

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS S-B-1.101-GS/PL
		Former Designation: ESP-B-1.101-GS
TITLE:	Hex Head Bolts – English Series (Noun Code 0810)	CURRENT REV No.: 1506
		DATE: June 2015
WRITTEN/EDITED BY: Materials Engineering	APPROVED BY: Materials Engineering	SUPERSEDES: ESP-B-1.101-GS - December 2012
PRINTED COPIES OF THIS DOCUMENT MUST BE VERIFIED FOR CURRENT REVISION		
<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>		
Change Notice: Changed to New MPAPS format; Combined GS, PP, NPP.		

1.0 GENERAL: The Hex Head Bolts in this standard are the same as Finished Hex Head Bolts described in SAE J105 and ANSI B 18.2.1-1981 with Style 1 max/min radius fillet. The ANSI Standard is a consolidation of two former standards, "Hex Cap Screws" and "Finished Hex Bolts." Sizes from 1/4 inch to 1-1/2 inch inclusive, are unified dimensionally with the British and Canadian Standards. NAVISTAR has retained the 1-14NF, now 1-14UNS, as standard for the 1 inch fine thread.

2.0 CONTENTS:

	Page
General	1
Policy for Selecting Parts for New Design	2
Dimensions	2
Head	2
Point	2
Length Tolerance	3
Threads	3
Thread Length	3
Incomplete Thread Diameter	4
Body Diameter	4
Material and Physical Properties	4
Finishes	4
Restricted Chemical Substances	5
Head Marking	5
Requirements For Drilled (DRLD) Holes In Body	5
Straightness	5
Thread Runout and Straightness Sleeve Gages and Gaging	5
Straightness Gages and Gaging	6
Surface Discontinuities	7
Service Parts Substitution Policy	7
Part List	8
Technical Information	12

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.

JUNE 2015



Documents

Page 1 of 12
Document Sharing Hub

NUMBER: MPAPS S-B-1.101-GS/PL	TITLE: Hex Head Bolts	REVISION: 1506
--	--	---------------------------------

3.0 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 in volume buying.

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

Material and Finish: MPAPS F-31, Part I, Type 5; Zinc Trivalent with Sealer (ZN8F)
MPAPS F-31, Part I, Type 8; Phosphate Coated (PHC)

Thread Pitch: Coarse

Diameters: 1/4, 5/16, 3/8, 1/2, 5/8, 3/4, 1, 1-1/4, and 1-1/2

Lengths: All diameters - 1/4 inch increments thru 4 inches.

1/4 and 5/16 Diameters	1/2 inch Increments - 4 thru 7 inches
	1 inch Increments - Over 7 inches

3/8 thru 1-1/2 Diameters	1/2 inch Increments - 4 thru 9 inches
	1 inch Increments - Over 9 inches

All preferred lengths beyond the 7 and 9 inch ranges indicated above will be carried in the "Not for new Design" section because of limited usage.

4.0 DIMENSIONS: All dimensions in this standard are in inches.

5.0 HEAD: Top of the head will be full form and chamfered or rounded with the diameter of chamfer circle or start of rounding being equal to the maximum width across flats within a tolerance of minus 15 percent.

Bearing surface will be flat washer faced. Diameter of bearing surface will be equal to the maximum width across flats within a tolerance of minus 10 percent.

Thickness of the washer face will not be less than .015 inch nor greater than .025 inch for bolt sizes 3/4 inch and smaller and not less than .015 inch nor greater than .035 inch for sizes larger than 3/4 inch. Wrenching height is a distance measured from the bearing surface up the side of the head at the corners. The width across corners will be within specified limits for the full wrenching height.

The plane of the bearing surface will be perpendicular to the axis of the body within the FIM limits specified. Measurement of FIM will be made as close to the periphery of the bearing surface as possible while the bolt is held in a collet or other gripping device at a distance of one bolt diameter from the underside of the head.

The axis of the head will be located at true position with respect to the axis of the body (determined over a distance under the head equal to one diameter) within a tolerance zone whose diameter is equivalent to 6% of the maximum width across flats, regardless of feature size.

6.0 POINT: Point will be chamfered or rounded at manufacturer's option from approximately .016 inch below the minor diameter of the thread, the length of point to be from 1/2 to 1-1/2 threads.

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.

JUNE 2015

NUMBER: MPAPS S-B-1.101-GS/PL	TITLE: Hex Head Bolts	REVISION: 1506
--	--	---------------------------------

7.0 LENGTH TOLERANCE: Bolts will be as tabulated below:

Length	Nominal Sizes				
	1/4 to 3/8	7/16 and 1/2	9/16 to 3/4	7/8 and 1	1-1/8 to 1-1/2
Up to 1 in, incl	+ .0, -.03	+ .0, -.03	+ .0, -.03		
Over 1 in to 2-1/2 in, incl	+ .0, -.04	+ .0, -.06	+ .0, -.08	+ .0, -.10	+ .0, -.12
Over 2-1/2 in to 4 in, incl	+ .0, -.06	+ .0, -.08	+ .0, -.10	+ .0, -.14	+ .0, -.16
Over 4 in to 6 in, incl	+ .0, -.10	+ .0, -.10	+ .0, -.10	+ .0, -.16	+ .0, -.18
Longer than 6 in	+ .0, -.18	+ .0, -.18	+ .0, -.18	+ .0, -.20	+ .0, -.22

8.0 THREADS: Threads will be Unified Series, Class 2A in accordance with American National Standard B-1.1. Threads, when rolled, will be Unified Inch coarse, fine, (UNRC or UNRF Series), Class 2A. Threads produced by other methods will preferably be UNRC or UNRF, but at manufacturer's option, may be Unified Inch coarse, fine, (UNC or UNF Series), Class 2A. Acceptability of screw threads will be determined based on System 21, ANSI B1.3 Screw Thread Gaging Systems for Dimensional Acceptability. For threads with additive finish, the maximum diameter of Class 2A may be exceeded by the amount of the allowance; that is, the Class 2A maximum diameters apply to an unplated or uncoated part or to a part before plating or coating, whereas the basic diameters (Class 2A maximum diameters plus the allowance) apply to a part after plating or coating

9.0 THREAD LENGTH: The length of thread on bolts will be controlled by the grip gaging length L_G max and body length L_B min as set forth in the following: Grip gaging length L_G max is the distance measured parallel to the axis of bolt from the underhead bearing surface to the face of a non-counterbored or non-countersunk standard GO thread ring gage assembled by hand as far as the thread will permit. It will be used as the criterion for inspection. The maximum grip gaging length, as calculated and rounded to two decimal places for any bolt not threaded full length, will be equal to the nominal bolt length minus the basic thread length ($L_G \text{ max} = L \text{ nom} - L_T$). For bolts which are threaded full length, L_G max defines the unthreaded length under the head and will conform to the values listed in table below for the respective nominal bolt lengths, L_G max represents the minimum design grip length of the bolt and will be used for determining thread availability when selecting bolt lengths even though usable threads may extend beyond this point. Basic thread length L_T is a reference dimension, intended for calculation purposes only, which represents the distance from the extreme end of the bolt to the last complete (full form) thread. Basic thread length equals twice the basic thread diameter plus 0.25 in. for nominal bolt lengths up to and including 6 in., and twice the basic thread diameter plus 0.50 in. for nominal lengths over 6 in.

Body length L_B min is the distance measured parallel to the axis of bolt from the underhead bearing surface to the last scratch of thread or to the top of the extrusion angle. It will be used as a criterion for inspection. The minimum body length as calculated and rounded to two decimal places will be equal to the maximum grip gaging length minus the maximum transition thread length ($L_B \text{ min} = L_G \text{ max} - Y \text{ max}$). Bolts of nominal lengths which have a calculated L_B min length equal to or shorter than the length of 2.5 times the coarse thread (UNC) pitch (see nominal lengths listed in the fifth column of table on page 4) will be threaded for full length. The distance from underhead bearing surface to the last scratch of thread will not be less than L_B max.

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.

JUNE 2015



Documents

Page 3 of 12
Document Sharing Hub

NUMBER: MPAPS S-B-1.101-GS/PL	TITLE: Hex Head Bolts	REVISION: 1506
--	--	---------------------------------

Transition thread length Y is a reference dimension equal to five coarse (UNC) pitches intended for calculation purposes only, which includes the length of incomplete threads, the extrusion angle on rolled threads, and tolerances on grip length.

LIMITATIONS FOR PRODUCTS

THREADED FULL LENGTH Unthreaded Length Under Head

Dimensions in inches:

Nominal Size	For Nominal Product Lengths (1)	L _G Max (2)	For Nominal Product Lengths		L _G Max (3)	
	≤ Than	All Thread Series	≥ Than	≤ Than	Course (UNC) Thd	Fine (UNF) Thd
1/4	1/2	0.075	1/2	1.125	0.125	0.089
5/16	5/8	0.083	5/8	1.375	0.139	0.104
3/8	3/4	0.094	3/4	1.500	0.156	0.104
7/16	7/8	0.107	7/8	1.750	0.179	0.125
1/2	1	0.115	1	1.875	0.192	0.125
9/16	1-1/8	0.125	1 1/8	2.000	0.208	0.139
5/8	1-1/4	0.136	1 1/4	2.250	0.227	0.139
3/4	1-1/2	0.150	1 1/2	2.250	0.250	0.156
7/8				2.875	0.278	0.179
1				3.250	0.312	0.208
1-1/8				3.625	0.357	0.208
1-1/4				3.875	0.357	0.208
1-3/8				4.250	0.417	0.208
1-1/2				4.500	0.417	0.208

NOTES:

- (1) Tabulated values are equal to 2 times the basic product diameter.
- (2) Tabulated values are equal to 1.5 times the coarse thread (UNC) pitch.
- (3) Tabulated values are equal to 2.5 times the thread pitch.

10.0 INCOMPLETE THREAD DIAMETER: The major diameter of incomplete threads will not exceed the actual major diameter of full form threads.

11.0 BODY DIAMETER: The diameter of body over the L_B minimum length will conform to the limits for E given in table on page 7. On screws threaded for full length, the diameter of the unthreaded shank will not exceed the tabulated E max body diameter nor be less than the specified minimum pitch diameter of the thread.

12.0 MATERIAL AND PHYSICAL PROPERTIES: NAVISTAR Types 1, 5 and 8 in accordance with MPAPS F-31, Part I. Stainless steel will be SST-304 or SST-410 as specified per MPAPS A-37.

13.0 FINISHES: Bolts will be furnished plain, plated or coated in accordance with Material Part And Process Specification (MPAPS)

Phosphate Coating	(PHC)	MPAPS G-1, Class B2.
Zinc Trivalent with Sealer	(ZN8F)	24 threads per inch and coarser, MPAPS G-20, Class 8F.
Chromium Bright	(CRB)	12 threads per inch and coarser, MPAPS G-19, Class 8. 24 to 13 threads per inch, MPAPS G-19, Class 5. 28 threads per inch and finer, MPAPS G-19, Class 3.
Zinc Aluminum Clear	(ZACLR)	Per MPAPS G-4518, Type 1.

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.

JUNE 2015



Documents

Page 4 of 12
Document Sharing Hub