



Surface Coating and Functional Performance for Wiper Arms, Blades, and Modules

1 Scope

1.1 Material Description. This specification defines the paint system durability, appearance and corrosion requirements for metal/coated front and rear wiper arms and blades. It also defines functional evaluation and requirements for wiper arm pivots and wiper system modules.

1.2 Symbols. Not applicable.

1.3 Applicability. Wiper washer arms, blades, and modules.

1.4 Remarks. All materials pertaining to meeting this standard shall be specified on the part drawing and/or in the math data file based on GM engineering standards.

1.4.1 Plastic Parts. All exterior plastic parts must comply with GMW14650.

1.4.2 Paint on Plastics. All exterior painted plastic parts must comply with GMW14797.

2 References

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

2.1 External Standards/Specifications.

ISO 2813	ISO 4892-2	SAE J1545
ISO 4892-1	ISO 7724-1	SAE J2527

2.2 GM Standards/Specifications.

9985670	GMW3221	GMW14700	GMW14872
B 040 1370	GMW3286	GMW14701	GMW14873
GMW3005	GMW14124	GMW14729	GMW15282
GMW3008	GMW14270	GMW14797	GMW15357
GMW3011	GMW14650	GMW14829	GMW15545
GMW3059	GMW14665	GMW14865	

2.3 Additional References.

- Safety and Industrial Hygiene (S&IH) Technical Standard (TS), S&IH TS 3.4-160-02
- Wiper Subsystem Technical Specification (SSTS).

3 Requirements

3.1 Requirements on Test Specimens.

3.1.1 All substrates and coatings, including adhesion promoters, shall be Chrome VI free.

3.1.2 Sample Conditioning. All samples are to be conditioned prior to each requirement test to GMW3221, Code A.

3.1.3 Panel or Part Preparation. Prior to start of panel or part preparation, contact the responsible GM engineer to ensure proper selection and agreement of substrates, pre-treatment, electrodeposition, primer, and/or primer surfacer materials. Unless otherwise specified, all coating layers will be applied at minimum dry film thickness (DFT) and cured at target bakes.

3.2 Paint Durability and Appearance Requirements for Coated Arms and Blades. Topcoat materials qualified to this standard must meet specific performance requirements as listed in this standard. Paint performance for this standard is taken from and referenced in GMW3005, Type B, Class 2. Only the sections

specifically called out herein are required. The topcoat may also be a low-gloss monocoat system. No hand polishing will be used for low-gloss, ≤ 60 gloss systems. Unless otherwise specified, a minimum of six (6) wiper arms and blades are to be tested per design. At the discretion of GM Engineering, plaques or surrogate parts may be tested/weathered instead of the actual production parts. If allowed, processed plaques or surrogate parts must emulate the processing of the intended production parts.

3.2.1 Dry Film Thickness.

3.2.1.1 Pre-treatment/E-Coat. Pre-treatments, E-Coat, or anodized material specifications and minimum dry film builds shall be called out separately on the GM part drawing.

3.2.1.2 Topcoat. The minimum topcoat dry film build for all surfaces of parts shall meet the minimum DFT as specified in the approved GM specification or by the appropriate GM Engineering group. The minimum DFT shall be called out on the GM part drawing.

3.2.2 Test/Part Substrates. All test/part substrates must be phosphated per a GMW3011 approved phosphate system and E-Coated with an approved GMW3008 electrodeposition primer or anodized per GMW14665 Functional Exterior Transparent unsealed (FETu) prior to topcoat/monocoat application.

3.2.3 Ultraviolet (UV)/Visible Transmission through Cured Paint Film (GMW15545). Panels must be prepared per the conditions at minimum topcoat/monocoat film build and a high bake condition to be determined at the time of test and agreed to by GM Engineering. The target/nominal bake will be used to establish the high bake condition. Report data as specified in GMW15545 for topcoats or monocoats at each bake condition. Requirements are as specified:

- a. ≤ 0.1 transmission from 290 nm to 360 nm, and
- b. ≤ 0.5 transmission at 400 nm.

Refer to GMW3005 for further definition.

3.2.4 Tape Adhesion Test for Paint Finishes (GMW14829). Adhesion testing shall be conducted in a minimum of three (3) separate areas. Evaluate the results using the Crosshatch Classification/Rating Scale. A maximum rating of 1 is required after the following environments:

3.2.4.1 Initial.

3.2.4.2 High Humidity Test (GMW14729, Options A or B). Parts and plaques will be used as required and agreed to by GM Engineering. Expose test samples for 240 h. Adhesion shall be conducted in three (3) separate areas on the panel or part. In addition to tape adhesion, there shall be no blistering or discoloration.

3.2.4.3 Automotive Environmental Cycles (GMW14124, Cycle A). Parts and plaques will be used as required and agreed to by GM Engineering. Unless otherwise stated, run 15 cycles, Cycle A. Adhesion (GMW14829) must be run after humidity every five (5) cycles. No cracking or adhesion loss required when tested per GMW14829.

3.2.4.4 Accelerated Weathering (SAE J2527 or ISO 4892-1, ISO 4892-2). Testing must be completed using a control retain. Exposure to SAE J2527 or ISO 4892-1 and ISO 4892-2 must be followed by 96 h humidity per GMW14729, Options A or B, prior to tape adhesion. Painted test panels or parts may be used for exposure at the discretion and approval of GM Engineering. Evaluate test samples at mid- and full-cycle exposure. No cracking or adhesion loss is allowed with minimum 70% gloss retention.

3.2.4.4.1 SAE J2527. Exposure required: 3500 kJ/m².

Note: Wiper blades with non-replaceable elements using this protocol shall meet all requirements herein with exception of accelerated weathering exposure to 1264 kJ/m².

3.2.4.4.2 ISO 4892-1, ISO 4892-2. Exposure required: 4200 kJ/m². Use parameters as follows:

3.2.4.4.2.1 Inner and outer filter: Borosilicate.

3.2.4.4.2.2 Radiant exposure: 0.50 W/m² at 340 nm.

3.2.4.4.2.3 Test program Cam No. 7:

- 102 minutes $\pm$ 0.5 minutes light only
- 18 minutes $\pm$ 0.5 minutes light and spray

3.2.4.4.2.4 Black-standard temperature: +80 °C $\pm$ 3 °C.

Note: Wiper blades with non-replaceable elements using this protocol shall meet all requirements herein with the exception of accelerated weathering exposure to 1500 kJ/m².

3.2.4.4.3 Gloss. Measure initial and exposed gloss per ISO 2813. Report test methods, measurement angles and test equipment used. Wash weathered specimens prior to making measurements and observations. Wash with scrubbing action, using a clean sponge or low-lint paint shop quality rag saturated with deionized water at $23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ for no more than 1 minute. Seventy percent (70%) retention is required after exposure and wash.

3.2.4.4.4 Color. Inspect mid- and full-exposed test samples for gloss or color change. Wash weathered specimens prior to making measurements and observations. Wash with scrubbing action, using a sponge that is saturated with deionized water at $23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$. Exposed parts shall not exhibit any indications of blistering or other factors that might affect the function or appearance of the part. The color change shall not exceed three (3) units (ΔE of ≤ 3.0).

The color change shall be measured per ISO 7724-1 or SAE J1545 (CIELAB color space, 10 degree observer, metering orifice $\leq 10\text{ mm}$, illuminant D65, specular component included).

Note: Visual color change that is considered objectionable shall override the ΔE measurement. Part must not exhibit objectionable color change.

3.2.4.5 Natural, Outdoor Weathering of Automotive Exterior Materials for 3, 6, 12 and 24 Months (GMW14873, Procedure 1). Technologies must have a minimum of 24 months exposure on the exact coating system to be considered for approval to this requirement. Natural weathering exposure performance takes precedence over accelerated weathering tests. Painted test panels or parts may be used for outdoor weathering exposure at the discretion and approval of GM Engineering. A minimum of two (2) panels/parts, one (1) for appearance and one (1) for adhesion testing, shall be sent out for each of the exposure durations. Exposed test samples must meet the adhesion, color and gloss requirements as called out in 3.2.4.4.

3.2.4.6 Stone Impact Resistance of Coatings (GMW14700). Run either Methods A or B for low temperature resistance and Method C, room temperature, of stone impact resistance per GMW14700. A minimum rating of 8 is required.

3.2.4.7 Determination of Scratch Resistance of Organic Coatings - Simulation of Car Wash Installations (GMW14865). Compare to a control material; there should be no objectionable change.

3.2.4.8 Resistance of Coatings to Chemical Etching and Distortion (GMW14701, Methods 1 or 2). A rating of 8 or greater is required.

3.2.4.8.1 GMW14701 Deviations.

3.2.4.8.1.1 Washer Fluid Resistance. Substitute the following listed solutions for washer fluid resistance in GMW14701. All ratios are in volume/volume (V/V) concentrations.

- 40% Methanol with 60% water per 9985670.
- 30% Isopropanol (IPA) with 70% deionized water per B 040 1370.
- 40% Ethanol:60% water or 50% Ethanol:50% water. See the regionally responsible GM Engineering Group for required ratio.

3.2.4.8.1.2 Motor oil, brake fluid, polyalkylene glycol oil, engine coolant, and fuel oil soot are excluded from this requirement.

3.2.4.8.1.3 Use the acid rain mixture of pH 3 only with a 4 h exposure duration.

3.2.4.8.1.4 Use the sulfuric acid solution of pH 2 only with 2 h exposure duration.

3.2.4.8.1.5 Expose samples to Basic Solution for 8 h duration.

Note: Use plant-specific materials in addition to the materials called out in GMW14701 if there is a target plant.

3.3 Corrosion Requirements.

3.3.1 Cosmetic Corrosion.

3.3.1.1 Coated Arms and Blades.

3.3.1.1.1 Cyclic Corrosion Test (GMW14872, Exterior (EXT), Method 1/2, Exposure C). A minimum of three (3) wiper arms and blades per design are to be subjected in in-vehicle position. Unless otherwise specified, scribe test samples in a minimum of two (2) locations per GMW15282. Determine total scribe creepback per GMW15282, Option A or Option B. Creepback shall not exceed 3 mm total for all substrates. Additionally, in other than scribed areas, the part(s) must demonstrate a minimum cosmetic corrosion rating of 9 per GMW15357.

3.3.1.1.2 Salt Spray Fog Test (GMW3286). Salt spray fog testing for painted metal arms and blades shall be conducted for 336 h according to GMW3286. No corrosion (except along scribe lines), blisters or any change of