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>
<thead>
<tr>
<th>TABLE 1: GENERAL APPEARANCE ZONES/SURFACE CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZONE/CLASS</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
</tbody>
</table>
### TABLE 1: GENERAL APPEARANCE ZONES/SURFACE CLASS

<table>
<thead>
<tr>
<th>ZONE/CLASS</th>
<th>DESCRIPTION</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Moderate Visibility.</td>
<td>Underside of parts, recessed areas, or area of part visible when doors, trunk lid, or hood is open.</td>
</tr>
<tr>
<td>D</td>
<td>Low Visibility</td>
<td>Any area of a painted surface that is permanently covered by another part. Back side of any part.</td>
</tr>
</tbody>
</table>

#### 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.

3.40 RELEASE AND REVISIONS
3.41 Release. First approved and published June 2004

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

Maximum Acceptable Size/Count per Part Per Zone, Separated by 100 mm
## Paint Appearance Standard

**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**
  - **Zone A**: 60
  - **Zone B**: 50
  - **Zone C**: Not Specified
  - **Zone D**: Not Specified

- **Special Met**
  - **Zone A**: 60
  - **Zone B**: 50
  - **Zone C**: Not Specified
  - **Zone D**: Not Specified

### Primer

- **Not Specified**
  - **Zone A**: Not Specified
  - **Zone B**: Not Specified
  - **Zone C**: Not Specified
  - **Zone D**: Not Specified

### Item 14: Dry Spray

- **Texture or seedy appearance of paint film with low gloss**
  - **Finish**: Visual evaluation and comparison to Boundary Sample
- **Zone A**: 70
- **Zone B**: 60
- **Zone C**: Not Specified
- **Zone D**: Not Specified

### Item 15: Gloss

- **Shininess of painted surface**
  - **Gloss Meter**: Finish
  - **BCCC**: 80
  - **Zone A**: 70
  - **Zone B**: 60
  - **Zone C**: 60
  - **Zone D**: Not Specified

### Item 16: Mottle

- **Blotchy, non-uniform appearance**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish**: Metallic colors only
  - **Zone A**: None
  - **Zone B**: Slight, uniform
  - **Zone C**: Not Acceptable
  - **Zone D**: Acceptable

### Item 17: Off-color

- **Variation in color within a surface**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish**: None
- **Zone A**: None
- **Zone B**: Acceptable
- **Zone C**: Acceptable
- **Zone D**: Acceptable

### Item 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**: Min 7
  - **Horizontal**: Min 7
  - **Vertical**: Min 5
- **Zone A**: Min 5
- **Zone B**: Min 4
- **Zone C**: Not Specified
- **Zone D**: Not Specified

### Item 19: Overspray

- **Paint deposited from a different target area**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish**: Different color
  - **Zone A**: None
  - **Zone B**: None
  - **Zone C**: Acceptable
  - **Zone D**: Acceptable

### Item 20: Paint Drops

- **Small drops of coating deposited on the finished surface**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish**: Any color w/gritty feel and lack of gloss
  - **Zone A**: None
  - **Zone B**: None
  - **Zone C**: None
  - **Zone D**: None

### Item 21: Peeling

- **Loss of adhesion between coating films or between coating and substrate**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish & Primer**: None
  - **Zone A**: None
  - **Zone B**: None
  - **Zone C**: Acceptable
  - **Zone D**: Acceptable

### Item 22: Picture Framing

- **Fat coating edge (coating build-up on part edge)**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish**: Same color
  - **Zone A**: 1 per part <\=1 mm dia
  - **Zone B**: 2 per part <\=2 mm dia
  - **Zone C**: 3 per part <\=3 mm dia
  - **Zone D**: Acceptable

### Item 23: Pits/porosity

- **Small holes in the coating surface**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish & Primer**: None
  - **Zone A**: None
  - **Zone B**: None
  - **Zone C**: Acceptable
  - **Zone D**: Acceptable

### Item 24: Poor repair

- **Inferior coating appearance due to improper paint repair techniques**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish & Primer**: None
  - **Zone A**: None
  - **Zone B**: None
  - **Zone C**: Not Specified
  - **Zone D**: Not specified

### Item 25: Ragged mask lines

- **Unsightly appearance of two-tone mask lines**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish & Primer**: None
  - **Zone A**: None
  - **Zone B**: None
  - **Zone C**: Acceptable
  - **Zone D**: Acceptable

### Item 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
  - **Zone A**: None
  - **Zone B**: None
  - **Zone C**: None
  - **Zone D**: None

### Item 27: Sags/Runs/Drips

- **Localized flow of coating which produces extreme film thickness**
  - **Visual evaluation and comparison to Boundary Sample**
  - **Finish**: Sag
  - **Zone A**: 1 sag <\=2mm long, <\=2mm wide
  - **Zone B**: 1 sag <\=2mm long, <\=5mm wide
  - **Zone C**: Acceptable
## Paint Appearance Standard

### Item Number | Appearance Attribute | Description | Measurement | State | Condition |
<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>variation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Sand Scratches</td>
<td>Hairline scratches in cured film caused by improper sanding techniques</td>
<td>Visual evaluation and comparison to Boundary Sample</td>
<td>Finish &amp; Primer</td>
<td>Acceptable</td>
</tr>
<tr>
<td>29</td>
<td>Scratches after paint</td>
<td>Scratches on coated surface caused by improper handling, etc.</td>
<td>Visual evaluation and comparison to Boundary Sample</td>
<td>Finish</td>
<td>Acceptable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Primer</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Shrinking</td>
<td></td>
<td>Visual evaluation and comparison to Boundary Sample</td>
<td>Finish &amp; Primer</td>
<td>Acceptable</td>
</tr>
<tr>
<td>31</td>
<td>Streaking/wipe marks</td>
<td>Series of blisters that appear as a streak</td>
<td>Visual evaluation and comparison to Boundary Sample</td>
<td>Finish &amp; Primer</td>
<td>Acceptable</td>
</tr>
<tr>
<td>32</td>
<td>Swirl Marks</td>
<td>Fine circular marks caused by improper polishing techniques or materials</td>
<td>Visual evaluation and comparison to Boundary Sample</td>
<td>Finish &amp; Primer</td>
<td>Acceptable</td>
</tr>
<tr>
<td>33</td>
<td>Thin Coating</td>
<td>Coating film is thinner than specified such that the underlying coating is visible and/or color does not match standard</td>
<td>Visual evaluation and comparison to Boundary Sample</td>
<td>Finish &amp; Primer</td>
<td>Acceptable</td>
</tr>
<tr>
<td>34</td>
<td>Water spots, rinse blisters</td>
<td>Irregular rings telegraphing through the coating surface due to improper water removal</td>
<td>Visual evaluation and comparison to Boundary Sample</td>
<td>Finish &amp; Primer</td>
<td>Acceptable</td>
</tr>
<tr>
<td>35</td>
<td>Wet mark</td>
<td>Damage to coating caused by something coming in contact with the wet coating</td>
<td>Visual evaluation and comparison to Boundary Sample</td>
<td>Finish</td>
<td>Acceptable</td>
</tr>
<tr>
<td>36</td>
<td>Wrinkling</td>
<td>Shrinkage of coating that results in uneven, wrinkled appearance</td>
<td>Visual evaluation and comparison to Boundary Sample</td>
<td>Finish &amp; Primer</td>
<td>Acceptable</td>
</tr>
</tbody>
</table>

### Maximum Acceptable Size/Count per Part Per Zone, Separated by 100 mm

<table>
<thead>
<tr>
<th>Zone A</th>
<th>Zone B</th>
<th>Zone C</th>
<th>Zone D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Notes
- Visual evaluation and comparison to Boundary Sample
- Primer seen or felt with fingernail
- Finish and Primer seen or felt with fingernail, lower coating film exposed and/or color change
- Visual evaluation and comparison to Boundary Sample