ENAMEL, (2 WET), HIGH SOLIDS THERMOSET STRAIGHT SHADE (NON-METALLIC) MONOCOAT, PROCESSED WITH WSS-M33J10-A1, EXTERIOR — **WSS-M33J11-A1**

ENAMEL, (2 WET), HIGH SOLIDS THERMOSET STRAIGHT SHADE (NON-METALLIC) MONOCOAT, PROCESSED WITH WSS-M33J10-B1, REDUCED VISCOSITY, EXTERIOR — **WSS-M33J11-B1**

1 SCOPE

The materials defined by these specifications are coatings, which consist of a pigmented thermoset straight shade (non-metallic) monocoat enamel in a wet-on-wet (2 Wet) process. These materials are monobaked. Note: for baked primer use with WSS-M6J152-B1, B2 and for Wet on Wet use with WSS-M33J10-A1, B1

2 APPLICATION

These specifications were released originally for materials used over baked primer or as the combined primer surfacer (guidecoat) and monocoat finish when applied wet-on-wet (2 Wet) and mono baked on automobile bodies, hoods, fenders and other exterior parts. These materials shall be satisfactory for use over previously baked enamel, as in paint repair or two toning operations. These materials have been formulated to provide windshield bonding without the use of flange primer (direct glazing) and allow for flush glass designs. The monocoat portion is used alone, without primer, as an interior baking enamel for some applications.

3 REQUIREMENTS

The responsible Materials Engineer will designate the appropriate material to be used as a control for testing

3.1 APPROVED SOURCES

This specification requires the use of approved sources. Only the sources identified on the Ford Approved Source List (ASL) can be used when this specification is listed on the drawing, CAD file, or other documents. The list of approved sources is located within Ford at www.mats.ford.com or available externally through a Ford Materials Engineer.

3.2 COMPOSITION

3.2.1 Resin

3.2.1.1 Primers shall be modified polyester and/or modified polyurethane crosslinkable resin(s), with melamine and/or reactive urethane crosslinker(s) or equivalent.

3.2.1.2 Topcoats shall be thermosetting, synthetic resins with a melamine crosslinking system or equivalent.

Each will be appropriately fortified so as to meet the durability requirement of 10 years. The primer composition will meet all performance expectations in terms of stone chip damage and adhesion.

Date	Action	Revisions	Rev. 01
2017 03 20	Revised	Revised Wave Scan 3.6.2	M. Zimmer / M. Jones, NA
2013 01 14	Activated		J. Cottrell, NA

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3.2.2 Pigments

Pigments are exterior quality automotive grade selected to meet durability requirements.

3.2.3 Solvents

The volatility of the solvents will be such that there shall be no paint sagging, roughness or dry spray at specified film thicknesses. Solvents shall be HAPS compliant if it is required by local government regulations.

3.2.4 Ultra Violet Light Absorber(s) (UVA) and Hindered Amine Light Stabilizers (HALS)

All approved materials shall include with the initial Sample Report an Ultra-Violet/Visible spectroscopic analysis. This shall be recorded and filed by the approving Paint Engineering Laboratory of the Ford Motor Company as a reference standard for future use and recertification.

The coating system shall contain sufficient fortification of suitable UVA and HALS to provide 10 year long term durability.

3.2.5 Flash Point

The flash point shall conform to the safety regulations applicable to the plant and/or country where the materials are used.

3.3 PHYSICAL PROPERTIES LIQUID STATE

The following evaluation must be conducted at as shipped and application viscosity. Over the application viscosity range, material shall be in compliance with local emissions regulations.

3.3.1	Non-Volatile Content (ASTM D2369-07)		See initial sample +/- 2 %
3.3.2	Volatile Organic Content (ASTM D3960)		See initial sample +/- 1.5 %
3.3.3	Weight per Volume (ASTM D1475)		See initial sample +/-0.025 g/ml
3.3.4	Volume Solids (ASTM D2697)		See initial sample +/-1.3 %
		Primer	42%minimum
		Topcoat	49% minimum
3.3.5	Viscosity (ASTM D1200)		Report Supplier shall report value at application reduction.
3.3.6	Stability (ASTM D1849)		
	3.3.6.1 Shelf Stability (90 days)		No more than 30% increase in viscosity permitted.

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3.3.6.2	Accelerated Stability (60 °C, 16 h)	No more than 30 % increase in viscosity permitted.

After the accelerated stability test, the material shall pass all specification requirements. Critical testing must include; solvent pop, sag resistance, appearance, direct to glass bonding, intercoat adhesion, repair paint system wetting, and tape/label adhesion.

3.3.7	Resistivity (ASTM D5682)	0.05 to 2.00 megohms

Volatile solvents and other components affecting electrical conductivity shall be adjusted such that the resistivity at application viscosity shall be within specified limits.

3.4 PREPARATION OF TEST PANELS

Substrate: All current production substrates, including but not limited to, pretreated galvanized steel, pretreated electro galvaneal steel, pretreated aluminum, unpolished pretreated cold rolled steel and current production primed exterior thermosetting plastic. Record all substrate information.

Electrocoat: Current Ford production approved medium build gray cathodic electrocoat, applied at 20 - 23 micrometers and baked utilizing the appropriate bake schedule. Record electrocoat and oven type used.

Primer: Within a wet-on-wet application process apply primer surfacer to required dry film thickness by spray under conditions appropriate for primers, and flash prime coat 180 seconds or as specified, prior to topcoat application. Record primer application information and include with the submission data package for system approval.

Topcoat: Apply topcoat to required dry film thickness (40-55 microns) and flash 10 minutes or as required. Bake using appropriate bake schedule as defined by paragraph 3.5. Record topcoat application information and oven type used and include with the submission data package for system approval.

Catalyzed Low Bake Repair: LBR: Catalyze enamel as per manufacturer's recommendations. Prepare (OEM) panels at target conditions. Wipe panels using naphtha and mask half of panel vertically. Apply low bake system, remove masking, flash and bake 10 minutes at 100 °C metal temperature.

See para 4.2 Table 1 for Topcoat Processing Matrix, Table 2 and 3 for New Resin Technology Test Matrices, and Table 4 for New Pigments/New Colors Test Matrix. Process application and coating thickness optimization including target ranges are to be defined within para 3.5 process window.

3.5 PROCESS WINDOW DEFINITION - NEW RESIN TECHNOLOGIES ONLY

The supplier shall perform a Design of Experiments (DOE) (Response Surface Analysis is recommended) to determine the process window of the control and candidate materials. The four variables/parameters to be included in the design are bake temperature, bake time, primer and topcoat film thickness. An initial screening experiment should be run to determine what levels should be tested for the variables/parameters. This screening experiment should be reviewed with the materials engineer to set up the final DOE. Responses to the response surface DOEs will be based

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on the materials tested and will be chosen from tests listed within the specification. Minimal critical performance testing required: cross-hatch adhesion, condensing humidity, acid/alkali resistance, scratch resistance, stone chip (SAE J400), intercoat adhesion (ICA), and quick knife glass bonding adhesive adhesion. The candidate coating system versus a control will also be required to be evaluated for application robustness utilizing DOEs agreed upon by the Ford responsible Approving Engineer. Information will be used by materials engineer to determine acceptable plant processing conditions. See also para 4.2.

3.6 APPEARANCE

Note: Appearance panels will be sprayed using standard plant processing parameters. Consideration should be given to an application process window DOE to assess impact of key process variables/parameters on final appearance. The appearance target values herein listed should be consistent with the mean values defined by the process window, and should be used as directional targets for production.

3.6.1 Color
(FLTM BI 109-01)
(SAE J1545 X-Rite MA-68 five angle CMC or equivalent)

Shall match the Master Appearance Standard color panel at the 45° angle

3.6.2 Wave Scan CF — equal or better than control
(Appearance is to be measured with a reliable instrument such as Byk Gardner Wave Scan.)

Laboratory Development Target Values	Horizontal	Vertical
Light Straight Shades (L15 >80)	65	55
Medium Straight Shades (L15 79-50)	65	55
Dark Straight Shades (L15 <50)	65	55

3.6.3 Gloss — 80 min
(ASTM D523, 20 degree Glossmeter)

3.6.3.1 Gloss After Re-bake, — $\Delta du < 5$ (wavescan)

Re-bake panel at target bake conditions.

3.6.4 Sanding

3.6.4.1 Holdout

There shall be no evidence of dulling, gloss loss or change of image clarity when the 2 Wet paint system is applied over sanded (P400 and P800 grit sand-paper) and unsanded ecoat, OEM repaired topcoat, and plastic substrate. There shall be no prominence of sand scratches.

3.6.4.2 Telegraphing

There shall be no evidence of color shift when the 2 Wet paint system is applied over sanded (P400 and P800 grit sandpaper) and unsanded ecoat OEM repaired topcoat, and plastic substrate.

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3.6.5 General

The material system shall cure to a presentable, serviceable, mar-resistant film showing no craters, seediness, abnormal roughness or excessive metallic mottling. It shall have reasonable tolerance for ordinary cleaning (such as automatic car washes) and exhibit excellent polishing characteristics when wheel polished with a wide range of various compounds and cleaners.

3.7 FILM PROPERTIES

3.7.1	Film Thickness (ASTM D1186)	Report

Target values shall be defined from process window (para 3.5).

3.7.2	Dry Hiding - Topcoat (FLTM BI 158-01)	15 – 35 micrometers

The topcoat is required to provide complete visual hiding over black and gray hiding chart.

3.7.3 Ultraviolet Light Transmittance

Max light transmission through topcoat applied at 80 % of dry hiding shall be no more than 0.1 % at 360 nm and 5 % at 400 nm. The complete primer/topcoat system shall at 80% of minimum film builds have 0.05% light transmission 290 nm – 470 nm and < 0.5% light transmission 470 – 550 nm. All primer surfacers used are to be free of aromatic epoxy resins. The equipment used for this measurement is an integrating sphere spectrophotometer or equivalent.

3.7.4	Bleeding of Pigments (ASTM D279) New Pigments Only	None Permitted
3.7.5	Hardness (ASTM D1474)	Greater or equal to 7.0 KHN

Record value at target film and bake conditions. Coating shall be sufficiently cured after baking so that it can meet the polishing requirements of para 3.7.7.

3.7.6 Adhesion

3.7.6.1	Scratch Test (FLTM BI 106-01, Method A)	No chipping or loss of adhesion permitted
3.7.6.2	Scribe Test (FLTM BI 106-01, Method B)	Grade = 2

3.7.7 Polishing

Shall be capable of being sanded with 1200 grit sandpaper and polished in accordance with current plant processes to minimize orange peel or to remove defects. No noticeable change in gloss or appearance except for a min of swirl marks is permitted. Deep polishing lines or swirl marks are unacceptable.

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3.7.8 Glass Bonding

Shall meet all requirements of Ford Automotive Operations Procedure No. AVP-T118-001, latest revision. See Table 5 for panel conditions.

3.8 RESISTANCE PROPERTIES

(Resistance properties are measured with the complete primer/topcoat system applied.)

3.8.1 Condensing Humidity (ASTM D4585, 43 °C) — 240 h

No blistering, dulling, wrinkling, softening and/or loss of adhesion permitted. Panels will be checked for adhesion upon removal from humidity cabinet, at no greater than 20 minutes elapsed time from removal, and meet the requirements of para 3.7.6.2.

3.8.2 Acid/Alkali Resistance (ASTM D7356 – 07) — Equal or better than control

ASTM D7356-07 Method or equivalent shall be used. Process window evaluation will be conducted following this testing method: Solution by weight (1) 997.5 grams DI Water, (2) 15 grams Sulfuric Acid - H_2SO_4 0.02N, (3) 2.2 grams Nitric Acid - HNO_3 0.3%, (4) 2.5 grams Sodium Hydroxide - NaOH 0.02N, (5) 1.8 grams $CaCl_2$ – Calcium Chloride 0.01M, and (6) 1.0 grams KCl – Potassium Chloride 0.01M.

Panel testing outlined in table 1 utilizing the following solutions shall be tested on candidate materials: 0.5 N HCl solution; a solution in water of 0.75 % by weight $CaSO_4$ adjusted to a pH of 4; deionized water (DI) and tap water, Bee Dropping (Ford Method 24; Formic Acid 47 gm, Tannic Acid in 10% water 24 gm, Honey 24 gm, Albumin 5 gm) and Ford European Solution 10 (10 grams Iron Sulfate/1N Sulfuric Acid solution H_2SO_4). The latter two solutions are both available from Global Paint Engineering.

Apply 2.0 ml of specified solutions along entire length of 2 test panels. Place the uncovered panels in a test cabinet at 40°C for 1 hour. Repeat at 50°C and 60° C. Rinse any remaining solution with water. Examine panels for etching, discoloration, pitting, etc. Report etch-free temperature for test material and control.

3.8.3 Xylene Resistance — No softening, or dulling permitted

Using a circular motion, rub surface of enamel 10 times with wetted cheesecloth.

3.8.4 Fluid Spotting Resistance (FLTM BI 113-01)

No color change, dulling, surface distortion, spotting or permanent softening permitted.

Test 2 sets of panels:
(1) Aged per test method
(2) Unaged and conditioned less than 8 h

The following fluids will be tested:
Deionized Water
Liquid Soap
Windshield Washer Fluid (Current Production Fill), Concentrated (100%)

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