

ZINC PHOSPHATE CONVERSION COATING ON FERROUS SURFACES

1. SCOPE

1.1 This specification defines the basic requirements of a black zinc phosphate conversion coating deposited directly on a ferrous substrate. Included are provisions for coating mass, thickness and neutral salt spray corrosion resistance.

1.2 This specification may involve hazardous materials, procedures and apparatus. This specification does not address the health and safety problems, if any, associated with its application or use. It is the specification user's responsibility to follow appropriate health or safety practices and determine the application or regulatory limitation before use.

2. APPLICATION

This specification was released to define the performance requirements for zinc phosphate conversion coatings where some corrosion protection on ferrous surfaces are required.

3. DESIGNATION

The Engineering Drawing shall contain the following notation for zinc phosphate conversion coating. This notation shall be taken from Table 1.

Phosphate per item (X)

BAKING is required per item (X)

where (X) is the item number

The baking requirement shall be noted on the Engineering drawing for parts having a hardness greater than 34 Rc or that are severely cold worked.

In addition to the above requirements, the coating specification shall be noted above the title block as noted in Figure 1. The number shall be taken from Table 1. This number shall be matched with the numbers in Table 3 and the matching name will be used in the item name block as seen in Figure 1. The quantity shall be "0".

Phosphate per Item 1

BAKING is required per Item 2

2	0	86512329	BAKE PER STD 86508306
1	0	86508340	ZN PH OIL STD 86508306
ITEM	QUANTITY	UNIT	PART NUMBER
J ANGLE SECTION EUROPEAN MATERIAL AMERICAN MATERIAL THE FOLLOWING TOLERANCES APPLY UNLESS OTHERWISE SPEC 90° ± 0.2° MACHINED SURFACE FINISH = 6.3 EXCEPT DRILLED IN POSITION TOLERANCES ± AND RELATED DATUMS. APPLY MMC OTHER GEOMETRIC			

FIGURE 1

3.1 The dimensions specified on the drawing are before plating. If the application does not allow the additional thickness of plating, the actual required limits must be specified on the drawing and noted "AFTER PLATING".

4. RELATED STANDARDS

- ASTM B117 - Standard Method of Salt Spray (Fog) Testing
- ASTM B183 - Practice for Preparation of Low-Carbon Steel for Electroplating
- ASTM B242 - Practice for Preparation of High-Carbon Steel for Electroplating
- ASTM B320 - Practice for Preparation of Iron Castings for Electroplating
- ASTM B487 - Standard Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of a Cross Section.

					NAME	STD ZINC PHOSPHATE		
					 NEW HOLLAND	ENGINEERING SPECIFICATION		
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ALL	D	EDF	110646	10/97			86508306	
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ALL	B	RE	104739	950123				
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TABLE 1 - ZINC PHOSPHATE REQUIREMENTS

Specification Number FNHA-2-H-501.	Part Number	Mass (Min) Zinc Phosphate		Min. Coating Thickness		Supplemental Treatment	Min. Hrs of Corrosion Resistance Red Corrosion
		g/m ²	mg/ft ²	um	Inches		
.01	86508339	11	1000	5	0.0002	NONE	4
.02	86508340	11	1000	5	0.0002	OIL	24
.03	86508341	11	1000	5	0.0002	WAX	72

5. REQUIREMENTS

5.1 CLASSIFICATION.

This specification provides a zinc phosphate coating with two (2) supplemental treatments as shown in Table 1.

5.2 CLEANING.

Before zinc phosphate conversion coating, the parts shall be thoroughly cleaned and free from rust, scale, oil and any other foreign matter which would be detrimental to the finish or adhesion of the coating. Particular care should be taken in the cleaning operation to prevent hydrogen embrittlement of parts exposed to high stress in service, prior heat treatment or cold working. It is recommended that the appropriate practices be used: ASTM B 183, ASTM B 242, and ASTM B 320.

5.3 ZINC PHOSPHATE

5.3.1 CONVERSION COATING THICKNESS.

The minimum zinc phosphate conversion coating shown on Table 1 is required on all significant surfaces. The non-significant surfaces shall have a minimum of at least one-half (1/2) of the minimum required thickness of the significant surface.

Definition: Significant Surface: Surfaces which are visible and are susceptible to corrosion on which zinc phosphate conversion coating is a necessary function, unless otherwise specified on Engineering drawings or standards. In general, the portion of the visible surface on the part which can be touched by a 20mm (0.75 inch) diameter sphere. Sharp edges are excluded.

5.3.2 MAXIMUM ZINC PHOSPHATE CONVERSION COATING THICKNESS FOR THREADS ON FASTENERS.

The maximum allowable thickness of zinc phosphate conversion coating applied to the threaded surface is described on Table II. The location of this thickness shall be measured at one (1) diameter from the threaded end of the fastener and at one-half (1/2) the tooth height of the thread. Internal threaded parts having a hole depth greater than 6mm (0.25 inches) need not meet the requirements of the threaded portion unless otherwise specified on the Engineering drawing or standard. When the fasteners are assembled, both the external and internal threaded parts must run freely in their intended use.

5.4 CORROSION RESISTANCE.

Zinc phosphate conversion coating on all significant surfaces except for sharp edges shall be capable of withstanding the neutral salt spray testing for the minimum number of hours specified in Table I. Non-significant surfaces shall withstand the neutral salt spray testing for one-half (1/2) the minimum required time on significant surface.

5.5 MASS OF ZINC PHOSPHATE COATING

The zinc phosphate coating mass shall be determined on panels or actual parts as per procedure described in methods of test. The mass shall meet the minimum requirements in Table 1.

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5.6 HYDROGEN EMBRITTLEMENT

All steel parts having a hardness above Rockwell C34 or 313 Brinell, and all parts which are severely cold worked are susceptible to embrittlement due to hydrogen absorption during the zinc phosphate conversion coating process. These parts shall be baked to relieve this condition immediately after zinc phosphate conversion coating, unless otherwise specified on the Engineering drawing or standard. The baking process shall consist of heating the parts in an oven to 107-121°C (225-250°F) within 2 hours after processing for at least 4 hours at temperature. The baking operation shall be done prior to any supplementary treatment. Engineering shall note

"Baking is required" on Engineering drawings when part hardness is greater than 34 Rockwell C or is severely cold worked.

5.7 QUALITY.

The zinc phosphate conversion coating shall be a uniform crystalline texture with a pattern not visible to the unaided eye at normal reading distance. The coating shall not etch the base metal and shall adhere to the substrate. The color shall be black, free from fingerprints, white stains and shall not have a mottled appearance. Having a brown color or orange staining due to chromic acid rinse or color variation due to heat treatment, cold working or variations due to composition of substrate shall not be cause for rejections.

6. METHODS OF TEST

6.1 ZINC PHOSPHATE CONVERSION COATING THICKNESS.

The minimum zinc phosphate conversion coating thickness is listed on Table 1. Maximum thickness values for fasteners threads are listed on Table II. In cases of disputes, the zinc phosphate conversion coating thickness measurements shall be performed by metallographic sectioning as per ASTM B487.

6.2 ACCELERATED CORROSION RESISTANCE. (NEUTRAL SALT SPRAY)

The neutral salt spray test will be performed per ASTM B117. The zinc phosphate conversion coating shall show no red corrosion product visible to the unaided eye at normal reading distance for the minimum times specified listed on Table 1.

6.3 ZINC PHOSPHATE COATING MASS.

The zinc phosphate coating mass per surface area shall be determined on actual parts or standard panels using the chromic acid method. The panels shall consist of a low carbon steel ground on one side. These panels shall be cycled through the coating system with production parts for determining the coating mass.

6.4 HYDROGEN EMBRITTLEMENT TEST

6.4.1 COMPONENT PARTS.

Parts which meet the requirements of being embrittled shall be tested. A random selection of at least 6 samples will be made. These samples are subjected to a load corresponding to its intended usage load or a minimum of 85% of its yield strength. This load shall be maintained for a minimum of 24 hours. Fracture of test parts are not acceptable.

6.4.2 THREAD FASTENERS.

Threaded fasteners which meet the requirements of being embrittled shall be tested. A random selection of at least 6 fasteners shall be subjected to a load of 85% of the minimum torque to yield the bolt. The test fixture shall consist of a plate with a hole for the fastener. This fixture also and has a one millimeter step to load one side of the head of the fastener. (See Figure 1) The assembly shall be in the tightened condition for at least a period of 24 hours. Fracture of fastener is not acceptable. The minimum torque to yield the bolt shall be the minimum yield torque valves from 3 tests performed with 3 fasteners.

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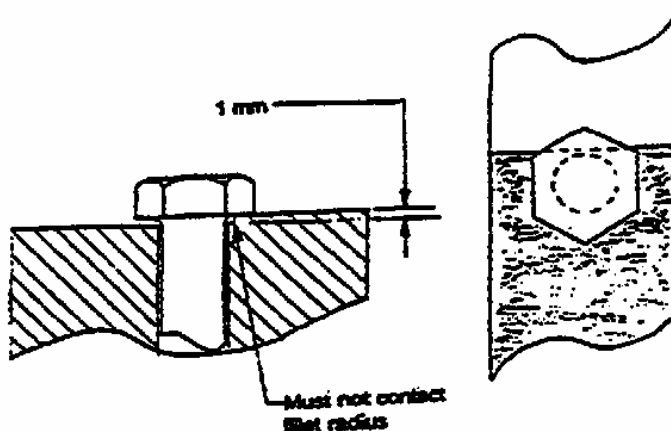


Figure 1 - Hydrogen Embrittlement Test Fixture

TABLE II
 MAXIMUM ALLOWABLE ZINC PHOSPHATE CONVERSION COATING THICKNESS FOR THE
 TYPE 2A THREADED AREAS OF FASTENERS

METRIC	THREADS/INCH		MAXIMUM THICKNESS	
	UNC	UNF	um	(INCHES)
----	----	48-44	4	(0.00015)
M2-M4	32	40-32	5	(0.0002)
M5-M8	24-20	28-24	6	(0.00025)
M10-M12	18-16	20	8	(0.0003)
M16	14-13	18-16	9	(0.00035)
M20	12-11	----	10	(0.0004)
M24	10-9	12	11	(0.00045)
M30	----	----	13	(0.0005)

7. SUPPLIER RESPONSIBILITY

7.1 Suppliers shall perform the necessary tests for sample approval for initial lots. After this approval suppliers are not required to perform the specific tests, but to ascertain that their product will conform to the specification limits. These specified requirements will be used to reconcile any disputed values.

7.2 All materials supplied to this specification shall be equivalent in all characteristics to the material upon which approval was originally granted. Prior to making any changes in materials the supplier shall notify Purchasing and the effect Materials Engineering Activity of the proposed change. These material changes include properties, composition, construction, color, dimensions, processing or labeling. The supplier shall obtain written acknowledgement from the Materials Engineering Activity before any production. Test data, test samples and a new identification code are to be submitted with the request.

TABLE III	
PART #	NAME
86508339	ZN PH STD 86508306
86508340	ZN PH OIL STD 86508306
86508341	ZN PH WAX STD 86508306
86512329	BAKE PER STD 86508306

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