NAVISTAR, INC.			
Material, Parts, and Process Specifications (MPAPS)		*NUMBER:* **MPAPS S-D-1.101-GS/PL**	
		Former Designation: **ESP-D-1.101-GS**	
TITLE: **Slotted and Cross Recess Tapping Screws- English Series Not Recommended (Noun Code 7450)**		*CURRENT REV No.:* **1604**	*DATE:* **April 2016**
WRITTEN/EDITED BY: **W. Cook**	*APPROVED BY:* **R. Goluch**	*SUPERSEDES:* **1506- June 2015**	

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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: **Corrections to 32.1 Parts List Table, editorial changes**

1.0 GENERAL: This standard conforms in all essentials with the SAE Standard and the American National Standard for Slotted and Cross Recess Head Tapping Screws.

2.0 CONTENTS:

	Page
General	1
Screw Types and Application	2
Height of Head	3
Bearing Surface	3
Depth of Recess	3
Slot Depth	3
Eccentricity	3
Length	3
Spaced Threads	4
Machine Screw Diameter-Pitch Threads	4
Length of Thread	4
Short Length Screws	5
Points	7
Diameter of Body	7
Materials	7
Finishes	8
Restricted Chemical Substances	8
Hole For Assembly	8
Performance Requirement and Test	8
Assembly Considerations	8
Policy for Selecting Parts for New Design	8
Defects	9
Flat Head Cross Recess Tapping Screws-Type AB, B, BP and BT	9

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	Page
Flat Head Cross Recess Tapping Screws-Type C, D, F and T	10
Oval Head Cross Recess Tapping Screws-Type AB, B, BP and BT	11
Oval Head Cross Recess Tapping Screws-Type C, D, F and T	12
Pan Head Cross Recess Tapping Screws-Type AB, B, BF, BP and BT	13
Pan Head Slotted Tapping Screws-Type AB, B and BT	15
Pan Head Cross Recess Tapping Screws-Type C, D, F and T	16
Hexagon Head Tapping Screws-Type AB, B, BP and BT	17
Hexagon Head Tapping Screws-Type C, D, F and T	18
Hexagon Washer Head Tapping Screws-Type AB, B, BP and BT	19
Hexagon Washer Head Tapping Screws-Type C, D, F and T	20
Technical Information	21

3.0 SCREW TYPES AND APPLICATIONS: Screws covered by this standard include tapping screws of both the thread forming and thread cutting varieties. The type designations, descriptions and applications are as follows:

3.1 Thread Forming Tapping Screws: Thread Forming Tapping screws are generally for application in materials where large internal stresses are permissible or desirable to increase resistance to loosening. They will be of the following types:

Type AB (Preferred): Type AB tapping screws will have spaced threads, with same pitches as Type B, and a gimlet point. They are primarily intended for use in thin metal, resin impregnated plywood, and asbestos compositions.

Type B (Non-Preferred): Type B tapping screws will have spaced threads and a blunt point with incomplete entering threads.

Type BP (Non-Preferred): Type BP tapping screws will have spaced threads the same as Type B but will have a conical point extending beyond the incomplete entering threads. They are intended for piercing fabrics or in assemblies where holes may be misaligned.

Type C (Non-Preferred): Type C tapping screws will have threads of machine screw diameter-pitch combinations approximating Unified Form with a blunt point and tapered incomplete entering threads. Type C tapping screws are not subject to thread gaging but will meet dimensions specified in this standard. They are intended for application where the use of a machine screw pitch thread is preferable to the use of the spaced thread types of thread forming screws, or where chips from machine screw pitch thread cutting screws are objectionable. It should be recognized that in specific applications, involving long thread engagement or hard materials, this type of screw may require extreme driving torques.

3.2 Thread Cutting Tapping Screws: Thread cutting tapping screws are generally for application in materials where disruptive internal stresses are undesirable or where excessive driving torques are encountered with thread forming screws. They will be of the following types:

Types D, F, and T (Preferred): Types D, F, and T tapping screws will have threads of machine screw diameter-pitch combinations approximating Unified Form with a blunt point and tapered entering threads having one or more cutting edges and chip cavities. The tapered threads of the Type F screw may be complete or incomplete at the manufacturer's option; all other types will have incomplete tapered threads. Types D, F, and T tapping screws are not subject to thread gaging but will meet

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dimensions specified in this standard. Type F is used in applications involving clogged tapped holes. Type T, in applications involving die castings.

Type BT (preferred): Type BT tapping screws will have spaced threads with a blunt point and tapered entering threads, as on Type B, with one large cutting edge and chip cavity. These screws are intended for use in plastics, asbestos, and other similar compositions.

4.0 HEIGHT OF HEAD: The head height in the dimensional tables represents a metal to metal measurement. In other words, on heads having rounded top surfaces, the truncation of the rounded surface due to recess or slot is not considered part of the head height.

On countersunk type heads, the height of the head is a reference dimension measured parallel to the axis of the screw from the largest diameter of the bearing surface of the head to the point of intersection of the bearing surface of the head and basic major diameter of the screw. This point of intersection may not necessarily be the same as the actual junction of head and shank.

The height of undercut head will be covered under the heading "Short Length Screws."

Hexagon head and hexagon washer head specifications may be found in section 31.0, 32.0, 33.0 and 34.0.

5.0 BEARING SURFACE: The bearing surface of the head will be perpendicular to the axis of the screw shank within 2 degrees.

6.0 DEPTH OF RECESS: The depth of recess in recessed head screws will be measured parallel to the axis of the screw from the intersection of the maximum diameter of the recess with the head surface to the bottom of the recess.

Recess penetration gaging depth values are included in the dimensional tables and the method of gaging and specifications for gages are covered in MPAPS S-D- 200.101-GS/PL.

Recess wobble gaging procedures and operating limits are also given in MPAPS S-D-200.101-GS/PL.

7.0 SLOT DEPTH: The depth of slot in head will be measured, parallel to axis of screw, from the top of head to the intersection of bottom of slot with the head surface or bearing surface.

8.0 ECCENTRICITY: The head will not be eccentric with axis of screw by more than 3 percent of the maximum head diameter. The slot or recess in the head will not be eccentric with axis of the screw by more than 6 percent of the basic body diameter or .015 inch (for Cross Recess Head), .010 inch (for Slotted Head) whichever is greater. Eccentricity is defined as one-half of the full indicator movement (FIM)

9.0 LENGTH: The length of screw will be measured, parallel to axis of screw, from the largest diameter of the bearing surface of the head to the extreme point.

Tolerance on Length

Tapping Screws, Types AB and BP

Nominal Screw Length	Tolerance on Length
Up to 1 inch, Incl.	±0.03
Over 1 inch	±0.05

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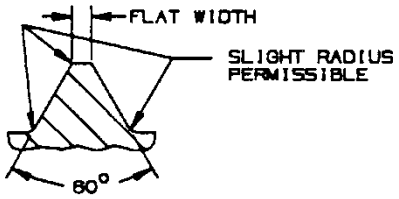
Tapping Screws, Types B, BT, C, D, F. and T

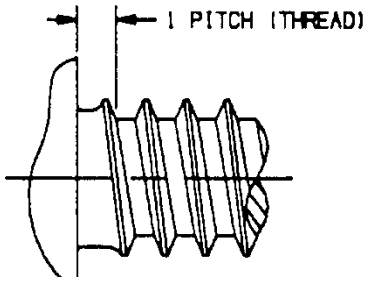
Nominal Screw Length	Tolerance on Length
Up to 3/4 inch, Incl.	-0.03
Over 3/4 to 1-1/2 inch, Incl.	-0.05
Over 1-1/2 inch	-0.06

10.0 SPACED THREADS: (Types B, AB, BP and BT). Thread form will be as shown below. The width of flat at crest of thread will not exceed .004 inch for size 8, or smaller, and .006 inch for larger sizes.



11.0 MACHINE SCREW DIAMETER-PITCH THREADS: (Types C, D, F and T). Threads will approximate Unified Form and comply with dimensions specified herein, but will not be subject to thread gaging requirements.

12.0 LENGTH OF THREAD: (Types AB, B, BP and BT). For screws of nominal lengths equal to 8 diameters or 1-1/2 inches, whichever is shorter, the full form threads will extend close to head such that specified minor diameter limits are maintained to within one pitch (thread) of the underside of the head, or closer if practicable (see below). Screws of longer nominal lengths will, unless otherwise specified, have a minimum length of full form thread equal to 6 diameters or 1.50 inches, whichever is shorter.



(Types C, D, F, and T). Screws of nominal lengths equal to 3 diameters and shorter will have full form threads extending to within one pitch (thread) of the head, or closer if practicable (see above). For nominal lengths exceeding 3 diameters; up to and including 8 diameters or 1-1/2 inches, whichever is shorter; the full form threads will extend to within 2 pitches (threads) of the head, or closer if practicable. Screws of longer nominal length will, unless otherwise specified, have a minimum length of full form thread equal to 6 diameters or 1.50 inches, whichever is shorter.

All dimensions are in inches.

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13.0 SHORT LENGTH SCREWS:

Undercut Heads: Screws of nominal lengths equal to or shorter than C_1, length in Table 1 and 3 will have undercut heads.

Reduced Tapered Point: Screws of nominal lengths equal to or shorter than the tables specified below will have the length of tapered point reduced.

Tables 1 and 2 "C_1" for Types B, BF and BT and "C_2" for Type BP
Table 3 "C_2"
Table 4 "C"

Impractical Lengths: Screws of nominal lengths less than the lengths listed in tables below for the various types are impractical.

Table 1 "C_1"
Table 2 "C_2"
Table 3 "C_3"
Table 4 "C"

FLAT AND OVAL HEADS
(Types AB, B, and BP)

Dimensions in inches:

Table I

Nominal Size	C_1		C_2			G^1		U†		R^1	Point Length Constant*		
	Nominal Screw Length		Minimum Practical Length			Head Side Height		Point Taper Length		Fillet Radius	Type AB	Type BP	
	Type AB	Other Types	Type AB	Type BF	Other Types	Max	Min	Min	Max	Max		Short Point	Long Point
0	3/16	1/8	7/64	13/64	3/32	.025	.018	.031	.042	.009	.070	.105	.115
1	3/16	5/32	9/64	1/4	1/8	.031	.023	.036	.048	.011	.091	.133	.145
2	3/16	3/16	11/64	9 /32	5/32	.036	.028	.047	.062	.013	.119	.174	.190
3	7/32	7/32	3/16	21 /64	3/16	.042	.033	.054	.071	.015	.139	.202	.220
4	1/4	1/4	7/32	3 /8	3/16	.047	.038	.063	.083	.017	.160	.233	.254
5	1/4	1/4	1/4	25/64	3/16	.053	.043	.075	.100	.019	.179	.264	.289
6	5/16	5/16	17/64	15/32	1/4	.059	.048	.075	.100	.021	.193	.281	.306
7	3/8	3/8	5116	17 /32	1/4	.064	.053	.079	.105	.023	.211	.306	.333
8	7/16	7/16	21/64	39 /64	1/4	.070	.058	.083	.111	.025	.224	.324	.352
10	1/2	1/2	3/8	11 /16	5/16	.081	.068	.094	.125	.028	.256	.371	.402
12	9/16	9/16	13/32	25/32	3/8	.092	.078	.107	.143	.032	.296	.429	.465
1/4	5/8	5/8	15/32	7/8	3/8	.107	.092	.107	.143	.038	.335	.478	.514
5/16	13/16	5/8	19/32	61 /64	7/16	.134	.116	.125	.167	.047	.418	.592	.634
3/8	--	5/8	--	1- 1 /32	7/16	.161	.140	.125	.167	.056	--	.706	.747
7/16	--	3/4	--	1-15 /64	5/8	.156	.133	.150	.200	.066	--	.826	.876
1/2	--	3/4	--	1- 5/16	5/8	.156	.130	.150	.200	.075	--	.938	.988

* Not a controlling limitation on product.

† Not applicable to Type AB screws.

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PAN, FILLISTER, TRUSS, HEX, AND ROUND HEADS
(Types AB, B, and BP)

Dimensions in inches: **Table 2**

Nominal Screw Size	C_1	C_2			U†		Point Length Constant*		
	Nominal Screw Length	Minimum Practical Length			Point Taper Length		Type AB	Type BP	
	Types B, BF & BT	Type AB	Type BF	Types B, BF & BT	Min	Max		Short Point	Long Point
0	5/64	3/32	5/32	5/64	.031	.042	.070	.105	.115
1	5/64	1/8	11/64	5/64	.036	.048	.091	.133	.145
2	7/64	9/64	13/64	7/64	.047	.062	.119	.174	.190
3	9/64	11/64	1/4	9/64	.054	.071	.139	.202	.220
4	3/16	3/16	5/16	9/64	.063	.083	.160	.233	.254
5	3/16	3/16	21/64	5/32	.075	.100	.179	.264	.289
6	1/4	7/32	25/64	11/64	.075	.100	.193	.281	.306
7	5/16	17/64	15/32	3/16	.079	.105	.211	.306	.333
8	5/16	9/32	31/64	3/16	.083	.111	.224	.324	.352
10	3/8	21/64	9/16	15/64	.094	.125	.256	.371	.402
12	7/16	3/8	21/32	9/32	.107	.143	.296	.429	.465
1/4	1/2	13/32	3/4	9/32	.107	.143	.335	.478	.514
5/16	1/2	17/32	53/64	5/16	.125	.167	.418	.592	.634
3/8	1/2	--	29/32	5/16	.125	.167	--	.706	.747
7/16	5/8	--	1- 7/64	15/32	.150	.200	--	.826	.876
1/2	5/8	--	1- 3/16	15/32	.150	.200	--	.938	.988

* Not a controlling limitation on product.

† Not applicable to Type AB screws.

FLAT AND OVAL HEADS
(Types C, D, F, and T)

Dimensions in inches:

Table 3

	C_1	C_2		C_3	G^1		N^1		J^1		U				R^1
Nominal Screw Length	Nominal Screw Length	Nominal Screw Length		Nominal Screw Length	Head Side Height		Total Head Height		Slot Depth		Point Taper Length				Fillet Radius
		For Coarse Thread	For Fine Thread		Max	Min	Max	Min	Min	Max	For Coarse Thread		For Fine Thread		Max
											Min	Max	Min	Max	
2	3/16	3/16	11/64	5/32	.036	.028	.065	.050	.023	.031	.045	.062	.039	.055	.013
3	7/32	7/32	3/16	3/16	.042	.033	.075	.059	.027	.035	.052	.073	.045	.062	.015
4	1/4	1/4	7/32	3/16	.047	.038	.084	.067	.031	.039	.062	.088	.052	.073	.017
5	1/4	9/32	1/4	3/16	.053	.043	.094	.076	.035	.043	.062	.088	.057	.080	.019
6	5/16	5/16	17/64	1/4	.059	.048	.104	.084	.039	.048	.078	.109	.062	.088	.021
8	7/16	21/64	19/64	1/4	.070	.058	.123	.101	.045	.054	.078	.109	.069	.097	.025
10	1/2	27/64	11/32	5/16	.081	.068	.142	.118	.050	.060	.104	.146	.078	.109	.028
12	9/16	7/16	25/64	3/8	.092	.078	.161	.135	.056	.067	.104	.146	.089	.125	.032
1/4	5/8	33/64	13/32	3/8	.107	.092	.186	.158	.064	.075	.125	.175	.089	.125	.038
5/16	5/8	19/32	15/32	7/16	.134	.116	.232	.198	.072	.084	.139	.194	.104	.146	.047
3/8	5/8	47/64	1/2	7/16	.161	.140	.278	.239	.081	.094	.156	.219	.104	.146	.056

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PAN, FILLISTER, TRUSS, HEX, AND ROUND HEADS
(Types C, D, F, and T)

Table 4

Dimensions in inches:

Nominal Screw Size	For Coarse Threads				For Fine Threads			
	C		U		C		U	
	Nominal Screw Length		Point Taper Length		Nominal Screw Length		Point Taper Length	
	Max	Min	Min	Max	Max	Min	Min	Max
2	9/64	1/8	.045	.062	1/8	1/8	.039	.055
3	11/64	1/8	.052	.073	9/64	1/8	.045	.062
4	13/64	1/8	.062	.088	11/64	1/8	.052	.073
5	13/64	1/8	.062	.088	3/16	1/8	.057	.080
6	1/4	3/16	.078	.109	13/64	3/16	.062	.088
8	1/4	3/16	.078	.109	15/64	3/16	.069	.097
10	11/32	15/64	.104	.146	1/4	15/64	.078	.109
12	11/32	17/64	.104	.146	19/64	17/64	.089	.125
1/4	13/32	17/64	.125	.175	19/64	17/64	.089	.125
5/16	29/64	9/32	.139	.194	11/32	9/32	.104	.146
3/8	1/2	9/32	.156	.219	11/32	9/32	.104	.146

14.0 POINTS: Type AB tapping screw will have a gimlet point. A slight rounding or truncation of point ends is desirable. No extrusion of excess metal will protrude beyond point apex.

Types B and BT tapping screws will have blunt point with tapered entering threads. The crests of tapered threads will be incomplete and BT points will have flutes as shown. Details of point design will be optional providing flutes extend through first form thread and screws meet the performance requirements set forth in MPAPS S-D-100.101-GS/PL.

Type BP tapping screws will have a conical point extending beyond tapered entering threads having incomplete crests.

Types C, D, F, and T tapping screws will have a blunt point with tapered entering threads. Except for Type F, which at manufacturer's option may have complete crests, the crests of tapered threads will be incomplete. Types D, F, and T points will have flutes or slots as shown. Details of point design will be optional providing flutes or slots extend through first full form thread (the flutes on Type F points having complete crests may be one pitch shorter) and the screws meet the performance requirements set forth in MPAPS S-D-100.101-GS/PL.

15.0 DIAMETER OF BODY: Tapping screw body diameters will conform to the following:

Types AB, B, BP, and BT: The diameter of body will not be less than the minimum minor diameter nor greater than the maximum major diameter of the thread.

Types C, D, F, and T: The diameter of body will not be less than the Class 2A thread minimum pitch diameter nor greater than the maximum major diameter of the thread.

16.0 MATERIALS: Tapping screws will be made from carbon steel (CST) as shown in MPAPS S-D-100.101-GS/PL. Stainless steel (SST) Type 304, or stainless steel (SST) Type 410 hardened and tempered to Rc 37-42, per MPAPS A-37. Both 304 and 410 stainless steel will be *passivated per Standard Parts specification in MPAPS A-37, Finish Type 5.

Brass (BRS) should conform to MPAPS C-3, Type C36000.

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