Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 2426A
Superseding AMS 2426
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CADMIUM PLATING
Vacuum Deposition

1. SCOPE:

1.1 Purpose: This specification covers the engineering requirements for vacuum deposition of cadmium on ferrous metal parts and the properties of the deposit.

1.2 Application: Primarily to provide a corrosion resistant coating to high strength ferrous parts operating at not higher than 450°F (230°C) and requiring freedom from hydrogen embrittlement.

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 Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Materials Specifications:

AMS 2350 - Standards and Test Methods

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

ASTM B117 - Salt Spray (Fog) Testing
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 Coulmetric Method
ASTM E290 - Semi-Guided Bend Test for Ductility of Metallic Materials

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

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3.1.2 Parts shall be stress-relieved before plating if they have been subjected to any of the following operations after heat treatment: machining, grinding, straightening, or other cold deformation (except residual compressive stess-inducing operations, such as shot peening) and proof testing. Temperatures to which parts are heated and time of heating shall be such that maximum stress-relief is obtained without reducing mechanical properties of parts below those specified on the drawing.

3.1.3 Residual compressive stress-inducing operations, such as shot peening, shall follow stress-relieving.

3.1.4 Ferrous parts having tensile strength of 240,000 psi (1655 MPa) or greater shall not be exposed to hydrogen contamination processes such as pickling, cathodic cleaning, and etching, or to corrosive environments.

3.1.5 Ferrous parts having tensile strength of 180,000 psi (1241 MPa) and greater but less than 240,000 psi (1655 MPa), which have been exposed to hydrogen contamination processes, shall be heated to 375° F ± 15 (190° C ± 8) and held at heat for not less than 3 hr prior to plating.

3.1.6 Parts shall be so processed that they will be within specified dimensional tolerances after plating, unless otherwise specified.

3.1.7 Immediately prior to plating, surfaces to be coated shall be degreased, lightly dry abrasive blasted, and cleaned with dry air. The size of abrasive and intensity of blast shall be controlled so as to maintain surface finish within part drawing requirements.

3.2 Procedure:

3.2.1 Cadmium shall be deposited directly onto the basis metal without a preliminary coating of other metal, unless otherwise specified.

3.2.2 Parts shall be plated by deposition of vaporized metallic cadmium within a suitable vacuum.

3.2.2.1 The equipment and processes employed shall be adequate to completely cover all visible surfaces, including roots of threads, recesses, and sharp corners.

3.2.3 Plated parts shall be dipped in an approved chromate solution, thoroughly rinsed, and dried, unless otherwise specified.

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

3.3.1 Thickness: Shall be as specified on the drawing, determined on representative parts or test panels ø in accordance with ASTM B487, ASTM B499, ASTM B504, or other method agreed upon by purchaser and vendor.

3.3.1.1 Plate thickness may be specified by AMS 2426 and a suffix number normally designating the minimum thickness in ten-thousandths of an inch (2.5 μm); except as indicated in Table I, the maximum plate thickness shall be 0.0002 in. (5 μm) greater than the minimum. Thus, AMS 2426-2 designates a thickness of 0.0002 - 0.0004 in. (5 - 10 μm) and AMS 2426-6 designates a thickness of 0.0006 - 0.0008 in. (15 - 20 μm).

3.3.1.1.1 Plate thickness, when specified by AMS 2426 and a suffix number, shall be as specified in Table I for the specified suffix number and type of part or surface.

3.3.1.2 Where "cadmium flash" is specified, plate thickness shall be approximately 0.0001 in. (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 will be permitted provided finished drawing dimensions are met.

3.3.1.4 No requirements are established for minimum plate thickness for surfaces of holes, recesses, and other areas where a controlled deposit cannot be obtained under normal plating conditions but such areas shall not be masked to prevent plating. Except as specified in Table I for externally threaded sections, the resultant thickness shall be considered only when such surfaces of parts can be touched by a sphere 0.75 in. (19 mm) in diameter.

3.3.1.4.1 If internal surfaces as defined in 3.3.1.4 are required to be plated to a specified thickness, notes on the drawing will so specify (See 8.2).

3.3.2 Adhesion: Specimens as in 4.3.3 shall not show separation of the plating from the basis metal, when examined at approximately 4X magnification, after being bent rapidly, in accordance with ASTM E290, through an angle of 180 deg 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.

3.3.3 Corrosion Resistance: Except as specified in 3.3.3.1, ferrous metal parts or representative test panels shall show no visual evidence of corrosion of the basis metal after being subjected for a time not less than specified in Table I to continuous salt spray corrosion test conducted in accordance with ASTM B117.

3.3.3.1 Salt spray corrosion tests shall not apply to plated parts made of austenitic corrosion-resistant steels, to parts made of any corrosion-resistant steel or alloy when not plated all over, and to parts made of any steel when thickness is specified as "flash".

3.4 Quality: Plated cadmium shall be smooth, continuous, adherent to basis metal, uniform in appearance, and essentially free from pinholes, 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.

3.4.1 The cadmium deposit shall show no indication of contamination or improper operation of equipment used to produce the deposit, such as excessively powdery or darkened coatings.

3.4.2 Double plating and spotting-in after plating are not permitted, unless otherwise specified.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The processing vendor shall supply all samples 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 perform such confirmatory testing as he deems 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 on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for adhesion (3.3.2) and corrosion-resistance (3.3.3) and of equipment and process controls 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 processing 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 on the initial shipment of plated parts to a purchaser, when a change in material 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, 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 one size and shape processed in a consecutive 8-hr operation of the same equipment and presented for vendor's inspection at one time:

4.3.1 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 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 they represent may be used. For adhesion tests, such specimens shall be panels of annealed, low-carbon steel approximately 0.032 x 1 x 4 in. (1 x 25 x 100 mm) and for thickness and quality tests shall be panels of the same size and type or shall be bars approximately 0.5 in. (10 mm) in diameter and 4 in. (100 mm) long. For corrosion resistance tests, specimens shall be panels 0.062 - 0.125 in. (1.5 - 3 mm) in nominal thickness and not less than 3 in. (75 mm) wide by 4 in. (100 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. Results of tests on production parts shall be essentially equivalent to those on the approved sample 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 any change is necessary in type of equipment, in established composition limits and operating conditions of process solutions, or in vacuum chamber operating conditions, vendor shall submit for reapproval of the process a statement of the proposed changes in processing and, when requested, sample plated parts, test panels, or both. Production parts plated by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports: The vendor of plated 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 they conform to the acceptance test requirements. This report shall include the purchase order number, this specification number and its revision letter, part number, and quantity.