

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS G-32
		Former Designation: CEMS D-32
TITLE: Decorative Physical Vapor Deposition (PVD) - Plastics		CURRENT REV No.: 1706
		DATE: June 2017
WRITTEN/EDITED BY: J. Goldschmidt	APPROVED BY: R. Goluch	SUPERSEDES: Rev. New – June 2013
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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 applies to decorative physical vapor deposition coatings used on interior or exterior plastics. These parts may be exterior grilles, bumpers, light bezels, nameplates, interior ornaments, knobs, or similar applications.

2.0 SCOPE

This specification covers the material requirements of the base plastic, coating requirements, performance requirements, and quality of the finished part, 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 B368	ASTM D1308
CFR Title 29, Part 1910	ASTM B456	ASTM D2247
NAVISTAR Supplier Packing and Shipping Std. D-13	ASTM B604	ASTM D3359
NAVISTAR Engineering Design Std. A-16	ASTM B727	ASTM D4060
NAVISTAR MPAPS B-50	ASTM D523	SAE J400
ASTM B244	ASTM D570	SAE J2527

4.0 REQUIREMENTS

The general plastic family from which the unplated plastic part is molded shall be compatible with the particular PVD process used by the supplier. The plastic part shall be free from visible molding defects, sink marks, weld or flow lines. Unless otherwise specified on the part drawing, the significant surface finish shall be equal to or better than the No. 2 diamond finish as found in the SPISPE Mold Finish Comparison Kit.*

* Available from D-M-E Corporation, 1975 N. 17th Street, Melrose Park, IL - Licensed by Society of Plastic Industry and Society for Plastic Engineers.

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4.1 Coating Requirements

PVD Coating systems on plastic parts typically consist of three layers. The first layer applied to the plastic base is an ultraviolet light (UV) curable base coat. The second layer is a thin layer of vapor deposited metal. The third layer is a UV resistant, clear, organic, topcoat. The performance requirements given below are expected of the composite coating not individual layers. Systems other than those specified which demonstrate satisfactory performance may be approved by Navistar Materials Engineering Laboratory.

4.2 Performance Requirements

4.2.1 Physical Measurements			
Ref	Test Description	Test Method(s)	Performance Requirement
4.2.1.1	Overall Coating Thickness	Use a DeFelsko B/Adv Non-destructive Sonic Gauge Analyzer per ASTM D6132	30 microns $\pm$ 5.0 microns
4.2.1.2	60°Gloss	ASTM D523	90 min or 85@20°
4.2.1.3	Crosshatch Adhesion - Dry	ASTM D3359 Method B	5B
4.2.1.4	Crosshatch Adhesion	ASTM D3359 Method B	1 hr wet sponge, 1B
4.2.1.5	Humidity Adhesion	ASTM D2247 10-minute recovery @ 24° C $\pm$ 2° C and 50% $\pm$ 5% Relative Humidity.	1000 hours Panel shall be blister free and shall pass Adhesion per ASTM D3359 Test Method A after each 250-hour interval.
4.2.1.6	Oven Aging <u>Minimum 5 test panels.</u> Cycle of Thermal Exposure	Oven (Air Circulating) Exposure at 180°F: 168 Hours Recovery: 1 Hour at Room Temperature Humidity Exposure: <u>750 Hours (-101, -102)</u>	2 Panels: Pass Humidity Adhesion in 4.2.1.5 2 Panels: Crosshatch Adhesion in 4.2.1.3 and Gravelometer in 4.2.3.2 1 Panel: Control Standard
4.2.1.7	Moisture Cold Cycle Testing: <u>Minimum 3 Panels.</u> Moisture Cycle Exposure	15 Cycles: Humidity Exposure: 24 Hours Cool Box Exposure (-18° C): 20 Hours Room Temperature: 4 Hours	1 Panel: Pass Crosshatch Adhesion in 4.2.1.3 2 Panels: <u>Pass 750 Hours of Humidity Exposure</u>
4.2.1.9	Orange Peel	BYK - Wave Scan Plus or ACT Orange Peel Standards	8.0 min.
4.2.1.10	Weatherometer/ (Xenon simulation/analysis) MPAPS GT-31	SAE J2527	Gloss retention (<10 units @ 60°) and $\Delta E < 3$. Refer to MPAPS GT-31 for appropriate test exposure period based on zone.

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4.2.2 Chemical Resistance			
Ref	Test Description	Test Method(s)	Performance Requirement
4.2.2.1	Water Immersion Testing	Immerse 2/3 of the surface area of a test panel in a water bath at a maintained temperature of 38° C $\pm$ 2° for 24 hours (ASTM D870), then 10 minutes of recovery at Room Temperature $\pm$ 2° C and 50% $\pm$ 5% Relative Humidity, then Crosshatch Adhesion testing per Section 4.2.1.3 and final gloss reading per ASTM D523 within 24 hours of completion.	No evidence of blistering, or cracking
4.2.2.2	Solvent Resistance	15 Double Rubs MEK	No evidence of softening or delamination from substrate
4.2.2.3	Ethylene Glycol Immersion	Immerse 2/3 of the surface area of a panel into a 50/50 w/w mixture of Ethylene Glycol and Water at Room Temperature $\pm$ 2° C for 96 Hours. After removal, examine panel for discoloration or blistering. After a two-hour recovery period, at room temperature, examine panel surface for discoloration, or blistering. Report final gloss reading per ASTM D523.	No evidence of blistering, or cracking < 20 points change
4.2.2.4	Engine Oil Immersion	Immerse 2/3 of the surface area of a panel of the current production engine oil, at 71° C $\pm$ 2° C for 24 Hours. Check panel for blistering, or discoloration after a two-hour recovery period. Report final gloss reading per ASTM D523.	< 20 points change
4.2.2.5	Diesel Fuel Immersion	Immerse 2/3 of the surface area of a test panel into diesel fuel at Room Temperature $\pm$ 2° C for 100 hours. After removal, observe panel for blistering, delamination, or severe discoloration. Note: In the case of sever discoloration, a retest with fresh diesel fuel may be performed.	< 20 points change

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