



Performance Requirements for Paints on Underhood Plastic Substrates

1 Scope

1.1 Material Description. This specification supercedes all prior regional specifications for interior paint performance for the General Motors Company and encompasses interior physical, environmental and chemical durability requirements for all underhood paints on plastic substrates. These paint systems can be metallic or non-metallic colors in both hard and soft haptic technologies. Paints covered by this specification can be applied to plastic substrates, flexible substrates, rigid substrates or integral skin foam systems.

The extended durability testing in this specification is required for corporate approval of all new underhood paints. The requirements listed in this specification must be met by all paint systems used in GM vehicle engine compartments. This specification will be used to generically qualify red and blue colored paints for global paint technology approval. When a paint system is generically approved on a specific plastic, the paint system will then be approved to the appropriate interior paint specification and entered into MATSPC. Once MATSPC approval is granted to a new paint system on a given class of plastics, specific color approval and Approval Paint on Plastic Systems (APOPS) testing (reference GMW14797 for interior trim components), will be required to complete the approval on that part. The approved paint system will then be entered into the APOPS database or documented through written approval from the responsible GM Materials Engineering department. The test requirements for APOPS testing will be found in Table A3 and Table A10 of GMW14797.

Note: In the case where parts are fabricated from pre-painted material, the paint film shall be capable of withstanding all the necessary fabrication processes, including forming stresses and temperatures, in addition to specified requirements as detailed in this specification.

1.2 Symbols. Not applicable.

1.3 Typical Applications. Appearance (Beauty) covers in the engine compartment.

2 References

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

2.1 External Standards/Specifications.

ASTM D3763	ISO 20433	ISO 6603-2
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2.2 GM Standards/Specifications.

GMW3059	GMW3221	GMW14729	GMW14829
GMW3205	GMW14444	GMW14797	GMW17013
GMW3208	GMW14698		

2.3 Additional References.

TMC003 Material Safety Data Sheet guidance documents (available at www.gmsupplypower.com).

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221. Straight shade paint system tested on panels must be identical to the production intent paint system including paint manufacturers' recommended film builds. All testing must be done in triplicate on painted red and blue panels at a GLDG gloss (gloss of 2 to 3 at a 60 degree angle) for initial paint technology approval.

Metallic paints must be submitted in bright colors similar to Nova Silver, and paint film must be between 25 μm +5 μm / -2 μm .

3.2. Sample Preparation and Identification. The plastic substrates and paint system shall be identified per 3.2.1 and 3.2.2.

3.2.1 Plastic Substrate.

- Vendor
- Compound number
- Sample plaque thickness in millimeters

3.2.2 Paint System.

- Vendor
- Paint formulation number
- The paint process guidelines of the paint supplier including coating thickness requirements shall be followed

3.3 Conditioning. Painted samples shall be subjected to the following tests after a minimum aging period of 72 h at room temperature following the baking or drying cycle.

3.4 Cure Test. The cloth to be used to perform the cure test shall be a crock cloth per ISO 20433. The solvent used for the cure test shall be 92% minimum ethyl alcohol denatured with 2-butanone. There shall be no paint film degradation after the following test method:

Five back and forth rub strokes, approximately 50 mm in length, as applied with firm finger pressure using a cloth saturated with denatured ethyl alcohol.

Note: There may be some visible transfer of color agents associated with this procedure, but there must not be any film degradation visible when viewed with a 10x magnifying glass.

3.5 As-received Paint Adhesion. Test per GMW14829, Type A, with a minimum of 95%, rating 1, of the paint remaining in the crosshatch area.

3.5.1 Brittleness of the paint film, as evidenced by chipping or flaking while scribing the test lines, shall be cause for rejection.

3.6 Humidity Test (GMW14729). Samples shall be exposed to 144 h of GMW14729, either Option A or B. After the 144 h humidity exposure, the painted samples will be removed from the humidity chamber and blotted dry with an absorbent paper or cloth.

3.6.1 There shall be no evidence of blistering, water spotting or gloss change when examined one minute after removal from the humidity cabinet.

3.6.2 One hour after removal from humidity chamber, the samples shall pass the crosshatch adhesion test GMW14829 with a rating of 1.

3.7 Effects of Underhood Fluids.

3.7.1 Parts in the as-received condition shall be resistant to attack from underhood fluids when tested per GMW17013, Method B, Standard Fluids.

3.7.2 One hour after removal from fluid, the samples shall pass the crosshatch adhesion test per GMW14829 with a rating of 1.

3.8 Oven Aging.

3.8.1 The surface finish must not develop any perceptible color or gloss change, loss of adhesion, distortion or exuding after being subjected to 168 h exposure at 150 °C in an air-circulating oven.

3.8.2 Temperatures of ovens shall not vary more than 2 °C. (Reference part location classification in GMW14444.)

3.8.3 Painted samples subjected to oven aging shall withstand the adhesion tests per GMW14829 after a 24 h humidity exposure per 3.6. Recovery period of 1 h should be allowed between removal from the oven and exposure in the humidity chamber. A rating of 1 per GMW14829, Type A, is the requirement.

3.9 Multi-axial Instrumented Impact Testing. Testing must be carried out according to ASTM D3763 and ISO 6603-2. The results according to ASTM D3763 are for approval and according to ISO 6603-2 for information. The results of both tests must be submitted. Test five painted and five unpainted control plaques at a temperature of -30 °C. (For the ASTM test, use an impact speed of 6.6 m/s. For the ISO test, use impact speed of 4.4 m/s, a 20 mm diameter impact probe, and a 40 mm diameter clamp.) Impact the samples on unpainted surface. Determine impact energy for each sample as the total area under the curve to the point of