



Ultraviolet Cured Abrasion Resistant Coatings for Lighting Applications and Emblems

1 Scope

1.1 Material Description. This specification covers qualification requirements for clear Ultraviolet (UV) cured, abrasion resistant hardcoat to be used on exterior exposed lens covers for lighting applications and exterior trim. The coatings in this specification are for protective purposes on polycarbonate substrates.

1.1.1 Types. Hardcoat can be classified to one of two types:

- Type 1: Hardcoat for exterior lighting, meeting 5 year exterior weathering requirement.
- Type 2: Hardcoat for other exterior trim, such as adaptive cruise control emblems.

When no type is specified, use Type 1.

1.2 Symbols. Not applicable.

1.3 Applicability. Exterior lighting lens covers or other exterior applications made from polycarbonate substrate which require a protective coating to allow usage in an exterior environment.

1.4 Remarks. These UV cure coatings are part of a total painted product system and must meet the requirements set forth in this specification and those shown on engineering drawings.

1.4.1 The substrate must be approved to the appropriate GM material specification and listed in a GM Materials Approved Source List

1.4.2 Initial approval per this specification must be evaluated and approved for each substrate.

1.4.3 This specification shall be used in conjunction with the Approved Paint on Plastics System (APOPS), a section of Materials Specification File (GM Materials Approved Source List), which identifies approved substrate, cleaning, priming and topcoat combinations.

1.4.4 APOPS per GMW14797 is required for the Production Part Approval Process (PPAP) for all applications referencing this specification.

1.4.5 This specification may involve hazardous materials, operations and equipment. This specification does not propose to address all the safety problems associated with its use. It is the responsibility of the user of this specification to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2 References

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

2.1 External Standards/Specifications.

ASTM D523	ISO 4892-1	ISO/TS 16949	SAE J2527
ASTM D1003	ISO 4892-2	SAE J576C	
ASTM D1044	ISO/IEC 17025	SAE J1545	

2.2 GM Standards/Specifications.

GMW3059	GMW14334	GMW14729	GMW15777
GMW3221	GMW14650	GMW14797	GMW15891
GMW14124	GMW14700	GMW14829	GMW17414
GMW14270	GMW14704	GMW14873	GMW17456

3 Requirements

3.1 Requirements on Test Specimens.

3.1.1 Facilities. For a new supplier to GM, all testing shall be performed in an accredited laboratory. Laboratory accreditations to ISO/IEC 17025 are acceptable. A current supplier planning to use a non-ISO/IEC 17025-approved laboratory shall receive approval, prior to testing, from the GM Engineer responsible for the specific technology. Generally, the unaccredited laboratory should be in a facility that has a quality system approval to ISO/TS 16949.

3.1.2 Test Piece. The number of samples for each test shall be three (3) per coating and per film build, unless the responsible engineer and supplier agree on a different number for specific tests prior to the start of testing. All substrates, pretreatments and coating layers shall be fully identified with source, product code and film build per specimen.

3.1.2.1 At minimum, the boundary conditions of the recommended film build range shall be tested to the requirements in this specification.

3.1.2.2 For initial source approval of the coating, the test specimens can be panels or component parts. If test panels are used, the recommended panel size is 100 mm × 150 mm.

3.1.2.3 The substrate must be clean and free of surface defects which would affect performance or appearance.

3.1.2.4 Each combination of specific substrate and hardcoat must be tested and approved as a system. The individual components are not interchangeable and are approved for use only with combinations of the total paint system which were used in qualification testing.

3.1.2.5 The panel appearance must exceed all requirements designated in GMW15777, Exterior Painted Parts Appearance Requirements, and GMW17414, Exterior Plastic Lens Quality Appearance Requirements.

3.1.3 Test Conditions.

3.1.3.1 Unless otherwise stated in respective test procedures, all samples shall be conditioned prior to each required test to GMW3221, Code A.

3.1.3.2 Unless otherwise specified, painted samples shall be subjected to testing after a minimum aging period of 72 h to 96 h following the baking or drying cycle. A shorter aging period may be used, provided it is recognized that this represents a more severe condition of test and that results obtained at different again times less than 72 h are not a good basis for comparing the relative performance characteristics of paint finishes.

3.1.3.3 Test panel/part orientation shall be such that it is not shingled or shielded by another test specimen or test equipment.

3.1.3.4 Expose the test specimens to specified environment(s). There shall not be a lapse of more than 2 minutes in transferring the test specimens from one environment to another. There is to be no chamber ramp times between cycle conditions unless specified.

3.1.3.5 Unless otherwise specified, the tolerance on exposure times is ± 5 minutes.

3.2 Submission. The pre-submission request, the content of the submission package and the tested specimens shall be reviewed and approved by the appropriate GM Materials Engineer.

3.2.1 Submission Letter. Prior to qualification testing, the supplier must submit a letter to the materials engineer of the appropriate region (GMNA, GM do Brasil, GMK and (if applicable) GM Holden) with the following information:

- Purpose of the submission
- Description of the topcoat technology chemistry and status
- Comparison to current approved technologies
- Manufacturing site of origin
- History of product evolution
- Key data for evaluating environmental impact, if available
- Product codes
- Approval center/target suppliers
- Impact on lacquer cost and cost per vehicle

3.2.2 Submission Package. All data and documentation generated during the material development must be included and approved by the responsible engineer. An electronic copy must be prepared and distributed to the responsible engineer of the approving region(s). The documentation is to be in English and the local language of the lead GM region.

3.2.2.1 Material Identification. All coatings used in the submission must be identified by product code, batch number and batch date. Color name must be included where appropriate. All related paint materials used for compatibility tests must also be identified in the same manner. All substrates used must be identified by source, product code and part number where appropriate.

3.2.2.2 Process Identification. A baseline and target range for film build and processing must be established prior to the submission. Actual target and range will be finalized after full evaluation of film build and cure interactions are determined. Application equipment and spray parameters used for the submission must be documented. Target and variance for mix ratio of two-component (2K) materials must be evaluated.

3.3 Test Requirements. Appendix A, Tables A1, A2 and A3 outline the complete test requirements for new technology submissions. For modifications outside the formulation limits of a previously approved technology, testing may be added or deleted by the responsible Materials Engineer. For Stone Impact Resistance ratings, see GMW17456, Appendix B.

3.4 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.

4 Manufacturing Process

4.1 All shipments of materials, or parts under contract or purchase order, manufactured to this specification shall be equivalent in every respect to the initial samples approved by engineering. There shall be no changes in either formulation or manufacturing processes permitted without prior notification and approval by engineering. Lack of notifications by the supplier constitutes grounds for rejection of any shipment. While samples may be taken from incoming shipments and checked for conformance to this specification, the supplier shall accept the responsibility for incoming shipments meeting this specification without dependence upon purchaser's inspection.

4.2 It will be the responsibility of the supplier to ensure that the material is not exposed to temperatures during shipment which would cause the material to fail to meet any of the requirements of this specification.

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.