



Performance Requirements for Exterior Plastic Parts with Paint Film

1 Scope

1.1 Material Description. This specification covers basic paint film technology approval requirements and the performance requirements of exterior plastic parts decorated with paint film. The parts must be made using regular production process and tooling. The parts may be functional within themselves or they may be a subassembly of, or attached to, decorative or functional parts. Examples are emblems, rocker moldings, air dams, body-side moldings, body claddings, mirror housings, appliques, inserts, lamp housings, and fascias.

1.2 Symbols. Not applicable.

1.3 Applicability.

1.3.1 Type I constructions are used for exterior parts such as rockers, appliqués, fascias, etc.

1.3.2 Type II constructions are for bright film.

1.3.3 Type III constructions are used for emblems (e.g., BowTies, GMC letters).

1.4 Remarks. Finished parts are made from thermoformed sheet stock (thin and thick film). The thin film can also be thermoformed into a preform and placed into an injection mold where plastic is injected onto the back of the preform to make an insert for emblems or the finished part. Injected molded materials must meet the requirements of GMW15572P-ABS-T1 or T2 for Acrylonitrile Butadiene Styrene (ABS) or GMW15187 or GMW16826 for Thermoplastic Olefin (TPO). The use of a masking film is optional and covered by the Approved Paint on Parts (APOP) approval.

Parts which require gasoline resistance will be designated by the suffix G.

Example of drawing call-out of molding located under the fuel filler GMW15202-G.

Typical paint film constructions are shown in Appendix B.

2 References

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

2.1 External Standards/Specifications.

ISO 4892-1	ISO 4892-2	SAE J1545	SAE J2527
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2.2 GM Standards/Specifications.

GMW3059	GMW14700	GMW14865	GMW15919
GMW3221	GMW14701	GMW14873	GMW16745
GMW14124	GMW14729	GMW15187	GMW16826
GMW14270	GMW14797	GMW15572	
GMW14333	GMW14829	GMW15777	

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221.

3.2 Appearance. The parts supplied to the assembly plant must meet the appearance requirements stated in GMW15202, Table A2. Reference GMW15777 for a description of appearance zones. Fascias and emblems fall within appearance Zone A, rocker panels in Zone B. The purpose of these requirements is to ensure that the level of paint film appearance on thermoformed parts will meet or exceed the level shown by our competitors and expected by our customers.

3.2.1 For assembly plant and Supplier Quality Assurance (SQA) audits, the part shall be inspected in the approximate vehicle position. It shall be viewed at an approximate distance of 600 mm (approximate arm's length) from the observer. Lighting conditions for inspection are defined in GMW15777.

3.2.2 Appearance must be consistent over the entire part. The part must match the high gloss paint standard plaque using a visual evaluation. Maximum variation for gloss and Distinctness of Image (DOI) measurements is 15 units. Maximum variation for orange peel is one unit within a 120 mm span. There shall be no color variation from the paint color standard plaque for Zones A and B.

3.2.3 All attributes are to be evaluated at a rate such that zero discrepant parts are shipped to the assembly plant.

3.2.4 Training programs may be required to educate operators, monitors, and managers in the techniques and acceptability standards of Table A2 and GMW15777.

3.3 Moldable Paint Film Basic Technology Approval Tests.

3.3.1 Stone Impact Resistance of Coatings (GMW14700). Methods A or B of chip resistance are to be performed. Minimum rating of 9.

3.3.2 Tape Adhesion Test for Paint Finishes (GMW14829). Initial adhesion maximum rating of 1.

3.3.3 Procedures for High Humidity Test (GMW14729, Option A, or Option B. The Option must be called out on the part drawing). Unless otherwise stated, standard test time is 240 h. Adhesion per GMW14829 shall be conducted in two separate areas on the panel. Maximum rating of 1.

3.3.3.1 After 96 h of test environment, panels must be returned to the humidity cabinet within 10 minutes to 15 minutes of removal from the cabinet.

3.3.3.2 After 240 h of Test Environment. No blistering, discoloration or adhesion loss.

3.3.4 Automotive Environmental Cycles (GMW14124, Cycle A). No cracking or adhesion loss. Run 15 cycles plus 96 h humidity (GMW14729, Option A). Tape Adhesion (GMW14829) must be run after humidity (within 15 minutes of removal from humidity chamber).

3.3.5 Determination of Scratch Resistance of Organic Coatings - Simulation of Car Wash Installations (GMW14865). The performance must be equal to or better than a relevant control.

3.3.6 Resistance of Coatings to Chemical Etching and Distortion (GMW14701).

3.3.6.1 Environmental and Plant Materials. Specific environmental materials and typical plant materials are listed in GMW14701. The performance must be equal to or better than a relevant control.

Note: Use plant-specific materials in addition to the materials called out in GMW14701, if there is a target plant.

3.3.7 High Pressure Wand Car Wash (GMW16745). No lifting or adhesion loss.

3.3.8 Thermal Shock Test for Paint Adhesion (GMW15919). No loss of adhesion.

3.3.9 Environmental Damage Resistance. Comparison with controls in Jacksonville, Florida. This 14-week test is performed on a yearly basis, beginning in May and ending in September, for clearcoat evaluation only with the appropriate basecoat/clearcoat technology in black only. "Etch Resistance" is classified by a Jacksonville rating from 1 to 10 with 1 being the best. The performance must be equal to or better than a relevant control.

3.3.10 Resistance to Fuels of Exterior Automotive Materials and Components (GMW14333, Method A). Use rating 2 under Method A (Dip) for evaluation.

3.3.11 Accelerated Weathering (SAE J2527 with Extended Ultraviolet (UV) Filters), 2500 kJ/m² and 4500 kJ/m². Accelerated weathering tests are used as an aid in predicting long-term durability performance. Testing must be done against a control. New technologies must be taken to failure. Note that white panels have a history of yellowing in accelerated tests and must be compared to controls in accelerated testing and in Florida exposure tests (one year minimum).

3.3.11.1 Xenon Exposure (SAE J2527 with Extended UV Filters). Exposure to SAE J2527 (Optional ASTM D7869), 2500 kJ/m² +96 h humidity, (GMW14729, Option A, or Option B. The Option must be called out on the part drawing.) Unless otherwise stated, standard test time is 240 h. Adhesion per GMW14829 and tape adhesion (GMW14829). Inspect test materials at periodic points (per engineering agreement) throughout the test. Rate panels for gloss and Distinctness of Image retention, cracking, color change, and yellowing.

Evaluate polish-back (hand polish only) if gloss retention is below minimum specification using regional-specific polishing compound material and processes.

Note: An additional panel must be run to failure or to 5500 kJ.

Gloss loss after 2500 kJ/m² is 15% (polished and unpolished) maximum, and after 4500 kJ/m² is 20% (polished and unpolished) maximum. Run one sample to failure or 5500 kJ/m². These requirements are for weatherometers supplied by Atlas. If weatherometers from other suppliers are used, correlation must be demonstrated with long term open rack weathering results (see 3.2.12). Test various constructions (clear and pigmented films), and various colors, using good and poor weathering samples. For visual examination, see 3.2.13.

3.3.12 Florida Outdoor Weathering of Automotive Exterior Materials (GMW14873). New technologies must have a minimum of 24 months exposure history. Five degrees open rack exposure is to be followed. Also, expose samples for 36 months, 48 months, and 60 months. Gloss loss after 24 months Florida exposure shall be 20% (unpolished) and 10% (polished) maximum, and 35% (unpolished) and 25% (polished) maximum after 60 months. There shall be no mildew/fungus growth observed after a minimum of 24 months exposure. For visual examination, see 3.2.13.

Note: Florida exposure performance takes precedence over accelerated weathering tests.

3.3.12.1 Natural Weathering Test Location Areas. Any of the following locations are considered equivalent as a test sample location. Obtain agreement from the regional GM Engineering group prior to sending test samples out for exposure.

- Miami or Southern Area, Florida, USA
- Juárez, Mexico
- Allunga, Queensland, Australia
- Cruz Alta, Brazil
- Okinawa, Japan

3.3.13 Visual Examination. Wash weathered specimens prior to making measurements and observations. Wash with scrubbing action, using a sponge that is saturated with a solution consisting of soap and deionized water at +23 °C ± 3 °C. Exposed parts shall not exhibit any indications of surface tackiness or embrittlement, change in hardness, blooming, blistering or other factors that might affect the function or appearance of the part. The color change shall not exceed a ΔE of 3.0 units.

The color change shall be measured per SAE J1545 (CIELAB color space, 10° observer, metering orifice ≤ 10 mm, Illuminant D65, specular component included). Visual color change that is considered objectionable shall override the ΔE measurement.

Part must not exhibit objectionable color change.

Note: Completion of Florida testing is not required for initial Engineering approval. The testing, however, shall be ongoing (with a minimum of 24 months Florida and 4500 kJ/m² Xenon exposures completed) before an approval is granted.

3.4 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to submit a full material composition disclosure to GM via the International Material Data System (IMDS) or via a completed GMW3059 report form.

See Table A1 for a moldable paint film basic technology approval matrix for test requirements.

For finished parts, see GMW14797, Table A1 (APOPS) Requirements for Exterior Painted Parts, white, white repair, light metallic, and a tricoat if it is part of the color palette, Table A1 also includes the Production Part Approval Process (PPAP) for all program colors.

The exact construction and individual layer thickness (substrate, adhesive layer, color coat or metallic layer, clear coat, and optional premask) must be detailed in GMW14797, Table A6 Exterior Paint Processing Data Sheet.

Run all tests in triplicate. Appropriate static dissipation equipment must be used throughout the process to remove excess static electrical charge.

4 Manufacturing Process

Not applicable.