

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS K-6045 Former Designation: TMS-6045
TITLE: Door and Body Seals (Rubber)		CURRENT REV No.: 1406
WRITTEN/EDITED BY: Materials Engineering		DATE: June 2014
APPROVED BY: Materials Engineering		SUPERSEDES: Rev. 1404 – April 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: Correction to Section 4.3.6.2; editorial changes.		
Reference: File 30-16	Key Words: Door seal, body seal	

1.0 APPLICATION

This specification covers elastomeric door, glass and body seals and trim applications.

- Type 1: Dual Durometer - solid extrusion with sponge bulb; with a woven wire carrier.
- Type 1A: Dual Durometer – solid extrusion with sponge bulb, no carrier.
- Type 2: Solid extrusion with a woven wire carrier.
- Type 3: Extruded sponge, adhesive mounted.
- Type 4: Trim – edge covering.
- Type 5: Glass run channel or belt line seal - solid extrusion with flocking.
- Type 6: Glass run channel or belt line seal - solid extrusion without flocking.
- Type 7: Solid extrusion without a woven wire carrier (fan seals).
- Type 8: Solid, dual durometer thermoplastic elastomer extrusion.

2.0 SCOPE

This specification covers the general requirements, property and performance requirements, quality, identification, qualification, source approval and quality control.

2.1 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 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	ASTM D 2240	ASTM D 412
NAVISTAR Manufacturing Standard MS-D-13	ASTM D 573	ASTM D 395
NAVISTAR Engineering Design Standard A-16	ASTM D 1171	ASTM D 2135
CFR Title 29, Part 1910	ASTM D 1056	SAE J200
RMA Handbook (Rubber Manufacturers Association)	SAE J18	ASTM D 618
NAVISTAR TMS-9544	MPAPS GT-31	ISO 6945
NAVISTAR CEMS G-5, Part II	MPAPS B-50	ASTM D 638
ASTM D 790	ASTM D 3029	MPAPS P-9543

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4.0 GENERAL REQUIREMENTS

Unless otherwise stated, all tests shall be performed at room temperature. Preconditioning: in case of dispute, ASTM D 618, Procedure A, shall govern conditioning of test samples.

4.1 General Properties

4.1.1 Finish

Unless otherwise specified on the engineering drawing, the finish for molded parts shall be uniform as produced from polished steel tools. The mold will be polished to a surface finish of 800 nm or better. Extruded products shall have a smooth, clean surface, free from any foreign matter. Extruded finish will be equivalent to Rubber Manufacturer's Association (RMA) F2 for mold finish.

4.1.2 Color

Unless otherwise stated on the engineering print, the color shall meet NAV0004 black N-gloss (2-5%)

4.1.3 Flash

Unless otherwise specified on the engineering drawing, the parts shall have a maximum flash allowance of 0.80 mm (RMA T.80mm).

4.1.4 Low-friction Coating (flock, slip coating, wear strips)

This requirement is under development. Silicone coatings are not allowed. Contact Materials Engineering for further information. Coating type and thickness shall be specified on engineering print.

4.1.5 Dimensional Tolerances

Reference part tolerances are shown in Table 1. Engineering print tolerances utilizing Geometric Design and Tolerancing (GD&T) shall be reasonably consistent with the intent of this table.

4.1.6 Appearance

Parts should have features that orient them correctly during installation process. There shall be no cosmetic defects visible after installation of seals.

TABLE 1 STANDARD DIMENSIONAL TOLERANCE TABLE

Dimension - inch	Tolerance - inch	Dimension - mm	Tolerance - mm
0 -1.00	.015	0 -25	.40
1.00-4.00	.025	25 -100	.50
4.00-6.30	.032	100 -160	.80
6.30 & over	0.50%	160 & over	0.50%

4.2 Material Requirements

See Table 2 at the end of this specification for solid and sponge elastomer material properties. Closed cell expanded rubber properties (sponge, Types 1 and 3) shall meet ASTM D 1056 for grade 2A2 in EPDM elastomer. The compression deflection requirement may be specified on the engineering print to fall into one of the other ranges in ASTM D 1056. Unless otherwise specified for a higher requirement the material shall meet the following suffixes in ASTM D 1056 – A1, B2, F1.

4.2.1.1 Adhesion: ASTM D 429, Method A. This test applies to any bonded assembly. All fracture modes are to be cohesive fractures or fracture through the substrate. The Qualification Test Report will

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include the fracture loads reported as MPa values, tested at standard lab conditions. Any adhesive failure modes shall be noted and explained in the report.

4.2.1.1.2 Pressure Sensitive Adhesive: When a pressure sensitive adhesive is specified, it shall meet the requirements of TMS-6929 unless it is directed to be a temporary adhesive on the engineering print.

4.2.1.2 Seal Abrasion Resistance – ISO 6945

4.2.1.2.1 Method: Prepare samples at 250 mm (10 in) in length and measure mass to 0.01 grams. Use a wear resistance tester per ISO 6945 except modified as described herein. Support the test sample as appropriate for its intended use. Set the rate to 1 Hz (60 cycles per minute) and the stroke is 150 mm (6 in) with one back and forth movement as one cycle. Apply 5 N for sponge, 50 N for solid force to the specimen. Test samples to 10,000 cycles. Record cycles, report weight loss and record final surface condition.

4.2.1.2.2 Required: The requirements for this test are still under development. Sponge materials shall not break the surface skin. Solid shall show minimal surface distress. Contact Materials Engineering for further judgment on results.

4.2.1.3 Staining Resistance: This requirement is *temporarily* ASTM D 925 Method B to be consistent with ASTM D 2000 classifications.

4.2.1.4 Salt Spray/Adhesion: ASTM B117 salt spray test for 100 hours. Test per **4.2.1.1 Adhesion.**

4.2.1.5 Heat Aged/Adhesion: Age test samples for the time, temperature and method specified in Table 2. Perform test as per **4.2.1.1 Adhesion.**

4.2.1.6 UV Exposure

4.2.1.6.1 Method: Test per Navistar MPAPS GT-31 Xenon Arc Exposure (SAE J2527)

4.2.1.6.2 Required: Report results

4.2.2 Material Requirements – Sponge only - Types 1 & 3

Material testing shall be done as closely as possible to finished product material conditions.

4.2.2.1 Compression – Deflection

4.2.2.1.1 Method: Test per ASTM D 1056 on samples prepared in paragraph 19.

4.2.2.1.2 Required: Range shall be between 35 to 65 KPa or as specified by the class and specified by ASTM D 1056.

4.2.2.2 Water Absorption

4.2.2.2.1 Method: Test per ASTM D 1056 on samples prepared in paragraph 43.

4.2.2.2.2 Required: Weight shall not change more than 5% of the original weight.

4.2.2.3 Weather Resistance

4.2.2.3.1 Method: Test per ASTM D 1171 method D, outdoor exposure.

4.2.2.3.2 Requires: Shall obtain 100% to pass.

4.3 Property and Performance Requirements – Mechanical Properties

The need for these tests, and details of the specific tests to be performed, will be indicated on the engineering drawing for the part or assembly. Additional details of the testing may be included in the Engineering Validation Plan for these parts. Unless otherwise specified all tests shall be performed on finished parts. Test fixtures, replicating, as closely possible, the production usage and intent shall be built. Details of the test fixtures, including engineering drawings and pictures shall be included in the supplier's qualification report (see Section 5.1).

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4.3.1 Compression Load Deflection: ASTM D 575, Test Method A, except that a finished part shall be used. The direction and amount of deflection shall be indicated on the engineering drawing.

4.3.2 Glass Edge Rub

The glass system for this test consists of the door assembly, door module with below belt run seals, window crank (manual systems), drop glass, glass run seal, inner belt seal, and outer belt seal.

All areas coated with flock or LFC must complete the following testing without rub through, or any other defects that would affect the function of the system.

Test Plan

One Life = 50,000 cycles (full up to full down to full up) for front doors consisting of

- Ambient (23±5C) = 20,000 cycles
- Cold (-40±3C) = 7,500 cycles
- Hot (82±3C) = 7,500 cycles
- Humidity (40±3C @ 95±5% RH) = 15,000 cycles

One Life = 20,000 cycles for rear doors consisting of

- Ambient (23±5C) = 8,000 cycles
- Cold (-40±3C) = 3,000 cycles
- Hot (82±3C) = 3,000 cycles
- Humidity (40±3C @ 95±5% RH) = 6,000 cycles

The system must be tested to a B10 life of 50,000 cycles for front doors and 20,000 cycles for rear doors. The target program goals are R90 C95 using Weibull with $\beta = 1.5$ for both power and manual systems.

Full Inspection

≈ Every 5K

Notify Navistar Engineering and Reliability departments of any concerns during the test to determine if the concerns are considered failures. Any concerns at less than one life are failures.

4.3.3 Load Loss Set

4.3.3.1 Method: Use samples from the Compression Load Deflection test to perform this test. Compress the samples using two compression plates that can be secured in the compressed state. Place the samples in an oven for 24 ± 0.1 h @ $70 \pm 2^\circ\text{C}$. Remove from the oven and remove the samples from the compression plates. Allow the samples to cool for 1 ± 0.1 h at room temperature $23 \pm 2^\circ\text{C}$. Rerun the samples in the Compression Load Deflection test.

4.3.3.2 Required: Report. % allowed TBD.

4.3.4 Separation of the Bulb from the Carrier

4.3.4.1 Method: Prepare 25 mm (1") sections from production parts. Cut the bulb material on a taper so that the knit line, where the bulb meets the carrier, to be tested is 12.5 mm (.5 in). Measure and record the thickness of the bulb material at the knit line. Pull the sample at a rate of 500 mm/min (20.0 in/min).

$$\text{Tensile Strength (MPa)} = (\text{Load (N)}) / (\text{Area (12.5mm x Thickness, mm)})$$

4.3.4.2 Required: Report the tensile strength of the samples.

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