



Primer Surfacer, Body Paint - Generic Qualification

1 Scope

This specification covers the procedure and the minimum; performance, compatibility, processing and general requirement for the GM global technology approval of primer paint materials.

Additional testing and any exceptions to the requirements detailed in this specification are noted in the individual primer's respective specification i.e., 998XXXX (GM North America), L XXX XXXX (GM Europe), and EDS-M-87XX (GM Korea), requirements included are:

- Product Information
- Performance
- Compatibility
- Processability

1.1 Material Description. The paint material covered in this specification is primer surfacer which is intended to be applied and baked over Electrodeposition (ELPO, E-coat, Electrocoat) primer prior to topcoat.

1.2 Symbols. Not applicable.

1.3 Applicability. Primers covered under this specification may be applied as liquids or powders. Typically, they are sprayed over ELPO or other primers applied to metal or plastic.

1.3.1 Primer surfacers may generally be applied as:

1.3.1.1 Color-Key Primer. This is the general body primer, applied to the exterior of the vehicle. Two to three systems are typically provided, which can include gray, white, and/or red.

1.3.1.2 Color-Specific Primer. These are primers which are utilized on the interior surfaces of the body (e.g., trunk, motor compartment and underhood/decklid) or exterior. Each color-specific primer is coordinated to the topcoat color.

1.3.2 The primer must be evaluated for plant-specific material compatibilities, if the materials currently used in the target plant are different from those used to approve the technology.

1.3.3 Performance on finished parts must be demonstrated per GMW14671 (metal parts) and GMW14797 (plastic parts) and the General Motors Europe (GME) equivalent specifications. Validation testing of specific combinations of approved plastic substrate, paint material, and processing on plastic parts must be completed as required by the responsible engineering group; approvals noted in the Applied Paint on Parts System (APOPS).

1.4 Remarks. None.

2 References

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

2.1 External Standards/Specifications.

ASTM D1125	ASTM D2240	ISO 2431	ISO 3251
ASTM D1474	ASTM D3451	ISO 2808	ISO/TS 16949
ASTM D1895	ASTM D3960	ISO 2811	
ASTM D1921	ISO 1148	ISO 2815	

2.2 GM Standards/Specifications.

9984801	GMW14333	GMW14873	GMW16639
GMW3008	GMW14671	GMW15119	GMW17105
GMW3011	GMW14700	GMW15545	GMW17328
GMW3041	GMW14729	GMW15777	GMW17405
GMW3059	GMW14797	GMW15891	
GMW14124	GMW14829	GMW16170	
GMW14270	GMW14872	GMW16569	

2.3 Additional References.

Advanced Product Quality Plan (APQP)

International Uniform Vehicle Audit Procedure

Manufacturing Control Plans

3 Requirements**3.1 Submission Requirements.**

3.1.1 Submission Letter. Prior to qualification testing, the supplier must submit a letter to the Global Paint and Polymers Center (GPPC) primer specialist with the following information (see 3.1.1 a thru 3.1.1 g).

- Product Name.
- Purpose of the Submission.
- Description of the chemistry and components (full product formulation) and as compared to a current, approved technology.
- Site of origin and history of product evolution.
- Key data for environmental impact; e.g., Volatile Organic Compounds (VOC), weight solids, volume solids, etc.
- Material Safety Data Sheet (MSDS) (full disclosure).
- Current Product Data Sheet.

Note: A summary of the product information required is shown on Appendix A, Data Sheet A1.

3.1.1.1 At completion of material testing, the supplier must provide at least two (2) copies of the submission book to the requesting GM engineer.

3.1.2 Material Identification. All paint layers and substrates used in the submission must be identified by the source, product code and batch, including color name, e.g., WAXXXX (GM North America) or L XXX XXXX (GME), where appropriate. All film builds and bakes are to be documented.

3.1.3 Process Identification. A baseline target and range for both film build and bake must be stated as part of the submission. Actual targets and ranges will be finalized following full evaluation of the data submitted per this specification. Application equipment and spray parameters are to be documented. Target and variance for mix ratio of any two (2) component materials must be specified. All reprocess materials and procedures must be evaluated and documented.

3.1.4 Health and Environmental Issues. The supplier must provide a Material Safety Data Sheet for all components of the primer technology. The MSDS will be reviewed by the health and environmental groups from each country.

3.1.5 Submission Package. The submission book must be prepared in two (2) formats: a hard copy and an electronic copy. The book shall have a table of contents and tabs that make it easy to find each section. Sections shall be organized to follow the order of the specification so that information of interest can be readily located. The electronic copy should also be organized in the same manner. All test results, Key Control Characteristics (KCC) and Key Product Characteristics (KPC), photographs, and related interim approvals are to be included as a permanent record of the product. The books are to be in English and according to the local language.



3.1.6 Plant-Specific or Mini-Submission. Some approvals may require plant-specific or mini-submissions when only minor changes are made to previously approved primer materials or if they are to be used in plants that will be receiving the material for the first time. Testing requirements are outlined in Appendix A, Data Sheet A2 and Data Sheet A3. Tests may be added or deleted according to the type and amount of material modifications. These shall be determined prior to testing by the responsible engineer.

3.2 Production Part Approval Process (PPAP) Requirements. Product approval is required under the established guidelines outlined in the Automotive Industry Action Group (AIAG) Production Part Approval Process and ISO/TS 16949. At product approval, the supplier is expected to have reviewed specific documentation per Advanced Product Quality Plan (APQP) to GM's satisfaction; i.e., Product Design Failure Mode and Effects Analysis (DFMEA); Process Failure Mode and Effects Analysis (PFMEA); KCCs; KPCs; Measurement Systems Analysis (MSA) and Manufacturing Control Plans.

3.3 Product Information.

3.3.1 Physical Constants. Data on all physical constants must be provided as formulated and as sprayed, if different. All reducing solvents used in the technology approval must be identified (see Appendix A, Data Sheet A1).

3.3.2 Formulating Range. The formulating range of all ingredients must be specified at the time of submission. Information on the technology's ingredient formulation ranges for the various resin systems, pigments, flow control agents, additives, and key manufacturing control characteristics must be provided as part of the submission package. If a product change is proposed outside of the technology formulation limits, the responsible engineer must be notified. All ingredient ranges, key manufacturing control limits, and certificate of analysis ranges must pass standard gage repeatability and reproducibility studies.

3.3.3 Infrared (IR) Chemical Fingerprint. The supplier must provide infrared data to document the fingerprint of the recommended formula. All materials subsequently supplied under the designated specification and material code must correspond to the reference spectrum when compared under the same conditions. GM may conduct infrared spectrophotometry analysis of the materials supplied to this specification. Analysis may also be performed on topcoat that is removed from representative panels with film thickness and bake at target levels. The IR spectra established for initial approval shall constitute a reference standard and shall be part of the submission package.

3.3.4 Ultraviolet (UV) Transmission (GMW15545). For exterior primers, samples must be prepared with primer alone at minimum film build and target bake and tested per GMW15545. The wavelength range is 300 nm to 700 nm and the scale is 20%. There must be no more than 0.1% T at 360 nm and 0.5% T at 400 nm. If the requirement causes a significant increase in Pigment-to-Binder (P/B) and/or cost, then the system would need to be evaluated for UV requirements. The system is defined as the primer and all the appropriate basecoat colors and clearcoat that will be applied over the primer and must pass requirements in 3.3.4.1 thru 3.3.4.3.

3.3.4.1 Primer. Lower Limit of Film Build for Durability (20 μ m for Liquid Solventborne Primer, 18 μ m for Liquid Waterborne Primer, 38 μ m for Powder Primer).

3.3.4.2 Basecoat. Lower Limit of Film Build for Durability (10 μ m).

3.3.4.3 Clearcoat. Lower Limit of Film Build for Durability (38 μ m).

3.3.5 Odor Characteristics (GMW16639). The material's odor potential must be compared with that of a current production material per GMW16639. Any solvent changes for plant-specific implementation must be reviewed to determine if retesting is required. This is not applicable to GMW17105 materials.

3.4 Panel Preparation. Prior to start of panel preparation, contact the responsible engineer to ensure proper selection of substrate, pretreatment, ELPO, topcoat and other miscellaneous materials.

3.4.1 Sample Size. The number of samples for each test shall be one (1) per color for all tests except chip, which shall be three (3) per color, product code, bake description, and film build. All substrates, pretreatments, and coating layers shall be fully identified with source, product code, batch number, bake description, and film build.

3.4.2 Pretreatment.

3.4.2.1 Plastic Substrates. All Reaction Injection Molding (RIM) or Reinforced Reaction Injection Molded (RRIM) resin panels must be given a postcure that is a minimum of 8 °C (15 °F) higher than the maximum topcoat bake prior to paint application.

Power washing per 9984801 or appropriate GM Europe cleaning agent must be used.

3.4.2.2 Metallic Substrates. All metallic substrates must be pretreated using either phosphate (GMW3011) or thin film pretreatment (GMW16170) and electro-coated with an approved electrodeposition primer (GMW3008). Pretreated test panels from the current approved supplier may be used where appropriate per agreement with the responsible engineer.

3.4.3 Paint Application. All test materials must be sprayed at the target application viscosity. Control samples must be sprayed at production viscosity and with production reducers where applicable.

3.4.4 Film Thickness (ISO 2808). Target upper and lower film build limits are established by initial screening. Primer film build is characterized by the following:

- T = Target which is typically a midpoint.
- LL = Lower film build limit.
- UL = Upper film build limit.

3.4.4.1 All other coating layers shall be applied at their target film builds for testing unless otherwise stated. Acceptable applied film build ranges (LL to UL) will be determined upon satisfactory completion of all test requirements.

3.4.5 Panel Conditioning. Coated panels shall be subject to an aging period of at least 72 h at room temperature $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($73^{\circ}\text{F} \pm 9^{\circ}\text{F}$) and $50 \pm 5\%$ relative humidity following the bake cycle and prior to testing unless otherwise requested.

3.4.6 Appearance. The primer coating shall be smooth and uniform; i.e., free of sags, craters and other surface defects. The appearance must meet or exceed all requirements as stated in GMW15777 and stated in the International Uniform Vehicle Audit Procedure.

3.4.7 Control Panels. Control panels of a proven commercial system are required for comparison on all tests except windshield bonding. The supplier is also expected to incorporate procedures which will ensure that the right material and processes are used and that test equipment is properly calibrated and run (and provide documentation if requested). In addition, the supplier shall provide explanations for any unusual defects that occur.

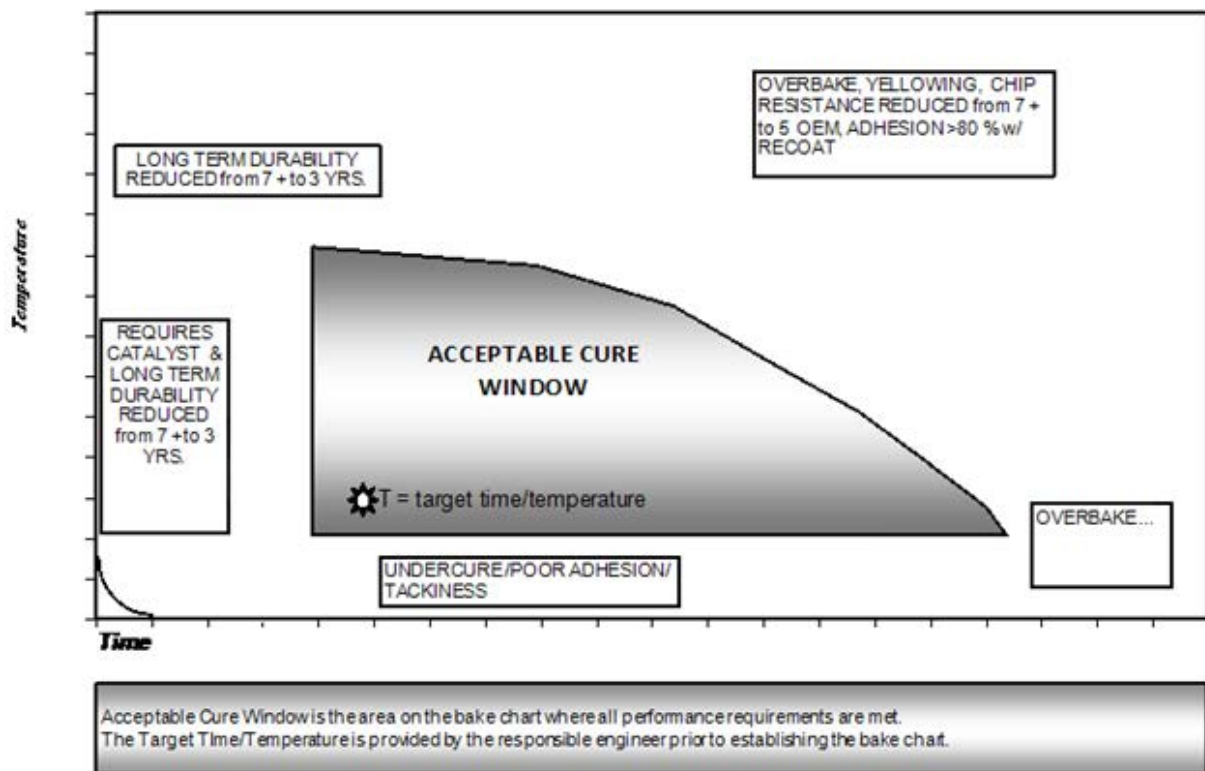
3.5 Bake Definitions. A baseline target and target range for both film build and bake must be established up-front for the submission. Actual targets and ranges will be finalized after full evaluation of film build and cure interactions. Application equipment and spray parameters used for the submission must be identified.

3.5.1 Bake. Bake is defined as the time the substrate is within the temperature range of acceptable cure. Document the oven type used (direct or indirect-fired). For testing performed in the United States, gas-fired ovens shall be utilized unless otherwise specified by the requesting engineer. Panel temperature must be monitored with thermocouples or thermistors, using a Datapaq or agreed upon equivalent to ensure that test panels are processed at specified times and temperatures.

Note: Oven loading and panel position may affect actual cure. Simulations may need to be initiated to address correlation between lab and plant ovens.

3.5.2 Target Bake Definition. The responsible engineer will dictate the target bake requirements of the primer material prior to technology approval.

3.5.3 Bake Chart. The supplier must furnish complete information regarding the effect of bake time and temperature on all appearance, durability and glass-bonding characteristics utilizing data generated from a Design of Experiment (DOE). The responsible engineer should identify the Target (T) bake time and temperature, around which the DOE will be performed. The minimum bake latitude for primers is a 20°C range, from minimum time up to three (3) x T minutes. The DOE shall be designed such that the bake parameters exceed the range of LL and UL bakes in order to ensure validation of the DOE through both pass and fail conditions. A bake chart with an explanation of expected results outside of acceptable cure parameters is required. See Figure 1 for Bake (Cure) Chart Template.



Key: OEM = Original Equipment Manufacturer

Figure 1: Bake (Cure) Chart Template

3.6 Performance Requirements. The test methods described herein are to be followed throughout the remainder of the specification where indicated. In the remainder of this document, the test methods will be listed by the name and number of the test, which is printed in bold. If two (2) test methods for a specific test are called out with the word "or", then **either** test method may be conducted, if a specific test is called out with the word "and" then **both** test methods must be performed (see 3.6 a and 3.6.b).

- a. or = **either** test method may be conducted
- b. and = **both** test methods must be performed

The primer must demonstrate compatibility with a production representative of each category of material with which it interfaces. The demonstration must include performance with all interfacing materials over a typical range of process conditions. Examples of these materials are topcoats, plastic primers, and sealers. When a target plant is selected at test initiation, the technology qualification will be done with that plant's specific materials and will include plant-specific process windows if processing is outside the typical norm. Details of the testing and the process variables required are listed in Appendix A, Data Sheet A3.

3.6.1 Color. The primer color shall match the specified color standard within a Difference Sensation (Delta E) of 1.00.

3.6.2 Gloss. Primer must show a minimum value of 70 with a 20 degree measurement angle. See GMW15777 for recommended instrumentation.

3.6.3 Orange Peel. Measure on primer-only and primer-plus-topcoat panels. Values are to be recorded for information only. See GMW15777 for recommended instrumentation.

3.6.4 Distinctness of Image (DOI). Only required for complete system (primer plus topcoat). Value is for information only. See GMW15777 for recommended instrumentation.

3.6.5 Hardness (ASTM D1474 or ISO 2815). This is not applicable to GMW17105 materials.

3.6.6 Tukon (ASTM D1474). Primer-only panels. Values are to be recorded for information only.

3.6.7 Buchholz (ISO 2815). Primer-only specified value of 80 to 100; primer with topcoat specified value of 77 minimum.

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