

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS L-6023
		Former Designation: TMS-6023
TITLE: Steering Wheel and Horn Pad Assemblies	CURRENT REV No.: 1404	DATE: April 2014
WRITTEN/EDITED BY: Materials Engineering	APPROVED BY: Materials Engineering	SUPERSEDES: Rev. 1402 – Feb. 2014
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<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: Updated design requirements document in Sections 4.3.12 and 4.3.13 for switches; editorial changes.		

1.0 APPLICATION

This specification covers a steering wheel assembly consisting of a welded steel ring-spoke-hub assembly with covering providing either a hard or a soft feel and a horn pad assembly.

2.0 SCOPE

This specification applies to steering wheel assemblies constructed of welded steel inserts and molded covers.

Grade A is a steering wheel manufactured with a butt weld.

Grade B is a steering wheel manufactured with a spoke-to-hub weld.

Grade C is a steering wheel manufactured with a swage fit between the hub and spoke. The hub is clinched in and the welds are a secondary means of retention of the hub to the armature. The clinched section (the swaged joint) is the primary means of retention.

2.1 Restricted Chemical Substances

All product supplied to the requirements of this specification must comply with the requirements of the MPAPS B-50 specification.

3.0 REFERENCE DOCUMENTS

Unless otherwise specified, the latest issue of all referenced standards shall apply. The following Specifications, Standards, and Regulations are referenced in this specification.

Quality System Standard ISO 9001 or TS-16949

NAVISTAR MPAPS A-6, Part 1

AATCC Test Method #8

NAVISTAR MPAPS B-50

AATCC Test Method #8

FMVSS 101

FMVSS 302

ISO 12103-A2

ISO 5011

NAVISTAR MPAPS P-9543

NAVISTAR TMS-9516

NAVISTAR MPAPS D-28

NAVISTAR CEMS DT-10

NAVISTAR MPAPS DT-12

NAVISTAR MPAPS DT-16

NAVISTAR MPAPS GT-31

NAVISTAR DR101142-00

NAVISTAR NDR-004

NAVISTAR SDS-SD-011

NAVISTAR TMS-7110

NAVISTAR TMS-7121

SAE J1455

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4.0 FUNCTIONAL MATERIAL AND COMPONENT REQUIREMENTS

4.1 Material

4.1.1 Cover Material

4.1.1.1 Type I: Hard Rubber – **VOID**; no longer in use.

4.1.1.2 Type II: PP, K30 SA82 U YA3600 AC3 Z1, per MPAPS D-28; Z1- minimum Izod impact of 12.4 J at -18°C per ASTM D758

4.1.1.3 Type III: PVC, A3 A45 A64 GB3 JA74 K9 L235 T140 U W 5742 YA120 AB1 AC1, per MPAPS D-28

4.1.1.4 Type IV: Steering wheel consists of a welded steel core with a micro-cellular integral skin polyurethane over mold.

4.1.1.5 Type V: Steering wheel consists of a welded steel core with a micro-cellular integral skin polyurethane over mold with wood grain or titanium inserts. Some Type V steering wheels may come with a leather cover sewn on it.

4.1.2 Color and Finish

Shall be specified on the part drawing.

4.1.3 Substrate Materials

4.1.3.1 Steel per MPAPS A-6 Part I - Low Carbon Steel, Flat Rolled and Structural Shapes

4.2 Property and Performance Requirements for Steering Wheel

All tests are to be performed at ambient temperature of 18°-24°C (65°-75°F) and 50 % relative humidity unless otherwise specified.

4.2.1 90°/180° Bend Test For Welds On Steering Wheel Insert

4.2.1.1 Procedure

Clamp welded section firmly in vise or other clamping fixture. At a distance of approximately 25.4mm (1 in) from the weld being tested, apply sufficient force to bend the member 90° in one direction. Reverse the direction and bend 180° in the opposite direction. See Figure 1.

4.2.1.2 Required

The weld shall not fracture as a result of the first 90° bend. When bending in the opposite direction, the weld must not fracture within the first 90° (back to original position). If the weld fractures before completing the remaining 90° of the 180° bend, the fractured surface must display a minimum of 75% parent metal.

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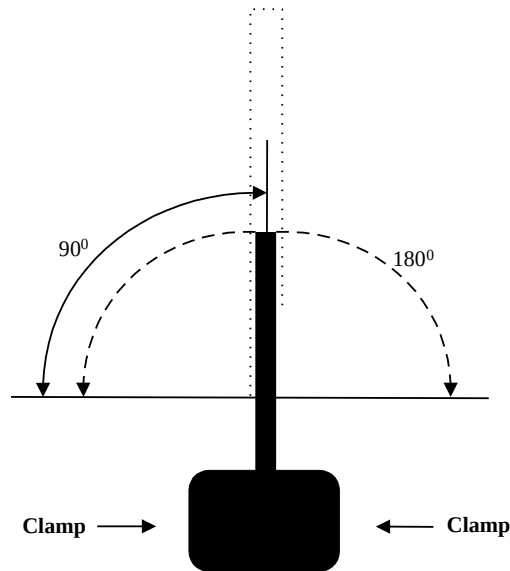


Figure 1: 90°/180° Bend Test

Note: This test applies to the rim butt weld and spoke-to-hub welds.

4.2.2 Vertical Impact Test For Welded Inserts

4.2.2.1 Procedure

Mount finished insert by the hub on the base of the impact tester leaving the spokes and the rim unsupported. Insert is mounted in a horizontal plane with the hub down, rim up. Elevate the 45.36kg (100 pound) impact weight to a distance of 1.829 meters (6 feet) from the hub mounting surface. Release the impact weight and allow it to fall vertically onto the insert rim. The resulting impact force is approximately 814N·m (600 ft · lb), depending upon the height of the insert.

4.2.2.2 Required

The impact force shall not cause the fracture of any weld on the insert. (see accompanying notes)

4.2.2.2.1 Note 1: When component is fixtured, the impact test is performed on different inserts at the locations depicted in Figure 2. Number of tests performed varies with the design of the insert.

4.2.2.2.2 Note 2: In-process tests are performed consecutively at the locations depicted in Figure 2.

4.2.2.2.3 Note 3: Shearing of the metal (e.g., rim or spoke wire) does not constitute a failure of this test.

4.2.2.2.4 Note 4: For Grade C steering wheels, hub-to-armature weld failures under these circumstances do not indicate an inadequacy in the design or manufacture of the steering wheels.

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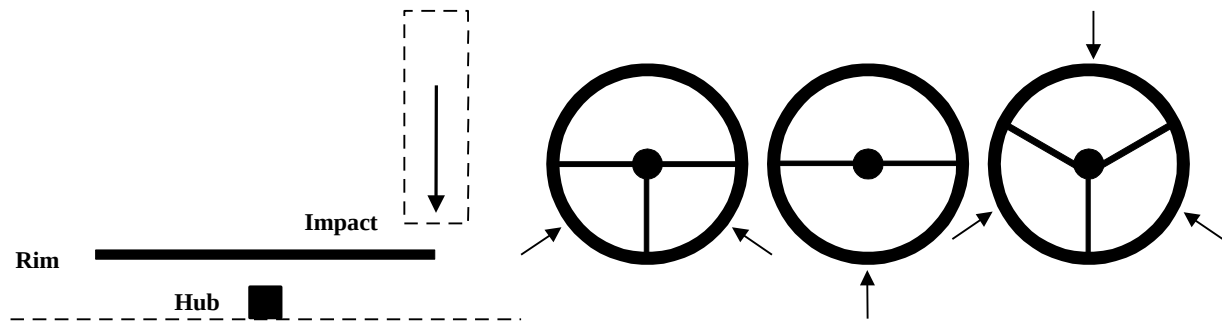


Figure 2: Vertical Impact Test

Typical Impact Locations For Common Designs

4.2.3 Torsion And Bend Fatigue Test For Welded Inserts

4.2.3.1 Procedure

Mount the finished insert on the test fixture using an appropriate shaft, and tighten securely to prevent rotation. Apply reversing loads of 112 N (25 lb.) to the insert rim as shown in Figure 3. Both torsional loads and both bending loads are to be applied simultaneously in sequence. One load application and one reversal comprise one cycle. Operate the test fixture at a cycle rate of 95 to 105 cycles per minute.

4.2.3.2 Required

4.2.3.2.1 Grade A and B

Insert shall pass 100,000 cycles without fracturing the rim, spoke or any weld.

4.2.3.2.2 Grade C

Same as Grade A except hub-to-armature weld failures under these circumstances do not indicate an inadequacy in the design or manufacture of the steering wheels.

Note: Production Validation tests are to be performed to failure or two times the test bogie of 100,000 cycles (200,000 cycles), whichever occurs first.

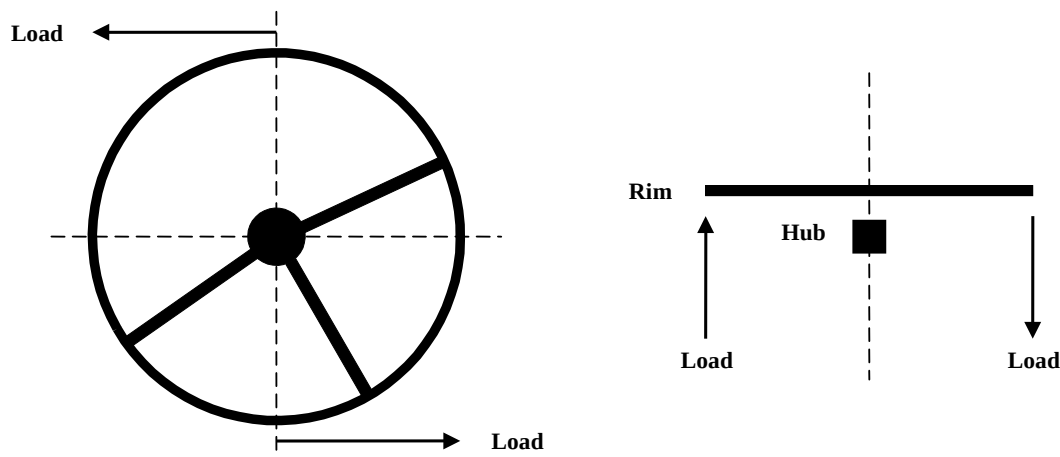


Figure 3: Torsion and Bend Fatigue Test

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4.2.4 Hub Push-Out

4.2.4.1 Procedure

Support steering wheel insert by outer ring, leaving the hub unsupported. Apply an increasing axial load to the steering wheel hub through the plane of the hub, parallel to the steering column until the hub breaks free from the steering wheel armature. See Figure 4.

4.2.4.2 Required

Insert shall withstand the 2,750 kg. (6050 lb) load without any weld fractures. When tested to failure, the fractured surface shall exhibit a minimum of 75% parent metal.

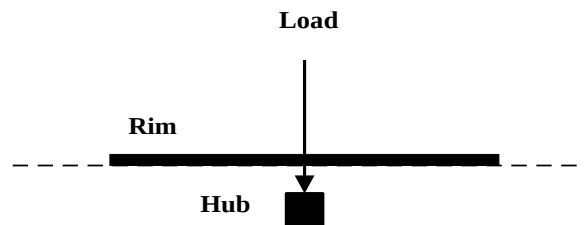


Figure 4: Hub Push-Out Test

4.2.5 Tangential Rim Pull Test for Molded Steering Wheels

4.2.5.1 Procedure

- 1) The molded steering wheel shall be mounted by the hub and securely tightened to prevent rotation. At the halfway distance between two spokes (typically the 12:00 position), a 90kg (200 lb) load shall be applied tangentially to the rim, held for one minute, and then released. See Figure 5. Perform experiment on steering wheels with and without welds.
- 2) Model test in CAE on a steering wheel with and without welds. Calculate deflection of the rim under the specified load.

4.2.5.2 Required

4.2.5.2.1 Grade A and B Steering wheel shall not exhibit any cracking or breaking of the welds or the molded covering material. No separation of the hub from the armature with or without welds.

Calculated rim deflection must correlate to measured deflection within +/-5%. Results must be provided to Navistar Design Engineering for review.

4.2.5.2.2 Grade C Same as Grade A except hub-to-armature weld failures under these circumstances do not indicate an inadequacy in the design or manufacture of the steering wheels. Modeled rim deflection must correlate to measured deflection within 5%. Results must be provided to Navistar Design Engineering for review.

No separation of the hub from the armature with or without welds

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