GM WORLDWIDE ENGINEERING STANDARDS	**Material Specification**	**GMW15520**

Interior Paint for Rigid Olefins

1 Scope

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

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

1.1 Purpose/Material Description. The requirements listed in this specification must be met by all interior paint systems used in all GM vehicle interiors. Paint systems must follow the steps in Figure 1 to complete the paint approval process of a part.

Figure 1: Paint Approval Process of a Part

Note 1: APOPS = Approved Paint on Parts

1.2 Symbols.

1.2.1 Paint Types. For a paint material approval, the paint system is required to be listed as approved in the GM Materials Approved Source List system. Paint systems approved to this specification shall be required to carry a type suffix to indicate the classification and the haptic feel that it has to the human skin. The suffix system shall be:

- Type C: Solid Color, Non-Haptic Paint.
- Type D: Solid Color, Non-Haptic Paint, Primary Gloss C (PGC) Gloss Capable.
- Type F: Solid Color, Satin Touch per GMHM012 Master Plaque available from Thierry Corporation at www.thierry-corp.com, PGC Gloss Capable.
- Type G: Solid Color, Non-Haptic Paint, PGC Gloss Capable at Low Film Thickness.
- Type M: Metallic Color.
- Type T: Translucent Monocoat. (Cure may be Ultraviolet (UV), Dual Cure-UV and Thermal or Thermal).

1.2.2 Paint Suffix. Basecoat/Clearcoat: (BC), Laser Etch (LE).

1.2.3 Paint Grades. Grade will define the performance requirements for Resistance to Fine Scratching for High gloss black colors or other highly reflective solid dark colors where the Initial Gloss > 80.

- Grade A: Resistance to fine Scratches ≥ 90% gloss retention per GMW14125.
- Grade B: Resistance to fine Scratches ≥ 75% gloss retention per GMW14125.

1.3 Applicability. This specification covers requirements for an interior, waterborne or solventborne, one or two component paint system for use on parts made of paintable olefins including rigid Thermoplastic Polyolefin (TPO) and Polypropylene (PP). All substrates must be tested per GMW16172 to confirm paintability.

1.4 Remarks. TPO and PP substrates can be pretreated by priming, fluorination, chlorination, plasma, flame, etc. A single pretreatment is required to achieve initial paint approval. The initial paint approval shall be linked to the specific pretreatment as listed in the GM Materials Approved Source List. Additional pretreatments using the specific approved paint must be evaluated per Table 1, Column 1B and added to the comments section of the

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initial approval in the GM Materials Approved Source List. All new colors must be evaluated per Table 1, Column 2.

1.4.1 Haptic Approval for Type F. Haptic feel must be approved by the GM Design Quality Paint Development Lead prior to evaluating the paint system performance. Paint types with an assigned GM haptic master shall have all paint system performance testing, i.e., Table 1, Column 1, reviewed by the region that originated the haptic master prior to GM Materials Approved Source List approval. After the system approval, color approvals are approved by any GM region.

2 References

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

2.1 External Standards/Specifications.

ASTM D523	ISO 105-A02	ISO 2813	ISO 20433
ASTM D3763	ISO 2808	ISO 6603-2	

2.2 GM Standards/Specifications.

GMW3059	GMW14125	GMW14698	GMW15548
GMW3208	GMW14162	GMW14729	GMW15891
GMW3221	GMW14270	GMW14797	GMW16172
GMW3232	GMW14334	GMW14829	GMW16727
GMW3417	GMW14445	GMW15340	GMW16853

2.3 Additional References.

- GMGA001 Darwin Grain available from Thierry Corporation at www.thierry-corp.com.
- GMHM012 Master Plaque available from Thierry Corporation at www.thierry-corp.com.
- Test Report labeled "GMW3232 PROTBEF_eng" available from GM Supply Power at https://gmsupplypower.convisint.com.

2.3.1 Cleaners.

- Ammoniated Window Cleaner, e.g., SC Johnson Windex Glass Cleaner Blue (North America).
- Armor-All (North America).
- Armor-All Protectant (North America).
- Bleach Free, Fragrance Free, Commercial Disinfecting Wipe, e.g., Clorox UltraClean Disinfecting Wipe (North America).
- Fantastik (North America).
- Formula 409 (North America).

3 Requirements

3.1 Sample Conditioning. All samples are to be conditioned prior to each requirement test to GMW3221, Code B. Painted samples shall be subjected to all testing after a minimum aging period of 72 h following the baking or drying cycle.

3.2 Paint System Requirements. The paint system tested on the panels must be identical to the production intent paint system.

3.3 Sample Preparation and Identification. The plastic substrates and paint system shall be identified per 3.3.1 and 3.3.2.

3.3.1 Plastic Substrates. Use only substrates as defined in Table 1. Identify:

- Vendor.
- Compound number.

3.3.2 Paint System. Identify:

- Vendor.

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- Pretreatment type, primer name, or adhesion promoter name.
- Paint formulation.
- Processing conditions, including all reduction parameters, surface preparation, flash and cure times and temperatures and dry film thickness for each film of paint applied.

3.4 Testing. Perform all testing as indicated in Table 1 and Table 2.

3.4.1 GM Confirmation Testing. For all Table 1, Column 1A Material Approvals, in addition to 3.4, three panels per combination listed in Table 1 must be submitted for sunscreen and insect repellent resistance testing and resistance to fine scratching to be performed by GM Materials Engineering.

3.4.2 Test Report. Use Data Sheet A1, Data Sheet A2, Data Sheet A3, and/or Data Sheet A4 in Appendix A are required to record all test results.

All testing to be completed on flat plaques unless noted as **Grain** in Table 2. Grained plaque testing to be done over GMGA001 Darwin Grain available from Thierry Corporation at www.thierry-corp.com. If GMGA001 is not available, consult with GM Materials Engineering for a similar regional animal grain with similar grain depth and a random pattern. Grained plaque testing is not required for Type M approvals.

Table 1: Required Testing Combinations

	Purpose:	**Combinations to Test:**	
Column 1A	Paint System Approval	GMW15548 If Type C, Type D or Type M: Select one resin. If Type F: Select three resins.	GMW15340 If Type C, Type D or Type M: Select one resin. If Type F: Select three resins.
		If Type D, Type F or Type G [Note 1]: Red, e.g., Morello Red, 747U, and Blue, e.g., Twilight Blue, 712U. Paint at PGC Gloss. If Type C: Red and Blue. Paint at Primary Gloss F (PGF) Gloss. If Type M or Type M(BC): Nova Silver II, 324N or similar bright metallic. If Type C(BC) or Type T: Piano Black, 424P or similar dark reflective color.	
Column 1B	Additional Pretreatment Approval	GMW15548 Agreed Upon Color	
Column 2	Color Approval	Requested Color and Substrate	

Note 1: For Type G: Resistance to Fine Scratch, must also be tested Jet Black, 600R or Backen Black, 103H.

Table 2: Testing Requirements

Test	**Standard**	**Requirement**	**1A**	**1B**	**2**
			Number of Samples		
Film Thickness	ISO 2808	Paint supplier specify range [Note 1]. Report actual values of samples.	1 [Note 2]	1	1
Appearance	Visual Check	No objectionable defects. Must match standard.	1 [Note 2]	1	1
Gloss	ISO 2813 or ASTM D523	Report 60 Degree (°) value.	1 [Note 2]	1	1
Cure	GMW15891, 92% Minimum Denatured Ethyl Alcohol	Rating ≤ 1 for monocoats. Rating = 0 for base/clear.	1 [Note 2]	1	1
Initial Adhesion	GMW14829 Method A	Rating ≤ 1	3 [Note 2] Flat and Grain	3	3

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Test	Standard	Requirement	1A	1B	2
			Number of Samples		
Humidity	Perform the following cycle: 144 h per GMW14729, Recover 1 h at room temperature, Perform GMW14829, Method A	Rating ≤ 1. No objectionable defects.	3 [Note 2] Flat and Grain	3	3
Oven Age and Humidity	Perform the following cycle: 168 h in oven [Note 3]. Recover 1 h at room temperature. 24 h per GMW14729. Recover 1 h at room temperature. Perform GMW14829, Method A.	Rating ≤ 1 No objectionable defects.	3 [Note 2] Flat and Grain	3	3
Effects of Cleaners and Lotions	For each cleaner [Note 4], apply ten drops for 1 minute to paint at room temperature. Per ISO 20433, perform ten double strokes of approximately 50 mm in length. For the commercial sanitizing wipe exposure, rub the area with ≥ 50 mm long strokes for ten double rubs using the folded wipe. Evaluate color transfer to the crock cloth or wipe and color change on the test plaque.	Rating ≥ 4 per ISO 105-A02	1 [Note 2]	Not applicable	1
Sunscreen and Insect Repellent Resistance	GMW14445 followed by GMW14698, 1 mm hemispherical tip, 8 N load. For **Type M Only:** 30 minutes after removal from oven, run 50 double strokes of **Color Crock** per ISO 20433 over exposed sunscreen exposed area.	Rating ≤ 2 [Note 5] For Type M: Scratch and **Color Crock**: No penetration of surface when evaluated with and without 10× magnification	3 [Note 2] Flat and Grain	3	3
Color Crock	ISO 20433 Dry Rubbing Method, ten double strokes	Rating ≥ 4 per ISO 105-A02	1 [Note 2]	Not applicable	1
Wear Resistance	GMW3208, CS-10 wheel, 500 g load, 1000 cycles per nominal 25 µm dry film build of total film build	No wear through to substrate or to an objectionable color change or other adverse effects	1 [Note 2]	Not applicable	1
Scratch Resistance, Initial	GMW14698, 1 mm hemispherical tip, 13 N load	No penetration of surface when evaluated with and without 10× magnification	1 [Note 2]	1	1
Scratch Resistance, After Oven Age	168 h in oven [Note 3], recover 1 h at room temperature followed by GMW14698, 1 mm hemispherical tip, 13 N load	No penetration of surface when evaluated with and without 10× magnification	1 [Note 2]	1	1

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Test	Standard	Requirement	1A	1B	2
			Number of Samples		
Resistance to Fine Scratching	GMW14125, Appendix K, X6 Low Gloss PGC or PGF For Type G only: Record Gloss at 60° and 85° High Gloss Initial Gloss > 80 For Type C, Type C(BC), and Type T: Record Gloss at 60° and 20°	Initial Gloss at 60°. For Type C, Type D, and Type F: Documentation of PGC or PGF Visual Approval for Color. Report Gloss Change at 85°. For Type G: Documentation of PGC Visual Approval for Color. Report Gloss Change at 85° ≤ 2.0 Gloss Units. For Type C, Type C(BC), and Type T Record Percent (%) Gloss Retention Grade A: Gloss Retention > 90% Grade B: Gloss Retention > 75%	3 Note 6	3	Low Gloss 3 - Type C, Type D, Type F and Type G: All colors. High Gloss 3 - Type C, Type C(BC), and Type T Only High Gloss Black or similar highly reflective colors.
Perspiration Resistance	GMW14334/C followed by GMW14698, 1 mm hemispherical tip, 8 N load	Rating ≥ 4 to 5 per ISO 105-A02. No objectionable defects. No penetration of surface when evaluated with and without 10× magnification.	1 Note 2	Not applicable	Not applicable
Odor	GMW16853	See GMW16853	1	1 Note 7	Not applicable
Fogging	GMW16853	See GMW16853	1	1 Note 7	Not applicable
Emissions	GMW16853	See GMW16853	1	1 Note 7	Not applicable
Flammability	GMW3232	< 100 mm/minute	See GMW3232 Note 8	Not applicable	Not applicable
Colorfastness to Artificial Light	GMW14162, Method D, 1240 kJ/m^2	Delta E ≤ 3.0. No objectionable defects. Rating ≥ 4 per ISO 105-A02.	3 Note 2	1	1
Humidity after Colorfastness to Artificial Light	Following Colorfastness to Artificial Light, perform the following cycle: 24 h per GMW14729, recover 1 h at room temperature per GMW14829, Method A	Rating ≤ 1. No objectionable defects.	3 Note 2	1	1
Natural Weathering, Florida, (Material)	GMW3417-L2-F1-G1-T6 1 year exposure. Interim report at 6 months exposure.	Delta E ≤ 3.0. No objectionable defects. Rating ≥ 4 per ISO 105-A02. Report total radiation at 1 year and at 6 month intervals	1 Note 2	Not applicable	Not applicable
Natural Weathering, Arizona, (Color)	GMW3417-L1-F2-G1-T6 Note 9 105 000 Temperature Normalized Radiation (TNR) Langleys. Interim report at 55 000 TNR Langleys.	Delta E ≤ 3.0. No objectionable defects. Rating ≥ 4 per ISO 105-A02.	Not applicable	Not applicable	1

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