

NAVISTAR, INC.		
Material, Parts, and Process Specifications (MPAPS)		NUMBER: MPAPS GT-Paint
		Former Designation: <i>CEMS GT Paint Test Methods</i>
TITLE: Paint Test Methods		CURRENT REV No.: 1807
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1.0 APPLICATION

The intent of this specification is to define paint test methods in order to ensure acceptable durability and quality levels for the finish on Navistar products and to define requirements and physical properties of the various materials used in the painting operation.

2.0 SCOPE

This specification covers test methods for paint and coatings.

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 E-6	ASTM B117
CFR Title 29, Part 1910	ASTM D5201	SAE EA-400
NAVISTAR MPAPS B-50	FTMS 141D-4203.1	SAE J400
NAVISTAR Engineering Design Std A-16	FTMS 141D-4321.1	ASTM D522
NAVISTAR MPAPS G-5	ASTM D1640	ASTM D3363
Federal Standard 141a, Method 4250	FTMS 141D-4331.1	ASTM D3359
NAVISTAR MPAPS G-9009	ASTM D5767	ASTM D523
NAVISTAR MPAPS G-9005	ASTM D364	ASTM D7087
NAVISTAR MPAPS P-9543	ASTM D1654	ASTM D2247
The Society for Protective Coatings SSPC-VIS-2	ASTM D4585	ASTM D5402
Federal Standard 141a, Method 6201	ASTM D4141	SAE J2334
NAVISTAR CEMS B-22	ASTM D1200	

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3.1 Index Of Test Methods

Spec GT	TITLE	Index	Spec GT	TITLE	Index
1A	Nonvolatile Content of Paint by Weight	ASTM D5201	7F	<u>South Florida Exposure Test For Paint</u>	
1B	Nonvolatile Content of Paint by Volume	ASTM D5201	7G	<u>Distilled Water Immersion Test For Paint</u>	
2A & 2B	<u>Hiding Power Of Paint – Wet & Dry Film</u>		7H	<u>Xylene-Mineral Spirits Immersion Test For Paint</u>	
3A	Dilution Stability of Paint	FSTM 4203.1	7J	<u>Antifreeze Immersion Test For Paint</u>	
3B	<u>Storage Stability Of Paint</u>		7K	<u>Engine Oil Immersion Test For Paint</u>	
3C	<u>Dip Paint Stability</u>		8	<u>Heat Resistant Properties of Paint</u>	
3D	Brushing Properties of Paint	FSTM 4321.1	9A	<u>Machinability of Painted Surfaces</u>	
3E	Spraying Properties of Paint	FSTM 4331.1	9B	<u>Solvent Resistance Of Paint</u>	
3F	<u>Storage Stability Of Paint In Pressurized Cans</u>		10	<u>Heated Paint Stability Test</u>	
4A	Curing Properties on Receipt	ASTM D1640	11	<u>Cracking Resistance Of Paint</u>	
4B	Color Stability of Paint		12	<u>Mar Resistance of Paint</u>	
4C	Toughness of Paint	ASTM D522 Method B, 9.5 mm	13	<u>Panel Preparation</u>	Section 4.2
4D	Hardness of Paint	ASTM D3363	14A	<u>Solvent Rubbing Test</u>	
4E	<u>Taping And Recoating Properties Of Paint</u>		14B	<u>Acid Spot Test</u>	
4F	<u>Wrinkling Resistance Of Paint</u>		14C	<u>Cold Crack Test</u>	
4G	Curing Properties At Three Months	Void	15	Ferroxyl Test	Void
4H	Properties of Catalyzed Paint	Void	16	Chromic Acid Compatibility Test	Void
4J	<u>Bleeding Of Paint</u>		17	<u>Oil Compatibility of Paint</u>	
4K	<u>Intercoat Compatibility</u>		18	<u>Dry Film Conductivity Of A Primer</u>	
5A	Adhesion of Paint (use 3M 610 or Permaceal 99 tape)	ASTM D3359 Method B	19	<u>Early Water Resistance Of Sealers And Paints</u>	
5B	<u>Intercoat Adhesion Of Paint</u>		20	<u>Surface Sealing</u>	
5C	<u>Accelerated Adhesion of Paint</u>		21	<u>Curling Properties On Receipt Air Drying</u>	
6A	<u>Holdout of Paint</u>		22	<u>Curing Properties on Receipt - Forced Dry Or Baking</u>	
6B	Initial Gloss of Paint	MPAPS P-9558	23	<u>Determination of Phosphate Coating Weight On Ferrous Substrate</u>	
6C	Color	FSTM 4250	24	Effect of Sheet Metal Processing Lubricants on the Wash/Phosphate System	MPAPS GT-24
6D	<u>Holdout Of Paint (Flash-Dry)</u>		25	<u>Chip Resistance Of Paint</u>	
6E	Distinctness of Image (D.O.I.)	ASTM D5767	26	<u>Glycol Compatibility Of Paint</u>	
7A	<u>Gravelometer Test for Paint</u>		27	<u>Application Heat Resistance</u>	
7B	<u>Sanding Test For Paint</u>		28	Maximum Allowable Paint Chipping Damage	SAE J400
7C	Immersion	7G, 7H, 7J	29	Error! Reference source not found.	MPAPS P-9558
7D	<u>Corrosion Tests To Evaluate Paint or Painted Parts (Salt Spray Test)</u>		30	<u>Chipping and Salt Spray Resistance</u>	
7E	<u>Humidity Test For Paint</u>		32	Color Match Evaluation and Acceptance Criteria	MPAPS P-9558

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4.0 REQUIREMENTS

The Sampling Procedure and Panel Preparation are required methods for MPAPS G-5 paint systems that Navistar purchases. For parts that Navistar purchases painted – MPAPS G-9009 or MPAPS G-9005 – these are recommended guidelines; manufacturer’s guidelines and actual manufacturing processes should be followed in test preparations.

4.1 Sampling Procedure

To ensure correct results, tests for conformance to the requirements of this specification will be conducted on samples of the paint prepared according to the following procedure:

4.1.2 For initial qualification samples and representative production samples received in small unpressurized containers, stir the paint by hand with a spatula for one to two minutes. If the paint does not mix readily, do not proceed but contact the vendor.

4.1.3 Using mechanical shakers for small containers such as 3.8 liter (one gallon) cans and rolling machines for large containers such as 208 liter (55 gallon) drums, thoroughly mix the paint in the as-received containers for at least 15 minutes. Do not mix water borne paints on shaker or excessive foam. and air entrainment will result. Mix pressurized containers for two to three minutes and immediately perform spray out tests. For a catalyzed system, mix the paint portion only. Do not mix the catalyst.

4.1.4 After mixing, allow sufficient time for bubbles of entrained air to dissipate. One to two minutes is generally sufficient. Puncture pressurized containers at highest point to allow propellant to escape slowly, then enlarge hole to permit removal of the paint.

4.1.5 With the paint at a temperature not less than 18°C (65°F), draw off into a clean, dry metal sample container enough paint to perform the tests required. With pressurized containers, transfer entire contents. Seal the sample container immediately.

4.1.6 Immediately before each test is started, stir the paint in the sample container with a spatula to insure uniform sampling.

4.1.7 For one component system (standard type), draw off sufficient sample from the sample container for the particular test being conducted and immediately reseal the sample container.

4.1.8 For catalyzed systems, draw off a sufficient sample from the sample container and catalyst from the catalyst container keeping sample and catalyst in separate test containers.

4.1.9 For catalyzed systems, measure out the proper ratio of sample to catalyst from the test containers per manufacturer’s recommendations and mix them together thoroughly.

4.1.10 For single component systems, repeat (4.1.6) and (4.1.7) each time a sample is drawn from the sample container.

4.1.11 Repeat (4.1.3) each time a test requires the use of the pressurized container, except for GT-3F.

4.1.12 For two component systems, repeat (4.1.8) and (4.1.9) each time a sample and catalyst are drawn from their respective containers for a catalyzed system.

4.1.13 For one component systems, all extra sample material may be saved for further use. For two component systems, discard all extra mixed sample material in a safe and proper way.

4.2 Panel Preparation (GT-13)

This test procedure covers the specific methods for paint panel preparation for each of the grades of paint described in MPAPS G-5. Purchased painted parts shall follow general Method M and use materials that closely match production materials, processes and conditions. All test designations refer to the latest issue unless otherwise stated.

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Method	Description	G-5 Grades	G-9009 Class
A	Exterior mono-coat finish	17HS, 19HS	IB, IC
B	Chassis, engine and repair	32W, 32HS/Ur, -62, -81W	IIA, IIB
C	Interior paint – Void – See M		III
D	High heat paint – Void – See M		
E	Flow coat primers – Void – See M		
F	Casting Sealer – Void – See M		IVC
G	Primers – Void – See M		
H	Plastic Primer		
I	Flash Primer	-54	
J	A merchandising paint in a pressurized container.	-61	
K	A cathodic, electro-deposited (e-coat) or auto deposition primer.	-56	IP, IIP, E, E1, E2
L	Exterior Base Coat/Clear Coat	-18	
M	General Paint		III, IIC

4.3 Test Panel Requirements

The supplier, submitting a product for qualification, shall use an appropriate number of panels to perform all required tests. Additional factors affecting the number of test panels include the types of substrates or coatings the product will be applied to and any subsequent coatings that may be applied over the vendor's product. Possible substrates include cold rolled steel, galvanized steel, cast iron, aluminum, and various plastics including SMC. Test materials shall be prepared in a method consistent with current manufacturing materials and processes and cured appropriately. Variations in cure shall be accounted for in the test plan. For additional information, contact the TECHNICAL INFORMATION in section 10.0.

Note: Known process and material variations shall be identified and controlled for in the test plan. Separate panels should be made at minimum and maximum condition for each test.

4.3.1 METHOD A - Exterior mono-coat finish

4.3.1.1 Using the appropriate solvent(s), dilute and activate if necessary one liter of paint prepared according to the steps outlined in "Sampling Procedure" above to a viscosity as follows:

4.3.1.1.1 Grade -17HS: Dilute the paint to 18 ± 1 seconds using a No.4 Ford Cup per ASTM D1200, then activate with isocyanate (6 parts paint:1 part isocyanate, unless otherwise specified by the manufacturer).

4.3.1.1.2 Grade -19HS: Dilute the paint to 25 ± 1 seconds using a No. 4 Ford Cup (unless otherwise specified by the manufacturer).

4.3.1.2 Spray the panels with adjusted paint from step (2.1.2) at 21 to 27°C (70 to 80°F) using a siphon or pressure gun set at 414 to 483 kPa (60 to 70 psi). Apply a first coat of enamel, flash dry for three minutes, then apply a second coat of enamel. For paints containing metallic pigments, a thin third coat is recommended.

4.3.1.3 All panels shall be uniformly coated and free from sags, runs, wrinkles, or other irregularities.

4.3.1.4 Dry the panels in a vertical position for five minutes in still air at 21 to 27°C (70 to 80°F), then place in a recirculating oven as follows.

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4.3.1.5 Grade -17HS: Bake the panels at $94 \pm 3^{\circ}\text{C}$ ($200 \pm 5^{\circ}\text{F}$) for thirty minutes. Remove and cool to 21 to 27°C (70 to 80°F).

4.3.1.6 Grade -19HS: Bake the panels at $121 \pm 3^{\circ}\text{C}$ ($250 \pm 5^{\circ}\text{F}$) for thirty minutes. Remove and cool to 21 to 27°C (70 to 80°F).

4.3.1.7 Determine the dry film thickness of the enamel applied to each panel by measuring the dry film thickness of the enamel and primer and subtracting from this the dry film thickness of the primer only. Panels suitable for use in testing the properties of these grades of enamel will exhibit a dry film thickness of the enamel topcoat of 43 to $59\ \mu\text{m}$ (1.7 to 2.3 mils).

4.3.1.8 Report dry film thickness and how process and material variation were accounted for in the test plan.

4.3.2 **METHOD B** - Chassis, engine and repair

4.3.2.1 Clean the panels by wiping with industrial grade xylene per ASTM D364.

4.3.2.2 For zinc phosphated steel panels only, age the cleaned panels for one hour in a recirculating oven $113 \pm 9^{\circ}\text{C}$ ($235 \pm 15^{\circ}\text{F}$) and then cool to 21 to 27°C (70 to 80°F).

4.3.2.3 Protect all panels from rust, oil, fingerprints, or other forms of surface contamination.

4.3.2.4 Using the appropriate solvents, dilute one liter of paint which has been prepared according to the steps outlined in "Sampling Procedure" above, to a viscosity as follows - Grade -62: Dilute the paint to 24 ± 1 second using a No. 4 Ford cup per ASTM D1200, per the paint manufacturer's recommendations.

4.3.2.5 For paints containing metallic pigments, spray the panels with adjusted paint from step (2.2.4) at 21 to 27°C (70 to 80°F) using a siphon or pressure gun set at 552 kPa (80 psi). For paints not containing metallic pigments, spray the panels with adjusted paint from step (2.2.4) at 21 to 27°C (70 to 80°F) using a siphon or pressure gun set at 414 to 483 kPa (60 to 70 psi). As an option, paints without metallic pigments may be applied to all panels except those to be used for testing initial gloss per Test Method GT-6B or color per Federal Standard 141a, Method 4250, by dipping or with a doctor blade. The panels to be used to determine conformance to the initial gloss or color requirements of this grade of paint will always be sprayed. On all referee questions, a sprayed panel will be used.

4.3.2.6 All panels will be uniformly coated and free from sags, runs, wrinkles, or other irregularities.

4.3.2.7 Dry the panels in still air at 21 to 27°C (70 to 80°F) or as shown in table, in a vertical position for the time shown below:

3 Minutes @180° F Panel Temp.	15 Minutes	30 Minutes	6 Hours
	Grade -32W	Grade -81W	Grade -62
Grade -32HS/Ur			

4.3.2.8 Measure the dry film thickness of the paint applied to each of the panels (after the panel is dry) with a micrometer or other accurate thickness gage. Panels suitable for use in testing will exhibit a dry film thickness of 38 to $51\ \mu\text{m}$ (1.5 to 2.0 mils). Exceptions: Grades -32W, -81W and -83W will exhibit a dry film thickness of 30 to $41\ \mu\text{m}$ (1.2 to 1.6 mils).

4.3.2.9 Report dry film thickness and how process and material variation were accounted for in the test plan.

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4.3.3 METHOD H - Plastic Primer

4.3.3.1 All plastic panels are flexed before priming on a 17 inch diameter wood block and then are divided into two equal groups.

4.3.3.2 One group is thoroughly dry sanded with stearted 280 grit paper.

4.3.3.3 All panels are cleaned by wiping with either buytl cellosolve or VM&P naptha and then with a tack rag.

4.3.3.4 Per manufacturer's recommendations, use the appropriate solvent(s) to dilute one liter of primer which has been prepared for testing according to the steps outlined in "Sampling Procedure" using a No.2 Zahn cup per ASTM D4212.

4.3.3.5 Spray the panels with the adjusted primer from step (2.8.4) of this method at 21 to 27°C (70 to 80°F) using a siphon or pressure gun set at 414 to 483 kPa (60 to 70 psi).

4.3.3.5.1 One Primer/One Bake System - Apply a wet film of primer which will yield a dry film thickness of $40 \pm 5 \mu\text{m}$ (1.6 ± 0.2 mils).

4.3.3.5.2 Two Primer/One Bake System - Apply a wet film of the first primer which will yield a dry film of $25 \pm 3 \mu\text{m}$ (1.0 ± 0.1 mils). Allow the wet film to flash dry for 3 minutes then apply a wet film of the second primer which will yield a dry film of 19 to 25 μm (0.75 to 1.0 to mils).

4.3.3.5.3 Two Primer/Two Bake System - Apply a wet film of the first primer which will yield a dry film of $25 \pm 3 \mu\text{m}$ (1.0 ± 0.1 mils). Dry and bake panels per step (4.3.3.7) of this method. After cooling to 21 to 27°C (70 to 80°F), apply a wet film of the second primer which will yield a dry film thickness of 19 to 25 μm (0.75 to 1.0 mils).

4.3.3.6 All panels should be uniformly coated and free from sags, runs, wrinkles or other irregularities.

4.3.3.7 Dry the panels in a vertical position for five minutes in still air 21 to 27°C (70 to 80°F), then place in a recirculating oven at $138 \pm 3^\circ\text{C}$ ($280 \pm 5^\circ\text{F}$) for thirty minutes or per the manufacturer's recommended drying procedure. Remove and cool to 21 to 27°C (70 to 80°F). [Alternate drying procedures for a specific primer may be recommended by the manufacturer. The procedure used will be determined by the Materials Engineering.] Evaluate per GT-20.

4.3.3.8 Determine the dry film thickness of primer on each panel by measuring metal reference panels that have been sprayed simultaneously with the non-metallic test panels. Panels suitable for further preparation will exhibit a total dry film thickness of primer of 44 to 51 μm (1.75 to 2.0 mils).

4.3.3.9 Separate the panels into two groups with each group containing an equal number of panels which were sanded and unsanded prior to priming.

4.3.3.10 Taking one group of panels from step (4.3.3.9), use either No. 360 sandpaper or No. 280 stearted sandpaper, and sand one half of each panel.

4.3.3.11 Taking the group of panels from step (4.3.3.10), spray them with an approved production topcoat. For enamel Grades -17HS, and -19HS, follow the procedure outlined in Panel Preparation, Method A (4.3.1). Grade -18 topcoat enamel, follow the procedure outlined in Panel Preparation, Method L (4.3.7). In both cases start prep in the appropriate step.

4.3.3.12 Determine the dry film thickness of the enamel applied to each panel. This is done by measuring the dry film thickness of the enamel with metal reference panels that have been sprayed simultaneously with the test panels. For Grades -17HS, and -19HS, panels suitable for use in testing will exhibit a dry film thickness of enamel topcoat of 59 to 77 μm (2.3 to 3.0 mils). For Grade -18, panels suitable for use in testing will exhibit a base coat dry thickness of 20 to 30 μm (0.8 to 1.2 mils) and a clear coat dry thickness of 38 to 51 μm (1.5 to 2.0 mils). Test panels will be free of surface defects such as blow holes, craters, etc.

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4.3.3.13 Report dry film thickness and how process and material variation were accounted for in the test plan.

4.3.4 METHOD I - Flash Primer

4.3.4.1 Clean the panels by wiping with industrial grade xylene per ASTM D364.

4.3.4.2 For zinc phosphated steel panels only, age the cleaned panels for one hour in a recirculating oven at $113 \pm 9^{\circ}\text{C}$ ($235 \pm 15^{\circ}\text{F}$) and then cool to 21 to 27°C (70 to 80°F).

4.3.4.3 Protect all panels from rust, oil, finger marks or other forms of surface contamination.

4.3.4.4 Per manufacturer's recommendations, use a specified reducer and dilute one liter of primer which has been prepared for testing according to the steps outlined in "Sampling Procedure."

4.3.4.5 Spray the panels from step (4.3.4.4) at 21 to 27°C (70 to 80°F) using a siphon or pressure gun set at 414 to 483 kPa (60 to 70 psi). Apply approximately 38 to 51 μm (1.5 to 2.0 mils) of wet primer and allow to flash dry for one minute.

4.3.4.6 If the panels are to be used to determine any dry film property except "Curing Properties on Receipt," proceed immediately to step (4.3.4.7). If the panels are to be used to determine "Curing Properties on Receipt," dry the sprayed panels in a vertical position for thirty minutes in a recirculating oven at $121 \pm 3^{\circ}\text{C}$ ($250 \pm 5^{\circ}\text{F}$). Remove and cool to 21 to 27°C (70 to 80°F). No further preparation prior to testing is required for these panels.

4.3.4.7 Spray the panels from step (4.3.4.6) with a red or yellow enamel for which the primer is intended and dry according to the procedures normally employed by the using International Plant for that enamel.

4.3.4.8 All panels will be uniformly coated and free from sags, runs, wrinkles or other irregularities.

4.3.4.9 Dry the panels in a vertical position for five minutes in still air at 21 to 27°C (70 to 80°F), then place in a recirculating oven for thirty minutes at $121 \pm 3^{\circ}\text{C}$ ($250 \pm 5^{\circ}\text{F}$) for Grades -18, Grade -17HS, and -19HS, or at $94 \pm 3^{\circ}\text{C}$ ($200 \pm 5^{\circ}\text{F}$).

4.3.4.10 Determine the dry film thickness of the enamel applied to each panel by measuring the dry film thickness of the enamel and primer and subtracting from this the dry film thickness of the primer only. For this calculation, assume that the 38 to 51 μm (1.5 to 2.0 mils) of wet primer applied to the panels in step (2.9.5) corresponds to a dry film thickness of 13 to 20 μm (0.5 to 0.8 mils). For grades -17HS, -19HS, panels suitable for use in testing will exhibit a dry film thickness of enamel topcoat of 59 to 77 μm (2.3 to 3.0 mils), for Grade -18, panels suitable for use in testing will exhibit a base coat dry thickness of 20 to 30 μm (0.8 to 1.2 mils) and a clear coat dry thickness of 38 to 51 μm (1.5 to 2.0 mils).

4.3.4.10 Report dry film thickness and how process and material variation were accounted for in the test plan.

4.3.5 METHOD J - A merchandising paint in a pressurized container

4.3.5.1 Clean the panels by wiping with industrial grade xylene per ASTM D364.

4.3.5.2 For zinc phosphated steel panels only, age the cleaned panels for one hour in a recirculating oven at $113 \pm 9^{\circ}\text{C}$ ($235 \pm 15^{\circ}\text{F}$) and then cool to 21 to 27°C (70 to 80°F).

4.3.5.3 Protect all panels from rust, oil, finger marks or other forms of surface contamination.

4.3.5.4 Using mechanical shaker for small containers thoroughly mix the sample for two to three minutes.

4.3.5.5 Spray the panels with short "dusting" strokes approximately ten to twelve inches from surface, allowing paint to become tacky between light mist coats. Shake the can up and down for ten seconds after each minute of spraying.

4.3.5.6 All panels will be uniformly coated and free from sags, runs, wrinkles or other irregularities.

4.3.5.7 Dry the panels for fifteen minutes in a horizontal position in still air at 21 to 27°C (70 to 80°F).

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4.3.5.8 Measure the dry film thickness of the paint applied to each of the panels with a micrometer or other accurate thickness gage. Panels suitable for use in testing the properties of this grade will exhibit a dry film thickness of 43 to 59 μm (1.7 to 2.3 mils).

4.3.5.9 Report dry film thickness and how process and material variation were accounted for in the test plan.

4.3.6 METHOD K - A cathodic, electro-deposited (e-coat) or auto deposition primer

4.3.6.1 Clean the panels by wiping with industrial grade xylene per ASTM D364

4.3.6.2 For zinc and iron phosphated steel panels, age the cleaned panels for one hour in a recirculating oven at $113 \pm 9^\circ\text{C}$ ($235 \pm 15^\circ\text{F}$) and then cool to 21 to 27°C (70 to 80°F).

4.3.6.3 Protect all panels from rust, oil, finger marks or other forms of surface contamination.

4.3.6.4 Prepare an E-Coat or Auto deposition tank utilizing a test sample of proper physical constants as outlined in the material data sheet. Follow the manufacturer's specifications for the material under test.

4.3.6.5 Coat the panels. Follow the manufacturer's specifications for the material under test.

4.3.6.6 After coating, panels will be rinsed and flash dried at ambient temperature.

4.3.6.7 Cure the panels for thirty minutes at $163 \pm 3^\circ\text{C}$ ($325 \pm 5^\circ\text{F}$) and then cool to 21 to 27°C (70 to 80°F).

4.3.6.8 Measure the dry film thickness of the coating on each panel with a micrometer or other accurate thickness gage. Film build of the panels will be 20 μm (0.8 mils) minimum.

4.3.9.9 Report dry film thickness and how process and material variation were accounted for in the test plan.

4.3.7 METHOD L - Exterior Base Coat/Clear Coat

4.3.7.1 Obtain panels pretreated with zinc phosphate and preprimed with a Grade -56 E-coat representative of current production material.

4.3.7.2 Using the appropriate solvent(s) if necessary, dilute one liter of basecoat which has been prepared according to the steps outlined in "Sampling Procedure" to a viscosity of 20 ± 1 second using a No. 4 Ford cup per ASTM D1200.

2.12.3 Prepare one liter of clearcoat according to the steps outlined in "Sampling Procedure." Then reduce to 23 seconds (No. 4 Ford cup per ASTM D1200) using an appropriate solvent and activate the clearcoat with isocyanate (3.3 parts clearcoat: 1 part isocyanate unless otherwise specified by the manufacturer).

4.3.7.4 Spray the panels with adjusted basecoat from step (4.3.7.2) at 21 to 27°C (70 to 80°F) using a siphon or pressure gun set at 414 to 483 kPa (60 to 70 psi). Apply a first coat of enamel, flash dry for two minutes, then apply a second coat of enamel. (Alternate spraying procedures for basecoats may be recommended by a manufacturer. The procedure used will be determined by the Materials Engineering) Allow panels to flash dry for three minutes before proceeding to step (4.3.7.5).

4.3.7.5 Spray the panels with adjusted clearcoat from step (4.3.7.3) at 21 to 27°C (70 to 80°F) using a siphon or pressure gun set at 414 to 483 kPa (60 to 70 psi).

4.3.7.6 All panels will be uniformly coated and free from sags, runs, wrinkles, or other irregularities.

4.3.7.7 Dry the panels in a vertical position for five minutes in still air at 21 to 27°C (70 to 80°F), then place in a recirculating oven for thirty minutes at $121 \pm 3^\circ\text{C}$ ($250 \pm 5^\circ\text{F}$). Remove and cool to 21 to 27°C (70 to 80°F).

4.3.7.8 Determine the dry film thickness of the enamel applied to each panel by measuring metal reference panels that have been sprayed simultaneously with the test panels. Spray one reference panel with basecoat only and one reference panel with clearcoat only. Panels suitable for use in testing the

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properties of this grade of enamel will exhibit a basecoat dry film of 20 to 30 μm (0.8 to 1.2 mils) and a clearcoat dry film of 38 to 51 μm (1.5 to 2.0 mils).

4.3.7.9 Report dry film thickness and how process and material variation were accounted for in the test plan.

4.3.8 METHOD M

4.3.8.1 Prepare panels using materials and methods that closely represent production materials and processes.

4.3.8.2 Paint and cure panels using manufacturer's guidelines that closely represent actual production conditions.

4.3.8.3 All panels will be uniformly coated and free from sags, runs, wrinkles or other irregularities.

4.3.8.4 Known process and material variations shall be identified and controlled for in the test plan. Separate panels should be made at minimum and maximum condition for separate test.

4.3.8.5 Measure the dry film thickness of the paint applied to each of the panels with a micrometer or other accurate thickness gage.

4.3.8.6 Report dry film thickness and how process and material variation were accounted for in the test plan.

5.0 QUALITY

Tests shall be performed by certified labs use good lab practices and conforming to all applicable standards and regulations. Traceable control samples shall be used as appropriate. Reports shall conform to good practice and MPAPS P-9543. Calibrations shall conform to applicable standards and show traceability to National Standards. Reports shall demonstrate compliance to appropriate standards and calibration records.

6.0 QUALIFICATION

6.1 Paint and Finished Product Qualification

See referencing standard for requirements.

6.1.1 Test Reporting

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

6.1.1.1 A detailed, signed test report documenting testing to this specification per MPAPS P-9543.

6.1.1.2 Test coupons or photographs showing failure modes for each destructive test that cannot be adequately described or as requested.

6.1.1.3 The complete procedure used for preparing and curing materials for test, especially surface preparation and condition of the test coupons.

6.1.1.4 Paint, substrate and any chemicals used for preparation including mixing and application procedure and any variations from expected methods.

6.1.1.5 Process variations and how those were accounted for in the material preparation.

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.

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8.0 SHIPPING AND HANDLING

Does not apply here; see referencing standard.

9.0 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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A.0 GENERAL INFORMATION

The materials for test shall be described in the referencing document, along with performance parameters.

GT 2A and 2B - Hiding Power Of Paint – Wet & Dry Film

These are methods of determining the hiding power of a wet and dry film.

2A – WET FILM

APPARATUS

1. Black and white Pfund Cryptometer with a No. 3.5 [88.9 μm (0.0035 inch) wedge] top plate.
2. Shore Viewer with two 100 watt bulbs.

PROCEDURE

1. Run this test five times for each paint sample being tested.
2. Place approximately 2 to 3 milliliters of paint which has been prepared for testing according to the steps outlined in “Sampling Procedure”, in the center of the black and white base plate of the cryptometer.
3. Place the No. 3.5 top plate over the deposited paint and press down lightly but uniformly on the top plate.
4. Move the top plate to the right until the entire length of the line of demarcation has disappeared completely. Record the etched number appearing directly under the lower right edge of the plate. Move the top plate slowly to the left until the line of demarcation reappears. Record the etched number as before. If the paint is light in shade, it is suggested that the test be conducted by drawing the paint from the white half across the black half across the white half. In all cases, the cryptometer should be placed so that the scale is read on the right and the pegs of the top plate are on the left.
5. For all catalyzed coatings, this test must be conducted within one hour after the addition of the catalyst.

CALCULATIONS

Calculate the average of the ten cryptometer readings.

REPORT

Report the average cryptometer reading in square feet per gallon.

2B – DRY FILM

MATERIAL - Black and Gray Morest Chart.

PROCEDURE

1. Tape a black and gray Morest Chart to the ground side of the panel so that approximately 25 mm (1 inch) of the panel extends beyond the edge of the Morest Chart.
2. Prepare the panel according to the procedure specified for the appropriate grade in Panel Preparation (4.2). Dry the panel according to the oven drying procedure specified therein. The dry film measurement will be made on the portion of the panel which was exposed to the spray.
3. Examine the surface of the Morest Chart with the unaided eye using a reasonable intensity of diffused light, preferably northern sky light. Evaluate the hiding power of the paint.

REPORT

Report the dry film of thickness necessary to completely hide the black and gray Morest Chart.

GT-3B Storage Stability Of Paint

This is a method for evaluating the ability of a paint to withstand degradation after prolonged storage in a closed container.

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APPARATUS

1. No. 4 Ford Cup per ASTM D1200
2. Paint can, 0.5 liters (1 pint) capacity and cover
3. Recirculating oven capable of maintaining a temperature of $60 \pm 3^{\circ}\text{C}$ ($140 \pm 5^{\circ}\text{F}$)
4. Squared-off spatula

PROCEDURE

1. Using a No. 4 Ford Cup per ASTM D1200, measure and record the as-received viscosity of the paint which has been prepared for testing according to the steps outlined in MPAPS G-5, Part I, Section B, under "Sampling Procedure".
2. Fill the 1 pint paint can approximately three-quarters full with paint from step (1).
3. Secure the cover tightly and place in a recirculating oven maintained at $60 \pm 3^{\circ}\text{C}$ ($140 \pm 5^{\circ}\text{F}$) for 16 hours. During this time, the container will not be agitated or disturbed.
4. At the conclusion of this time period, remove the container from the oven and cool to 21 to 27°C (70 to 80°F).
5. Scrape the bottom of the paint can with a squared-off spatula. Examine the sample and the spatula tip with the unaided eye; any evidence of curdling, jelling, skinning or settling that cannot be readily dispersed will constitute a failure.
6. Again using the No. 4 Ford Cup per ASTM D1200, measure and record the viscosity of the sample after oven aging.

REPORT

Report the following information:

1. Whether the appearance passes or fails this test.
2. The change in viscosity after oven aging.

GT-3C Dip Paint Stability

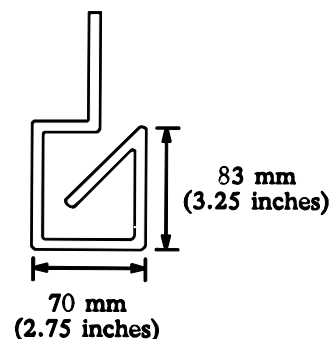
This is a method for evaluating the ability of a paint to withstand degradation after prolonged storage in an open container.

APPARATUS

1. No. 4 Ford Cup per ASTM D1200 (latest issue)
2. Paint can, 0.5 liters (1 pint) capacity and cover
3. Stirring rod, 6 mm (0.25 inch) in diameter, with dimensions as shown in Figure 1 at right.
4. Mechanical paint shaker.
5. Balance with a sensitivity of ± 1 gram.
6. 110 volt mixer, Lightnin Model L

MATERIAL

An appropriate reducer/solvent.



Stirring Rod

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PROCEDURE

1. Using a No. 4 Ford Cup per ASTM D1200, measure and record the as-received viscosity of the paint which has been prepared for testing according to the steps outlined under "Sampling Procedure".
2. Fill the 1 pint paint can to a depth of about 75 mm (3 inches) with adjusted paint from step (1).
3. Place the stirring rod into the paint can and determine the combined weight of the test sample, container, and stirring rod to ± 1 gram. Record this as weight W_1 .
4. Stir the paint continuously for 24 hours by rotating the stirring rod in the Lightning mixer at 100 ± 5 revolutions per minute.
5. At the conclusion of this time period, add a sufficient amount of the solvent used in step (1) to the test sample to restore the combined weight of the test sample, container and stirring rod to its original weight W_1 .
6. Repeat steps (4) and (5) for the number of 24 hour time periods specified on the appropriate paint grade sheet in MPAPS G5.
7. After restoring the combined weight to the original weight W_1 at the conclusion of the final 24 hour period, thoroughly mix the sample in a mechanical paint shaker.
8. Again using the No. 4 Ford Cup per ASTM D1200, determine the viscosity of the sample after the specified number of test periods. Record the final viscosity.

REPORT

Report the change in viscosity of the paint after stirring for the number of time-periods specified in the appropriate paint grade sheet in MPAPS G-5.

GT-3F Storage Stability Of Paint In Pressurized Cans

This is a method for evaluating the ability of a paint to withstand degradation after prolonged storage in pressurized containers.

APPARATUS

1. Mechanical small can shaker.
2. Recirculating oven capable of maintaining a temperature of $60 \pm 3^\circ\text{C}$ ($140 \pm 5^\circ\text{F}$).

PROCEDURE

1. Spray two panels according to Panel Preparation (4.2) procedure as outlined in Method J (4.3.5), using a new pressurized can for each panel.
2. After spray application, store a used and unused can in an upright position and the other used and unused can in an inverted position for 21 days at 60°C (140°F).
3. At the end of this period, cool the cans to room temperature 21 to 27°C (70 to 80°F).
4. Shake can vigorously up and down and in rotary motion for 3 minutes by hand.
5. Using the application techniques outlined in Method J spray one panel from each can of test sample observing the spray characteristics. Any sputtering, orifice plugging or irregular spray output will be considered a failure.
6. Compare the panels from step (5) with the original panels from step (1). Any change of color or texture or evidence of resin/pigment separation will be considered a failure.

REPORT

Report pass or fail.

GT-4B Color Stability Of Paint

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This is a method for evaluating the ability of a paint to retain its original color when subjected to over-drying.

APPARATUS

Recirculating oven capable of maintaining the specified temperature within $\pm 3^{\circ}\text{C}$ ($\pm 5^{\circ}\text{F}$).

PROCEDURE

1. Prepare two panels according to the procedure specified for the applicable grade in Panel Preparation (4.2).
2. Dry the panels according to the oven drying procedure specified therein and cool to 21 to 27°C (70 to 80°F).
3. Select one of the panels and give it a second oven drying identical to the first oven drying procedure specified in Panel Preparation.
4. Evaluate the color stability of the paint by comparing the twice-dried panel with panel dried once. Make this comparison with the unaided eye using a reasonable intensity of diffused light, preferably northern sky light. The paint will pass if the twice-dried panel exhibits no appreciable color difference from the panel dried once.

REPORT

Report whether the paint passes or fails this test.

GT-4E Taping And Recoating Properties Of Paint

This is a method for evaluating the quality of a dry film of paint which has been subjected to taping and recoating.

MATERIAL

Masking tape with a 8.3 to 11.1 N (30 to 40 ounce) pull.

PROCEDURE

1. Prepare two panels according to the procedure specified for the applicable grade in Panel Preparation (4.2). Pre-condition/age paint appropriately to the paint being tested.
2. Cover one-half of the width of each panel using masking tape.
3. Recoat all panels using the identical procedure specified in step (1) above except for the drying procedure. Dry the panels for 30 minutes in still air at 21 to 27°C (70 to 80°F).
4. Remove the tape from each panel and allow both to dry for an additional 24 hours in still air at 21 to 27°C (70 to 80°F).
5. At the conclusion of this period, examine each panel with the unaided eye. Any evidence of strike-in lift or tape marking on any panel will constitute a failure.

REPORT

Report whether the paint passes or fails this test.

GT-4F Wrinkling Resistance Of Paint

NOTE: Test method GT-4F provides two procedures (Method A and Method B) for evaluating the wrinkling resistance of a paint film. All drawings, blue prints, specifications, and/or standards which reference Test Method GT-4F without designating either Method A or Method B will be tested using Method A.

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METHOD A:

This method evaluates the ability of a dry film to resist wrinkling upon exposure to ultraviolet light.

APPARATUS

1. Recirculating oven capable of maintaining the specified temperature within $\pm 3^{\circ}\text{C}$ ($\pm 5^{\circ}\text{F}$)
2. Q-Panel Accelerated Weathering Tester

MATERIAL

Q-Panels, Type S, 75 x 225 mm (3 x 9 inches), available from the Q-Panel Company, 15610 Industrial Parkway, Cleveland, Ohio 44135.

PROCEDURE

1. Prepare two panels according to the procedure specified for the applicable grade in Panel Preparation (4.2), except dry the panels for 10 minutes in still air at 21 to 27°C (70 to 80°F). The dry film thickness will be 70 to 81 mm (2.8 to 3.2 mils).
2. Place both panels in a recirculating oven at $43 \pm 3^{\circ}\text{C}$ ($110 \pm 5^{\circ}\text{F}$) for 30 minutes.
3. Remove both panels and place in an Q-Panel Accelerated Weathering Tester at 60 to 66°C (140 to 150°F) for one hour between water spray cycles. (No water is to be sprayed on panels.)
4. Remove both panels and place in a recirculating oven at $82 \pm 3^{\circ}\text{C}$ ($180 \pm 5^{\circ}\text{F}$) for one hour. Remove and cool to 21 to 27°C (70 to 80°F).
5. Examine both panels with the unaided eye; any evidence of wrinkling on either panel will constitute a failure.

REPORT

Report whether the paint passes or fails this test.

METHOD B:

This method evaluates the ability of a dry film to resist wrinkling at high film builds during initial cure.

APPARATUS

Drawdown bar which will yield 6 wet mils after pull down. GARDCO or equivalent; available from P.N.Gardner Co., 316 N.E. First St., Pompano Beach, Florida 33061-6688.

MATERIAL

8" x 6" float glass - available at local glass suppliers.

PROCEDURE

1. Place glass on level table or bench top and secure with tape.
2. Position drawdown bar at top of glass.
3. Pour 5 - 10 ml of paint to be tested in front of bar.
4. With even pressure draw paint down past bottom of glass plate.
5. Place coated glass in an environment of 70-80°F @ 30-60% relative humidity. Let cure for 24 hours.
6. Examine the glass panels with the unaided eye. Any evidence of wrinkling will constitute a failure.

REPORT

Report whether the paint passes or fails this test.

GT-4J Bleeding Of Paint

This is a method for determining if an undercoat enamel discolors a subsequent top coat of enamel by bleeding.