NOTICE OF
VALIDATION

VALIDATION NOTICE 1
29 April 1991 for
AMS 2412F-83
1 October 1983

AMS 2412F-83, adopted on 23 December 1985, has been reviewed and determined to be current.

Custodians:
Army - MR
Navy - AS
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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 2412F
Superseding AMS 2412E

Issued 8-1-45
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SILVER PLATING
Copper Strike, Low Bake

1. SCOPE:

1.1 Purpose: This specification covers the engineering requirements for electrodeposition of silver, usually with a copper strike between the basis metal and the silver, and the properties of the deposit.

1.2 Application: Primarily to provide a bearing surface and to prevent galling or seizing of metal surfaces of parts made of materials where a high baking temperature may be detrimental to the properties of the basis material.

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 ASTM Publications: Available from American Society for Testing and Materials, 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 E376 - Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Test Methods

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications 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

2.4 ANSI Publications: Available from American National Standards Institute, 1430 Broadway, New York, NY 10018.

ANSI B46.1 - Surface Texture

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 Prior to cleaning, texture of surfaces to be plated, on parts other than nuts, shall be not rougher than 80 microin. (2 µm), determined in accordance with ANSI B46.1, unless otherwise specified.

3.1.3 Parts, prior to immersion in the plating solution, shall have chemically clean surfaces, prepared with minimum abrasion, erosion, or pitting. Treatments which may produce hydrogen embrittlement shall be avoided.

3.1.4 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. These requirements do not apply to the bulk plating process.

3.2 Procedure: Parts shall be plated in the following sequence, using the solutions specified; parts shall be immersed in each plating solution with the current on:

3.2.1 Copper Strike: A copper strike shall be electrodeposited from a copper cyanide bath. The copper strike may be omitted in plating copper and copper alloys, except for copper alloys containing zinc in quantities of 30% or more by weight. A nickel flash shall be used before the copper strike when plating corrosion-resistant steels.

3.2.2 Silver Strike and Silver Plate: Parts shall be given a silver strike and then plated by electrodeposition of silver from a silver cyanide solution directly onto the strike surfaces.

3.2.3 Rinsing: The plated parts shall be removed from the plating solution, thoroughly rinsed, and dried.

3.3 Post Treatment: Except as specified herein, all parts except nuts shall be heated to 300° - 500°F (150° - 260°C) after plating, rinsing, and drying and held for not less than 2 hr, unless such heating would lower hardness to below drawing limits or otherwise deleteriously affect the parts, in which case heating shall be at the highest practicable temperature which will maintain specified properties. Parts shall be so heated as to prevent harmful oxidation.

3.4 Properties: Plated parts shall conform to the following requirements:

3.4.1 Thickness: Shall be as follows, determined on representative parts or on Ø test panels as in 4.3.3 in accordance with ASTM B487, ASTM B499, ASTM B504, ASTM E376, or other method agreed upon by purchaser and vendor:

3.4.1.1 Where "silver flash" is specified, plate thickness shall be approximately 0.0001 in. (2.5 μm).

3.4.1.2 Thickness of plate other than flash shall be as specified on the drawing. If machining of plated metal is required, plate thickness as deposited shall be sufficient to allow machining of all areas of plated surfaces to the dimensions specified on the drawing.

3.4.2 Composition: Silver, as plated, shall be not less than 99.9% pure; the process of plating shall be controlled to produce this purity.

3.4.3 Adhesion: Shall be as follows:

3.4.3.1 Plated metal shall be firmly and continuously bonded to the underlying metal. Nuts, and other parts after heating as in 3.3, shall show no blisters or other indications of poor bond.

3.4.3.2 Parts, other than nuts, shall withstand, after heating as in 3.3, a shear or chisel test so conducted as to indicate quality of the bond. Silver shall shear away with no parting of plate and basis metal.

3.4.3.3 Nuts shall show no peeling of the silver when scratched with a knife or other sharp tool.

3.5 Quality:

3.5.1 Silver plate which is not subsequently machined shall be sound, smooth, continuous, uniform in color, and free from blisters and other imperfections detrimental to performance of the silver plate. Selectively plated areas shall be sharply defined.

3.5.2 Silver plate which is to be machined shall be sound and free from excessive nodulation or treeing at edges. Finished parts shall be free from visible pits, excessive porosity, and other imperfections detrimental to fabrication or to performance of parts.

3.5.3 Abrasion of plating on corners and edges of nuts is acceptable but plate shall be continuous on threads. Marking of the cone section of self-locking nuts, produced in offsetting the locking beams or other locking feature, is acceptable.

3.5.4 Double plating and spotting-in after plating are not permitted, unless Ø otherwise authorized by purchaser.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The processing vendor shall supply all Ø 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 Ø thickness (3.4.1) and quality (3.5) are classified as acceptance tests and shall be performed on each sample as in 4.3.1.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for Ø composition (3.4.2) and adhesion (3.4.3) and tests of cleaning and plating solutions to ensure that the deposited silver 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 Ø requirements of this specification are classified as preproduction tests and shall be performed prior to or on the first-article shipment of plated 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, Ø 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:

4.3.1 For Acceptance Tests:

4.3.1.1 Thickness: Three parts, except as specified in 4.3.3, for each Ø consecutive 24-hr period, or fraction thereof, of operation of the same set of solutions.