



Metal Laminated Sheet Stock and Moldings

1 Scope

1.1 Material Description. This specification covers the performance, durability and adhesion requirements for metal laminated sheet stock and laminated part moldings. The laminate shall be suitable for exterior decorative applications.

Note: A laminate system (as defined by this specification) includes assemblies using press bonding techniques to adhere previously extruded thermoplastic decorative components to the metal substrate.

1.2 Symbols. Not applicable.

1.3 Applicability. Metal (Aluminum, Stainless Steel) laminated moldings in exterior decorative applications.

1.4 Remarks. Finished parts may be topcoated with clear or pigmented organic coating to obtain the required appearance or durability. The requirements for the topcoat performance must be indicated on the engineering drawing.

2 References

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

2.1 External Standards/Specifications.

ISO 7724-1	SAE J1545	SAE J2527
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2.2 GM Standards/Specifications.

GMW3059	GMW14270	GMW14829	GMW15777
GMW3208	GMW14334	GMW14865	GMW15919
GMW3221	GMW14700	GMW14872	GMW16745
GMW6992	GMW14701	GMW14873	GMW16854
GMW14124	GMW14729	GMW15287	

2.3 Additional References.

- Engineering drawing.
- GM material specification.

3 Requirements

The exact construction and individual layer thickness (substrate, adhesive layer, color coat or metallic layer, clear coat, and optional premask) must be provided to the GM Materials Engineer for documentation in the Appearance Database system.

3.1 Requirements on Test Specimens. Reference GMW3221.

All tests shall be performed at $(22 \pm 3)^\circ\text{C}$ and $(50 \pm 5)\%$ Relative Humidity (RH) per GMW3221 unless otherwise specified.

Molding systems which are mechanically attached to body panels shall be tested in grounded condition using panels which represent the appropriate production paint system. Samples shall be mounted using production released attachment system.

3.2 Appearance. Finished parts shall be equal to or better than the approved engineering sample when viewed under the conditions set forth in GMW6992. In addition, the parts supplied to the assembly plant must meet the appearance requirements stated in Appendix A, Table A1.

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 (approximately an 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.

3.3 Laminated Sheet Stock. The following requirements apply to Laminated Sheet Stock.

3.3.1 Cup Ductility Test for Sheet and Strip Metal (GMW16854). Three specimens shall be cut from the laminate. One of these sample shall be formed to determine the depth of draw of the laminate. Depth to fracture the plastic film must be no < 10 mm. If the criteria is met, the additional samples shall be scored by two lines cut through the plastic and adhesive layers but not the metal itself. The cuts shall be parallel to one side 50 mm long and 6.4 mm apart along the center line of the sample. Two additional cuts shall be made perpendicular to the first along the perpendicular center line. 6.4 mm apart. These cuts shall intersect to form a 6.4 mm square.

These additional scribed samples shall be formed to a depth 1.6 mm less than the previously determined fracture point of the film or to a maximum depth of 10 mm. One of these formed samples will be immediately examined for loss of adhesion of the film. The second formed sample shall be cycle tested per appropriate environmental cycle (see 3.5) and then examined for adhesion. There shall be no loss of adhesion.

3.3.2 Wear Resistance. There shall be no removal of topcoat or other adverse effects after 750 cycles of the Taber abrader wear tester per GMW3208, CS-10 wheels, with 500 g load. The test shall be performed as received, after Humidity (3.5.1 of GMW17159) and following Accelerated Weathering (3.5.4 of GMW17159).

3.3.3 Simulation of Car Wash (GMW14865). The performance must be equal to or better than relevant control.

3.3.4 Resistance to Coatings to Chemical Etching and Distortion (GMW14701).

3.3.4.1 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.

3.4 Laminated Sheet Stock and Laminated Moldings. The following requirements apply to both the Laminated Sheet Stock and Laminated Moldings.

3.4.1 Tape Adhesion Test (GMW14829). Initial adhesion shall exhibit a maximum rating of one (1). Sheet stock shall exhibit no objectionable surface changes (e.g., blooming, pitting, spotting, or bubbling of the film, etc.), or delamination. In addition, there shall be no separation of the individual film layers or of the film from the metal substrate after the Environmental Exposure (3.5 of GMW17159). Table A2 and Table A3 show summary of requirements.

Laminated moldings shall exhibit no objectionable surface changes (e.g., blooming, pitting, spotting, or bubbling of the film, etc.), or delamination. In addition there shall be no separation of the individual film layers of the film from the metal substrate after Humidity (3.5.1 of GMW17159) and Heat Aging (3.5.2 of GMW17159).

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

3.4.3 High Pressure Car Wash (GMW16745). This test is to evaluate the appearance and adhesion of the plastic/metal laminated system. There shall be no objectionable surface changes (i.e., blooming, pitting, spotting, or bubbling of the film, etc.), lifting or adhesion loss.

3.4.4 Cyclic Corrosion Test (GMW14872).

3.4.4.1 Cosmetic Corrosion. Test shall be performed as defined in GMW14872-EXT-Exposure C. The laminate shall exhibit no red or white surface metal or service corrosion either at the interface of the metal substrate and plastic laminate. In addition, there shall be no indication of galvanic interaction during these exposure.

3.4.4.2 Functional Corrosion. Test shall be performed as defined in GMW14872-EXT-Exposure E. The molding shall remain intact and show no indications of losing of the fastening system. In addition, there shall be no indication of galvanic interaction during exposure.

3.4.5 Filiform Corrosion Test (for aluminum substrates only) (GMW15287). Test parts per GMW15287. Painted parts must meet a filiform resistance requirement of no > 4 mm 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 the test, excluding sample prepared cut edges.

3.4.6 Thermal Shock Test for Paint Adhesion (GMW15919). Test parts per GMW15919. There shall be no loss of adhesion.

3.4.7 Chemical Resistance. Test per GMW14334 Code B. There shall be no material degradation, loss of adhesion, objectionable shrinkage, blistering or noticeable color or gloss change after exposure.

3.5 Environmental Exposure.

3.5.1 Procedures for High Humidity test (GMW14729). Unless otherwise stated, standard test time is 240 h followed by Tape Adhesion.

3.5.2 Heat Aging. Sample shall be exposed for 14 consecutive days in an air-circulating oven at $(80 \pm 2) ^\circ\text{C}$.

3.5.3 Automotive Environmental Cycles (GMW14124). Samples shall be exposed for 30 cycles per GMW14124 cycle G.

3.5.4 Accelerated Weathering (SAE J2527). Samples shall be exposed for at 3500 KJ/m² and 2500 KJ/m² + 96 h humidity. Maximum gloss loss after 3500 KJ/m² shall be 20%. An additional panel must be ran to failure or 5500 KJ/m².

3.5.5 Florida Outdoor Weathering of Automotive Exterior Materials (GMW14873). New technologies must have a minimum of 24 months of exposure history before submission and exposure to be continued for 36 months, 48 months and 60 months. Five degrees (5 °) open rack exposure is to be followed. For visual examination procedures see 3.5.5.1. Requirements are as follows.

- a. **24 months:** Gloss loss shall be 20% (unpolished) and 10% (polished) maximum. There shall be no mildew/fungus growth.
- b. **60 months:** Gloss loss shall be 35% (unpolished) and 25% (polished) maximum.

Note: Any deviations from the weathering requirements must be reviewed and approved by the Materials Engineer.

3.5.5.1 Visual Examination. Wash weathered specimens prior to making measurements and observations. Wash with scrubbing action, using a sponge that is saturated with solution consisting of soap and deionized water at $(23 \pm 3) ^\circ\text{C}$. 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 ISO 7724-1 or SAE J1545 (CIELAB color space, 10 ° observer, metering orifice ≤ 10 mm, illuminated D65, specular component included). Visual color change that is considered objectionable shall override the ΔE measurement.

Parts 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 exposure complete) before an approval is granted.

4 Manufacturing Process

Not applicable.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

5.2 Language. In the event of conflict between the English and domestic language, the English language shall take precedence.

5.3 Inspection and Rejection. Samples of components or materials released to a GM material specification shall be tested for conformity with the requirements of this material specification and approved by the responsible Engineering department prior to commencement of delivery of bulk supplies.

A new approval must be received for any changes, e.g., properties, manufacturing process, location of manufacture, etc. If not otherwise agreed, all testing and documentation normally required for initial release must be completed.

It is the responsibility of the supplier to inform the customer in a timely manner, without solicitation, and to include documentation of all modifications of materials and/or processes and to apply for a new release.