NAVISTAR, INC.			
Material, Parts, and Process Specifications (MPAPS)		*NUMBER:* **MPAPS S-EM-3.101-GS/PL**	
		Former Designation: **ESP-EM-3.101-GS**	
TITLE: **Hex Flange Nuts –Metric Series (Noun Code 5780)**		*CURRENT REV No.:* **1506**	*DATE:* **June 2015**
WRITTEN/EDITED BY: **Materials Engineering**	*APPROVED BY:* **Materials Engineering**	*SUPERSEDES:* **ESP-EM-3.101-GS - May 2008**	

PRINTED COPIES OF THIS DOCUMENT MUST BE VERIFIED FOR CURRENT REVISION

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: Implementation of this standard must be in accordance with the policies and procedures outlined in MPAPS S-A-0.101. There may also be supplemental group instructions in regard to use of metric standards that should be taken into account.

Some segments of the ISO and national standards encompassed by this general specification may differ. 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.

This specification is based on ISO 4161, ANSI B18.2.4.4 and contains elements of the following standards:

International Organization for Standardization: ISO 68, 261, 262, 272, 898/2 and 965/2.

2.0 CONTENTS:

	Page
General	1
Design Consideration	2
Metric-Inch Related Sizes	3
Threads	3
Thread Tolerances	3
Material	3
Property Class	3
Color Coding	3
Method of Designation	3
Policy for Selecting Parts for New Design	4
Width Across Flats	4
Top of Nut	4
Thickness	4
Hex Height	4
Wrenching Height	4

This document is restricted and may not be sent outside Navistar, Inc. or reproduced without permission from Corporate Technical Standards. Suppliers are required to assume all patent liability. ©2015 by Navistar, Inc.

Documents Document Sharing Hub

Copyright Navistar International Corporation
Provided by IHS Markit under license with INTERN
No reproduction or networking permitted without license from IHS
Licensee=/, User=,
Not for Resale,
Full document details: NAVISTAR MPAPS S-EM-3.101-GS/PL 2015

	Page
Corner Fill	4
Gaging of Hex Portion	4
Flange	4
Gaging of Flange	4
Bearing Surface	5
True Position of Tapped Hole	5
Countersink	5
Threads	5
Nut Identification	5
Material	5
Finish	5
Restricted Chemical Substances	6
Surface Discontinuities	6
Dimension	6
Part List	7
Technical Information	7

3.0 DESIGN CONSIDERATION: Use should be restricted to special structural applications requiring maximum clamping capabilities.

Coarse thread series only will be considered as part of this standard, because of the following advantages:

Less tendency to cross thread.

Less likely to be seriously affected by decarburization and oversized minor diameter of internal threads.

In the event of failure of matched class bolt/nut combination, the stronger thread will increase tendency toward bolt fracture rather than undetectable strip.

COMPARISON OF BEARING SURFACE STRESSES USING REGULAR HEX AND FLANGED HEX

Nominal Dia	Tensile Stress Area [a]	Medium (3) Clearance Hole "H3"	REGULAR HEX					FLANGED HEX				
			Bearing Face Dia	Bearing Surface			Ratio (1)	Bearing Face Dia	Bearing Surface			Ratio (2)
				Area [b]	Compressive Stress (4)				Area [c]	Compressive Stress		
mm	mm²	mm	mm	mm²	MPa	(ksi)		mm	mm²	MPa	(ksi)	
6	20.1	6.6	9	29.4	541	(78.4)	1.46	12.2	82.69	192	(27.9)	4.11
8	36.6	9	11.7	43.9	658	(95.4)	1.2	15.8	132.4	218	(31.6)	3.62
10	58	11	15.3	88.8	516	74.8	1.53	19.6	206.7	222	(32.1)	3.56
12	84.3	14	17.1	75.7	880	(127.6)	.9	23.8	290.9	229	(33.2)	3.45
16	157	18	21.6	112	1107	(160.6)	.71	31.9	544.8	228	(33)	3.47
20	245	22	27	192.4	1005	145.8	.79	39.9	870.2	222	(32.2)	3.55

(1) Ratio of Bearing Surface Area [b] to Tensile Stress Area [a] for Regular Hex.

(2) Ratio of Bearing Surface Area [c] to Tensile Stress Area [a] for Flanged Hex.

(3) Per ISO 273, Part 1.

(4) Class 10.9 proof loads used for calculations.

This document is restricted and may not be sent outside Navistar, Inc. or reproduced without permission from Corporate Technical Standards. Suppliers are required to assume all patent liability. ©2015 by Navistar, Inc.

Documents Document Sharing Hub

Copyright Navistar International Corporation
Provided by IHS Markit under license with INTERN
No reproduction or networking permitted without license from IHS
Licensee=/, User=,
Not for Resale,
Full document details: NAVISTAR MPAPS S-EM-3.101-GS/PL 2015

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 exhibiting approximate dimensional and stress area relationship.

Nominal Metric Sizes			Inch Size (By Stress Area)							
			Nearest Smaller Size				Nearest Larger Size			
Diameter mm	Pitch mm	Stress Area mm ^{2}	Diameter in	Pitch TPI	Stress Area		Diameter in	Pitch TPI	Stress Area	
					mm ^{2}	% Metric			mm ^{2}	% Metric
M6	1	20.1	#12	24	15.6	78	1/4	20	20.5	102
M8	1.25	36.6	5/16	18	33.8	92	3/8	16	50	137
M10	1.5	58	3/8	16	50	86	7/16	14	68.6	118
M12	1.75	84.3	7/16	14	68.6	81	1/2	13	91.5	108
M14*	2	115	1/2	13	91.5	80	9/16	12	117.4	102
M16	2	157	5/8	11	145.8	93	3/4	10	215.5	137
M20	2.5	245	3/4	10	215.5	88	7/8	9	298.1	122

* Non-Preferred Size.

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 6H.

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

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

7.0 MATERIAL: Proof and tensile strength values are listed in section 26.0.

Nuts will not be used for special applications such as those requiring weldability, corrosion resistance, or ability to withstand temperatures above 300 ° C or below minus 50 ° C.

8.0 PROPERTY CLASS: The property class designation for steel nuts is equal to one-hundredth of the approximate proof load 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 flange nuts will be designated on purchase orders by size, word description, material class, finish and part number as follows:

M10, Hex Flange Nut, Class 10, PHC, Part Number

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

This document is restricted and may not be sent outside Navistar, Inc. or reproduced without permission from Corporate Technical Standards. Suppliers are required to assume all patent liability. ©2015 by Navistar, Inc.

Documents Document Sharing Hub

Copyright Navistar International Corporation
Provided by IHS Markit under license with INTERN
No reproduction or networking permitted without license from IHS
Licensee=/, User=,
Not for Resale,
Full document details: NAVISTAR MPAPS S-EM-3.101-GS/PL 2015