

ZINC PLATING

1. SCOPE

1.1 This specification covers requirements for zinc (Zn) electroplated and mechanically plated finishes. Seven Types of plating finishes are defined; see Tables 1 and 3. Restricted plating Types may involve special plating processing to achieve specified performance and require approval by Materials Engineering for identified part applications. Approved supplier plating processes for these restricted plating Types and applications are tabulated in the MAT0310P Zinc Plating, Processing Supplier specification. The MAT0310 specification replaces Former Company specifications listed in Table 2 for use on all new and updated drawings.

Table 1 Zinc Plating Types and Material Description	
Type	Description
ZN YCR	Zinc electroplating with yellow colored chromate passivation. Cr3 or Cr6 passivation is permitted. Type ZN YCR exhibits good corrosion resistance; and is the most commonly used Type for exterior applications, hydraulic fittings and tubing, and other components.
ZN TCR ⁽³⁾	Zinc electroplating with clear Cr3 chromium passivation; No Cr6 passivation is permitted. Type ZN TCR specified corrosion resistance is equivalent to Type ZN YCR with the same part applications.
ZN CCR (Withdrawn)	ZN CCR is withdrawn effective with MAT0310 revision P; do not specify for new and updated drawings. Zinc electroplating with clear or colored and leached clear chromate passivation. Cr3 or Cr6 passivation is permitted. Type ZN CCR finish exhibits the least corrosion resistance and its use should be minimized.
ZN BCR	Zinc electroplating with black colored chromate passivation. Cr3 or Cr6 passivation is permitted. ZN BCR finish exhibits moderate corrosion resistance; primarily used for appearance purposes in interior applications.
ZNM YCR	Zinc mechanical plating with yellow colored chromate passivation and a matte finish. Cr3 or Cr6 passivation is permitted. ZNM YCR applications include spring steel wire in coiled springs and snap rings.
ZNM TCR ⁽³⁾	Zinc mechanical plating with clear Cr3 passivation; No Cr6 passivation is permitted. Same applications as described for Type ZNM YCR. Type ZNM TCR may be substituted for Type ZNM YCR with the same required conditions as described for ZN TCR.
Zinc Plating - Restricted Types and Application	
Restricted Types; Materials Engineering approval of supplier plating processing is required for all part applications.	
ZN TCRSP ⁽¹⁾	ZN TCRSP is restricted to parts used by Crop Harvesting manufacturing plants in Europe per ES-ZD249. Zinc electroplating with Cr3 thick passivation ⁽²⁾ and a required topcoat sealant. No Cr6 passivation permitted. Exhibits significantly improved corrosion resistance; required before bending, forming, or other processing. Restricted to non-threaded parts such as flared end hydraulic tubing, supports, and brackets. Where Type ZN TCRSP is specified, supplier plating process approval is required, see MAT0310P.

(1) No automatic substitution for other zinc plating Types or by other zinc plating Types is permitted.

(2) Thick (heavy) Cr3 passivation is required with a film thickness of 200 – 400 nm; see also Table 3.

(3) While not required, Cr3 thick passivation is also preferred for Types ZN TCR and ZNM TCR for improved corrosion resistance.

1.2 Some suppliers have begun a transition to trivalent chromium (Cr3) passivation to replace and eliminate hexavalent chromium (Cr6) passivation and compounds from zinc plated finishes they supply to this specification. This transition to Cr3 passivation is not required, however it is permitted where the same corrosion protection and frictional characteristics, where applicable, afforded by Cr6 passivation are achieved. Cr6 and Cr3 passivation are permitted where finish Types specified allow the use of Cr6 passivation unless otherwise specified or restricted. CNH must be notified of all changes in plating materials and compliance with specified requirements for zinc plating Type and Class must be verified.

1.2.1 In addition to meeting the requirements of this specification, there are defined implementation requirements for a transition to Cr3 passivation that must be met for zinc plated parts supplied to some company facilities. For example see CNH ES-H176. See also Sections 3.2.1 and 3.2.4

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Material Specifications

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2. RELATED SPECIFICATIONS

ANSI B1.3 Screw Thread Gaging Systems for Dimensional Acceptability
 ASTM B117 Salt Spray (Fog) Testing
 ASTM B183 Practice for Preparation of Low Carbon Steel for Electroplating
 ASTM B201 Practice for Testing Chromate Coatings on Zinc and Cadmium Surfaces
 ASTM B242 Practice for Preparation of High Carbon Steel for Electroplating
 ASTM B320 Practice of Preparation of Iron Castings for Electroplating
 ASTM B487 Measurement of Metal & Oxide Coating Thickness, Microscopical Exam of a Cross Section
 ASTM B504 Measurement of Thickness of Metallic Coating by the Coulometric Method
 ASTM B499 Measurement of Coating Thickness by Magnetic Method, Nonmagnetic Coating on Magnetic Basis Metals
 ASTM B571 Test Adhesion of Metallic Coatings
 ASTM B839 Method - Residual Embrittlement of Metallic Coated Externally Threaded Articles, Fasteners, and Rod-Inclined Wedge Method
 ASTM B850 Post-Coating Treatment of Steel for Reducing Risk of Hydrogen Embrittlement
 CNH ENPJ100 (86619032) Significant Characteristics
 CNH ENS7001 (86629329) Tightening of Threaded Fasteners
 CNH ES-H176 Trivalent Implementation Requirements & Timing for Wichita, KS Products
 CNH ES-ZD249 Zinc Plating of Hydraulic Tube Assemblies and Non-threaded Metal Parts
 CNH MAT0310P (48158401) Zinc Plating Processing Suppliers
 CNH MAT0320 (87346989) High Corrosion Resistance Coatings
 CNH MAT0318 (47646779) Zinc Flake Coating
 CNH MAT1003 (86979049) Metallic Material Designations on Engineering Drawings
 FNHA-2-J-071 (86615362) Autophoretic Coating
 ISO 898/1 Mechanical Properties of Fasteners - Bolts, Screws and Studs
 ISO 898/2 Mech. Properties of Fasteners, Nuts - Specified Proof Load Values-Coarse Thread
 ISO 4042 Fasteners - Electroplated Coatings
 ISO 10587 Metallic & Other Inorganic Ctg's – Test for Residual Embrittlement Inclined Wedge Method
 SAE J429 Mechanical & Material Requirements for Externally Threaded Fasteners
 SAE J995 Mechanical & Material Requirements for Steel Nuts

Table 2 Former CNH Company Material Specifications					
CNH Type	CASE	NH Pennsylvania FNHA Standard ⁽¹⁾	O&K Engineering		NH Tractor Engineering
			Standard Fasteners	General Parts	
ZN YCR (Yellow)	MS-201 Class A	2-H-500 (86508305) ZN YCR	EN ISO 4042, A1C, A2C, or A3C	DIN 50961, Fe/Zn Xc C EN 12329, Fe/Zn Xc C	Fiat 9.57405, Type III
ZN TCR (Clear)	---	---	---	---	Fiat 9.57405, Type IV
ZN TCRSP (Clear)	---	---	---	---	---
ZN CCR (Clear)	MS-201 Class B	2-H-500 (86508305) ZN CCR	EN ISO 4042, A1B, A2B, or A3B	DIN 50961, Fe/Zn Xc B EN 12329, Fe/Zn Xc B	Fiat 9.57405, Type II
ZN BCR (Black)	MS-203	2-H-500 (86508305) ZN BCR	EN ISO 4042, A1R, A2R, or A3R	DIN 50961, Fe/Zn Xc F EN 12329, Fe/Zn Xc F	Fiat 9.57405, Type VI
ZNM YCR (Yellow)	---	2-H-505 (86580475) ZNM YCR	---	---	---
ZNM TCR (Clear)	---	---	---	---	---

(1) Zedelgem Engineering Standard WS 48.01 was superseded by FNHA 2-H-500

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3. APPLICATION

3.1 Zinc plated finishes are used primarily as a protective coating on ferrous based materials. They are intended to extend the corrosion resistance of the substrate material. Required corrosion protection and appearance are factors to consider in specifying the Type and Class of zinc plating for an application. Painting a part or use of a high corrosion resistance coating per CNH MAT0320 should be considered where significantly improved corrosion resistance compared to zinc plating is required.

3.2 The zinc passivation finishes have typically contained hexavalent chromium. Per the European Commission Directive 2000/53/EC, regarding end-of-life vehicles, hexavalent chromium containing finishes are not permitted on new automobiles and light trucks sold in Europe after 01 July 2007. Although this directive does not govern off-highway equipment, availability of these passivation types may become problematic in Europe and also in North America.

3.2.1 Type ZN TCR may be supplied, but is not required, for parts where Type ZN YCR or ZN CCR is specified on existing part drawings. Approval of this substitution by the procuring CNH facility is required prior to supplier shipment of parts. Compliance with specified finish Type and Class requirements must be verified. See Sections 3.2.3 and 7 related to zinc plating finishes changes.

3.2.2 Type ZN TCR may be specified for new applications where Type ZN YCR or ZN CCR has typically been specified. No special part approval is required where the Type ZN TCR is specified and the finish meets Table 3 defined corrosion resistance and color requirements.

3.2.3 When applied properly, finishes with Cr3 passivation can provide corrosion resistance (white, black, and red) that fully meets the corrosion resistance requirements specified in Table 3. Special approval, in addition to Section 3.2.1 requirements, for Cr3 passivated parts supplied to this specification is not required where the submitted parts meet the defined corrosion resistance and color requirements for the specified plating Types. Special part approval, prior to shipment of the parts, must be obtained from the procuring CNH facility in cases where use of Cr3 finish results in reduced corrosion resistance or the color of parts is distinctly different from the finish color typically supplied (e.g. light iridescent yellow hue versus a dark yellow or bronze color). Prior to making any changes to the specified zinc plating finish, such as the type of chromium passivation, the supplier shall notify the procuring CNH facility of the proposed changes; see also Sections 3.2.1 and 7.

3.2.4 Basic zinc plating with Cr6 or Cr3 passivation will typically exhibit comparable coefficient of friction values. However, both finishes can exhibit significant variability in coefficient of friction and related torque tension characteristics. Applying a sealant is permitted for any of the plating Types, but is not required. Sealants may be applied over Cr3 passivation to achieve required corrosion resistance. Where a sealant, including those formulated or used with friction modifiers, is applied over any plating Type it shall not significantly affect the coefficient of friction and related torque-tension characteristics when compared to a corresponding basic Cr6 conversion finish. When a change from Cr6 to Cr3 passivation is made or where sealants are applied, finishes are expected to comply with torque-tension values per CNH ENS7001.

3.3 Type ZN YCR plating finish is commonly specified for standard hardware due to its good corrosion resistance and process availability. See STPA020 (87026717) for information on standard fastener finishes. Special color requirements should be specified on the drawing or purchase order by agreement between the supplier and the procuring CNH facility. For some parts Type ZN BCR may be specified for appearance reasons. Black Type ZN BCR is susceptible to highly visible white corrosion in exterior applications. Autophoretic coating, FNHA-2-J-071, or CNH MAT0320 high corrosion resistant coatings are available in a black finish with higher corrosion resistance for exterior applications.

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3.4 Certain zinc electroplated parts may require a baking treatment due to the possibility of hydrogen embrittlement, see Section 4.6. Susceptibility of parts to hydrogen embrittlement can be significantly reduced by specifying non-electrolytically applied coatings per CNH MAT0320 or MAT0318.

3.5 Zinc plated parts shall not be used in applications that have direct contact with aluminum. Direct contact between the two metals will result in unacceptable galvanic corrosion of the zinc plated components. This restriction does not apply to anodized aluminum.

4. REQUIREMENTS

Table 3 Zinc Plating Appearance, Thickness, and Neutral Salt Spray Corrosion Resistance Requirements					
CNH Type	Appearance	Plating Class	Thickness after Passivation, µm (inches), min	Corrosion Resistance (see Section 4.5)	
				White and Black Corrosion Hours, Minimum	Red Corrosion Hours, Minimum
ZN YCR	Iridescent light yellow or gold to light bronze or dark yellow	3 ⁽¹⁾	3 (0.00010)	72	90
		5	5 (0.00020)		110
		8	8 (0.00030)		140
		13	13 (0.00050)		170
		18	18 (0.00070)		200
ZN TCR ⁽⁴⁾	Dull to semi-bright metallic finish with no or slight iridescent light yellow hue	3 ⁽¹⁾	3 (0.00010)	72	90
		5	5 (0.00020)		110
		8	8 (0.00030)		140
		13	13 (0.00050)		170
		18	18 (0.00070)		200
ZN CCR ⁽²⁾ (Withdrawn)	Bright silvery or light blue hue	3 ⁽¹⁾	3 (0.00010)	8	32
		5	5 (0.00020)		54
		8	8 (0.00030)		94
		13	13 (0.00050)		120
ZN BCR	Black	3 ⁽¹⁾	3 (0.00010)	24	45
		5	5 (0.00020)		64
		8	8 (0.00030)		110
		13	13 (0.00050)		150
ZNM YCR	Same appearance as ZN YCR, smooth matte to semi-bright finish	3 ⁽¹⁾	3 (0.00010)	72	90
		5	5 (0.00020)		110
		8	8 (0.00030)		140
		13	13 (0.00050)		170
ZNM TCR ⁽⁴⁾	Similar appearance to ZN TCR; matte to semi-bright metallic finish; no or slight iridescent yellow hue	3 ⁽¹⁾	3 (0.00010)	72	90
		5	5 (0.00020)		110
		8	8 (0.00030)		140
		13	13 (0.00050)		170
Zinc Plating - Restricted Types					
ZN TCRSP ⁽³⁾	Same as ZN TCR; dull to semi-bright metallic finish.	8	8 (0.00030)	120	260
		13	13 (0.00050)		360

(1) Coating Class 3 should only be specified for small sized fasteners as described in Table 4.

(2) Type ZN CCR is withdrawn effective with MAT0310 revision P. It shall not be specified on new or updated drawings.

(3) Minimum thickness is after passivation and sealant application. Thick (heavy) Cr3 passivation with a film thickness of 200 to 400 nm is required. Sealant is limited to a thickness of 2 microns.

(4) While not required, Cr3 thick passivation is also preferred for Types ZN TCR and ZNM TCR for improved corrosion resistance.

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4.1 CNH zinc plated parts shall meet all requirements of this specification in addition to any special requirements specified on the drawing. These requirements only apply to significant surfaces. Significant surfaces are those where the plating is necessary to the function or appearance of the part after assembly and may be defined on the drawing or previously agreed upon in the purchase order. Generally, it is that portion of the visible surface on the part that can be contacted by a 13 mm (0.50 inch) diameter sphere. Unless otherwise specified; holes, recesses, threads, sharp edged rims, and angles are considered non-significant surfaces, see Section 4.3 for minimum plating requirements.

4.2 SURFACE PREPARATION

4.2.1 Prior to plating, parts shall be thoroughly cleaned and free of tool marks, rust, scale, oil, pits, foreign matter, and any surface conditions detrimental to plating finish or adhesion. Cleaning operations, particularly acid cleaning, must be controlled to prevent hydrogen embrittlement, particularly on parts that are hardened, cold worked, and/or highly stressed in service. Acid cleaning is not permitted for parts with hardness above 39 HRC (or equivalent). For both electroplated and mechanical plated finishes appropriate cleaning practices such as ASTM B183, ASTM B242, or ASTM B320 are recommended.

4.2.2 Prior to mechanical zinc plating, parts shall be deposited with a thin coating of copper (i.e. copper flash) or similar metal by immersion in appropriate chemical solutions without the use of electric current. There is no thickness requirement for this coating.

Table 4 Threaded Fasteners, Required Zinc Plating Thickness Range					
Metric Fasteners Classes 6g & 6H Thread Fits			US Customary (inch) Fasteners Classes 2A & 2B Thread Fits		
Thread Pitch, mm	Required Thickness Class ⁽¹⁾	Maximum Thickness, µm (inches)	Threads per Inch	Required Thickness Class ⁽¹⁾	Maximum Thickness, µm (inches)
1.00 and finer	3	6 (0.00025)	24 and finer	3	6 (0.00025)
1.25 through 1.75	5	8 (0.00030)	20 through 14	5	8 (0.00030)
2.00 and coarser	8	13 (0.00050)	13 through 6	8	13 (0.00050)

(1) See Table 3 for minimum thickness requirements.

4.3 PLATING THICKNESS

4.3.1 Fasteners & Threaded Areas

The minimum required plating thickness Class and the maximum permissible plating thickness for threaded surfaces are shown in Table 4. Zinc plating thickness requirements are indicated for metric fasteners with Class 6g (external) and Class 6H (internal) thread fits and US customary (inch) fasteners with Class 2A (external) and Class 2B (internal) thread fits. The maximum thickness may be altered if the manufacturer of the threaded fastener takes into account the changes in pitch diameter due to the plating and can assure there is an allowance maintained within standard threaded manufacturing practice after plating. This shall be negotiated with the procuring CNH facility and Materials Engineering activity prior to submittal of samples. Internal threaded component parts having a hole depth greater than 6mm (0.25 inches) need not meet the thickness requirements on the threaded portion unless otherwise specified on the Engineering drawing or standard.

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4.3.2 General Parts

The plating thickness of significant surfaces shall meet the minimum required by the plating thickness Class specified on the engineering drawing or standard. Standard plating classes are shown in Table 3. Non-significant surfaces must be visibly plated and shall have a minimum plating thickness of the next lowest class with respect to the designated plating class. Where Class 3 thickness is specified, non-significant surfaces shall have a minimum plating thickness of 1.5 micrometers (0.00006 inches).

4.4 DIMENSIONS AND TOLERANCES

4.4.1 General Parts

The dimensions specified on drawings where zinc plating is specified shall be after plating unless otherwise specified.

4.4.2 Fasteners & Threaded Areas

In general when fasteners are assembled, both the external and internal threaded component must run freely in their intended use. For metric threads, dimensional requirements and gauging shall be per ISO 4042. For external inch threads, acceptability of screw threads shall be determined based on System 21 per ANSI B1.3. The Class 2A maximum diameters apply to a part before plating or coating, whereas the basic diameters (Class 2A maximum diameters plus the plating allowance) apply to a part after plating or coating. Internal inch threads shall meet the Class 2B gauging requirements before and after plating.

4.5 CORROSION RESISTANCE

4.5.1 White and Black Corrosion

Evaluate the amount of corrosion visible to the unaided eye on significant surfaces after neutral salt spray testing of samples for the number of hours specified in Table 3. There shall be no white corrosion products visible on significant surfaces. Black corrosion products, if present, must be less than ten percent (<10%) of the total area of the significant surfaces.

4.5.2 Red Corrosion

After neutral salt spray testing, for the number of hours specified in Table 3, there shall be no more than one spot of red corrosion visible to the unaided eye per 650 square millimeters (one spot per square inch) of significant surface. On pieces having less than 650 square millimeters (1 square inch) of significant surface, a maximum of one spot of red corrosion is permissible. No individual red corrosion spot larger than 1.5 mm (0.060 inches) in diameter is permissible.

4.6 HYDROGEN EMBRITTLEMENT / BAKING

4.6.1 Susceptible Parts

4.6.1.1 All steel parts subsequently zinc electroplated having a measured surface hardness above 34 HRC (or equivalent) and all medium or high carbon ($C \geq 0.35\%$) cold formed parts can experience hydrogen embrittlement. This encompasses all standard Class 10.9 fasteners meeting ISO 898/1 or Grade 8 meeting SAE J429. The baking of such parts immediately after electroplating helps to relieve this condition. Baking per Section 4.6.3 is required for these susceptible parts. Susceptibility to hydrogen embrittlement is significantly reduced by specifying a high corrosion resistant coating per CNH MAT0320 or a zinc flake coating per CNH MAT0318.

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4.6.1.2 The baking requirement for susceptible parts per Section 4.6.1.1 shall be noted on the drawing with "Baking Required" or specified in the Engineering Parts List (EPL), see examples Section 8.3.1. However, even where the "Baking Required" note or EPL designation to bake is not included on drawings for susceptible parts, baking of these parts according to Section 4.6.3 is required.

4.6.2 Exempted Parts – Baking Not Required

Class 10 nuts meeting ISO 898/2 and Grade 8 nuts meeting SAE J995 and all standard fasteners specified per ISO 898/1 Class 8.8 or SAE J429 Grade 5 and lower are exempted from the baking requirement given in Section 4.6.3. Individual mechanical plated parts may also be exempted. Under limited circumstances the susceptible parts described in Section 4.6.1 may be exempted from the baking requirement, for these parts the engineering drawing shall note "Baking Not Required".

4.6.3 Baking Requirement

The zinc electroplated parts described in Section 4.6.1 must be baked (relieved) immediately after electroplating and before other chemical treatment (i.e. chromate passivation). Baking treatment per ISO 9588, Table 1 or ASTM B850, Classes ER1-6 or ER8-9, are acceptable practices to assure freedom from hydrogen embrittlement.

4.6.4 High Hardness Fasteners - Restricted Use

Certain zinc electroplated and mechanical plated high hardness fasteners have been identified as being highly susceptible to hydrogen assisted cracking (HAC). Use of these fasteners is restricted; they shall not be used in new designs after 01 October, 2011. Fastener material and finish of concern are covered by the noted CNH Standard Parts documents; new parts shall not be created with these combinations.

- CNH STPB690: Material 12.9; Finishes ZND and ZNM
- CNH STPB740: Material 12.9; Finish ZND
- CNH STPB810: Material 10.9 and 12.9; All Finishes (Effective 01 May, 2015)
- CNH STPB830: Material 12.9; Finish ZND
- CNH STPC120: Materials AST; Finish ZND and BZN
- CNH STPC130: Materials AST; Finish ZND
- CNH STPC140: Materials AST and 5; Finish ZND
- CNH STPC510: Material 12.9; Finish ZNM
- CNH STPC520: Material 12.9; Finish ZND and ZNM
- CNH STPC525: Material 12.9; Finish ZND and BZN
- CNH STPC530: Material 45H and AST; Finish ZND
- CNH STPC540: Material 12.9; Finish ZND
- Case C-071: Material is alloy steel, Finish ZN and ZND
- Case C-072: Material is alloy steel, Finish ZN and ZND
- Case C-073: Material is alloy steel, Finish ZN
- Case CM-028 Material is 12.9; Finish ZND
- Case JM-021: Material is Q&T Spring Steel, Finish ZND

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4.7 ADHESION

4.7.1 For all classes, plating shall demonstrate satisfactory adhesion to the substrate and as required by passing adhesion tests identified in Section 6.3. Parts that are formed, such as tubing, shall be evaluated for adhesion in their final shape and plating finish as intended for use in production.

4.7.2 Paint materials applied over zinc plating finishes on parts shall demonstrate satisfactory adhesion to the plating finish to assure acceptable appearance of the part during normal operating conditions.

4.8 PLATING QUALITY & APPEARANCE

The plating shall be dense, uniform, and free of porosity, pinholes, blisters, flaking, cracks, and stains. The plating shall be free of other discontinuities that affect appearance, part reliability (such as arc strikes), or corrosion resistance. It shall not exhibit gray or burned areas. The color of the finished part shall meet the description given in Table 3 for the designated CNH Type. Unique color requirements may be specified on the drawing as a special requirement or obtained by agreement between the procuring CNH facility and supplier. Zinc plated fasteners should be received effectively dry with only minimal residual oil from processing expected.

5. SPECIAL REQUIREMENTS

5.1 Special surface finishes, conditions, methods, or plating thicknesses may be applied as special requirements (SPCL). These requirements shall be indicated on the engineering drawing and apply to the specified CNH plating class.

5.2 SPCL PLATING TYPES & CLASSES

The finish Types and thickness Classes given in Table 3 should be the primary finishes designated. A special plating finish, type, color, and/or minimum plating thickness may be designated for unique appearance or corrosion resistance requirements. Special plating finishes include plain or olive-drab chromate. Special zinc alloy plating types, such as zinc cobalt and zinc nickel, are available. In addition to a special finish, type, and/or minimum plating thickness, a modified salt spray corrosion resistance requirement may also be specified on the engineering drawing, see Sections 8.3.3 and 8.3.4 for drawing note examples.

5.3 WAXES AND SPECIAL LUBRICANTS

Waxes or special lubricants are not permitted on nuts and bolts, except as noted below, unless their application is agreed to by the procuring CNH facility and the supplier. Industry practice in some regions is to apply wax or special lubricant to Inch Prevailing Torque Nuts (lock nuts) to reduce torque-tension coefficients to that of standard nuts. If wax or special lubricant is applied to standard fasteners, testing to establish new torque-tension values will be necessary.

5.4 SEALANTS

Sealants may be applied to zinc plated parts to improve white corrosion resistance but are not required unless specified on the drawing. The sealant should be applied less than 30 minutes after a chromate treatment. Sealant application to threaded components may affect the torque-tension values, see Section 3.2.4. Testing should be conducted to verify torque-tension values with the actual joint involved for these parts.

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6. METHODS OF TEST

All designated National Standards and test methods are to be latest issue unless otherwise specified.

6.1 PLATING THICKNESS

Plating thickness shall be measured on significant surfaces using one of the following methods: microscopic method per ASTM B487, magnetic method per ASTM B499, coulometric method per ASTM B504, or other equivalent method. Plating thickness on threaded fasteners shall be determined on the shank, bolt head, hexagon flats, or other smooth surface.

6.2 CORROSION RESISTANCE

6.2.1 The neutral salt spray test shall be performed per the ASTM B117 method. Evaluation of results will be based only on significant surfaces unless otherwise specified on the Engineering drawing. The plating shall conform to limitations for white, black, and red corrosion as defined in Section 4.5 after the minimum test hours specified in Table 3.

6.2.2 For testing corrosion resistance, the complete part is the preferred test specimen size. Parts may be cut into smaller test specimens as necessary, but shall not be less than 150 mm (6 inches) in length.

6.2.3 Test specimens shall be suitably clean, free of fingerprints, and other stains. Loose particles should be removed by gentle wiping with a clean, dry, soft cloth. Rinsing the sample with warm water is recommended if required to remove dirt or other surface contaminants. Oily or greasy surfaces should not be used for testing. Degreasing of test specimens with organic solvents is not permitted.

6.3 ADHESION

Plating shall not exhibit blistering, lifting, cracking, or peeling of the plating, which indicates failure to meet required adhesion. Parts that are formed, such as tubing, shall be evaluated for adhesion in their final shape and plating finish as intended for use in production. Other tests for adhesion that are appropriate for zinc plating are detailed in ASTM B571. Depending on the end use of the plated part or its method of fabrication, passing one or more of these tests, such as the burnishing test, grind-saw test, or bend test may be required. In those instances, CNH Engineering or the procuring CNH facility shall specify the additional adhesion tests that the plating must pass.

6.4 CHROMATE PASSIVATION

Determine the presence of clear chromate passivation according to applicable sections of ASTM B201 used to test for colorless (clear) coatings. The presence of other colored chromate coatings may be determined by visual examination.

7. INSPECTION AND REJECTION

All zinc plated parts supplied to this specification shall be equivalent in every respect to samples approved by the procuring CNH location. Prior to making any changes to the zinc plating used for an application under this specification, whether or not the change affects the plating meeting the specified requirements, the supplier shall notify the procuring CNH facility of the proposed changes. Test data, test samples, a new supplier code, or other information may be required for the proposed material change as part of the Supplier Quality Statement of Requirements (SQ SOR), Production Part Approval Process (PPAP). While the supplier is responsible to ensure that shipments meet the stated requirements without depending upon the purchaser's inspection, it is expected that CNH Industrial procuring facilities will conduct periodic inspection of incoming zinc plated components for quality assurance, including salt spray testing.

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8. DRAWING SPECIFICATIONS

8.1 Specifying a restricted (RSTR) or special (SPCL) plating thickness, finish, or process may require the use of a significant characteristic per CNH Engineering Procedure ENPJ100 (86619032). This determination will be made as part of the design review process.

8.2 Per local practice, zinc plating may be specified on an engineering drawing with a material note or using the Engineering Parts List (EPL) method. Where a material note is used the notation shall include the generic name (Zinc Plate), CNH Material Specification number, the plating finish Type and plating thickness Class. Where the EPL method is used, see Table 5 for Type and Class descriptions and corresponding part numbers and Section 8.3.1 Example 2. In the plating designation or description, 'ZN' indicates electroplated zinc and 'ZNM' indicates mechanical plated zinc.

8.3 The following are examples of zinc plating designations on drawings. Section 8.3.1 Examples 1 and 2 include the material designation in the CNH and Local Material blocks of the title block.

8.3.1 Zinc Electroplate; Designations by Material Notes or EPL method

Example 1, Zinc Plating designation using material notes:

- Includes baking requirement per MAT0310 guidelines

CNH Material
NOT APPLICABLE
Local Material
ISO 898-1, CLASS 10.9

MATERIAL (Note on drawing above title block):
ZINC PLATE, CNH MAT0310, ZN YCR 5
BAKING REQUIRED

Example 2, Zinc Plating designation using the Engineering Part List (EPL) method:

- See Table 5 for zinc plating Types, plating thickness Classes, and corresponding part numbers
- Material notes may be required for any special requirements or restrictions

Example 2A, Standard (purchased) Part type, no part number assigned for the plated part:

- Includes baking requirement per MAT0310 guidelines

(Engineering Parts List directly above the Title Block)

2	0		86512106		PLATING, BAKE PER CNH MAT0310
1	0		86508316		PLATING, ZN YCR 5 CNH MAT0310
ITEM	QUANTITY	U/M	PART NUMBER	TYPE	NOUN, DESCRIPTION
ENGINEERING PARTS LIST					

(Blocks extracted from CNH Drawing Title Block)

CNH Material	
NOT APPLICABLE	
Local Material	
ISO 898-1, CLASS 10.9	
Noun Description	Part Number
BOLT	8XXXXXXX

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Example 2B, Designed Part type, part number typically assigned in EPL for plated part:

(Engineering Parts List directly above the Title Block)

2	0		86508316		PLATING, ZN YCR 5 CNH MAT0310
1	1		8XXXXXX1		PLATE
ITEM	QUANTITY	U/M	PART NUMBER	TYPE	NOUN, DESCRIPTION
Description					Part Number
PLATE					8XXXXXX2
ENGINEERING PARTS LIST					

(Blocks extracted from CNH Drawing Title Block)

CNH Material	
HR Plate, CNH MAT1015, Grade B	
Local Material	
EN 10025-2 S235JR	
Noun Description	Part Number
PLATE	8XXXXXX1

8.3.2 Mechanical Zinc Plate

MATERIAL (Note on drawing above title block):
MECHANICAL ZINC PLATE, CNH MAT0310, ZNM TCR 5

8.3.3 Special Plating Thickness (SPCL)

For a non-standard minimum plating thickness, designate the required minimum plating thickness (in micrometers) after the finish Type and before SPCL. Note the minimum plating thickness and any additional corrosion resistance requirements under special requirements in the material note on the drawing.

MATERIAL (Note on drawing above title block):
ZINC PLATE, CNH MAT0310, ZN YCR 25, SPCL
SPECIAL REQUIREMENTS ARE:
25 MICROMETERS MIN PLATING THICKNESS
275 HOURS MIN. SALT SPRAY RED CORROSION RESISTANCE

8.3.4 Special Plating Finish (SPCL)

For non-standard minimum plating finish types, replace the plating finish Type with 'ZN' or 'ZNM' and designate SPCL after the plating thickness Class. Under special requirements in the material note specify the plating finish type and any additional corrosion resistance requirements.

MATERIAL (Note on drawing above title block):
ZINC PLATE, CNH MAT0310, ZN 8, SPCL
SPECIAL REQUIREMENTS ARE:
OLIVE-DRAB CHROMATE FINISH
96 HOURS MIN. SALT SPRAY WHITE CORROSION RESISTANCE
200 HOURS MIN. SALT SPRAY RED CORROSION RESISTANCE

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TABLE 5 Type, Class, Part Number for Specifying Zinc Plating by the EPL Method	
PART NUMBER	DESCRIPTION
86508311 ⁽¹⁾	PLATING, ZN CCR 3 CNH MAT0310 ⁽¹⁾
86508312 ⁽¹⁾	PLATING, ZN CCR 5 CNH MAT0310 ⁽¹⁾
86508313 ⁽¹⁾	PLATING, ZN CCR 8 CNH MAT0310 ⁽¹⁾
86508314 ⁽¹⁾	PLATING, ZN CCR 13 CNH MAT0310 ⁽¹⁾
86508315	PLATING, ZN YCR 3 CNH MAT0310
86508316	PLATING, ZN YCR 5 CNH MAT0310
86508317	PLATING, ZN YCR 8 CNH MAT0310
86508318	PLATING, ZN YCR 13 CNH MAT0310
84481442	PLATING, ZN YCR 18 CNH MAT0310
86508319	PLATING, ZN BCR 3 CNH MAT0310
86508320	PLATING, ZN BCR 5 CNH MAT0310
86508321	PLATING, ZN BCR 8 CNH MAT0310
86508322	PLATING, ZN BCR 13 CNH MAT0310
84482797	PLATING, ZN TCR 3 CNH MAT0310
84482800	PLATING, ZN TCR 5 CNH MAT0310
84482802	PLATING, ZN TCR 8 CNH MAT0310
84482804	PLATING, ZN TCR 13 CNH MAT0310
84482806	PLATING, ZN TCR 18 CNH MAT0310
84482808	PLATING, ZNM YCR 3 CNH MAT0310
86580485	PLATING, ZNM YCR 5 CNH MAT0310
84482810	PLATING, ZNM YCR 8 CNH MAT0310
84482813	PLATING, ZNM YCR 13 CNH MAT0310
84482811	PLATING, ZNM TCR 3 CNH MAT0310
84482828	PLATING, ZNM TCR 5 CNH MAT0310
84482841	PLATING, ZNM TCR 8 CNH MAT0310
84482855	PLATING, ZNM TCR 13 CNH MAT0310
86512106	PLATING, BAKE PER CNH MAT0310
Zinc Plating Restricted Types	
51411502	PLATING, ZN TCRSP 8 CNH MAT0310
48011485	PLATING, ZN TCRSP 13 CNH MAT0310

(1) Type ZN CCR is withdrawn effective with MAT0310 revision P. It shall not be specified on new or updated drawings.

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