AEROSPACE MATERIAL SPECIFICATION

AMS2480	REV. H

Issued 1948-05
Revised 2009-07
Reaffirmed 2013-11

Superseding AMS2480G

Phosphate Treatment
Paint Base

RATIONALE

AMS2480H has been reaffirmed to comply with the SAE five-year review policy.

NOTICE

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

Purchase order shall specify not less than the following:

- AMS2480H
- Basis metal to be treated
- Tensile strength or hardness of the basis metal
- Pre-treatment stress relief to be performed by processor (time and temperature) if different from 3.1.1
- Special features, geometry, or processing present onparts that requires special attention by the processor
- Hydrogen embrittlement relief to be performed by the processor if different from 3.3.2
- Quantity of pieces to be treated

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 that will ensure satisfactory paint adherence, but usage is not limited to such applications.

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

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 that 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.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2759/9 Hydrogen Embrittlement Relief (Baking) of Steel Parts
AS2390 Chemical Process Test Specimen Material

2.2 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 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 the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

MIL-PRF-23377 Primer Coatings: Epoxy, High Solids
MIL-PRF-85582 Primer Coatings: Epoxy, Waterborne

3. TECHNICAL REQUIREMENTS

3.1 Preparation

3.1.1 Steel parts having a hardness of 40 HRC or higher and that have been ground, cold formed or cold straightened after heat treatment shall be cleaned to remove surface contamination and stress relieved before preparation for coating. Temperatures to which parts are heated shall be such that maximum stress relief is obtained without reducing hardness of parts below drawing limits, but, unless otherwise specified, the stress relief shall be not less than 275 °F (135 °C) for not less than five hours for parts having hardness of 55 HRC or higher or not less than 375 °F (191 °C) for not less than four hours for other parts. If a higher stress relief temperature is selected, it shall not exceed 50 Fahrenheit (28 Celsius) degrees below the tempering temperature of the basis metal for a minimum of one hour per inch of thickness.

3.1.2 The phosphate coating shall be applied over a surface free from waterbreaks. The cleaning procedure shall not produce pitting or intergranular attack of the basis metal and shall preserve dimensional requirements,

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 temperature recommended by the manufacturer 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 Hydrogen embrittlement relief baking of steel parts having a hardness of 40 HRC or higher shall be in accordance with AMS2759/9 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

Phosphate treated, primed and scratched test specimens 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. Prior to testing, phosphate-treated test specimens shall be coated with a primer in accordance with either MIL-PRF-23377 or MIL-PRF-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. The primer shall be scratched with a sharp instrument to a depth that cuts through the primer film and phosphate coating, exposing the base metal. The scratch shall be 1 inch (2.5 cm) minimum in length. See 4.3.3.2.

3.4.3 Hydrogen Embrittlement

The coating process after baking shall not cause hydrogen embrittlement in steel parts 40 HRC (180 ksi) and over determined in accordance with 4.3.3.3.

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. The cognizant engineering organization 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 parts, or specimens representing parts when permitted herein from each lot. See 4.3.3.1.

4.2.2 Periodic Tests

Corrosion resistance (3.4.2) is a periodic test and shall be performed at least monthly unless frequency of testing is specified by the cognizant engineering organization. Hydrogen embrittlement (3.4.3) is a periodic test and shall be performed 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 coating 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 4.4.3 and 8.4. Periodic testing is not required during periods of non-use. Periodic testing must either be completed prior to production restart or periodic test specimens must be processed with the first lot of hardware processed.

4.2.3 Preproduction Tests

All property verification tests (section 3.4) are preproduction tests and shall be performed prior to or on the initial shipment of coated parts to a purchaser and when the cognizant engineering organization requires confirmatory testing.

4.3 Sampling for Testing

4.3.1 Acceptance Tests

Acceptance 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 (3.1 through 3.3), in not longer than eight consecutive hours, and presented for processor's inspection at one time. Unless the cognizant engineering organization provides a sampling plan, the minimum number of samples shall be shown in Table 1.

TABLE 1 Acceptance Test Sampling

Number of Parts in Lot	Coverage and Quality
Up to 6	All or 3*
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

*Whichever is less

4.3.2 Periodic Tests

Sample quantity shall be two for corrosion resistance. For hydrogen embrittlement, sample quantity shall be as specified in ASTM F 519 unless otherwise specified by the cognizant engineering organization.