

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS K - 6931
		Former Designation: TMS-6931
TITLE: Bus Floor Mat and Step Tread Adhesives		CURRENT REV No.: 1608
		DATE: Aug. 2016
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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>		

1.0 APPLICATION

This specification covers multiple adhesive systems used for bonding bus floor mats and finished bond requirements for mat materials that are either pre-bonded or bonded in factory to bus floor and step components, including step treads. This specification supersedes the adhesive requirements outlined in MPAPS L-6041.

2.0 SCOPE

This specification covers the material properties, performance requirements, production quality and process control, supplier's responsibility, source approval and quality control, and sources for the approved adhesive systems.

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	NAVISTAR MPAPS L-6041	ASTM D2919
CFR Title 29, Part 1910	NAVISTAR MPAPS P-9543	ASTM D3654
NAVISTAR Supplier Packing & Shipping Std. D-13	ASTM B117	SAE J243
NAVISTAR Engineering Design Std. A-16	ASTM D1002	SAE J1679
NAVISTAR MPAPS B-50	ASTM D2294	

4.0 REQUIREMENTS

Adhesive materials supplied to this specification shall bond the intended substrates to produce a permanent bond. The general properties of as – received materials, in the uncured state, are listed in Table 3. Adhesive materials supplied to this specification shall be compatible with current production materials and processes for which the new adhesive approval is sought including resistance to plasticizer migration. It is the responsibility of the adhesive supplier to insure compatibility of the new adhesive materials with the Assembly Plant's product materials and processes and obtain approval from the Production Process Manager of the Assembly Plant for the use of new adhesive materials.

4.0.1 Swell

Adhesive must not induce more than 5% swelling of the resilient flooring. Method is to be determined. Contact Materials Engineering for further instructions.

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4.1 Description of Application

4.1.1 Type 1: Laminating type operation used to bond sheets of material together, mostly in floor and sub-floor application.

4.1.2 Type 2: High strength bonding application like those used for bonding steps and step treads.

4.2 Material

4.2.1 Class A: Water based urethane adhesive. Includes both one and two part materials and moisture cured and contact cement.

4.2.2 Class B: Hybrid urethane – silane single part adhesive.

4.2.3 Class C: Methyl methacrylate (MMA) adhesive.

4.3 General Properties

Properties are provided for reference only. Properties shall be reported on submitted test reports and will be included in Table 3.

4.3.1 Uncured Properties

Specific requirements are to be determined between the material supplier, equipment supplier and the applicator.

Requirement:	Typical Test Method
Solids	SAE J243 Procedure ADS-7, Method A
Viscosity - Method A	SAE J243, Procedure ADS-1, Agitated - Conditioning Method C, Pressure Flow Method 275 kPa (40 psi), 25 ± 1°C (77 ± 2°F), 20 g.
- Method B	SAE J243, Procedure ADS-1, Agitated - Conditioning Method C, Test 2.2 Brookfield, spindle 7, 50 RPM

4.4 Sample Preparation

A minimum of five samples shall be prepared for each condition tested. The surface condition tested shall be representative of production conditions and fully described in the test report. The bond overlap for lap shear shall be 25 mm (1 inch). Peel specimens may typically use a 25 mm by 150 mm strip with a 25 mm tab at one end if appropriate. All samples shall be conditioned for 72 hours in ambient lab conditions prior to testing or exposure. The test-sample geometry may vary as necessary for each test to conform to the specified test method. The test-sample geometry must be fully described in the Qualification Report (see Section 5.1). The adhesive application conditions (applied pressure, dwell time, and temperature) should match production conditions as closely as possible and will be fully described in the Qualification Report. The failure mode and failure load for each sample will be reported and data summaries, including average values and standard deviations for each test, will be included in the Qualification Report. Any discarded test result must be noted and reasons for discarding the result fully explained in the report.

4.5 Property and Performance Requirements

4.5.1 Lap Shear Strength

4.5.1.1 Method: Test per ASTM D1002 on samples prepared as directed in *4.4 Sample Preparation*. Tensile machine jaw separation rate shall be 13 mm (0.5 in) per minute. Test overlap shear at the temperatures specified in Table 1 after holding at temperature for 30 minutes. Report the average and standard deviation of five tests and their failure modes.

4.5.1.2 Required: See Table 1.

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4.5.2 Peel Test

4.5.2.1 Method: Test per SAE J1679 on samples prepared as in 4.4 *Sample Preparation*. Perform 90° peel at 300 mm/min and at the temperatures specified in Table 1 after holding at that temperature for 30 minutes. Report the average and standard deviation of five tests and their failure modes.

4.5.2.2 Required: See Table 1.

4.5.3 Salt Spray

4.5.3.1 Method: 500 hours of salt spray exposure per ASTM B117 on lap shear coupons prepared as directed in 4.4 *Sample Preparation*. Test as directed in 4.5.1.

4.5.3.2 Required: See Table 1.

4.5.4 Water Immersion

4.5.4.1 Method: Immerse coupons prepared in 4.4 *Sample Preparation* for shear strength test in distilled water at 25°C (77°F) ± 2°C (3.6°F) for 168 hours. Test as directed in 4.5.1.

4.5.4.2 Required: See Table 1.

4.5.5 Heat Aging

4.5.5.1 Method: Prepare samples for lap shear and peel as directed in 4.4 *Sample Preparation*. Age in a recirculating air oven for 168 hours at 90± 2°C (194± 3.6°F).

4.5.5.2 Required: See Table 1.

4.5.6 Cyclic Aging

4.5.6.1 Method: Prepare samples for lap shear (ASTM D1002) and peel (SAE J1679) as directed in 4.4 *Sample Preparation*. A minimum of 3 samples are required per step below. Remove 3 samples after each step and test immediately.

4.5.6.1.1 24 hours at 38° C (100° F) and 100% RH

4.5.6.1.2 24 hours at 82° C (180° F)

4.5.6.1.3 Cool at room temperature (for one hour)

4.5.6.1.4 24 hours at -29° C (-20° F)

4.5.6.1.5 24 hours at 38° C (100° F) and 100% RH

4.5.6.1.6 7 days at 70° C (158° F)

4.5.6.1.7 24 hours at RT

4.5.6.2 Required: See Table 1.

4.5.7 Stress Durability

4.5.7.1 Method: Test per ASTM D 2919 or ASTM D 3654 using a fixture described in ASTM D 2294, ASTM D 2919, or ASTM D 3654. Prepare samples as indicated in Section 4.4 *Sample Preparation*, except for the geometry requirements of the fixture used. Load shear samples to 750 grams per 25 mm by 25 mm overlap. Load peel samples to 250 grams per 25 mm sample width. Expose separate sets of samples to 500 hours heat aging at 70± 2°C and 500 hours at 100% relative humidity at 35± 2°C.

4.5.7.2 Required: Samples shall remain intact with no more than 2 mm of creep. Samples shall be tested for residual strength as in 4.5.1, Lap Shear Strength, or 4.5.2, Peel Test. Report test values.

5.0 QUALITY

Material and processes submitted for approval to this specification shall include the following:

5.1 Report

A detailed, signed test report documenting testing to this specification per MPAPS P – 9543. The report will include actual test data, not merely test summaries.

5.1.1 Failure Modes: Test coupons or photographs showing failure modes for each test.

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