

**AEROSPACE  
MATERIAL  
SPECIFICATION**

**AMS 2420B**

Superseding AMS 2420A

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**PLATING ALUMINUM FOR SOLDERABILITY  
Zinc Immersion Process**

1. **SCOPE:** This specification covers the engineering requirements for the preparation, by the zinc immersion process, of aluminum and aluminum alloy parts for soft soldering.
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 Material Specifications:**
      - AMS 2350 - Standards and Test Methods
      - AMS 2408 - Tin Plating
      - AMS 4751 - Solder, Tin-Lead, 63Sn - 37Pb
    - 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 Thickness by Microscopical Examination of a Cross Section
      - 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 Specifications**
        - MIL-STD-794 - Parts and Equipment. Procedures for Packaging and Packing of
  3. **TECHNICAL REQUIREMENTS:**
    - 3.1 **Preparation:**
      - 3.1.1 Impregnation of castings, when required or permitted, shall be done prior to plating. Prior to curing or baking, all excess impregnant shall be removed from surfaces to be plated.
      - 3.1.2 All machining shall be completed prior to cleaning and plating, unless otherwise specified.
    - 3.2 **Cleaning and Etching:** Prior to plating, the parts shall be cleaned as follows to remove grease, oil, and other surface contamination:
      - 3.2.1 Vapor degrease.
      - 3.2.2 Immerse parts in etch-type alkaline cleaner at 150° - 170°F (66° - 77°C) for 20 - 120 seconds.
      - 3.2.3 Rinse in cold, running water.

**REAFFIRMED**

3.2.4 Alloys containing more than 1% silicon should be immersed in an aqueous solution of ammonium bifluoride and sulfuric acid at room temperature for 20 - 45 seconds. The solution shall contain 6 - 7 oz per gal (44.9 - 52.4 kg/m<sup>3</sup>) of ammonium bifluoride and 4 - 5 oz per gal (31.3 - 39.1 g/m<sup>3</sup>) of sulfuric acid.

3.2.5 Alloys containing more than 0.5% magnesium should be treated in an aqueous solution containing 14 - 16 oz per gal (109.4 - 125 g/m<sup>3</sup>) of sulfuric acid at 140°F ± 10 (60°C ± 5) for 3 - 5 minutes.

3.2.6 Rinse in cold, running water.

3.2.7 Immerse in nitric acid solution (50% by volume) at room temperature for 30 - 60 seconds.

3.2.8 Rinse in cold, running water.

## Ø 3.3 Zinc Immersion Coating:

3.3.1 Immerse the parts at room temperature for 10 - 60 sec, with mild agitation, in zinc immersion solution containing 13 - 14 oz per gal (97.4 - 104.8 kg/m<sup>3</sup>) of zinc oxide and 70 - 71 oz per gal (524 - 531 kg/m<sup>3</sup>) sodium hydroxide. Other suitable zinc immersion solutions may be used to obtain the desired coating.

3.3.2 Rinse in cold, running water.

Ø 3.3.3 Immerse in nitric acid solution (50% by volume) at room temperature for 30 - 60 seconds.

Ø 3.3.4 Rinse in cold, running water.

Ø 3.3.5 Immerse the parts at room temperature for 10 - 60 sec, with mild agitation, in zinc immersion solution containing 13 - 14 oz per gal (97.4 - 104.8 kg/m<sup>3</sup>) of zinc oxide and 70 - 71 oz per gal (524 - 531 kg/m<sup>3</sup>) sodium hydroxide. Other suitable zinc immersion solutions may be used to obtain the desired coating.

Ø 3.3.6 Rinse in cold, running water.

## 3.4 Plating:

3.4.1 Apply a brass or copper strike to the parts in a solution having pH of 9.8 - 10.2, making electrical contact before immersion.

Ø 3.4.1.1 Electrical contact 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.

3.4.2 Rinse in cold, running water.

3.4.3 Copper plate in a high-speed copper cyanide solution to a thickness of 0.0004 - 0.0006 in. (10.2 - 15.2 µm).

3.4.4 Rinse in cold, running water.

3.4.5 Electrodeposit tin, in accordance with AMS 2408, or tin-zinc alloy with a maximum of 25% zinc, to a thickness of 0.0003 - 0.0005 in. (7.6 - 12.7 µm), unless otherwise specified.

3.4.6 Rinse in cold, running water.

3.4.7 Rinse in hot water and dry.

3.5 Properties:

- 3.5.1 Coverage: The deposit shall be smooth, continuous, adherent, and free from objectionable imperfections.
- 3.5.2 Thickness: Shall be as specified in 3.4.3 and 3.4.5, determined in accordance with ASTM B487 or other suitable method agreed upon by purchaser and vendor.
- 3.5.3 Heat Resistance: Specimens shall show no evidence of blistering after being baked for 30 min.  $\pm 3$  at  $350^{\circ}\text{F} \pm 10$  ( $175^{\circ}\text{C} \pm 5$ ).
- 3.5.4 Adhesion: A test specimen as in 4.3.3 shall withstand, without exhibiting separation of the deposit from the basis metal when examined at approximately 4X magnification, bending in accordance with ASTM E290 at room temperature through an angle of 180 deg (3.14 rad) around a diameter equal to the thickness of the specimen. Slight cracking in the bend, which does not result in flaking, is permissible.
- 3.5.5 Solderability: The plating shall demonstrate good solderability, determined by soldering the specimen used for the adhesion test in 3.5.4, using AMS 4751 solder and a mildly activated rosin (RMA) flux.

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 tests as he deems necessary to ensure that processing conforms to the requirements of this specification.
- 4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests.
- 4.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, reproduction 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 Coverage and Appearance: All parts.
- 4.3.2 Thickness: Three parts, or three specimens as in 4.3.3, for each consecutive 8 hr of operation of the same set of solutions.
- 4.3.3 Heat Resistance, Adhesion, and Solderability: One specimen for each consecutive 8 hr of operation of the same set of solutions. Specimens shall be aluminum or aluminum alloy of similar composition to the parts represented, approximately 0.032 x 4 x 1 in. or 1 x 100 x 25 mm, cleaned and plated simultaneously with the parts.
- 4.4 Approval:
- 4.4.1 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 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 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 processing vendor shall furnish with each shipment three copies of a report stating that the parts have been processed and tested in accordance with this specification and that they conform to the technical requirements. This report shall include the purchase order number, this specification number and its revision letter, part number, and quantity.

4.6 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the parts may be based on the results of testing three additional specimens for each original nonconforming specimen. Except as specified in 4.6.1, failure of any retest specimen to meet the specified requirements shall be cause for rejection of the parts represented and no additional testing shall be permitted. Results of all tests shall be reported.

4.6.1 If any part fails to meet the specified requirements, either on the original sampling as in 4.3 or upon resampling as in 4.6, the parts in that lot may be stripped by a method approved by purchaser which does not roughen, pit, or embrittle the basis metal, replated, and retested.

5. PREPARATION FOR DELIVERY:

5.1 Packaging:

5.1.1 Parts shall be handled and packaged in such a manner as will ensure that the required physical characteristics and properties of the plating are preserved.

5.1.2 Packages of parts shall be prepared for shipment in accordance with commercial practice to ensure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.1.3 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.1.2 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Parts on which the plating does not conform to this specification or to authorized modifications will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi ( $\phi$ ) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 For direct U.S. Military procurement, purchase documents should specify the following:

Title, number, and date of this specification  
Plate thickness desired  
Quantity of pieces to be plated  
Applicable level of packaging (See 5.1.3).