



Electrodeposition Primer for Purchased Parts

1 Scope

This specification details the general materials performance, compatibility, and processing requirements for approval of electrodeposition (ELPO, E-Coat (electrocoat)) primers for purchased parts.

1.1 Material Description. The coating material described in this specification is an organic coating applied electrically over steel and aluminum. It is often referred to as: Electrophoretic coating, E-Coat, and electrocoat.

1.2 Symbols. Not applicable.

1.3 Applicability. This specification covers parts that are ELPO coated outside of GM, including those parts that may receive subsequent topcoats. Parts must be cleaned and receive a pretreatment using approved materials. Processing parameters should conform to those recommended by the chemical suppliers. De-ionized or reverse osmosis water rinses must be included and properly maintained in order to meet the processing performance requirements of this specification. These primers are intended to provide corrosion and chip resistance and may or may not be intended for subsequent coating for appearance purposes. These coatings must perform over bare Cold Rolled Steel (CRS), Galvanized steel, and Aluminum substrates (Al).

1.4 Remarks. Not applicable.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW2	GMW14700	GMW15192	GMW16823
GMW8	GMW14729	GMW15282	GMW17199
GMW3059	GMW14829	GMW15287	GMW17218
GMW14270	GMW14872	GMW16656	GMW17405

2.3 Additional References. Not applicable.

3 Requirements

3.1 Requirements on Delivery.

3.1.1 Chemical Requirements.

3.1.1.1 Chemical Fingerprint. GM may conduct Infrared (IR) spectrophotometry analysis of the materials supplied to this specification. Analysis may also be performed on ELPO that is removed from representative panels with film thickness and bake at target levels. The infrared spectra established for initial approval shall constitute a reference standard. If a product change is proposed which is outside the technology formulation limits, the responsible engineer must be notified.

3.1.1.2 Delivery Documentation. The supplier shall be responsible for submitting a certificate of analysis with each batch of material. This document shall be prepared and provide data in accordance with the requirements detailed in GMW17405.

3.1.2 Additional Requirements.

3.1.2.1 Panel Preparation. The specific number and substrate combinations to be evaluated are shown in Table A1. Test panels are to meet a profilometer Ra roughness per GMW16823 Table 2. Initial test panel substrate roughness must be recorded prior to any coating applications.

3.1.3.2 Test Substrates. Table A2 outlines which substrate types are to be used and the durability requirements for each test. The required test panels must meet the designations in Table 1.

Table 1: Test Panel Designations

Type	Specification
CRS	GMW2
Gal. STEEL	GMW8
Al	GMW15192 (X611 or AA6016) or AA6061

Note: AA = Aluminum Company of America, Gal. = Galvanized

Other aluminum alloys may be requested for testing as new lightweight alloys are developed.

3.1.3.3 Sample Size. Three (3) test panels are to be used for each test condition, however the responsible engineer and the supplier may agree on a different number for specific tests prior to the initiation of generic approval work. All substrates, pre-treatments and coating layers shall be fully identified with source, product code, batch number, bake description and film build. Common test panel dimensions are 200 mm × 100 mm.

3.1.3.4 Bake. The bake temperature and time ranges (minimum/maximum) and targets shall be recommended by the supplier and be provided on a time/temperature graph.

3.1.3.5 Conditioning. When testing is to take place over fully layered panels, the samples shall be subject to an aging period of at least 72 h at room temperature following the bake cycle.

3.1.3.6 Storage Requirements. The materials approved to this specification must be stable after storage under the following conditions:

- Resin: 180 days at +5 °C to +35 °C
- Paste: 90 days at +5 °C to +35 °C, as defined by the ability to pass all initial test requirements in the application facility

3.2 Processing Requirements.

3.2.1 Chemical Requirements.

3.2.1.1 Bath Performance. The system being tested shall be identical to the intended production system and processing.

3.2.2 Physical Requirements.

3.2.2.1 Appearance. The coating on samples shall be smooth, uniform, and free of sags, craters, or other surface defects.

3.2.2.2 ELPO Film Smoothness. Profilometer Ra values on properly baked ELPO panels must achieve the following:

- Vertical surfaces: 0.36 µm (14 µin) maximum
- Horizontal surfaces: 0.41 µm(16 µin) maximum

3.2.2.3 ELPO Film Thickness. The required thickness range should be called out on the appropriate engineering part drawing. However, if it is not, refer to Table 2.

Table 2: Film Thickness Requirements

Application	Film Thickness (microns)
Interior and Lower Performance Area	Target: 15, Minimum: 10
Exterior	Target: 20, Minimum: 15

Exterior Body Panel	Target: 20, Minimum: 17.5, Maximum: 30
Interior Cavities	Minimum: 10

3.2.2.4 Throw Power. Throw power characteristics are to be assessed using a four (4)-panel box test. Panel faces A thru H must be evaluated and reported. Throw power must be equal to or better than the current control but $\geq 9 \mu\text{m}$ on the G face for traditional and Hyper-throw ELPO materials. The A face must target $17.5 \mu\text{m}$ for traditional ELPO, and $15 \mu\text{m}$ for Hyper-throw products. Box test details are shown in Appendix B, Figures B1 thru B4.

3.2.3.5 Rupture Voltage; Pre-coated ZnFe Steel or CRS. Rupture characteristics must be evaluated and recorded at the following voltages: Fresh material or non-purged - 150V, 200V, 250V, 275V, 300V, 325V, 350V, 375V and 400V at a bath temperature of 33°C (92°F), using a 5 s ramp time and a 60 s hold time. The test rating shall be based on profilometer and percent of panel ruptured and equivalent to or exceed that of the controls. Testing is to be performed per the ELPO supplier's panel coating protocol.

3.2.3.6 Edge Coverage. This testing is to be performed at the discretion of the responsible engineer. When required, test per GMW17218. Performance requirements are shown in Table A2.

3.3 Performance Requirements.

3.3.1 Chemical Requirements.

3.3.1.1 Lubricant Compatibility. Compatibility testing is to be performed per GMW16656. Reference oil RP-4107-S from Fuchs is to be used.

3.3.1.2 Fume Yellowing. The degree of topcoat yellowing resulting from the cathodic E-Coat after baking is to be determined per GMW17199. Use an electric or indirect-fired oven for this purpose. The resulting yellowing exhibited on the panel shall not exceed that of the control electrocoat. (Baseline data is to be acquired for quantitative comparison.)

3.3.2 Mechanical Requirements. Not applicable.

3.3.3 Physical Requirements.

3.3.3.1 Chip Resistance. Two (2) chip-resistance methods are to be performed. Low-temperature Method A or Method B is acceptable. Room-temperature testing per GMW14700 Method C is also required. The results must meet the specified requirements shown in Table A2 and be at least equivalent to the control.

3.3.3.2 Accelerated Corrosion Testing. GM laboratory cosmetic corrosion testing is required. All test cycles must achieve the equivalent of 5 years cosmetic corrosion exposure minimum. Creep is to be evaluated using GMW15282 (maximum peak to maximum peak). Lab testing is per GMW14872, EXT, Exposure C.

4 Manufacturing Process

4.1 Immersion. ELPO materials are electrically applied while immersed in a bath that has the correct proportion of pigment, resin and additives to meet the application requirements.

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.