Material Name	Specification Number
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS THERMOSET BASECOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS, EXTERIOR	WSS-M33J3-D1
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET CLEARCOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS, EXTERIOR	WSS-M33J3-D2
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET CLEARCOAT, WET-ON-WET WITH TWO-COMPONENT URETHANE BASECOAT/CLEARCOAT SYSTEMS	WSS-M33J3-D3
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS THERMOSET BASECOAT, BASECOAT/CLEAR COAT WET-ON-WET PROCESS, REDUCED VISCOSITY, EXTERIOR	WSS-M33J3-D4
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET CLEARCOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS, REDUCED VISCOSITY, EXTERIOR	WSS-M33J3-D5
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET CLEARCOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS WITH WSS-M33J3-D1, ETCH RESISTANT, EXTERIOR	WSS-M33J3-E1
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET BASECOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS WITH WSS-M33J3-E3, ETCH RESISTANT, EXTERIOR	WSS-M33J3-E2
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET CLEARCOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS WITH WSS-M33J3-E2, ETCH RESISTANT, EXTERIOR	WSS-M33J3-E3
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET TINTED CLEARCOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS, EXTERIOR	WSS-M33J3-F1
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET TINTED CLEARCOAT, WET-ON-WET WITH TWO-COMPONENT URETHANE BASECOAT/CLEARCOAT SYSTEMS	WSS-M33J3-F2
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET TINTED CLEARCOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS, REDUCED VISCOSITY, EXTERIOR	WSS-M33J3-F3
ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET TINTED CLEARCOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS WITH WSS-M33J3-D1, ETCH RESISTANT, EXTERIOR	WSS-M33J3-F4

Date	Action	Changes
1998 07 01	Activated	E. M. Mangin

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ENAMEL, COMPLIANCE VOC, HIGH SOLIDS, THERMOSET TINTED CLEARCOAT, BASECOAT/CLEARCOAT WET-ON-WET PROCESS WITH WSS-M33J3-E2, ETCH RESISTANT, EXTERIOR

WSS-M33J3-F5

1. SCOPE

The materials defined by this specification are coatings which consist of a pigmented thermoset basecoat enamel over which is applied a clear or tinted clear thermoset clearcoat in a wet-on-wet process. These materials are monobaked. Unique tricoat colors are also included in this specification. Tricoat colors consist of a pigmented basecoat followed by a non-hiding midcoat over which is applied a clear or tinted clear. Tricoat colors may be processed wet-on-wet-on-wet application and monobaked or in a wet on bake operation. WSS-M33J3-D1/F5 replaces ESB-M33J3-A1/C5.

2. APPLICATION

These specifications were released originally for materials used as the topcoat finish on automobile bodies, hoods, fenders and other exterior parts, and shall be satisfactory for use over specified primers or over previously baked enamel, as in paint repair or two toning operations. The basecoat portion is used alone, without clearcoat, as an interior baking enamel for some applications.

WSS-M33J3-D1, D2, D3, E1, E2, E3, F1, F2, F4, and F5

The material defined by these specifications is supplied at normal viscosity and solids level as shown in this document.

WSS-M33J3-D4, D5 and F3

The material defined by these specifications is supplied with reduced viscosity such that they are ready for use in the assembly plants. The reduced viscosity and associated reduced solids levels shall be agreed upon by the supplier, the affected assembly plant, Global Paint Engineering, and Production Purchasing prior to delivery of the materials to the respective assembly plant.

3. REQUIREMENTS

Test shall be made on the basis of comparison with approved production material, to be chosen by approving materials engineer.

Note: For purposes of the specification, paint systems which utilize a standard basecoat/clearcoat, a basecoat/midcoat/clearcoat and/or a system with a tinted clearcoat shall be considered the "complete basecoat/clearcoat enamel system". For basecoat-only applications refer to para 3.12.

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3.1 QUALITY SYSTEM REQUIREMENTS

Material suppliers and part producers must conform to Quality System Requirements, QS-9000. Material specification requirements are to be used for initial qualification of materials. A Control Plan for ongoing production verification is required. This plan must be reviewed and approved by the relevant Ford Materials activity and/or Ford Supplier Technical Assistance (STA) prior to production parts submission. Appropriate statistical tools must be used to analyze process/product data and assure consistent processing of the materials.

Part producers using this material in their products, must use Ford approved materials and must conform to a process control plan which has been approved by STA and/or the relevant Materials Activity.

3.2 INFRARED SPECTROPHOTOMETRY AND/OR THERMAL ANALYSIS

Ford Motor Company, at its option, may conduct infrared and/or thermal analysis of material/parts supplied to this specification. The IR spectra and thermograms established for initial approval shall constitute the reference standard and shall be kept on file at the designated material laboratory. All samples shall produce IR spectra and thermograms that correspond to the reference standard when tested under the same conditions.

3.3 CONDITIONING AND TEST CONDITIONS

All test values indicated herein are based on material conditioned in a controlled atmosphere of 23 +/- 2 C and 50 +/- 5 % relative humidity for not less than 24 hours prior to testing and tested under the same conditions unless otherwise specified.

3.4 COMPOSITION

3.4.1 Resin

Basecoats shall be thermosetting, synthetic resins, and clearcoats will be thermosetting, acrylic-modified synthetic resins. Each will be appropriately fortified so as to meet the durability requirement of 10 years.

3.4.2 Pigments

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

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3.4.3 Solvents

The volatility of the solvents will be such that there shall be no paint sagging, roughness or dry spray at specified film thicknesses.

3.4.4 One-Component Cut-in-Clearcoats (WSS-M33J3-D3, F2)

These materials are formulated to provide additional compatibility with current production two-component urethane basecoat/clearcoat systems but shall be identical in performance to WSS-M33J3-D2. The clearcoat will be used only for cut-in at door-openings, inside hood and trunk.

3.5 PHYSICAL PROPERTIES LIQUID STATE

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

3.5.1	Non-Volatile Content, range (ASTM D 1353)	See initial sample +/- 4 %
3.5.2	Volatile Organic Content, range (ASTM D 3960)	See initial sample +/- 1 %
3.5.3	Weight per Volume, range (ASTM D 1475)	See initial sample +/- 0.03 g/ml
3.5.4.	Volume Solids, range (ASTM D 2697)	See initial sample +/- 2.0 %
3.5.5	Pigment Content in Tinted Clearcoat, max (ASTM D 2471, max weight % [on total formula] of colored pigment)	0.25 %

3.5.6 Viscosity
(ASTM D 1200)

Supplier shall report value at application reduction.

3.5.7 Stability
(ASTM D 1849)

After test, the material shall pass all specification requirements.

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3.5.7.1	Shelf Stability	90 days
	No more than 30 % increase in viscosity permitted.	
3.5.7.2	Accelerated Stability (60 C, 16 h)	
	No more than 30 % increase in viscosity permitted.	
3.5.8	Resistivity (ASTM D 5682)	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.

3.6 PREPARATION OF TEST PANELS

Substrate:	Current production phosphated galvanized steel and current production primed exterior thermosetting plastic. Record all substrate information. See para 5.1.
Electrocoat:	Current production medium build gray cathodic electrocoat, applied at 20 - 23 micrometers and baked 10 minutes at 182 C metal temperature (MT). Record electrocoat and oven type used.
Primer:	Current production primer surfacer in a color consistent with production, applied at 25 - 28 micrometers and baked 10 minutes at 149 C MT. Record primer and oven type used.
Enamel: (OEM)	Apply basecoat to required dry film thickness by spray under conditions appropriate for basecoats, and flash as required. Apply clearcoat to required dry film thickness. Bake using appropriate bake schedule. Record enamel and oven type used.

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Catalyzed Low Bake Repair: (LBR)

For catalyzed low-bake repair, a current production basecoat/clearcoat system from the same manufacturer that has been approved for use may be substituted, provided that it meets all the catalyzed repair systems criteria. 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 99 C MT.

See para 5.2 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.

3.7 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 three variables/parameters to be included in the design are bake temperature, bake time, and clearcoat film thickness (basecoats applied at hiding). 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 DOE will be based on the materials tested and will be chosen from tests listed within the specification. Minimal critical testing required: cross-hatch adhesion, condensing humidity, acid/alkali resistance, mar resistance, stone chip (SAE J400 and Erichsen), and intercoat adhesion (ICA). Information will be used by materials engineer to determine acceptable plant processing conditions. See also para 5.2.

3.8 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.

3.8.1 Color
(FLTM BI 109-01)
(SAE J1545 X-Rite MA58 Three-Angle CMC)

Shall match the Master Appearance Standard color panel.

3.8.2 Distinctness of Image, min 70
(FLTM BI 110-03)

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3.8.3 Gloss, min 90
(ASTM D 523, 20 degree Glossmeter)

3.8.3.1 Gloss After Rebake, max 4 unit decrease

Rebake panel at target bake conditions.

3.8.4 Leveling

The surface of material under test shall be equal to or better than currently approved production material for smoothness when applied and baked under identical conditions. Orange peel values taken from QMS data obtained using Autospect shall be reported.

3.8.5 Sanding

3.8.5.1 Holdout

There shall be no evidence of dulling, gloss loss or change of image clarity when enamel color coat is applied over sanded (P400 and P800 grit sandpaper) or unsanded primer surfacer. There shall be no prominence of sand scratches.

3.8.5.2 Telegraphing

There shall be no evidence of color shift when enamel color coat is applied over sanded (P400 and P800 grit sandpaper) or unsanded primer surfacer.

3.8.6 General

The enamel 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.

3.9 FILM PROPERTIES

3.9.1 Film Thickness
(ASTM D 1186)

Target values shall be defined from process window (para 3.7).

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