



AEROSPACE MATERIAL SPECIFICATION

AMS03™-11**REV. A**

Issued 2015-04

Stabilized 2017-10

Superseding AMS03-11

Phosphate Treatment of Iron and Steel

RATIONALE

AMS03-11A stabilizes this document because this document contains mature technology that is not expected to change and thus no further revisions are anticipated.

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NOTE: In many cases the purchaser may be a sub tier supplier and not the cognizant engineering organization.

AMS Committee B recommends that the following similar (e.g., properties, fit, form, function) specifications be considered for future procurement. This listing does not constitute authority to substitute these specifications for the "STABILIZED" specification.

AMS2480 Phosphate Treatment, Paint Base

AMS2481 Phosphate Treatment Antichafing

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FOREWORD

REVISION NOTE

This Defence Standard was raised to Issue 5 to update its content and incorporate the latest MoD/DStan policy in place at the time.

HISTORICAL RECORD

This standard supersedes the following:

Def 29A dated September 1965

Def Stan 03-11 / Issue 1 dated 21 November 1974

Def Stan 03-11 / Issue 2 dated 26 May 1986

Def Stan 03-11 / Issue 3 dated 24 February 1995

Def Stan 03-11 / Issue 4 dated 16 December 2003

INTRODUCTION

This document constitutes the requirements for the phosphate treatment of iron and steel to provide coatings for the protection of items against corrosion and wear. It covers four classes of phosphate coatings, which are designated as follows:

Class I

A coating consisting essentially of inorganic phosphates of manganese or iron and having a weight of not less than 7.5 g/m² of treated surface. The coating is produced by certain immersion-type accelerated and unaccelerated processes. This class will be used normally when sealing with oil or grease supplementary finishes are specified, and maximum corrosion protection (or wear resistance) is desired. It is not recommended for use under paint, varnish, and lacquer finishes on sheet materials less than 1.0 mm thick.

Class II

A coating consisting essentially of inorganic phosphates of zinc and having a weight of not less than 4.5 g/m² of treated surface. The coating is usually produced by an immersion-type accelerated process. This class will normally be used for general protective purposes under paint finishes. A Class I coating may be used when a Class II coating is called for, except on thin sheet materials.

Class III

A coating consisting essentially of inorganic phosphates of zinc or iron and having a weight within the range 1.5 to 4.5 g/m² of treated surface. The coating is usually produced by a spray type accelerated process. This class will normally be used only for the pre-treatment of thin sheet steel sections under paint, varnish, or lacquer coatings of high protective value.

Class IV

A coating consisting essentially of inorganic phosphates of zinc or iron having a weight within the range 0.2 to 1.5 g/m² of treated surface. This class will normally be used where items are to be deformed during further fabrication after the application of paint, varnish, or lacquer.

NOTE 1 Dimensional changes resulting from phosphating treatments are normally within a maximum increase of 8 µm/surface, depending on the particular process selected and a strict adherence to the process manufacturer's operating instructions. Deviation from the specified operating conditions of the phosphating solution can result in excessive attack of the item with possible decrease in dimensions and uneven coatings of inferior properties.

NOTE 2 The dimensions of the finished item shall be those of the item after phosphating and before the application of any supplementary finish. Where phosphating is used to give antiwear properties to sliding surfaces the coating is consolidated during the running-in period, and consequently no machining allowance should normally be made for phosphating.

TABLE OF CONTENTS

1.	SCOPE.....	4
2.	WARNING	4
3.	NORMATIVE REFERENCES	4
4.	DEFINITIONS	5
5.	INFORMATION TO BE SUPPLIED TO THE PROCESSOR.....	6
6.	PROCESS CONTROL.....	6
7.	PROCESS REQUIREMENTS	6
7.1	General.....	6
7.2	Heat Treatment	6
7.3	Surface Preparation	7
7.4	Phosphate Treatment.....	7
7.5	Washing	7
7.6	Staining	8
7.7	Drying.....	8
7.8	Heat Treatment Relief of Hydrogen Embrittlement.....	8
7.9	Sealing	9
8.	INSPECTION AND TEST	9
8.1	Inspection.....	9
8.2	Selection of Test Samples	9
8.2.1	Intermittent Processing	9
8.2.2	Continuous Processing	9
8.3	Visual Inspection	9
8.4	Test for the Presence of a Coating	10
8.5	Coating Weight.....	10
8.6	Freedom from Corrosive Residues	10
8.7	Resistance to Salt Spray.....	10
8.8	Re-Treatment of Items Rejected on Inspection	11
9.	NOTES.....	11
ANNEX A	DETERMINATION OF RINSE WATER CONTAMINATION.....	12
ANNEX B	PHOSPHATING OF HIGH STRENGTH STEELS	13
ANNEX C	DETERMINATION OF PHOSPHATE COATING WEIGHT	14
ANNEX D	DETERMINATION OF THE FREEDOM FROM CORROSIVE RESIDUE	16
ANNEX E	SALT DROPLET TEST	17
Table 1	Tensile strength of steels.....	6
Table 2	Coating weight	10
Table 3	Examples of supplementary finishes for resistance to salt spray	11

1. SCOPE

This SAE Standard specifies requirements for the processing of iron and steel (excluding corrosion resisting steels) to produce coatings consisting essentially of inorganic phosphates, which are intended to be used in conjunction with supplementary finishes for the protection of the basis metal against corrosion (and in certain cases to give, additionally, anti-wear properties to sliding surfaces).

2. WARNING

This section which appeared in DEF STAN 03-11 Issue 5 has been deliberately deleted.

3. NORMATIVE REFERENCES

3.1 The publications shown below are referred to in the text of this standard. Publications are grouped and listed in alpha-numeric order.

BS EN ISO 4536	Metallic and Non-Organic Coatings on Metallic Substrates. Saline Droplets Corrosion Test (SD Test)
BS EN ISO 6507-1	Metallic Materials. Vickers Hardness Test. Test Method
BS 3900: Part F4	Methods of Tests for Paints. Resistance to Continuous Salt Spray
Def Stan 03-2	Cleaning and Preparation of Metal Surfaces
AMS03-2	Cleaning and Preparation of Metal Surfaces
Def Stan 03-4	The Pre-Treatment and Protection of Steel Items of Specified Maximum Tensile Strength Exceeding 1450 MPa
AMS03-4	The Pre-Treatment and Protection of Steel Items of Specified Maximum Tensile Strength Exceeding 1450 MPa
Def Stan 03-29	Protection of Metallic Springs Against Corrosion
Def Stan 68-10	Corrosion Preventive: Water Displacing. NATO Code No: C-634, Joint Service Designation: PX-24
Def Stan 80-25	Paint, Ammunition Finishing, Stoving Spraying and Dipping
Def Stan 80-27	Paint, Ammunition Finishing, Brushing, Spraying and Dipping
Def Stan 80-34	Corrosion Preventive, Compound Oil, Thin Film, Joint Service Designation: PX-4
Def Stan 80-56	Paint, Finishing Epoxide, Stoving, Black for Small Arms. Spraying

3.2 This section which appeared in DEF STAN 03-11 Issue 5 has been deliberately deleted.

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4. DEFINITIONS

4.1 For the purposes of this standard the following definitions apply:

4.2 FREE ACID

The free acid of a phosphating solution is the number of milliliters (mL) of 0.1M sodium hydroxide solution required to neutralize 10 mL of the phosphating solution to pH 4 using methyl orange or an equivalent indicator system.

4.3 POINTAGE

Pointage is a measure of the total acidity of a phosphating solution. It is the number of milliliters (mL) of 0.1M sodium hydroxide solution required to neutralize 10 mL of the phosphating solution to pH 10 using phenolphthalein as an indicator.

4.4 PROCESS CONTROL SCHEDULE

The document which specifies/defines:

- a. The sequence of manufacturing operations and processes.
- b. The control parameters and their tolerances for each individual process within the total sequence.

4.5 PROCESS TYPE

4.5.1 Accelerated Process

An accelerated process is one where the processing solution is of the metal phosphate/phosphoric acid type containing additions such as oxidizing agents, e.g., nitroguanidine, nitrate, nitrite, or chlorate, which accelerate the coating formation

4.5.2 Unaccelerated Process

An unaccelerated process is one in which the processing solution is of the plain metal phosphate/phosphoric acid type and no accelerating agents are employed.

4.6 SEALING

Sealing is the application of a supplementary finish to the phosphate surface immediately after phosphating, washing, and drying, to form a complete protective or lubrication scheme.

4.7 SIGNIFICANT SURFACE

That area of the item, covered or to be covered by the coating, and for which the coating is essential for serviceability and/or appearance.

4.8 SUPPLEMENTARY FINISH

A supplementary finish is a coating material, usually of an organic nature, e.g., oil, grease, lacquer, varnish, paint or dry lubricant.

4.9 TENSILE STRENGTH OF STEELS

- 4.9.1 Throughout this Standard the tensile strength figures refer to specified maximum tensile strength. Steels shall be categorized according to specified maximum tensile strength in accordance with Table 1. Where the steel specification specifies only the minimum tensile strength, the equivalent maximum tensile strength category shall be determined from Table 1:

NOTE: Maximum Tensile Strength may also be referred to as Ultimate Tensile Strength.