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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

# AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2480G

Issued MAY 1948
Revised MAY 2001
Reaffirmed APR 2006

Superseding AMS 2480F

## Phosphate Treatment
## Paint Base

1. SCOPE:

1.1 Form:

This specification covers the requirements for producing a zinc phosphate coating on ferrous alloys and the properties of the coating.

1.2 Application:

This process has been used typically to produce a coating which will ensure satisfactory paint adherence, 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 cancelled and no superseding document has been specified, the last published issue of that document shall apply.





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2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2759/9 Hydrogen Embrittlement Relief (Baking) of Steel Parts

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 117 Operating Salt Spray (Fog) Apparatus
ASTM F 519 Mechanical Hydrogen Embrittlement Evaluation of Plating Processes and Service Environments

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-P-23377 Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-P-85582 Primer Coatings: Epoxy, VOC Compliant, Chemical and Solvent Resistant

3. TECHNICAL REQUIREMENTS:

3.1 Preparation:

3.1.1 Unless otherwise specified, prior to coating, parts having a hardness of 40 HRC or higher and which have been ground, cold formed or cold straightened shall be cleaned and given a stress relief treatment at a temperature 50 F (28 C) degrees below the tempering temperature for a minimum of one hour per inch of thickness. When parts, including carburized parts having a hardness of 55 HRC or higher and having been tempered at less than 400 °F (204 °C), stress relief shall be at a temperature of not less than 275 °F (135 °C) for not less than 23 hours.

3.1.2 Surfaces of parts, prior to phosphate coating, shall be free from waterbreaks.

3.2 Procedure:

Parts shall be coated by immersing in, or spraying with, a balanced phosphate solution containing a nitrate salt as an accelerating agent. The solution shall be maintained at the proper temperature and parts shall be held in contact with the solution for sufficient time to form a uniform, insoluble, crystalline zinc phosphate coating meeting the requirements of 3.4. Immediately after coating, parts shall be thoroughly rinsed in cold, running water.

3.3 Post Treatment:

3.3.1 Chromic Acid Dip: After the cold water rinse, parts shall be dipped in dilute chromic acid solution for 20 to 60 seconds at 190 °F ± 10 (88 °C ± 6), and dried. The chromic acid solution shall be made up of 7.5 ounces of chromic acid in 100 gallons of water (0.56 g/L) with an approximate pH of 5. Other post treatments may be used in place of the chromic acid dip, if approved by the cognizant engineering organization. After drying, parts shall be protected against contamination and shall be painted, if applicable, as soon as practicable.

3.3.2 After phosphate coating and chromic acid dip, steel parts having a hardness of 40 HRC or higher shall be hydrogen embrittlement relief baked in accordance with the requirements of AMS 2759/9, except that parts shall be baked at 210 to 225 °F (99 to 107 °C) for eight hours.

3.4 Properties:

The coating shall conform to the following requirements:

3.4.1 Coverage: Prior to post treatment, coated parts and test panels shall have a uniform, dull appearance ranging from light to dark gray, with or without some silvery iridescence.

3.4.2 Corrosion Resistance: Representative parts or test panels (See 4.3.3) processed with parts as in 3.2 and 3.3, coated with a primer in accordance with either MIL-P-23377 or MIL-P-85582 to a dry film thickness of 0.0004 to 0.0010 inch (10 to 25 µm) and cured in accordance with manufacturer's instructions, scratched with a sharp instrument to a depth that cuts through the primer film and phosphate coating, exposing the base metal, shall show no visual evidence of corrosion extending more than 1/8 inch (3.2 mm) on either side of the scratch mark after being subjected to 150 hours of continuous salt spray conducted in accordance with ASTM B 117.

3.4.3 Hydrogen Embrittlement Relief Test: The coating process shall not cause hydrogen embrittlement in ferrous parts. Testing in accordance with ASTM F 519, Type 1a, notched round specimens, unless a different specimen type is specified by purchaser, stressed in tension under constant load, is required when parts 40 HRC or higher are coated. Coating shall meet the requirements of this specification on specimen surfaces and shall be visible at the root of the notch.

3.5 Quality:

Surfaces of treated parts, as received by purchaser, shall be uniform in texture and appearance. Powdery areas, excessive buildup, and darkening of corners and edges are not acceptable.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The processor shall supply all samples for processor's tests and shall be responsible for the performance of all required tests. Parts, if required for tests, shall be supplied by purchaser. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the processing conforms to the specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Coverage (3.4.1) and quality (3.5) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Corrosion resistance (3.4.2), hydrogen embrittlement relief (3.4.3), tests of cleaning and coating solutions (See 8.4) to ensure that coatings will conform to this specification are periodic tests and shall be performed at a frequency selected by the processor unless frequency of testing is specified by purchaser, but not less than monthly for corrosion testing.

4.2.3 Preproduction Tests: All technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of coated parts to a purchaser, when a change in materials or processing requires reapproval by the cognizant engineering organization (See 4.4.2), and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing:

Shall be as follows; a lot shall be all parts with the same part number, heat treated to the same hardness or tensile strength level, processed in the same solution(s) within eight consecutive hours, and presented for processor's inspection at one time.

4.3.1 For Acceptance Tests: As shown in Table 1.



TABLE 1 - Acceptance Test Sampling

| Number of Parts in Lot | Coverage and Quality |
|---|---|
| Up to 6 | All |
| 7 to 15 | 7 |
| 16 to 40 | 10 |
| 41 to 110 | 15 |
| 111 to 300 | 25 |
| 301 to 500 | 35 |
| 501 to 700 | 50 |
| 701 to 1200 | 75 |
| Over 1200 | 125 |

4.3.2 Periodic Tests: Sample quantity and frequency of sampling shall be selected at the discretion of the processor, unless frequency of testing is specified by purchaser, except corrosion testing shall be performed a minimum of once a month.

4.3.3 When coated parts are of such configuration or size as to be not readily adaptable for the specified tests, separate test specimens fabricated from low carbon steel, cleaned, coated, and post-treated with the parts may be used. Specimens shall be panels 0.032 x 4 x 2 inches (0.81 x 102 x 51 mm). Specimens for hydrogen embrittlement relief testing are defined in ASTM F 519.

4.4 Approval:

4.4.1 The process and control procedures, a preproduction sample part, or both, whichever is specified, shall be approved by the cognizant engineering organization before production parts are supplied. Preproduction test specimens may be substituted for a preproduction sample part at the discretion of the cognizant engineering organization.

4.4.2 The processor shall make no significant change to materials, processes, coating conditions or control factors from those on which the approval was based, 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.

4.4.2.1 Control factors include, but are not limited to the following:

Bath type and control limits
Bath temperature controls and limits
Hydrogen embrittlement treatment time and temperature
Post-treatment solution type and control limits
Stripping procedure, if used
Periodic test plan.

4.5 Reports:

The processor of coated parts shall furnish with each shipment a report stating that the parts have been processed and tested in accordance with specified requirements and that they conform to the acceptance test requirements. This report shall include the purchase order number, lot number, AMS 2480G, part number, and quantity.

4.6 Resampling and Retesting:

4.6.1 If the results of any acceptance test fails to meet specified requirements, parts in that lot may be stripped by a method acceptable to purchaser which does not roughen, pit, or embrittle the basis metal, recoated as defined herein, and tested. Alternatively, all parts in the lot may be inspected for the nonconforming attribute and those parts nonconforming may be stripped by a method acceptable to purchaser that does not pit, roughen, or embrittle the basis metal, recoated and post-treated as defined herein, and tested.