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| <b>NAVISTAR, INC.</b>                                                                                                                                                                                                                                                                                                                   |                                  |                                        |
| <b>Material, Parts, and Process Specifications<br/>(MPAPS)</b>                                                                                                                                                                                                                                                                          |                                  | NUMBER:<br><b>MPAPS G-4519</b>         |
|                                                                                                                                                                                                                                                                                                                                         |                                  | Former Designation:<br>TMS 4519        |
| <b>TITLE:<br/>Black Corrosion-Resistant Cathodic E-coat Finish for<br/>Fasteners</b>                                                                                                                                                                                                                                                    |                                  | CURRENT REV No.:<br><b>1512</b>        |
|                                                                                                                                                                                                                                                                                                                                         |                                  | DATE:<br><b>Dec. 2015</b>              |
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| <b>PRINTED COPIES OF THIS DOCUMENT MUST BE VERIFIED FOR CURRENT REVISION</b>                                                                                                                                                                                                                                                            |                                  |                                        |
| <i>This specification may involve hazardous materials, equipment, and procedures. This specification does not purport to address all of the safety issues associated with its use. The user is responsible to consult appropriate safety and health practices and to determine the applicability of regulatory limits prior to use.</i> |                                  |                                        |
| <b>Change Notice: Updated to new format and reactivated specification</b>                                                                                                                                                                                                                                                               |                                  |                                        |

## 1.0 APPLICATION

This specification is for a black non-decorative corrosion-resistant finish consisting of zinc plating with a black cathodic electrocoat (e-coat) as applied to Fasteners. This type of finish is intended for exterior applications requiring good corrosion resistance, but not requiring UV resistance, such as for underhood or non-visible/non-exposed chassis parts. Fastener applications might include fasteners size M6 and larger, thread formers, tapping screws, some SEMS screws, and hex flange bolts. This coating should not be used on small machine screws (less than M6) or on washers.

## 2.0 SCOPE

This specification covers the requirements for the coating, part performance, quality, KCC, source approval and quality control, packing, shipping, and identification, and designation on drawings.  
**\*\*Note\*\* this specification is only for fasteners! See MPAPS G-9009 for cathodic electrocoat (e-coat) requirements associated with all non- fastener parts.**

## 2.1 RESTRICTED CHEMICAL SUBSTANCES

Effective January 1, 2007, all product supplied to the requirements of this specification must comply with the requirements of the MPAPS B-50 specification.

## 3.0 REFERENCE DOCUMENTS

Unless otherwise specified, the latest issue of all referenced standards shall apply. The following Specifications, Standards, and Regulations are referenced in this specification.

|                                              |              |
|----------------------------------------------|--------------|
| Quality System Standard ISO 9001 or TS-16949 | ASTM B117    |
| CFR Title 29, Part 1910                      | ASTM D1735   |
| NAVISTAR Manufacturing Std. MS-D-13          | ASTM D2247   |
| NAVISTAR Engineering Design Std A-16         | SAE/USCAR-11 |
| NAVISTAR MPAPS B-50                          | MPAPS G-9009 |

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|--------------------------------|--------------------------------------------------------------------------------------------|--------------------------|
| NUMBER:<br><b>MPAPS G-4519</b> | TITLE:<br><b><i>Black Corrosion-Resistant Cathodic E-coat<br/>Finish for Fasteners</i></b> | REVISION:<br><b>1512</b> |
|--------------------------------|--------------------------------------------------------------------------------------------|--------------------------|

## **4.0 REQUIREMENTS**

### **4.1 Coating Requirements**

#### **4.1.1 Pre-Treatment**

Zinc shall be electroplated onto steel fasteners which have been pre-cleaned to remove rust, scale, oil, dirt, and other debris. The electroplated layer shall be uniformly dense over the entire surface and exhibit a thickness of 8-10 µm. A thin layer of zinc phosphate shall be deposited on top of the zinc to aid in adhesion of the topcoat.

#### **4.1.2 Topcoat**

The topcoat will consist of black cathodic e-coat resulting in a maximum total film build of 12-16 µm. The e-coat will not fill recesses or threads in threaded fasteners, or otherwise interfere with normal installation procedures for threaded joints. The coating shall not have an adverse effect on production assembly and disassembly practices. After coating, the parts must pass the appropriate thread GO gages without sticking or binding. An evaluation of coating thickness on threads will be included in the Quality Control Plan for each part

### **4.2 Part Performance**

#### **4.2.1 Adhesion**

After curing, coated parts shall show no flaking, peeling, or loss of adhesion with normal handling. Parts shall show no evidence of blistering, flaking, peeling, or appearance changes, after heating coated parts to 120°C for 60 minutes.

#### **4.2.2 Corrosion Resistance**

Finished parts must exhibit no corrosion on significant surfaces after salt spray testing per ASTM B117 for 600 hrs. minimum. *[Significant surfaces are those which are visible and subject to wear or corrosion or both, or surfaces for which the coating is otherwise functionally necessary.]* Parts will not exhibit blistering or change in color. Threaded parts shall be evaluated on areas other than the threaded portion.

#### **4.2.3 Torque-Tension Requirement for Threaded Fasteners**

##### **4.2.3.1 Method: SAE/USCAR-11**

Control parts {7/16 X 20NSF – or M10 bolts) shall be processed along with each production lot of parts being coated. The control parts will be tested to determine the torque required to develop a specified tension value in the fastener.

##### **4.2.3.2 Required**

The measured torque value shall be within  $\pm 3\sigma$  of the median value established for this fastener.

## **5.0 QUALITY**

The black coating will be dense and uniform in color, free from porosity, pinholes and blisters, and substantially free from other defects that may affect the appearance or protective value of the coating. The topcoat will withstand normal shipping and handling practices without chipping, flaking, or other damage.

### **5.1 Relief of Hydrogen Embrittlement**

Steel parts heat treated or cold worked to a specified core hardness of 32 HRC or greater, or surface hardness of 35 HRC or greater, shall be baked after the zinc plating pre-treatment to prevent hydrogen embrittlement. Generally, the plated parts will be baked at a part core temperature (not over

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