PAINT, ONE COMPONENT BASECOAT/CLEARCOAT OVER RIGID SUSTRATES, EXTERIOR **WSS-M16J9-B2**

PAINT, TWO COMPONENT BASECOAT/CLEARCOAT OVER RIGID SUSTRATES, EXTERIOR **WSS-M16J9-B3**

PAINT, ONE COMPONENT BASECOAT/TWO COMPONENT CLEARCOAT OVER RIGID SUSTRATES, EXTERIOR **WSS-M16J9-B4**

1. SCOPE

The materials defined by these specifications are paints, which consist of a basecoat and clear topcoat applied by a baked process. This specification also includes unique colors that require Tri or 4 coat systems. Tricoat colors consist of a pigmented groundcoat followed by a non-hiding midcoat over which is applied a clear or tinted clear. Four coat systems consist of a Basecoat, Clearcoat baked then the application of an effect basecoat with a clear or tinted clear.

2. APPLICATION

These specifications were released originally for paints used as the final topcoat on exterior trim components made of rigid substrates, such as spoilers, appliqués, mirror housings, handles, roof racks, running boards. It shall be satisfactory for use over specified primers or over previously baked enamel, as in paint repair or tutone operations.

2.1 LIMITATIONS

Bake temperature should not exceed softening temperature of substrate material as agreed upon by Ford Materials Engineering.

2.1.1 One Component, Basecoat/Clearcoat, Exterior Paint Systems for Rigid Substrates already approved to WSS-M33J7 do not need to retest for Technology approval to WSS-M16J9-B2/B3/B4.

3. REQUIREMENTS

Testing to be used for initial qualification of materials and shall be made on the basis of comparison with approved production material, chosen by the approving materials engineer.

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

Both the basecoat and clearcoat contain UV absorbers. The supplier will furnish the specific composition and concentration of the absorbers upon request.

Date	Action	Revisions	Rev. 03
2016 10 04	Editorial	See Summary of Revisions for Details	C. Taylor, NA
2016 02 02	Revised	See Summary of Revisions for Details	C. Taylor, NA / Global Team
2007 07 31	Activated		J. Robincheck

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3.2.1 Resin

Shall be either a polyester, acrylic, modified urethane polymer or a polyurethane. Minor amounts of modifiers and/or plasticizers are allowed.

3.2.2 Pigments

Pigments are exterior automotive grade selected to match the Ford Motor Company master and meet the durability requirements.

3.2.3 Solvents

The volatility of solvents will be such that there shall be no paint sagging, roughness or dry spray at specified film thicknesses. Solvents shall be compliant with any regional requirements (HAPs, etc.).

3.3 PHYSICAL PROPERTIES LIQUID STATE

The following evaluation must be conducted on both the basecoat and clearcoat application viscosity.

Throughout the application viscosity range, material shall be in compliance with local emission regulations.

Property variation acceptability as identified below, shall be based on the recorded values of the originally approved production sample as approved by Ford Materials Engineering. This data will be used in developing control plan requirements.

3.3.1	Non-Volatile Content, range (ASTM D 1353)	Initial sample +/- 4%
3.3.2	Volatile Organic Compound, range (ASTM D 3960)	Initial sample +/- 1%
3.3.3	Weight per Volume, range (ASTM D 1475)	Initial sample +/- 0.03 g/ml
3.3.4	Volume Solids, range (ASTM D 2697)	Initial sample +/- 2.0%
3.3.5	Viscosity (ASTM D 1200)	Report
3.3.6	Stability (ASTM D 1849)	No more than 30% viscosity increase permitted.
3.3.6.1	Shelf Stability, 90 days	
3.3.6.2	Accelerated Stability, 60 °C, 16 h	
3.3.7	Resistivity (ASTM D 5682)	0.005 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.

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3.4 PREPARATION OF TEST PANELS

3.4.1 Substrates

Auto body steel, aluminum, pre-coated or electroplated zinc or zinc alloy coated steel and zinc die casting or as specified on Engineering Document.

Rigid polymer and rigid polymer blends, SMC, ABS, PC/ABS, PA, etc.

3.4.2 Substrate Condition

The surface to be coated must be cleaned to ensure the absence of oil or alkaline residues, fingerprints, corrosion, mold release agents, dirt, moisture, and other foreign materials.

Surface energy/resistivity or chemical reaction(s) enhancements (flaming, corona discharge or plasma) and/or addition of conductive materials, necessary to meet the requirements of this specification, shall be approved by Materials Engineering and noted on the Ford Approved Source List (ASL) and/or Material Color Durability Compliance Certification (MCDCC).

3.4.3 Electrocoat

For metallic substrates requiring e-coat, apply 17- 24 µm and bake 10 minutes at 182 °C metal temperature or as otherwise recommended. Record e-coat and oven type used.

3.4.4 Primer

Apply 17 - 24 µm DFT (Dry Film Thickness) of the primer or as otherwise recommended, as specified for the substrate. Primer must be applied over e-coat for paint system robustness.

3.4.5 Basecoat/Clearcoat

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 paint and oven type used. (As developed by para 3.5).

3.4.6 Design Verification/Initial Qualification Test Requirements as listed in Table 1

3.4.7 Aging

After application of the top coat, all panels shall be aged at least 72 h at 23 +/- 2 °C (preferred) or 16 hours at 45 +/- 1 °C before testing.

3.4.8 Cure Process Window

Must be developed per paragraph 3.5.

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3.5 PROCESS WINDOW DEFINITION - NEW RESIN TECHNOLOGIES ONLY

The supplier shall perform a DOE utilizing response surface analysis to determine the Process Window of the system. The three variables to be included in the design are Bake Time, Bake Temperature, and Film Thickness. An initial screening experiment should be run to determine what level will generate a window which includes testing to failure. This screening experiment should be reviewed with the Materials Engineer to set up the final DOE. The DOE shall include, but is not limited to, the conditions in paragraph 4.4. Response attributes to the DOE should be based on the materials tested and should include, but not be limited to:

- Film Thickness (Para 3.6.3, 3.6.4)
- Ultraviolet Light Transmittance (Para 3.6.5)
- Adhesion (Para 3.7.1)
- Water Immersion (Para 3.7.2)
- Chipping (Para 3.7.8)
- Environmental Cycling (Para 3.7.9)
- High Performance Adhesion (Para 3.7.10)
- Adhesion after Repairs (Perform Para 3.7.1 on panel coated to Para 3.6.4)

Report minimum, maximum, and target values for time, temperature, and film thickness.

3.6 FILM PROPERTIES

3.6.1 Color
(FLTM BI 109-01, SAE J1545 Three Angle CMC)

Shall match the Master Approved Sample color panel or the initial sample as approved by Design Center.

3.6.2 Gloss
(FLTM BI 110-01, ASTM D 523)

Shall match the Master Approved Sample color panel or the initial sample as approved by Design Center.

Gloss	A:	20° Glossmeter	min 92
	B:	60° Glossmeter	76 - 84
	C:	60° Glossmeter	66 - 74
	D:	60° Glossmeter	58 - 66
	E:	60° Glossmeter	47 - 53
	F:	60° Glossmeter	33 - 38
	G:	60° Glossmeter	17 - 23
	H:	60° Glossmeter	7 - 13
	J:	60° Glossmeter	4 - 6
	K:	60° Glossmeter	2 - 4
	L:	60° Glossmeter	0.5 - 2.0
	N:	60° Glossmeter	1.8 - 2.4
	R:	60° Glossmeter	1.2 – 1.6

3.6.2.1 Gloss After Rebake 4 unit decrease max

Rebake panel at target bake conditions per Para 3.5.

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3.6.3 Film Thickness Report
(FLTM BI 117-01, Metallic Substrates, minimum of 400x magnification,
ASTM B 487, Non-Metallic Substrates, minimum of 400x magnification)

Targeted Film Thickness: These ranges are considered to be requirements unless otherwise supported by testing data agreed to by Materials Engineering.

E-coat	17-24 µm
Primer/Surfacer	17–24 µm
Basecoat/Clearcoat	15-30 µm /38-50 µm
Tricoat (Basecoat/Midcoat/Clearcoat)	20-30 µm /15-30 µm /38-50 µm
4 Layer (Base/Clear/Base/Clear)	

Values other than the above Target values shall be defined from process window (Para 3.5). If values do not meet the requirements listed here, they should be noted on the Material Color Durability Compliance Certification (MCDCC).

3.6.4 Film Thickness Report
(FLTM BI 117-01, Metallic Substrates, minimum of 400x magnification,
ASTM B 487, Non-Metallic Substrates, minimum of 400x magnification)

Not to exceed 350 micrometers.

There shall be no more than 3 in-department repairs. 3 in department repairs = 1st run part + 2 in line repairs.

3.6.5 Ultraviolet Light Transmittance

For each color, report the minimum film build of basecoat and of clearcoat over epoxy-free spray primer required to meet a maximum light transmission of no more than 0.1% at 360 nm and 0.5% at 400 nm.

Fortified (with UV package) clearcoat can be used for this evaluation. The equipment used for this measurement is an integrating sphere spectrophotometer or equivalent. These values shall be used to help determine minimum film thickness for the process window in section 3.5.

3.6.6 General

The paint shall bake out to a presentable serviceable film showing no craters, pinholes, seediness, abnormal roughness or excessive metallic mottling. It shall have a reasonable tolerance for ordinary cleaning, and exhibit no dulling or color change when washed with commercially available cleaners.

3.7 RESISTANCE PROPERTIES

3.7.1 Paint Adhesion, Grade 2 max
(FLTM BI 106-01, Method B
Carbide tip scribe for metal & thermoset resins and
knife blade for all other, note method used on test data)

Lightly hand sand paint film surface (10 double rubs, moderate pressure) with P600 paper until dull, before scribe operation and checking adhesion.

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