NAVISTAR, INC.			
Material, Parts, and Process Specifications (MPAPS)		*NUMBER:* **MPAPS-S-D-100.101-GS/PL**	
		Former Designation: **ESP-D-100.101-GS**	
TITLE: **Mechanical and Quality Requirements for Tapping Screws English Series – (Noun Code 7450)**		*CURRENT REV No.:* **1506**	*DATE:* **June 2015**
WRITTEN/EDITED BY: **Materials Engineering**	*APPROVED BY:* **Materials Engineering**	*SUPERSEDES:* **ESP-D-100.101-GS - March 2002**	

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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.**

1.0 GENERAL: This specification covers the mechanical and quality requirements for carbon steel tapping screws as used in automotive and related industries. It does not apply to corrosion resistant (stainless) steel screws.

The primary objective of the specification is to insure that screws form or cut mating threads in materials of construction into which they are normally driven, without deforming their own thread and without breaking during assembly or service.

Note: Certain limitations on basic material and manufacturing processes have been incorporated because the size and configuration of the parts under consideration make them vulnerable to relatively small variations in chemistry, heat treatment, etc.; and because experience has shown that in processing it is difficult to keep these variables consistently "in balance." Until improved performance tests are developed these limitations will supplement the "performance" features of the specifications.

2.0 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 PERFORMANCE REQUIREMENTS:

3.1 Drive Test: Sample screws (coated or uncoated, as received) will, without deforming their own, form a mating thread in test plate described below until a thread of full diameter is completely through the test plate.

In cases where screws are plated subsequent to delivery to the purchasers (or where plating of screws is otherwise under the control of the purchaser), the screw producer is not responsible for failures due to plating. Additional screws from the same lot will be stripped of plating, baked, lubricated with machine oil and retested in the plain finish condition.

The test plate will be made of low carbon cold rolled steel, having hardness of Rockwell B70-85 (Vickers 125-169), or equivalent, and thickness as specified in Table 1. Test holes will be drilled or punched and redrilled, or reamed, to plus and minus .0010 inch (.0254 mm) or nominal diameters specified in Table 1 for the type and size of screw being tested.

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3.2 Torsional Strength Test: Shank of sample screw (coated or uncoated, as received) will be clamped in a mating, split, blind-hole die (see Figure 1), or other means, such that the clamped portion of the thread is not damaged and that at least two full form threads project above the clamping device, and at least two full form threads exclusive of point, flutes or end slots are held within the clamping device. (A blind hole may be used in place of a threaded clamping device, providing the hole depth is such as to insure that breakage will occur beyond the point, or the full length of the flutes or end slot.) By means of a suitably calibrated torque measuring device, apply torque to the screw until failure occurs. The torque required to cause failure will equal or exceed the minimum value shown in Table 2 for the type and size of screw being tested.

4.0 MATERIAL REQUIREMENTS: Screws will be made from cold heading quality, killed steel wire. Chemical composition (percent by weight) will conform to the following:

Tapping Screw Size	Analysis	% Carbon	% Manganese	
No. 4 or Smaller	Ladle2	.13 - .25	.60 -	1.65
	Check	.11 - .27	.57 -	1.71
No. 6 or Larger (3.5 mm)	Ladle2	.15 - .25	.70 -	1.65
	Check	.13 - .27	.64 -	1.71

4.1 Core Hardness: Types AB, B, BP, BT, C, D, F, T, and TT will be Rockwell C28-38[3] (Vickers 286-372); Type BSD (self drilling point) will be Rockwell C32-40 (Vickers 318-392).

Core hardness will be determined at mid-radius of a transverse section through the screw taken at a distance sufficiently behind the point of the screw to be through the full minor diameter.

'Drive test does not apply to Types BT screws.

[2]Ladle analyses are shown for informational purposes. Check analyses are mandatory and refer to individual determinations on uncarburized or core portion of screws.

[3]Core hardness will not exceed maximum shown and preferably should be no higher than C36 (Vickers 354) to insure against failure in assembly and service.

4.2 Surface Hardness After Tempering: Types AB, B, BP, BT, C, D, F, T, and TT will be Rockwell 15N 83 (C45 [Vickers 446]) minimum. Type BSD will be Rockwell 15N 86 (C52 [Vickers 544]) minimum.

Surface hardness will be determined by a microhardness instrument at "root of thread profile" as exposed by removal of enough material to form a "flat" along length of screw. For routine quality control purposes, it is common practice to measure surface hardness on end, shank, or head.

4.3 Case Depth: will conform to following, as measured at thread flank, mid-point between crest and root:

Inch			Metric		
Nominal Size	Case Depth		Nominal Size	Case Depth	
	Min	Max		Min	Max
#4 thru #6	.002	.007	3.5	0.05	0.18
#8 thru #12	.004	.009	4.2 and 4.8	0.1	0.23
1/4 and Larger	.006	.011	6.3 and 8	0.15	0.28

4.4 Microstructure: Will show no band of free ferrite between case and core as determined by metallographic examination.

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