NAVISTAR, INC.			
Material, Parts, and Process Specifications (MPAPS)		*NUMBER:* **MPAPS S-CM-28.101-GS/PL**	
		Former Designation: **ESP-CM-28.101-GS**	
TITLE: **Hex Socket Head Cap screws – Metric Series**		*CURRENT REV No.:* **1506**	*DATE:* **June 2015**
WRITTEN/EDITED BY: **Materials Engineering**	*APPROVED BY:* **Materials Engineering**	*SUPERSEDES:* **ESP-CM-28.101-GS - October 2013**	
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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.			
Change Notice: **Changed to New MPAPS format; Combined GS, GI, PP.**			

1.0 GENERAL: This standard may differ in some respects with certain segments of ISO and national standards. In recognition of these possible differences, the sizes and tolerance ranges used were established in an effort to enable the use of commercially available items, dimensionally interchangeable worldwide.
The specification contains the essentials of the following standards:

International Organization for Standardization: ISO 861, 885, 888, 965, and 4762
British Standards Institute: BS 4168
German Institute of Standardization: DIN 912
Standards Association of Australia: AS 1420
ASME/ANSI: B18.3.1M

The inclusion of dimensional data is not intended to imply that all the capscrews described are stock production sizes.

Inch dimensioned standard capscrews may be found in MPAPS S-C-28.101-GS/PL.

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3.0 DESIGN CONSIDERATION: Coarse thread series only will be considered as part of this standard, because of the following advantages:
Resists nicking and has less tendency to cross thread.
Load and stress concentrations on threads are lower.
Less likely to be seriously affected by manufacturing errors such as decarburization and oversize minor diameter of internal threads.

Hex socket head capscrews are suitable for use only in conditions of limited clearancence.

Hex socket head capscrews are interchangeable with flanged 12-point screws. Because of larger gripping surface which permits better wrenching, 12-point screws from 10 mm size and up are preferred over hex socket head capscrews.

4.0 METRIC-INCH RELATED SIZES: During the inch to metric design transition period, the following chart of related sizes can be used for reference. This information is not to be considered as a recommendation for substitutions but only as a means of determining approximate equivalents.

Metric Series mm	Approximate Inch Series
3	#4, #5
4	#6, #8
6	1 /4
8	5/16

Metric Series mm	Approximate Inch Series
10	3/8, 7/16
12	1/ 2
16	9/16, 5/8
20	3/4

5.0 THREADS: The ISO basic profile is essentially the same geometric configuration as the unified screw thread basic form. The threads will be coarse series, tolerance class 6g. Class 5g6g is an acceptable alternate for class 12.9 as specified in ISO 4762.

6.0 THREAD TOLERANCES: The medium ISO class of fit 6H(Int)/6g(Ext) is approximately the same as the 2A(Ext)/2B(Int) allowance in the U.S. unified thread series for comparable size. For example:

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Thread	Allowance
M10 x 1.5 – 6H (Int) / 6g (Ext)	0.032 mm (.00126 in)
3/8 – 16 UNC 2A (Ext) / 2B (Int)	.0013 in (0.033 mm)

7.0 THREAD LENGTH FORMULA: The thread lengths shown in section 25.0 are based on the formulas shown below:

Dimensions in millimeters:

Nominal Length		Formula for Thread Length		
Over	To			
---	125	2d	+	6
125	200	2d	+	12
200	---	2d	+	25

D = Nominal Diameter of the Screw

8.0 PROPERTY CLASS: The property class designation symbol for hex socket head capscrews consists of two parts, the first is approximately one-hundredth of the minimum tensile strength in megapascals (MPa) and the second is one-tenth of the ratio between the minimum yield stress and the minimum tensile strength, expressed as a percentage. The multiplication of the figures will approximate 1/10 the minimum yield stress in megapascals (1 MPa = 1 N/mm^2).

9.0 COLOR CODING: Not recommended, except in cases where adequate insurance is needed to prevent mixing of "metric parts" with look-alike "inch parts." The color blue is standard identifier used in some industries. This must be handled internally at individual plants where needed and is meant to be supplemental to the normal finish and easily deleted when the need for supplemental identification no longer exists. The supplemental blue color should not be used on finishes such as chromium bright which are specified for cosmetic purposes, or phosphate coating which causes a loss of color identity.

10.0 METHOD OF DESIGNATION: Hex socket head capscrews will be designated by size, length, word description, material, finish, and part number as shown in the following example.

M8 x 20, Hex Socket Head Capscrew, Class 12.9, PHC, Part Number

The absence of a specification for pitch indicates that coarse thread s required; e.g., a coarse thread of the dimensions M10 x 1.5 is designated as “M10.”

11.0 POLICY FOR SELECTING PARTS FOR NEW DESIGN: Approved parts are so designated to reduce variety of parts and assure maximum availability, interchangeability, and cost savings.

For new design, parts shall be selected from "Approved" part list only.

Material: Class 12.9
Finish: Plain (PLN)
Phosphate Coated (PHC)

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