

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS K - 6927
		Former Designation: TMS-6927
TITLE: Glass Bonding: Part 1 and 2		CURRENT REV No.: 1602
		DATE: Feb. 2016
WRITTEN/EDITED BY: S. Brailey	APPROVED BY: R. Goluch	SUPERSEDES: Rev. 1504 – April 2015
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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: Changed 9000 bead dimensions Part 2 Table 1		

1.0 APPLICATION

Part 1 of the specification covers material properties, performance requirements, production quality control, supplier's responsibilities, source approvals and quality controls, in addition to approved sources for adhesive systems. Part 2 of the specification covers manufacturing and assembly process controls and general information.

2.0 SCOPE

This specification covers bonding systems, including adhesives and primers, used for bonding glass in the construction of truck and tractor cabs, sleeper boxes, and/or other parts used in truck cab manufacturing. The bonds developed by these systems retain adhesion and physical properties while resisting exposure to weathering conditions.

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 Std ISO 9001 or TS-16949	ASTM B117	SAE J1720
NAVISTAR Engineering Design Std. A-16	ASTM D2247	SAE J1721
NAVISTAR Manufacturing Std. MS-D-13	ASTM D2369	SAE J1885
CFR Title 29, Section 1910	ASTM D2196	SAE J243
NAVISTAR MPAPS B-50	ASTM D1084	SAE J1529
NAVISTAR MPAPS G-5	ASTM D1200	
NAVISTAR TMS-6915	ASTM G53	
NAVISTAR MPAPS D-7016		
NAVISTAR TMS-9522		
NAVISTAR MPAPS P-9543		

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FEBRUARY 2016



Documents

Page 1 of 14

Document Sharing Hub

NUMBER: MPAPS K - 6927	TITLE: Glass Bonding: Part 1 and 2	REVISION: 1602
----------------------------------	--	--------------------------

Part 1 – General, Property, and Performance Requirements

4.0 REQUIREMENTS

Material supplied to this specification shall bond glass and substrates together to produce a permanent structural bond. General properties of received materials, in the uncured state, are shown in Table 3.

4.1 Compatibility

Material supplied to this specification shall be compatible with all subsequent cleaning, pre-treatment, and paint operations for the assembly plant process, in addition to material substrate combinations for which the bonding system approval is sought. It is the adhesive supplier's responsibility to demonstrate and insure compatibility of the bond system's materials and procedures with the assembly plant material and process combinations.

4.2 Uncured Properties

See **Table 3** for specific requirements for each material. Test properties and methods are shown below.

Requirement:	Test Method
Percent Solids	ASTM D 2369
Viscosity - Method A	SAE J243, Procedure ADS-1, Unagitated, Conditioning Method A, Pressure Flow Method 275 kPa (40 psi), 25° ± 1°C (77 ± 2°F), 20 g.
- Method B	ASTM D 1200, Cup #4, 24°C.
- Method C	ASTM D 2196, Method A.
- Method D	ASTM D 1084, Cup #1, 24°C

4.3 Cured Properties

4.3.1 Sample Preparation

A minimum of five samples shall be prepared for each test condition and substrate unless otherwise specified. Prepare glass samples per SAE J1529 except as indicated below. The surface condition tested shall be representative of production conditions and will be fully described in the test report. The cure condition shall also be representative of production conditions and be described fully in the test report. The test conditions will be listed in **Table 1** and be reproducible for future testing. Substrate test matrices are described in section 5.0 *Qualification*.

4.3.2 Lap Shear Strength

4.3.2.1 Method: Prepare samples as directed in Sample Preparation (Section 4.3.1). Test per SAE J1529, as appropriate. Tensile machine jaw separation rate shall be 13 mm (.5 in) per minute. Test overlap shear at the following specified temperatures (listed in **Table 1**) after holding at temperature for 30 minutes. Report the average of five tests and their failure modes.

4.3.2.2 Required: See **Table 1** for requirements and **APPROVED SUBSTRATES** list in Table 2.

4.3.3 Corrosion

4.3.3.1 Method: Prepare samples as directed in Sample Preparation (Section 4.3.1). Test per ASTM B117 salt spray test for the length of time listed in **Table 1**.

4.3.3.2 Required: See **Table 1**.

NUMBER: MPAPS K - 6927	TITLE: Glass Bonding: Part 1 and 2	REVISION: 1602
----------------------------------	--	--------------------------

4.3.4 Water Immersion

4.3.4.1 Method: Prepare samples as directed in Sample Preparation (Section 4.3.1). Immerse samples in distilled water at 38° C (100° F) $\pm$ 2° C (3.6° F) for 240 hours.

4.3.4.2 Required: See **Table 1**.

4.3.5 Humidity

4.3.5.1 Method: Prepare samples as directed in Sample Preparation (Section 4.3.1). Test per ASTM D2247 for the length of time listed in **Table 1**.

4.3.5.2 Required: See **Table 1**.

4.3.6 Heat-Aging

4.3.6.1 Method: Prepare samples for lap shear strength test. Heat-age in a recirculating air oven for 330 hours at 82 $\pm$ 2°C (180 $\pm$ 3.6°F).

4.3.6.2 Required: See **Table 1**.

4.3.7 Accelerated Weathering

4.3.7.1 Method A – QUV: Perform 500 hours QUV-B (FS40 bulbs) test as per ASTM G53. Cycle = 8 hours UV @ 140°F - 4 hours dark condensing humidity @ 122°F - repeat cycle for test duration

4.3.7.1.1 Required: See **Table 1**. Material should not crack, lose adhesion, nor have more than a slight color change.

4.3.7.2 Method B – Weatherometer: Test per SAE J1885 on samples prepared for shear strength. Test for 2000 hours.

4.3.7.2.1 Required: See **Table 1**. Material should not crack, lose adhesion, nor have more than a slight color change.

4.3.8 Quick Knife Adhesion

4.3.8.1 Method: Prepare and test specimens per SAE J1720.

4.3.8.2 Required: Test specimens should exhibit cohesive failure.

4.3.9 Tape Link-Up

4.3.9.1 Method: Prepare and test specimens per SAE J1721.

4.3.9.2 Required: Test specimens exhibit 100% adhesion in less than eight hours.

4.3.10 Cold-Crack

4.3.0.1 Method: Prepare and test specimens per MPAPS GT Paint, GT-14C.

4.3.0.2 Required: See **Table 1**. Material should not crack, lose adhesion, nor have more than a slight color change.

4.3.11 Time Study

A quick knife test study shall be performed to determine open time of the top-coat to receive the new adhesive system. The adhesive is to be applied to topcoat at 4hr, 72hr, 7 days, and 14 days from the topcoat being cured under nominal top coat bake conditions as described in section 5.0. The top coated panels shall be stored at standard laboratory conditions during the waiting period. Test conditions shall be initial adhesion and humidity exposure. In addition two colors shall be tested NAV9219 and NAV2503.

NUMBER: MPAPS K - 6927	TITLE: Glass Bonding: Part 1 and 2	REVISION: 1602
----------------------------------	--	--------------------------

5.0 QUALITY

Materials and processes submitted for approval to this specification shall include a detailed, signed test report per MPAPS P – 9543, test coupons or photographs showing failure modes for each test, the complete test procedure, and a description of the adhesive, substrate(s), and any chemicals/primers used for bonding.

5.1 E-Coat Test Matrix

Each new material must be tested with current E-coat substrates using a nine-condition test matrix. The matrix evaluates the adhesion of the urethane to E-coated panels that have been exposed to nominal oven conditions of 30 minutes at 350° F, over-bake conditions of 60 minutes at 390° F, and under-bake conditions of 15 minutes at 325° F. The matrix includes test conditions in which film thickness is varied at 0.6 mil, 0.9 mil, and 1.2 mil. Ten (10) 4"x12" panels are tested at each condition.

5.2 Primerless to Top Coat - Full Substrate Test Matrix

Each new material seeking primerless approval to top coat must be tested with current top coated substrates at nominal (30min @ 250°F), under bake (20min @ 200°F), and over bake conditions (40min @ 260°F). Paint film build shall be nominal as recommended by the paint manufacturer. The adhesive shall be applied to the fresh top coat without prior ageing of the top coat and within the nominal manufacturing cycle time. The test matrix is to include the current base coat/clear coat system at catalyzed and uncatalyzed clear coat conditions in the following colors: NAV0001, NAV9219, NAV2503, and NAV4587. The test matrix is also to include thermoset acrylic monocoats, catalyzed and uncatalyzed urethane monocoats, and re-paint base coat/clear coat panels simulating two and three tone paint jobs.

5.3 Primerless to Top Coat - Screening Substrate Test Matrix

In the event of material screening the Full Test Matrix may be truncated to include only the nominal bake, one pass, base coat/clear coat panels on all four colors as described in *Section 5.6*, and omitting the accelerated weathering and cold crack tests.

5.4 Primerless to Top Coat - Manufacturing Validation Test Matrix

Manufacturing validation shall consist of a 9 week panel audit at each plant. A total of four colors and four panels per color shall be tested per week per plant by quick knife adhesion at initial conditions and after 240hrs of humidity exposure. The panels shall be tested as quickly as possible upon receipt from the plant.

6.0 QUALIFICATION

6.1 Quality Control Plan

A Quality Control Plan for products supplied to the requirements of this specification will be established by mutual agreement between NAVISTAR and the supplier. Unless specific exception is noted, the following characteristics, where applicable*, shall be included in the plan as features for management by statistical process control.**



Bead height

* Other characteristics for inclusion in the control plan may be specified on the engineering drawing and/or purchase order.

** See NAVISTAR Engineering Design Standard A-16

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FEBRUARY 2016



Documents

Page 4 of 14
Document Sharing Hub

NUMBER: MPAPS K - 6927	TITLE: Glass Bonding: Part 1 and 2	REVISION: 1602
----------------------------------	--	--------------------------

7.0 SOURCE APPROVAL AND QUALITY CONTROL

7.1 Supplier Requirements

All suppliers to NAVISTAR are required to be registered to ISO 9001 Quality System Requirements. NAVISTAR will also accept TS-16949 registration as long as the supplier can also fulfill all AIAG PPAP (Production Part Approval Process) documentation and approval requirements. Suppliers must maintain their certification with an accredited registrar and must furnish copies of registration certificates to their Corporate Buyer upon request.

7.2 Approval

Parts supplied against contracts or purchase orders citing this specification shall be equivalent in all respects to those samples which were approved by the purchaser. No changes in formulation or processing practices are permitted without approval. In the event that changes in material, properties, processing practices, construction, color, or labeling of the product are required, the supplier shall notify NAVISTAR Materials Engineering and Purchasing and Supplier Development of the proposed change(s). Test data indicating conformance to all requirements of this specification, test samples, and new or amended or updated Material Safety Data Sheet(s) (MSDS), in accordance with CFR Title 29, Part 1910 shall be submitted with the request for change.

7.3 Process Control

The supplier shall either perform and report results of tests on specific lots of parts produced using ISO 9001 or TS-16949 guidelines, or provide statistical evidence of the lot having been produced in a state of statistical control and with a process capable of providing all required properties. The part supplier and the quality control manager of the using NAVISTAR plant may determine testing and reporting requirements on specific products.

8.0 SHIPPING AND HANDLING

Shipping and identification shall be in accordance with NAVISTAR Manufacturing Standard MS-D-13. Parts shall be packaged so as to avoid any damage in shipment detrimental to the appearance of the part.

9.0 DESIGNATION ON DRAWINGS

Example of note to use on drawings:

Bond per MPAPS K-6927 or Bond per MPAPS K-6927, System A (to designate the adhesive system)

Adhesive per MPAPS K-6927 or Adhesive A4/A5 MPAPS K-6927 (to designate a single specific material)

10.0 TECHNICAL INFORMATION

For further information related to the technical content of this specification, contact:	Suppliers may purchase controlled copies of this specification by contacting:
Materials Engineering and Technology Dept. 10400 W. North Avenue Melrose Park, IL 60160 E-mail: MaterialsEngineering@Navistar.com	IHS Global Inc. 15 Inverness Way East Englewood CO 80112-5776 Phone: 1-800-854-7179 E-mail: Automotive@IHS.com Website: http://global.ihs.com

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FEBRUARY 2016



Documents

Page 5 of 14
Document Sharing Hub