1 Introduction

Note: Nothing in this standard supersedes applicable laws and regulations.

Note: In the event of a conflict between the English and the domestic language, the English language shall take precedence.

1.1 Scope. This performance standard applies to organic surface finishes on automobile body parts and components.

1.2 Mission / Theme. This standard covers the performance requirements for applied organic surface finishes on automobile body parts and components.

Six types of requirements are specified in paragraph 1.3 dependent upon the severity of service operation of the component. All interior painted metal parts must also meet the requirements of GMW14444 Material Related Interior Part Performance.

1.3 Classification.

1.3.1 Type A1. Applicable to surface finishes used on the external body and on external components in areas of exceptionally severe service e.g., vehicle front, sides, and roof.

1.3.2 Type A2. Applicable to surface finishes used on the external body and on external components in areas of severe service operations e.g., vehicle rear-facing areas with little/no chipping exposure.

1.3.3 Type A3. Applicable to surface finishes used on external components which are not type A1 or A2, and for which performance requirements must be specially defined; this type typically is not used.

1.3.4 Type B1. Applicable to surface finishes used on internal body parts and components in areas of exceptionally severe service operations e.g., solar – direct sunlight exposure, and corrosion – items in contact with wet floor, such as lower seat structure.

1.3.5 Type B2. Applicable to surface finishes used on internal body parts and components in areas of severe or moderate service operation e.g., solar – indirect sunlight exposure, and corrosion – items readily visible near floor such as brake pedal arm, speaker grilles in lower door.

1.3.6 Type B3. Applicable to surface finishes used on internal components in areas of normal service operation e.g., solar – no direct sunlight exposure; corrosion – any other steel components visible with difficulty such as upper structure under seats, structures visible with closures (e.g. glove box) open or seats folded. Note: structures not visible to customers (e.g. I.P. support) may require only temporary corrosion protection not covered under this standard.

1.3.7 It is anticipated that some interior components may have mixed service severity (e.g. B1 for corrosion and B3 for solar). In this case the most severe type shall be listed and exception(s) noted on the engineering drawing.

1.3.8 This standard does not cover performance requirements for:

1.3.8.1 Organic coatings on highly stressed exterior parts (e.g. road wheels). See GMW14670 for steel wheels and/or GMW14885 for aluminum wheels.

1.3.8.2 Organic coatings on chassis components. See GMW14671.

1.3.8.3 Organic coatings on plastic parts. See GMW14797.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

ISO 105-A02
ISO 2813
ISO 15184
SAE J1545
SAE J1767
SAE J1885

2.2 GM Group Standards/Specifications.

GM9163P
GM9509P
3 Test Preparation and Evaluation

3.1 Resources.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this specification shall be determined correctly with respect to its physical definition.

3.1.3 Facilities.

3.1.3.1 Apparatus as required by the appropriate test methods.

3.1.4 Equipment. Not applicable.

3.1.5 Test Vehicle / Test Piece. The size, dimensions and number of test pieces shall be as specified in the relevant test method for the property concerned.

3.1.6 Test Time. Not applicable.

3.1.7 Test Required Information. Not applicable.

3.1.8 Personnel / Skills. Not applicable.

3.2 Preparation. Conditioning, where required, shall be as specified in the relevant test method for the property concerned.

3.3 Conditions. Subparagraphs were not applicable.

3.4 Instructions. Not applicable.

3.5 Data. Not applicable.

3.6 Safety. This standard may involve hazardous materials, operations and equipment. This standard does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

3.7 Documentation. Samples of components or material released to this standard shall be tested for conformity with the requirements of this standard and approved by the responsible GM Department prior to the start of delivery of production level components or materials.

Any change to the component or material e.g. design, function, properties, manufacturing process and/or location of manufacture requires a new release of the product. It is the sole responsibility of the supplier to provide the customer, unsolicited, with documentation of any change or modification to the product/process, and to apply for a new release.

If not otherwise agreed to the entire verification test shall be repeated and documented by the supplier prior to start of delivery of the modified or changed product. In some cases a shorter test can be agreed to between the responsible GM Department and the supplier.

3.7.1 Test Results. The results shall be represented in a test report with reference to this standard.

3.7.2 Deviations from Test Procedure. Deviations from the requirements of the test procedures shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports etc.

4 Requirements and Procedure

4.1 General.

4.1.1 Post-treatment. Post-treatments, if performed, shall be Chrome VI free.
4.1.2 Chrome VI used as adhesion promoter is impermissible.

4.1.3 Coatings shall be Chrome VI free.

4.2 Cross Hatch Test. Test per GMW14829.
Coatings must perform both as-received and after humidity exposure to GMW14729 of the hours shown.
Type A1 and A2: Rating 0 after 120 h
Type A3: Must be specially defined
Type B1: Rating 0 to 1 after 96 h
Type B2 and B3: Rating 0 to 1 after 24 h

Note: Rating 0 requires \( \geq 99 \% \) adhesion, and Rating 1 requires \( \geq 95 \% \)

4.3 Testing to High Humidity Environments. Test per GMW14729.
Type A1 and A2: 240 h
Type A3: Must be specially defined
Type B1: 96 h
Type B2 and B3: 72 h
Performance: Components shall show no surface change.

4.4 Corrosion Tests. The determination of the resistance of the organic coating to corrosion has to be done by a salt spray fog test or by a cyclic corrosion test. If the coating is intended to be used for painting of aluminum substrates, an additional cyclic climate test is necessary (refer to paragraph 4.4.3).

4.4.1 Salt Spray Fog Test (required for GME and GMHA only). Salt spray fog testing for 336 h (Type A1 and A2), 168 h (Type B1), 96 h (Type B2) and 24 h (Type B3) shall be performed according to GMW3286. No corrosion (except along scribe lines) blisters, or any change of surface allowed. Total scribe creepback determined per GMW15282 shall be 3 mm max. for all substrates. Exception: Zinc coated steel substrates 6 mm max. (The evaluation of scribe creepback can be determined by scrape and blow off with compressed air or by using tape adhesion per GMW14829).

4.4.2 Cyclic Corrosion Test (required for all regions except GME and GMHA). A Cyclic corrosion test per GMW14872 is required to be performed on normally processed parts, or representative sections of parts. Refer to the Table in Appendix A for specific details associated with required test duration for specified test class suffix, vehicle area, and mounting location.
Type A: Corrosion Rating of 8 or better per GMW15356.
Type B: Corrosion Rating of 8 or better per GMW15356 or GMW15357.

4.4.3 Cyclic Climate Tests for Exterior Painted Parts with Aluminum Substrates. Aluminum substrates may be tested and evaluated per either of the following two methods:
4.4.3.1 Cyclic Climate Test (for Aluminum substrates only). The determination of resistance of the coating to corrosion under cyclic alternating conditions has to be performed according to GME 60203-F-Grade 7 or per an acceptable method on agreement of the supplier and GM Materials Engineer. After the test, no corrosion or blisters \( \leq 2 \) mm except along the scribe line, or any change of surface are allowed. Total corrosion creepback according to GMW15282 shall be 2 mm max. (The evaluation of creepback can be realized by blowing with compressed air or by using adhesive tape per GMW14829).

4.4.3.2 Filiform Corrosion Test (for Aluminum substrates only). Test parts per GMW15287. Painted parts must meet a filiform resistance requirement of no more than 4 mm max. length of any filament from the scribe line after a period of 672 h in humidity. Also, there shall be no filament growth on the non-scribed test surfaces at the end of test, excluding sample-prepared cut edges.

4.5 Scratch Resistance. Test per GME 60402. See paragraphs 4.5.1 and 4.5.2 for test time duration and performance requirements.

4.5.1 144 h salt spray exposure (GME 60402 - 1A)
Type A1, A2 and B1: Rating 1
Type A3: Must be specially defined
Type B2, B3: Not applicable

4.5.2 72 h salt spray exposure (GME 60402-1B).
Type A1, A2, A3, and B1: Not applicable
Type B2: Rating 1
Type B3: Rating 1 (after 24 h salt spray)

4.5.3 Optionally, pencil hardness test per ISO 15184 may be used to evaluate scratch resistance; requirement is 1H to 3H.
4.6 Cure Test. Test per GM9509P.
Applicable to all coating types; shall show no more than slight – barely observable change to paint surface (Rating 0 or 1).

4.7 Anti-Freeze Resistance. Test per GME 60406.
Type A1 and A2: Rating 2
All other types: Not applicable
Performance: No swelling, no dissolution, and no discoloration.

4.8 Resistance to Color Change. Test per GMW14701.
Type A1 and A2: Rating 0
All other types: Not applicable

4.9 Resistance to Surface Deterioration by Chemical Action. Test per GME 60404.
Type A1 and A2: Rating 0
Type A3: Must be specially defined
Type B1: Rating 1
Type B2 and B3: Not applicable

4.10 Resistance to Exterior Glass Washer Fluid. Test per HN 0292.
Type A: Rating ≥ 8
Type B: Not applicable
Performance: Coating surface must show no less than subjective Rating of 8 per GMW14264.
Note: Must choose fluid composition(s) (i.e. basic alcohol) appropriate for vehicle operating area(s).

4.11 Abrasion Resistance. Test per GME 60400 (where component size permits).
Type A1 and A2: ≥ 1.2 l/µm
Type A3: Must be specially defined
Type B1 and B2: ≥ 0.5 l/µm
Type B3: Not applicable

4.12 Fuel Resistance. Test per GMW14333 - A.
This test shall be run only if specifically required by drawing notes.
Type A1 and A2: Rating 2
Type A3: Must be specially defined
Type B: Not applicable
Performance: No swelling, no dissolution, and no discoloration. No paint removal to previous surface, or lifting, peeling or defect in paint film.

4.13 Resistance to Cleaning Agents. Test per GMW14334.
All Types: Rating 2
Alternatively, testing per GM9900P; satisfactory performance required for all coating types.
Note: Must choose cleaning compounds appropriate for and available in vehicle operating areas.

4.14 Resistance to Stone Impact. Test per GMW14700 Method A (or B), and Method C.
Type A1: Rating 8
Type A2: Rating 7
Type A3: Must be specially defined
Type B: Not applicable

4.15 Gloss. Test per ISO 2813.
Gloss standards and measurement frequency are specified elsewhere in other documents by a GM Engineering Unit.

4.16 Weather Resistance. Paragraph 4.16.1 and 4.16.2 apply to topcoat systems only, for initial (paint) sample approval only.
Note: These requirements apply to interior (Type B) parts only. Exterior (Type A) paint and part requirements are covered in GMW3005.
Note: These requirements were not intended for use in routine quality testing.
Deviation from the stated requirements is subject to arbitration between the supplier and the appropriate GM Materials Engineer.

4.16.1 Natural Weathering. Natural weathering is required for the validation process of a paint material itself. This test is not applicable for painted body parts; please refer to Appendix B for Specific Regional Requirements and Test Methodologies.

4.16.2 Accelerated Weathering. If a supplier shall be able to prove a positive result of 2 years natural weathering test, the accelerated weathering test is not applicable for body parts. Please refer to Appendix B for Specific Regional Requirements and Test Methodologies.

4.16.3 Color measurements per SAE J1545 and SAE J1767 in CIELAB color scale, dE* ≤ 3.0 (D65 illuminant, 10º observer, 45º geometry).

5 Provisions for Shipping
Not applicable.
6 Notes

Subparagraphs were not applicable.

7 Additional Paragraphs

7.1 All parts or systems supplied to this specification must comply with the requirements of GMW3059, Restricted and Reportable Substances for Parts.

7.2 Other additional requirements may be specified on the relevant component drawings.

8 Coding System

This standard shall be referenced in other documents, drawings, etc. as follows:

Example: “GMW14669 Type X# (e.g. GMW14669 Type A1)”

9 Release and Revisions

Appendix A

Requirements for Cyclic Corrosion Test (applicable to all regions except GME and GM Holden)

<table>
<thead>
<tr>
<th>Test Class Suffix</th>
<th>Type A</th>
<th>Type B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Area</td>
<td>Exterior Note 1</td>
<td>Secondary Surface</td>
</tr>
<tr>
<td>Mounting Location</td>
<td>Outside Weatherstrip Note 2</td>
<td>Inside Weatherstrip Note 3</td>
</tr>
<tr>
<td>Gravelometer &amp; Cyclic Corrosion (GMW14700 &amp; GMW14872)</td>
<td>Not applicable</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Cyclic Corrosion &amp; Scribe Creepback (GMW14872 &amp; GMW15282)</td>
<td>Duration C (a)</td>
<td>Duration C (a)</td>
</tr>
<tr>
<td>Acceptance Criteria</td>
<td>Corrosion Rating 8 or better per GMW15356</td>
<td>Corrosion Rating 8 or better per GMW15357</td>
</tr>
</tbody>
</table>

**Note:** The Testing Criteria will be indicated by the Test Class Suffix (e.g. GMW14669 – A). When the Test Class Suffix is not indicated (for example, GMW14669), the Testing Criteria will be based on the part’s location on the vehicle per the following:

**Note 1** Exterior Surface Parts – EXT All, Method SH/SL Duration C cosmetic evaluation and scribe creepback evaluation, Duration D for functional evaluation (if applicable). Mass loss targets are defined in GMW14872.

**Note 2** Secondary Surface Parts, Area I (Outside Weatherstrip) – SS OW, Method SH/SL Duration C cosmetic evaluation and scribe creepback evaluation, Duration D for functional evaluation (if applicable). Mass loss targets are defined in GMW14872.

**Note 3** Secondary Surface Parts, Area II (Inside Weatherstrip) – SS IW, Method SH/SL Duration C cosmetic evaluation and scribe creepback evaluation, Duration D for functional evaluation (if applicable). Mass loss targets are defined in GMW14872.

**Note 4** Interior Parts, Area I (low mount location): INT Low, Method SH/SL, Duration C cosmetic evaluation and scribe creepback evaluation, Duration D for functional evaluation (if applicable). Mass loss targets are defined in GMW14872.

**Note 5** Interior Parts, Area II (mid-to-high mount location): INT Mid/High, Method SH/SL, Duration C cosmetic evaluation and scribe creepback evaluation, Duration D for functional evaluation (if applicable). Mass loss targets are defined in GMW14872.

**Note 6** Gravelometer testing is required, but not in conjunction with GMW14872.

(a): Maximum allowable creepback is 6 mm on bare steel and cast iron substrates and 3 mm creepback on all other substrates.
## Appendix B - Regional Requirements for Natural and Accelerated Weathering

### I. Natural Weathering

<table>
<thead>
<tr>
<th>Region</th>
<th>Specification</th>
<th>Location / Instrument</th>
<th>Test Method</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP/GM Holden Limited</td>
<td>HN 0283</td>
<td>Allunga, Queensland, Australia ( \text{GM Black Box Fixture} )</td>
<td>For Type B: Exposed due north 20° from horizontal under glass (southern hemisphere), Area I (in direct sunlight): 110 000 Langleys Area II (not in direct sunlight): 55 000 Langleys</td>
<td>No cracking, blistering, loss of adhesion or other surface destruction. Color change after test: CIELAB color scale, ( \Delta E^* \leq 3.0 ) (D65 illuminant, 10° observer, 45° geometry), with visual approval is preferred. Maximum unpolished gloss loss shall be ( \leq 50 % ), Maximum gloss loss on polished shall be ( \leq 20 % ). Polishing is not applicable to low gloss finishes.</td>
</tr>
<tr>
<td>LAAM/Mercosur</td>
<td>GM14873 GM9163P</td>
<td>Cruz Alta Proving Ground Exposure GM Black Box Fixture</td>
<td>For Type B: Exposure the panels 20° facing north under glass by exposed due north 20° from horizontal under glass (southern hemisphere), Area I: 110 000 Langley, Area II: 25 000 Langley</td>
<td>No cracking, blistering, loss of adhesion or other surface destruction. Color change after test: CIELAB color scale, ( \Delta E^* \leq 3.0 ) (D65 illuminant, 10° observer, 45° geometry), with visual approval is preferred. Maximum unpolished gloss loss shall be ( \leq 50 % ), Maximum gloss loss on polished shall be ( \leq 20 % ).</td>
</tr>
<tr>
<td>AP/GM DAT, APPATAC, GME, GMNA</td>
<td>GM14873 GM9163P</td>
<td>Florida Exposure GM Black Box Fixture</td>
<td>Not required</td>
<td>Not required</td>
</tr>
</tbody>
</table>

Deviations from the above standards shall be agreed upon with the responsible Materials Engineer.
### II. Accelerated Weathering

<table>
<thead>
<tr>
<th>Region</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type B</strong></td>
<td>No cracking, blistering, loss of adhesion or other surface destruction. Color change after test: CIELAB color scale, ( \Delta E^* \leq 3.0 ) (D65 illuminant, 10(^\circ) observer, 45(^\circ) geometry), with visual approval is preferred. Maximum unpolished gloss loss shall be ( \leq 50% ), Maximum gloss loss on polished shall be ( \leq 20% ). For Type B parts that cannot be measured for gloss, after exposure parts must fulfill value 3 or more per ISO 105-A02 grey scale. No cracking, blistering or other surface destruction.</td>
</tr>
<tr>
<td><strong>GME</strong></td>
<td>GMW14162 (B), (300...400) nm, Area I = 28 MJ, Area II = 14 MJ</td>
</tr>
<tr>
<td><strong>AP/GM Holden Limited</strong></td>
<td>Test to SAE J1885 Area I = 720 kJ/m(^2) (in direct sunlight), Area II = 360 kJ/m(^2) (not in direct sunlight)</td>
</tr>
<tr>
<td><strong>LAAM/Mercosur, GMNA, AP/GMDAT, AP/PATAC</strong></td>
<td>Area I = 1240.8 kJ/m(^2) per SAE J1885 Area II = not required</td>
</tr>
</tbody>
</table>
Deviations

For GMNA, Abrasion Resistance (paragraph 4.11) is not required.

For paints already approved under topcoat specification GMW3005, the following requirements will not be required for parts testing:

4.3 Testing to High Humidity Environments
4.7 Anti-Freeze Resistance
4.8 Resistance to Color Change
4.9 Resistance to Surface Deterioration by Chemical Action
4.10 Resistance to Exterior Glass Washer Fluid
4.16 Weather Resistance