



Waterborne Basecoat Component for Semi-compressed Integrated Topcoat System

1 Scope

This specification covers the qualification and performance requirements of Waterborne (WB) basecoat, also referred to as Basecoat (BC) that is applied to rigid substrates.

1.1 Material Description. These primers are waterborne technologies and are components of rigid topcoat systems that are used in conjunction with 9986474 and 9984515.

1.1.1 Specified herein are material requirements per the Materials Engineering Vehicle Systems Paint Materials Group. These specifications are used to verify the materials have been processed to produce a finished product of quality consistent with that proven in initial qualification testing.

1.2 Symbols. Not applicable.

1.3 Applicability. The waterborne basecoats are typically applied to dehydrated waterborne basecoat compatible primers (9986474) which have been applied to the electrocoated metal surfaces or appropriately primed rigid plastics. Following the basecoat application, heated flash is employed to dehydrate the basecoat prior to solvent borne clearcoat (9984515) application. Specific heated flash temperatures are dependent on supplier technology and heated flash design conditions needed to achieve prescribed dehydration levels. Following the 9984515 clearcoat application, the entire system consisting of the primer layer, basecoat layer and clearcoat layer is baked simultaneously in a single bake, as described in 3.2.

1.4 Remarks. Each combination of Basecoat Compatible Primer (BCP), Basecoat (BC) and Clearcoat (CC) must be tested and approved as a topcoat system. The individual components are not interchangeable between suppliers unless otherwise tested and approved. In addition, the topcoat system is part of the total coating system and must meet qualifications set forth in this specification and those shown on Engineering Drawings. Validation Testing for Plant-Specific Layering, Ancillary Materials and Processing must be conducted before release.

2 References

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

2.1 External Standards/Specifications.

ASTM D1186	ASTM D3960	ISO/TS 16949	ISO 2811
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2.2 GM Standards/Specifications.

9984515	GMW3005	GMW14270	GMW15777
9986474	GMW3059	GMW15545	GMW17434

2.3 Additional References.

- Advanced Product Quality Process
- Engineering Drawings
- Performance Specifications
- Validation Testing for Plant-Specific Layering, Ancillary Materials and Processing

3 Requirements

Individual material sources may differ in their physical or chemical properties. Upon submission, all material properties, system performance, and system processing properties shall meet the Performance Specifications as outlined by the responsible engineer. The percent volume non-volatiles for each primer color must not

exceed $\pm 1.5\%$ of the established baseline. The percent volume non-volatile data will be acquired from the Certificate of Analysis (COA). Film build target and range baseline for a given basecoat color are established during the GMW3005 qualification process. Volume non-volatile and film build baseline properties shall form the basis of all subsequent lots. Deviation from these established baseline properties must be approved by the appropriate GM engineer

3.1 Requirements on Test Specimens. Material submitted for qualification to this specification must meet all the material, performance and processing requirements of GMW3005, Type A and/or B, Class 1.

3.2 Processing Requirements. Basecoats covered under this specification are intended to be applied wet-on-wet over the basecoat compatible primer layer and under the clearcoat layer. Processing or material requirements differences are specified, see 3.2.1 thru 3.2.6.

3.2.1 Booth Conditions. Booth humidity level during application is to be controlled. A nominal operating range of $65\% \pm 5\%$ Relative Humidity at $24\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ ($75\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$) defines a humidity ratio range of 5.44 per gram $\pm$ 0.227 per gram (0.012 per pound $\pm$ 0.0005 per pound) of moisture per gram of dry air. Supplier shall establish the optimum booth conditions and humidity ratio tolerance level required to maintain consistent appearance without formulation adjustments.

3.2.2 Ambient Flash Between Coats. The basecoat is typically applied to the vehicle exterior in two coat application with a minimum flash time between coats of 90 s. Interior application typically precedes exterior application. Should interior application be required after one or more exterior coats, determination of flash time limitations between interior and exterior coats and appropriate sequence of operations must be demonstrated.

3.2.3 Heated Flash. After application, the basecoat is exposed to a heated flash time ranging between four (4) minutes to seven (7) minutes at $60\text{ }^{\circ}\text{C}$ ($140\text{ }^{\circ}\text{F}$) to $99\text{ }^{\circ}\text{C}$ ($210\text{ }^{\circ}\text{F}$) air temperature. Supplier shall demonstrate the air flow and temperature conditions which yield the vehicle surface temperature profile and dehydration solids levels required for appearance and to prevent defects. The surface temperature profile and dehydration solids shall be included for all potential vehicle surfaces including exterior, interior, and heavy metal areas. Specific heated flash temperatures or air flows may be dependent on supplier technology, as agreed to by the responsible approving materials engineer.

3.2.4 Cooling After Heated Flash. Supplier shall demonstrate the maximum and minimum surface temperatures required prior to clearcoat application following the heated flash to ensure a uniform and defect free surface. The surface temperatures shall be included for all potential vehicle surfaces including exterior, interior, and heavy metal areas.

3.2.5 Bake. Following subsequent application of basecoat and clearcoat, the BCP shall be co-baked with the other constituents of the integrated topcoat paint system. The nominal bake for this system is 20 minutes at a target temperature of $129\text{ }^{\circ}\text{C}$ to $135\text{ }^{\circ}\text{C}$ ($264\text{ }^{\circ}\text{F}$ to $275\text{ }^{\circ}\text{F}$) substrate temperature. Supplier shall provide bake time and temperature charts showing the bake processing window wherein all performance requirements are met. To account for typical variation across the vehicle, performance must be retained across a bake range of 15 minutes to 80 minutes and temperature range of $-6\text{ }^{\circ}\text{C}$ to $+14\text{ }^{\circ}\text{C}$ from the target temperature.

3.2.6 Oven Ramp. Targeted oven ramp for the integrated topcoat system is nominally a 15 minute ramp with exterior surface temperatures targeted to include ramp rates and a plateau as shown in Figure A1.

3.3 Chemical Requirements.

3.3.1 Solids Level. This product is to be comprised of between 15% to 32% solids by total volume of paint, including water, as determined by ISO 2811.

3.3.2 Volatile Organic Compound (VOC) Level. This product is to be comprised of a VOC content of 8% to 20% by weight, as determined by ASTM D3960.

3.4 Physical Requirements.

3.4.1 Film Thickness (ASTM D1186). The coating must meet all specified appearance and durability requirements within the film build ranges as in Table 1. The actual acceptable range for a color or specific pigmentation will be dictated by appearance and hiding capability established during the workability phase of annual color testing (GMW17434).