1. PURPOSE

The purpose of this standard is to describe painted surface appearance requirements for components. These requirements, with regard to appearance attributes and surface blemishes, are outlined according to appearance zones. The purpose of these appearance requirements is to ensure that the finish of components will meet or exceed customer expectations.

2. SCOPE

This procedure applies to Roush Manufacturing and component suppliers and focuses only on the visual/tactile characteristics of the components. This standard applies to primer and top coat surface appearance, unless otherwise specified.

3. APPEARANCE

The components (see Table 1) are divided into different appearance zones to set the appearance quality requirements of each zone separately.

TABLE 1: GENERAL APPEARANCE ZONES/SURFACE CLASS

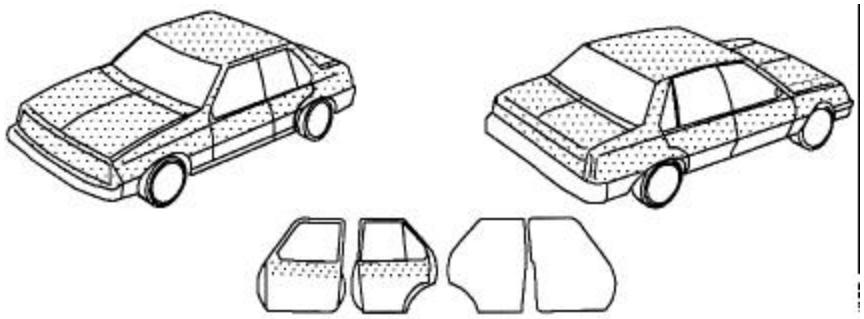
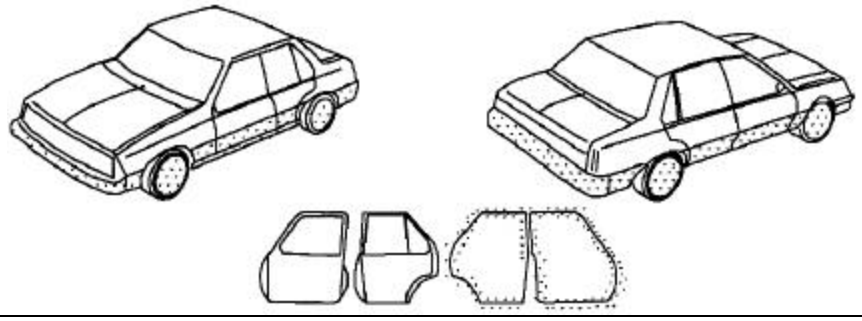
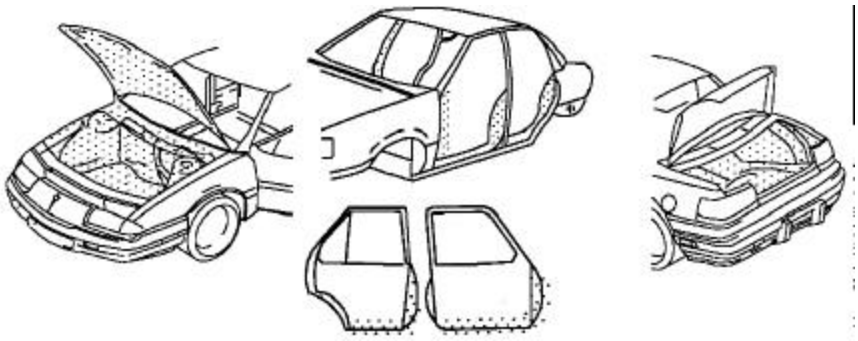
ZONE/ CLASS	DESCRIPTION	EXAMPLE
A	Very High Visibility	Exterior; Horizontal: Hood, Roof, Deck Lid, Quarter Panels, Fenders, Front & Rear Fascia's Vertical: All surfaces above a horizontal line from the Front to Rear Bumper's Interior: Door inner belt/waist line "A" & "B" Pillars 
B	High Visibility	Door openings and inner panels, with the exception of door hinge areas and lower side of door inner panel. All surfaces below a horizontal line from the Front to Rear Bumper's horizontal 

TABLE 1: GENERAL APPEARANCE ZONES/SURFACE CLASS		
ZONE/ CLASS	**DESCRIPTION**	**EXAMPLE**
C	Moderate Visibility.	Underside of parts, recessed areas, or area of part visible when doors, trunk lid, or hood is open. 
D	Low Visibility	Any area of a painted surface that is permanently covered by another part. Back side of any part. 

3.10 AUDIT PROCESS

3.11 Visual inspection, UNLESS OTHERWISE SPECIFIED, shall be performed at an approximate distance of 600mm (approximate arm's length) from the observer, normal to the part surface +/- 90 degrees.

3.12 Requirements for Appraisers
Any person appraising color must be tested for the absence of color blindness and demonstrate color acuity per ASTM-E 1499.

3.13 Training
Training programs should be implemented to educate operators, inspectors, and managers in the techniques and acceptability standards of this specification.

3.14 Light Intensity
In the inspection area, the light intensity shall be 80 to 125 maintained foot-candles.

3.15 Inspection Area
The Inspection Area shall comply with SAE J361.

3.16 Lighting Requirements for Color Match

Lighting for color match shall comply with SAE J361.

3.17 Uniformity

Appearance must be consistent over entire part. Maximum variation on any individual part for a specific attribute is as follows:

- DOI - 15 units
- Gloss - 15 units
- Orange Peel - One unit of variation within a 120mm span
- Color - No color variation from the approved color master for Zones A, B or C. Slight variation in Zone D.

Use of an X-Rite multi-angle spectrophotometer is the approved measuring method. Target values and tolerances for X-Rite shall be determined by the Product/Platform Team and specified on part print or in a separate program manual.

3.20 DEVIATIONS

If any of the target values, or tolerances in **Table A** cannot be achieved or are deemed inappropriate, it is the responsibility of the Product Team to establish achievable and appropriate target values and tolerances through material and process capability

If any of the target sizes, frequencies, or minimum distances of defects in **Table A** cannot be achieved, it is the responsibility of the Product Team to establish achievable and appropriate defect sizes, frequencies, and minimum distances based on material and process capability.

Deviations from this standard, if required, must be detailed on the appropriate part drawing. It is the responsibility of the Product/Release Engineer to ensure that any and all deviations are updated.

It is the responsibility of any supplier who does not have the recommended measuring equipment to coordinate, through the Product Team, their verification methods with the equipment the Assembly Plant uses.

3.30 REFERENCES

ASTM E284, Standard Terminology of Appearance.
ASTM E1499 - Standard Guide to the Selection, Evaluation, and Training of Observers.
SAE J361 - Procedure for Visual Evaluation of Interior and Exterior Automotive Trim.

3.40 RELEASE AND REVISIONS

3.41 Release. First approved and published June 2004

3.42 Revisions. None.

Table A

Item Number	Appearance Attribute	Description	Measurement	State	Condition	Maximum Acceptable Size/Count per Part Per Zone, Separated by 100 mm			
						Zone A	Zone B	Zone C	Zone D
1	Bare Substrate	Voids in the paint exposing bare substrate	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Per Customer Requirements	Per Customer Requirements
2	Bleeding	Component of lower coating film diffuses into top-coat and discolors	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Acceptable	Acceptable
3	Blushing	Whitish or milky areas on coating	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Acceptable	Acceptable
4	Boiling /pinholes /popping	Small bubbles in coating which may have small holes at top	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Up to 3 </= 2mm Dia	Acceptable
				Primer		None	None	None	None
5	Bulls-eye	Coating surface depressions	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Acceptable	Acceptable
				Primer		None	None	None	None
6	Chips	Removal of coating from underlying coating or substrate in small irregular pieces	Visual evaluation and comparison to Boundary Sample	Finish	No color change	None	1 per surface </= 1mm dia	1 per surface </= 1mm dia, no closer than 200mm	Acceptable
				Primer		None	None	1 per surface </= 1mm dia, no closer than 200mm	Acceptable
7	Corrosion	Rust, oxidation	Visual evaluation and comparison to Boundary Sample	Finish	Metallic substrates only	None	None	None	None
8	Cracked part	Cracks/split/punctures in substrate	Visual evaluation	Finish		None	None	None	None
9	Cracking/ crazing of coating	Hairline breaks in paint film	Visual evaluation	Finish		None	None	None	Acceptable
10	Craters, fish-eyes	Small round depressions which may expose underlying substrate	Visual evaluation and comparison to Boundary Sample	Finish	Primer or substrate not exposed	None	Max 2 per surface < 2mm dia	Max 5 per surface < 2mm dia	Acceptable
				Finish	Primer or substrate exposed	None	None	None	Max 5 per 100mm < 3mm dia
11	Dings/bumps / dents	Depressions or protrusions in substrate	Visual evaluation and comparison to Boundary Sample	Finish		None	None	1 defect per part < 10mm dia	Acceptable
12	Dirt	Foreign object or contaminant in coating film	Visual evaluation and comparison to Boundary Sample	Finish	Same color	up to 4 per part </= 1mm separated by 100 mm	up to 4 per part </= 1mm separated by 100 mm	up to 5 per part </= 1mm	Acceptable
				Primer		None	None	up to 5 per part </= 1mm	Acceptable
13	DOI	Distinctness of Image Reflected by coating	DOI Meter	Finish	**BC/CC**		**& Vert A**		
					Nonmetallic	80	70	Not Specified	Not Specified
					Dk. Metallic	80	70	Not Specified	Not Specified
					Med/Lt Met	80	70	Not Specified	Not Specified
					Special Met	70	60	Not Specified	Not Specified
				Finish	**Enamel**				
					Nonmetallic	70	60	Not Specified	Not Specified
					Dk.	70	60	Not Specified	Not Specified

Item Number	Appearance Attribute	Description	Measurement	State	Condition	Maximum Acceptable Size/Count per Part Per Zone, Separated by 100 mm			
						Zone A	Zone B	Zone C	Zone D
					Metallic				
					Med/Lt Met	70	60	Not Specified	Not Specified
					Special Met	60	50	Not Specified	Not Specified
				Primer		Not Specified	Not Specified	Not Specified	Not Specified
14	Dry Spray	Textured or seedy appearance of paint film with low gloss	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Same color, gritty feel, low gloss acceptable	Same color, gritty feel, low gloss acceptable
15	Gloss	Shininess of painted surface	Gloss Meter	Finish	BC/CC	80	70	60	Not Specified
				Finish	Enamel	70	60	50	
16	Mottle	Blotchy, non-uniform appearance	Visual evaluation and comparison to Boundary Sample	Finish	Metallic colors only	None	Slight, uniform	Not Acceptable	Acceptable
17	Off-color	Variation in color within a surface	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Acceptable	Acceptable
18	Orange peel	Rough or wavy appearance of coating surface resembling the skin of an orange	Visual comparison to A.C.T. standards, or Byk-Gandner Wavescan	Finish & Primer	Visual-Horizontal	Min 7	Min 7	Min5	Not Specified
					Visual-Vertical	Min 5	Min 6	N/A	Not Specified
					Wavescan-Horizontal	Min 6	Min 6	Min 4	Not Specified
					Wavescan-Vertical	Min 5	Min 5	N/A	Not Specified
19	Overspray	Paint deposited from a different target area	Visual evaluation and comparison to Boundary Sample	Finish	Different color	None	None	None	None
				Finish	Any color w/gritty feel and lack of gloss	None	None	None	None
20	Paint Drops	Small drops of coating deposited on the finished surface	Visual evaluation and comparison to Boundary Sample	Finish		None	None	3 per part up to 2mm dia, 100 mm apart	Not Specified
				Primer		None	None	None	None
21	Peeling	Loss of adhesion between coating films or between coating and substrate	Visual evaluation and comparison to Boundary Sample	Finish & Primer		None	None	None	None
22	Picture Framing	Fat coating edge (coating build-up on part edge)	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Acceptable	Acceptable
				Primer		None	None	None	Acceptable
23	Pits/porosity	Small holes in the coating surface	Visual evaluation and comparison to Boundary Sample	Finish	Same color	1 per part </=1 mm dia	2 per part </=2 mm dia	3 per part </=3 mm dia	Acceptable
				Primer		None	None	None	Acceptable
24	Poor repair	Inferior coating appearance due to improper paint repair techniques	Visual evaluation and comparison to Boundary Sample	Finish & Primer		None	None	None	Not specified
25	Ragged mask lines	Unsightly appearance of two-tone mask lines	Visual evaluation and comparison to Boundary Sample	Finish & Primer		None	None	None	Acceptable
26	Rub through	Area of coating surface where film is worn through exposing the underlying surfaces	Visual evaluation and comparison to Boundary Sample	Finish		None	None	None	None
27	Sags/Runs/ Drips	Localized flow of coating which produces extreme film thickness	Visual evaluation and comparison to Boundary Sample	Finish	Sag	None	1 sag </= 2mm long, </=2mm	1 sag </= 2mm long, </=5mm wide	Acceptable

Item Number	Appearance Attribute	Description	Measurement	State	Condition	Maximum Acceptable Size/Count per Part Per Zone, Separated by 100 mm			
						Zone A	Zone B	Zone C	Zone D
		variation					wide		
					Run	None	1 run </= 2mm long, </=5mm wide	1 run </= 2mm long, </= 10mm wide	Acceptable
				Primer	Sag	None	None	None	Acceptable
					Run	None	None	None	Acceptable
28	Sand Scratches	Hairline scratches in cured film caused by improper sanding techniques	Visual evaluation and comparison to Boundary Sample	Finish & Primer	Scratches	None	None	Acceptable	Acceptable
					Off Color Spot	None	None	Acceptable	Acceptable
29	Scratches after paint	Scratches on coated surface caused by improper handling, etc.	Visual evaluation and comparison to Boundary Sample	Finish	Seen or felt with finger-nail	None	None	</=12mm long	Acceptable
				Primer		None	None	None	Acceptable
				Finish	Seen or felt with finger-nail, lower coating film exposed and/or color change	None	None	</=12mm long	Acceptable
				Primer		None	None	None	Acceptable
				Finish	Seen or felt with finger-nail, substrate exposed	None	None	None	None
				Primer		None	None	None	None
30	Shrinking		Visual evaluation and comparison to Boundary Sample	Finish & Primer		None	None	Acceptable	Acceptable
31	Streaking/wipe marks	Series of blisters that appear as a streak	Visual evaluation and comparison to Boundary Sample	Finish & Primer		None	None	</= 25mm long	Acceptable
32	Swirl Marks	Fine circular marks cause by improper polishing techniques or materials	Visual evaluation and comparison to Boundary Sample	Finish & Primer		None	None	Acceptable	Acceptable
33	Thin Coating	Coating film is thinner than specified such that the underlying coating is visible and/or color does not match standard	Visual evaluation and comparison to Boundary Sample	Finish & Primer		None	None	Acceptable	Acceptable
34	Water spots, rinse blisters	Irregular rings telegraphing through the coating surface due to improper water removal	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Acceptable	Acceptable
				Primer		None	None	None	Acceptable
35	Wet mark	Damage to coating caused by something coming in contact with the wet coating	Visual evaluation and comparison to Boundary Sample	Finish		None	None	1 </= 5mm long	Acceptable
				Primer		None	None	None	Acceptable
36	Wrinkling	Shrinkage of coating that results in uneven, wrinkled appearance	Visual evaluation and comparison to Boundary Sample	Finish		None	None	Acceptable	Acceptable
				Primer		None	None	None	Acceptable