



Powder Coat Finish

1 Scope

This specification details the minimum performance, compatibility, and processing requirements for initial material approval of powder topcoats.

1.1 Material Description. Powder coatings for the purpose of this specification shall be defined as organic resin material in a finely powdered state, for application to suitably prepared ferrous or nonferrous metallic surfaces, followed by heat cure (to develop the desired characteristics in the finished film).

1.1.1 These coatings are intended to ensure adequate protection against corrosion on surfaces of both external and internal parts of passenger and commercial vehicles.

1.1.2 In order to meet the requirements of this specification, it is necessary for components to undergo a suitable cleaning process/removal operation (including scale or other oxide layers). Cleaning is to be followed by an appropriate pretreatment before powder coat application.

1.2 Symbols. Not applicable.

1.3 Applicability. Parts with a coating according to this specification can be classified into one (1) of the following categories.

Type A: Exterior body decorative parts such as roof rails, guide rails, and decorative moldings. The following suffixes may be added to Type A line callouts:

- **T:** Textured.
- **L:** Slip resistant.
- **W:** Wear resistant.

Type B: Interior body, such as partition grille and brackets.

- **Area I:** Direct sunlight, all specific colors.
- **Area II:** Indirect sunlight, non-color-matched.

Type C: Underhood and underbody components.

2 References

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

2.1 External Standards/Specifications.

ASTM D7869	ISO 2808	SAE J1545	SAE J2527
ISO 105-A02	ISO 15184	SAE J1767	

2.2 GM Standards/Specifications.

GMW3059	GMW14334	GMW14865	GMW15359
GMW3286	GMW14698	GMW14872	GMW15433
GMW3417	GMW14700	GMW14873	GMW15891
GMW14124	GMW14701	GMW15119	GMW16853
GMW14162	GMW14729	GMW15282	
GMW14333	GMW14829	GMW15357	

2.3 Additional References

- Hardness Test Pencil, Model 318, ERICHSEN GmbH and Co. KG (available at www.erichsen.com).
- Taber Industries, North Tonawanda, New York (available at www.taberindustries.com).

3 Requirements

In order to receive material approval from General Motors, the paint supplier shall submit an approval package consisting of the following:

- Test data from an accredited lab according to this standard.
- Bake chart (showing an acceptable bake window and target temperature/time).
- Information about the preparation of approval test samples.
 - Substrate
 - Pretreatment (e.g., phosphating, thin film)
 - Bake temperature/time

The full requirements for Type A, Type B, and Type C, are listed in Table A1, Table A2, and Table A3. Some requirements are also described in detail in 3.2 through 3.11.

3.1 Requirements on Test Specimens.

3.2 Test Samples. Use test pieces as specified in the appropriate test methods. Test pieces shall be tested in the as-received condition (i.e., without any preconditioning, irrespective of conditioning requirements of specified test methods). Wait a minimum of 72 h after bake, before commencing test. Unless otherwise specified, each test shall be performed on a minimum of three (3) specimens.

3.3 Appearance. The powder coating finish on the component shall be free from any surface blemishes prejudicial to serviceability or appearance.

3.4 Coating Thickness. The coating thickness shall be 50 µm to 100 µm unless otherwise specified on the engineering drawing or as recommended by the paint supplier.

3.5 Hardness. The paint shall have a minimum hardness value of "H" per ISO 15184.

3.6 Corrosion Resistance. Corrosion resistance requirements are detailed in Appendix B, Table B1. Cyclic corrosion testing per GMW14872, is the globally preferred method. In instances where cyclic corrosion testing is not available, approvals may be completed with neutral salt spray corrosion testing. (See Table B2). Use of neutral salt spray testing in place of cyclic corrosion must be approved by GM Materials Engineering.

3.7 Oil Resistance (Type C Only).

3.7.1 Procedure. Immerse test piece in a commercially available automotive engine oil, and expose for +24 h ± 1 h in a drying oven at 100 °C ± 3 °C. Evaluate after cooling to 23 °C ± 5 °C.

3.8 Requirement. No cracking or blistering.

Note: Deviations from the specified test standards shall be agreed upon with the responsible GM Materials Engineer.

3.9 Wear Resistance (only applicable for Type A, Suffix W). For a powder paint to be approved as "wear resistant" (suffix W), the paint must not show wear through to the substrate after the test described in 3.9.1 through 3.9.2.

3.9.1 Equipment. This test shall be performed using Taber Linear Abrasion Tester Model 5750 with Wedge Kit Number 133423 – P2 (total mass 430 g and standard 80 grit sandpaper).

3.9.2 Procedure. Clamp a strip of sandpaper under the test head. Fixture the test sample alongside the abrasion tester such that the test arm is level. Set the stroke length to 10 cm. Set the stroke speed to 60 cycles per minute. Run for a total of 150 strokes. The sandpaper shall be changed after 75 cycles, so that two (2) strips shall be used per test.

3.10 Erichsen Scratch Resistance Test. Perform scratch resistance according to GMW14698 in the as received condition and after 144 h of humidity exposure. Use Hardness Test Pencil, Model 318. The spring tension at which the tip of the test rod penetrates the coating shall be recorded. Penetration of the coating shall require a minimum force of 4.0 N.

3.11 Car Wash Brush Test (Type A Only). After 200 test strokes, there shall be no more than a 20% change in gloss value (examples: an initial gloss reading of 80 shall not be reduced to lower than 64, and an initial gloss reading of 20 shall not be reduced to lower than 16). Coating tested shall compare favorably to a control sample consisting of an approved exterior powder topcoat or body basecoat/clearcoat (BC/CC) system. Final acceptability judgment is to be made by GM Materials Engineering.

4 Manufacturing Process

Powder coatings may be applied by electrostatic spray or fluidized bed techniques. Powder coated metal processes must be pretreated with a process appropriate to ensure adhesion on a given substrate. Thin film pretreatments (e.g., Alodine) are recommended for pretreatment aluminum substrates. Zinc phosphate is recommended for ferrous and galvanized substrates. Iron phosphate is prohibited for Type A and Type C. Primer may be used if specified on the engineering drawing.

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.

5.4 Material Safety Data Sheets/Safety Data Sheets (MSDS/SDS). For new product submissions, or when a change in chemical composition of an existing product has occurred, a complete copy of the Material Safety Data Sheet/Safety Data Sheet must be submitted in compliance with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements or other country-specific MSDS/SDS requirements.

5.5 All materials supplied to this standard must comply with the requirements of the International Material Data System (IMDS) and GMW3059, **Restricted and Reportable Substances**.

6 Approved Sources

Materials supplied to this specification must be approved by General Motors.

A list of approved materials can be found in MATSPC. This GM Material File is provided to third parties to reduce redundant testing of materials. If approved material already listed is used, the part supplier can use GM Material File reference for Production Part Approval Process (PPAP) material approval. If the decision is made to use a not yet approved material, contact the Finishes and Coatings Subsystem Leadership Team for details on the approval process. The material approval process must be completed prior to PPAP start date of the part supplied to General Motors.

Paint technology approvals (families of powder coatings) will be stored in MATSPC under the appropriate paint technology specification (e.g. GMW14664 for powder coatings). Approvals for specific color matched grades of paint will be stored in the Bluesky appearance database.

7 Notes

7.1 Glossary.

CIELAB (L*a*b* color space): Commission Internationale de l'Eclairage (International Commission on Illumination) representation of colors using the coordinates in a uniform color space consisting of lightness variable L* and chromaticity indices a* and b*.

The standard short-form is defined in SAE J1545 and SAE J1767 to explain color terminology. CIE stands for Commission Internationale de l'Eclairage. LAB is the short-form to indicate the color values on the three-dimensional axes, L*, a* and b*. This is usually, very simply, denoted as CIELAB, in the Uppercase and by omitting the asterisk, as shown.

Delta E (ΔE^*): A resultant color change calculated by the equation:

$$\Delta E^* = \sqrt{\Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2}}$$

L*A*B* Color System: A color measurement system using orthogonal coordinates to describe color. The L* axis is the white-black (light-dark) axis with a large L* = light and a small L* = dark. The a* axis is the red-green axis where (+a*) = red and (-a*) = green. The b* axis is the yellow-blue axis where (+b*) = yellow and (-b*) = blue. See Figure 1.

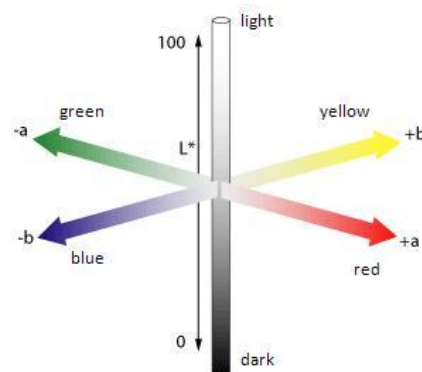


Figure 1: CIELAB Coordinate System

Langley: A traditional unit of measure for natural light energy defined as 1 g-cal/cm². A Langley is equivalent to 0.04184 MJ/m².