AEROSPACE MATERIAL SPECIFICATION

AMS2407™	REV. G

Issued	1951-08
Revised	2012-07
Reaffirmed	2017-08
Stabilized	2022-09

Superseding AMS2407F

Plating, Chromium, Porous

RATIONALE

AMS2407G has been declared "STABILIZED" by AMS Committee B. This document will no longer be updated and may no longer represent standard industry practice. This document was stabilized because committee B could not find users for this document.

NOTE: Previously, this document was reaffirmed. The last technical update of this document occurred in July 2012. Users of this document should refer to the cognizant engineering organization for disposition of any issues with reports/certifications to this specification, including exceptions listed on the certification. In many cases, the purchaser may represent a sub-tier supplier and not the cognizant engineering organization.

STABILIZED NOTICE

AMS2407G has been declared “STABILIZED” by SAE AMS Committee B, Finishes Processes and Fluids Committee, and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
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SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS2407G/

NOTICE

ORDERING INFORMATION: The following information shall be provided to the plating processor by the purchaser.

1) Purchase order shall specify not less than the following:

- AMS2407F
- Plating thickness desired. See 3.3.1.
- Basis metal to be plated
- Tensile strength or hardness of the basis metal
- Pre-plate stress relief to be performed by plating processor (time and temperature) if different from 3.1.1
- Special features, geometry or processing present on parts that requires special attention by the plating processor
- Hydrogen embrittlement relief to be performed by plating processor (parameters or reference document) if different from 3.2.3.
- Minimum thickness on internal surfaces, if required. See 3.3.1.
- Quantity of pieces to be plated

2) Parts manufacturing operations such as heat treating, forming, joining and media finishing can affect the condition of the substrate for plating, or if performed after plating, could adversely affect the plated part. The sequencing of these types of operations should be specified by the cognizant engineering organization or purchaser and is not controlled by this specification.

1. SCOPE

1.1 Purpose

This specification covers requirements for electrodeposited porous chromium plate .

1.2 Application

This plating has been used typically to improve load-carrying and lubricating characteristics of ferrous parts, but usage Is not limited to such applications.

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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been canceled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 487 Measurement of Metal and Oxide Coating Thicknesses by Microscopical Examination of a Cross Section

ASTM B 499 Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals

ASTM B 504 Measurement of the Thickness of Metallic Coatings by the Coulometric Method

ASTM B 567 Method for Measurement of Coating Thickness by the Beta Backscatter Method

ASTM B 568 Measurement of Coating Thickness by X-Ray Spectrometry

ASTM B 571 Adhesion of Metallic Coatings

ASTM B 748 Measurement of Thickness of Metallic Coatings by Measurement of Cross Section with a Scanning Electron Microscope

ASTM B 764 Simultaneous Thickness and Electrochemical Potential Determination of Individual Layers on the Multilayer Nickel Deposit (STEP Test)

ASTM F 519 Mechanical Hydrogen Embrittlement Evaluation of Plating/Coating Processes and Service Environments

2.2 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI B46.1 Surface Texture

3. TECHNICAL REQUIREMENTS

3.1 Preparation

3.1.1 Stress Relief Treatment

All steel parts having a hardness of 40 HRC and above and that are machined, ground, cold formed or cold straightened shall be cleaned to remove surface contamination and thermally stress relieved before plating. Temperatures to which parts are heated shall be such that maximum stress relief is obtained while still maintaining hardness of parts within drawing limits. (Residual tensile stresses have been found to be damaging during electrofinishing.) Unless otherwise specified, the following treatment temperatures and times shall be used:

3.1.1.1 For parts, excluding nitrided parts, having a hardness of 55 HRC and above, including carburized and induction hardened parts, stress relieve at 275 °F ± 25 (135 °C ± 14) for a minimum of 5 hours.

3.1.1.2 For parts having a hardness less than 55 HRC, stress relieve at 375 °F ± 25 (191 °C ± 14) for a minimum of 4 hours. Nitrided parts fall into this category. Higher temperatures shall be used only when specified or approved by the cognizant engineering organization.

3.1.1.3 For peened parts: If stress relief temperatures above 375 °F (191 °C) are elected, the stress relieve shall be performed prior to peening or the cognizant engineering organization shall be consulted and shall approve the stress relief temperature.

3.1.2 The plating shall be applied over a surface free from water breaks. The cleaning procedure shall not produce pitting or intergranular attack of the basis metal and shall preserve dimensional requirements.

3.1.3 Unless otherwise specified, parts, before plating, shall have surface texture not greater than 10 microinches (0.3 µm), determined in accordance with ANSI B46.1

3.1.4 Except for barrel plating, electrical contact points shall be as follows. For parts which are to be plated all over, locations shall be specified or approved by the cognizant engineering organization. For parts which are not to be plated all over, locations shall be in areas on which plating is not required, or locations shall be specified or approved by the cognizant engineering organization..

3.2 Procedure

3.2.1 Chromium shall be electrodeposited from a chromic acid solution containing added sulfate or fluoride ions. Chromium shall be deposited directly on the basis metal without a flash coating of other metal underneath, except in the case of parts made of corrosion-resistant steel on which a preliminary flash of nickel or other suitable metal is permissible.

3.2.2 Unless the cognizant engineering organization permits the use of other methods of producing porosity, the plating current shall be reversed immediately after plating and the plate partially removed to produce porosity and surface texture as specified in 3.3.2 and 3.3.3.

3.2.3 Immediately following the reversed-current operation of 3.2.2, parts shall be rinsed in cold water, immersed in boiling water for not less than 1 hour to relieve possible hydrogen embrittlement, and dried. Optionally, after cold water rinse and dry, parts shall be transferred immediately to a forced air convection oven and embrittlement relief baked at 375 °F ± 25 (191 °C ± 14) for 8 hours minimum. For carburized, induction hardened, or other surface hardened steels where embrittlement relief baking at 375 °F ± 25 (191 °C ± 14) may damage the substrate steel, the parts shall be baked at 275 °F ± 25 (135 °C ± 14) for 23 hours minimum.

3.3 Properties

The deposit shall conform to the following requirements except as otherwise specified:

3.3.1

Thickness of plating shall be as specified on the drawing, determined in accordance with any of the following methods as applicable: ASTM B 487, ASTM B 499, ASTM B 567, ASTM B 568, ASTM B 748, ASTM B 764, or by other method permitted by the cognizant engineering organization.

3.3.2 Porosity shall be of the pinpoint type and its depth shall be 0.0010 to 0.0015 inch (0.025 to 0.038 mm). Pores in the plate shall be free from metal chips and powder residue.

3.3.3 Surface texture shall be 45 to 90 microinches (1.1 to 2.3 µm), determined on plated areas of finished parts in accordance with ANSI B46.1.

3.3.4 Hydrogen Embrittlement

The plating process after baking shall not cause hydrogen embrittlement in steel parts 36 HRC and over, determined in accordance with 4.3.4.

3.3.5 The plate shall meet the adhesion requirements of ASTM B 571 by the Chisel-Knife Test.

3.4 Quality

Plate, as received by purchaser, shall be firmly bonded to the basis metal and shall be uniform in appearance and free from frosty areas, blisters, and imperfections detrimental to usage of the plate. Slight staining or discoloration is permissible.

3.4.1 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 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 All technical requirements of this specification except hydrogen embrittlement (3.3.4) are classified as acceptance tests and shall be performed on parts from each lot.

4.2.2 Periodic Tests

Hydrogen embrittlement (3.3.4) is a periodic test and shall be performed in accordance with 4.3.4 at least once in each month that steel parts 36 HRC and over are plated unless frequency of testing is specified by the cognizant engineering organization. Tests of cleaning and processing solutions are periodic tests and shall be performed at a frequency established by the processor unless frequency of testing is specified by the cognizant engineering organization. See 8.4.

4.2.2.1 Periodic testing may be suspended in any test period when parts are not processed; however, preproduction testing may be required by the cognizant quality organization upon resumption of processing.

4.2.3 Preproduction Tests

All property verification tests (3.3) are preproduction tests and shall be performed prior to production and when the cognizant engineering organization requires confirmatory testing.

4.3 Sampling for Testing

4.3.1 Acceptance Tests

Test samples shall be randomly selected from all parts in the lot. A lot shall be all parts of the same part number, processed in a continuous series of operations (3.2) and presented for processor's inspection at one time. Unless the purchaser provides a sampling plan, the minimum number of samples shall be as specified below.

4.3.2 Coverage and Appearance

All parts in each lot.

4.3.3 Thickness, Porosity, Surface Texture, and Adhesion

Three (3) parts from each lot. At the option of the processor, separate test specimens in lieu of actual parts may be used for adhesion testing.

4.3.4 Hydrogen Embrittlement Test

Test shall be in accordance with the requirements of ASTM F 519 Type 1a.1 using round notched specimens, unless a different specimen is specified by the cognizant engineering organization, stressed in tension under constant load. For test purposes, the plating thickness shall be 0.002 to 0.003 inch (xx to xx µm) measured on the smooth section of the specimen, but with visual plating at the root of the notch.

4.4 Approval

4.4.1 The process and control factors or a preproduction part, or both, whichever is specified, shall be approved by the cognizant engineering organization before production parts are supplied.

4.4.2 If the processor makes a significant change to any material, process, or control factor from that which was used for process approval, all preproduction tests shall be performed and the results submitted to the cognizant engineering organization for process reapproval unless the change is approved by the cognizant engineering organization. A significant change is one which, in the judgment of the cognizant engineering organization, could affect the properties or performance of the parts. Production parts plated by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports

The processor shall furnish with each shipment a report stating that the parts have been-processed and tested in accordance with the requirements of this specification and that they conform to all test requirements. This report shall include the purchase order number, AMS2407F, part number, lot identification number, and quantity.

4.6 Resampling and Retesting

4.6.1 If any acceptance test fails to meet specified test requirements, the parts in that lot may be stripped, pretreated, coated, and post treated as defined herein and retested. Alternatively, all parts in the lot may be inspected for the nonconforming attribute, and the nonconforming parts may be stripped, pretreated, coated, and post treated as defined herein, and tested. After stripping and [replating *or* recoating], parts shall meet the dimensions on the drawing

4.6.1.1 When stripping is performed, the method shall be permitted by the cognizant engineering organization and shall not roughen, pit, or embrittle the basis metal or adversely affect part dimensions. When parts have been stripped and replated, the purchaser shall be informed.