

3.1.2 Parts shall have chemically clean surfaces, prepared with minimum abrasion, erosion, or pitting, prior to immersion in the plating solution.

3.1.3 Electrical contacts between the parts and power source shall be made in such a manner as will ensure that neither chemical or immersion deposition nor electrical arcing or overheating will occur. If parts are to be plated all over, contact points shall be located where specified or where agreed upon by purchaser and vendor. If parts are not required to be plated all over, contact points shall be located in areas on which plating is not required or is optional.

3.2 Procedure:

3.2.1 Parts shall be plated by electrodeposition of lead from a suitable lead solution directly on the basis metal except that, in the case of parts made of corrosion-resistant steels, high speed steels, and aluminum alloys, a suitable strike plate may be used for bonding purposes. Either lead sulfamate or lead fluoroborate solution may be used but purchaser shall approve solution used for each part involved.

3.2.2 After plating, the parts shall be thoroughly rinsed in running water to remove plating solution, dipped in hot water, dried, and oiled or otherwise protected against corrosion.

3.3 Properties: The deposited lead shall conform to the following requirements:

3.3.1 Thickness: AMS 2414 shall designate plate thickness of 0.0005 - 0.0007 inch (12.7 - 17.8 µm), determined on representative parts or test panels in accordance with ASTM B487, ASTM B499, ASTM B504, ASTM B567, or other method agreed upon by purchaser and vendor. Ø

3.3.1.1 Plate thickness may be specified by AMS 2414 and a suffix number normally designating the minimum thickness in ten-thousandths of an inch (µm); the maximum plate thickness shall be 0.0002 inch (5 µm) greater than the minimum. Thus, AMS 2414-2 designates a thickness of 0.0002 - 0.0004 inch (5 - 10 µm) and AMS 2414-6 designates a thickness of 0.0006 - 0.0008 inch (15 - 20 µm).

3.3.1.2 Where "lead flash" is specified, the thickness of lead shall be approximately 0.0001 inch (2.5 µm).

3.3.1.3 The plate shall be substantially uniform in thickness on significant surfaces except that slight build-up on exterior corners or edges is acceptable provided finished drawing dimensions are met.

3.3.1.4 If internal surfaces or surfaces of small holes and deep recesses are required to be plated, notes on drawings will so specify, but minimum plate thickness requirements will be waived except when such surfaces can be touched by a sphere 0.75 inch (19 mm) in diameter. When plating of such surfaces is specified, external surfaces may have plate thickness greater than that specified but will not be cause for rejection if dimensions of parts are within specified tolerances.

3.3.2 Adhesion: Specimens as in 4.3.3 shall show no separation of the plating from the basis metal, when examined at approximately 4X magnification, after being bent rapidly at room temperature, in accordance with ASTM E290, through an angle of 180 degrees around a diameter equal to the nominal thickness of the specimen. Formation of cracks which do not result in flaking or blistering of the plating is acceptable.

3.4 Quality: Plating, as received by purchaser, shall be continuous, adherent to basis metal, uniform in appearance, and essentially free from pin holes, porosity, blisters, nodules, pits, and other imperfections detrimental to performance of parts. Slight staining or discoloration is permissible. Standards for acceptance shall be as agreed upon by purchaser and vendor. Ø

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The processing 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 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 thickness (3.3.1) and quality (3.4) are classified as acceptance tests and shall be performed to represent each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for adhesion (3.3.2) and tests of cleaning and plating solutions to ensure that the deposited metal 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 and shall be performed prior to or on the initial shipment of plated parts to a purchaser, when a change in material and/or processing 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, contracting officer, or request for procurement.

4.3 Sampling: Shall be not less than the following; a lot shall be all parts made from the same basis material, processed to the same plate thickness in the same set of solutions in not longer than eight consecutive hours, and presented for vendor's inspection at one time:

4.3.1 For Acceptance Tests:

4.3.1.1 Thickness: Three parts from each lot, except as specified in 4.3.3.

4.3.1.2 Quality: As agreed upon by purchaser and vendor.

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

4.3.3 When plated parts are of such configuration or size as to be not readily adaptable to the specified tests, separate test specimens cleaned and plated with the parts represented may be used. For adhesion tests, such specimens shall be panels of annealed, low-carbon steel approximately 0.032 x 4 x 1 inches (0.81 x 102 x 25 mm) and for thickness and quality tests shall be panels of the same size and type or shall be bars approximately 0.5 inch (12.7 mm) in diameter and 4 inches (102 mm) long.

4.4 Approval:

4.4.1 Sample plated parts shall be approved by purchaser before parts for 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.