GM	WORLDWIDE ENGINEERING STANDARDS	Material Specification	GMW15703

Two-Component Urethane Clearcoat Over Exterior Exposed Weave Carbon Fiber

1 Scope

This specification covers the qualification and performance requirements of two-component, high solids (40% volume solids to 55% volume solids as sprayed), urethane clearcoats directly over epoxy reinforced exposed weave carbon fiber substrate. These clearcoats may require the addition of pigmentation to maintain "neutral" clearcoat color due to the inherent color of the ultraviolet (UV) stabilizers needed to maintain durability in UV visible range.

1.1 Material Description. Clearcoat (CC) is a rigid, two-component urethane or urethane blends.

1.1.1 Color Description. Color coding (i.e., WAXXXX), supplier code and batch number used for testing.

1.2 Symbols. Not applicable.

1.3 Applicability. These clearcoats are designed to be applied directly to GM approved epoxy based exposed weave carbon fiber substrates. Parts coated in this manner are typically used on the exterior of the vehicle and are designed to meet exterior durability performance requirements.

1.4 Remarks. Not applicable.

2 References

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

2.1 External Standards/Specifications.

ISO 2808	SAE J2527

2.2 GM Standards/Specifications.

9984801	GMW14124	GMW14873	GMW15777
GMW3005	GMW14270	GMW15433	GMW15931
GMW3059	GMW14865	GMW15545	GMW17405

2.3 Additional References.

Bulk Material Interim Approval Requirements

Jacksonville Rating System

Original Equipment Manufacturer (OEM) Body System Control

Part Drawings

Safety and Industrial Hygiene (S&IH) Technical Standard (TS), S&IH TS 3.4-160-02

3 Requirements

3.1 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.

3.2 Submission. Submission requirements per GMW3005 must be completed prior to approval of the product. The supplier must clearly define the usage target.

3.3 Durability Performance. Materials approved to this specification must meet all minimum requirements of GMW3005, Class 1, Type B.

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3.4 Etch Resistance. Minimum etch rating is five (5) per the Jacksonville rating system, or equal to the typical Original Equipment Manufacturer (OEM) body system control for a given exposure test.

3.5 Scratch Resistance (GMW14865). Control to be used is a typical OEM body topcoat system.

3.6 Processing Requirements. The general processability must be demonstrated to be production capable and documented in the submission per GMW3005. Documentation of panel preparation must include all sanding procedures. The baseline process contains the following requirements.

3.6.1 Epoxy reinforced carbon fiber substrate material must be sanded prior to painting.

3.6.2 Substrate material must be cleaned prior to painting. Power washing per 9984801 is required.

3.6.3 To achieve minimum film build requirements, the clearcoat will require at least two (2) separate clearcoat applications of 40 µm to 45 µm (1.6 mil to 1.8 mil) with bake and sanding to de-gloss the clearcoat between each application layer.

3.6.4 Flash. Flash is typically 1 minute to 2 minutes between wet coats of clearcoat. Flash prior to oven is typically 8 minutes to 10 minutes.

3.6.5 Bake. Paints that are approved to this specification have a typical bake range of 60 °C to 135 °C (140 °F to 275 °F). Time at substrate temperature typically varies from 20 minutes to 90 minutes. Refer to the approving engineer for additional information regarding exceptions for the typical bake and time ranges.

3.6.6 Reprocess. One (1) additional recoat is allowed for a total of three (3) applications of clearcoat and three (3) bake cycles, with sanding required prior to each recoat application. Evaluation of recoats beyond what is allowed requires additional testing per agreement with the responsible paint engineer.

3.6.7 Chemical Requirements. All reducers must be urethane grade or equivalent.

3.6.8 Special Handling. Clearcoat may require a dry nitrogen blanket to prevent the entry of moist air. Isocyanate materials in the activator components will react with water, alcohols and certain other materials; therefore, precautions must be taken to ensure that none of these are present or introduced into storage containers or circulating systems containing materials noted.

3.7 Panel Preparation. Panels are to be prepared using GMW3005 Type B materials and processing. Carbon fiber substrates typically include materials approved to GMW15931, provided that the basis for the paintability approval includes application of this clearcoat directly to the substrate and weathering test results meet requirements described in 3.14, of this specification. Additional controls may be required per agreement with the responsible paint engineer.

3.8 Compatibility. Compatibility with associated materials is evaluated for Type B usage per GMW3005.

3.9 Film Build (ISO 2808). The clearcoat must meet all specified appearance and durability requirements at a minimum total film of 75 µm (3.0 mil) applied in two (2) 37.5 µm (1.5 mil) clearcoat applications, with bake and sanding between clearcoat layers.

3.10 Ultraviolet/Visible Transmission Through Cured Paint Film (GMW15545). Panels must be prepared per the conditions in Table 1 at required clearcoat film builds. Report data as specified in GMW15545 for CC only at target bake conditions. Requirements are as specified in Table 1.

Table 1: Sample Preparation and Performance for Ultraviolet Transmission

Layer	Film Build	Bake	Performance Criteria
CC Only	62.5 µm (2.5 mil) (info only)	20 minutes at Target Bake	≤0.1% Transmission from 290 nm to 360 nm
			≤0.5% Transmission at 400 nm
			≤12% Transmission at 420 nm
CC Only	75 µm (3.0 mil)	20 minutes at Target Bake	≤0.1% Transmission from 290 nm to 360 nm
			≤0.5% Transmission at 400 nm
			≤12% Transmission at 420 nm

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