



Decorative Paint on Stainless Steel

1 Scope

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose/Material Description. This material specification shall be used to qualify paint material systems with excellent adhesion to stainless steel (SS). This includes paints that are transparent or tinted, as well as opaque (non-transparent). This covers liquid monocoat or topcoat (basecoat (BC)/clearcoat (CC)) paint systems. These paint systems can also use primers or other pretreatments to improve adhesion to stainless steel substrates as necessary to meet stated performance requirements. This standard also details the performance requirements for approval of the entire pretreatment, paint, and painting process in the production setting. Table 1 describes paint on stainless steel classifications by type.

Table 1: Paint on Stainless Steel (SS) Classifications

Type	Appearance
A1	Exterior Fully pigmented (opaque ^{Note 1})
A2	Exterior Transparent or translucent (tint coat)
B1	Interior Fully pigmented (opaque ^{Note 1})
B2	Interior Transparent or translucent (tint coat)

Note 1: Opaque colors are identified as colors that do not get any of their hue/brightness from the base substrate, getting their color solely from the paint.

1.2 Symbols. Not applicable.

1.3 Applicability. This type of coating is used to enhance the appearance of SS. Typical applications include speaker grills, greenhouse moldings, exterior trim parts, grilles and door handles. This specification does not apply to exhaust components or exhaust tips (reference GMW15196 for these commodities).

1.4 Remarks. Each combination of specific stainless steel grade, pretreatment, and paint must be tested and approved to this specification as a system. The individual components are not interchangeable. Each applicator, (paint line) must also be qualified for each paint system. In addition, the paint system is part of the total painted product system and must meet qualifications set forth in this specification and those shown on engineering drawings.

2 References

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

2.1 External Standards/Specifications.

ASTM D7869	ISO 2178	ISO 17025	SAE J2527
ISO 105-A02	ISO 2808	ISO 20433	

2.2 GM Standards/Specifications.

GMW3005	GMW14333	GMW14729	GMW15777
GMW3059	GMW14334	GMW14829	GMW15891
GMW3208	GMW14445	GMW14865	GMW15919
GMW3221	GMW14668	GMW14872	GMW16745
GMW3417	GMW14669	GMW14873	GMW16847
GMW6992	GMW14698	GMW15356	GMW16853
GMW14124	GMW14700	GMW15357	
GMW14162	GMW14701	GMW15359	
GMW14270	GMW14704	GMW15614	

2.3 Additional References.

- CG6346 - Painted Metallic Add-on Parts Process Documentation Form

3 Requirements**3.1 Requirements on Test Specimens.**

3.1.1 Sample Conditioning. All samples are to be conditioned prior to each requirement test as specified in GMW3221, Code D.

3.1.1.1 Test Samples. Any final submission parts or plaques for approval of paint on stainless steel will be prepared using base materials that meet applicable GM standards. Effort should be made to select parts that are consistent with the size and complexity of parts that will be manufactured for GM. Sample painting shall be in a manner consistent with production intent processes. No laboratory or pilot-painted samples will be accepted for approval.

3.1.1.2 Surface Preparation. Stainless steel (SS) is a particularly difficult surface to adhere to because it readily forms a passive oxide layer that adversely affects paint adhesion. Paints can be formulated specifically to adhere to stainless steel, or pretreatment methods can be used to counteract the oxide layer. Any pretreatment processes, or primers used to prepare the substrate for painting must be documented using Appendix C, Data Sheet C1 and approved by GM Materials Engineering. Topcoat, monocoat or powder coat processes must also be approved and documented per Appendix C. The surface must be free of any dirt, oil, or other foreign matter prior to painting. Any deviations to the sample preparation and application methods used for initial approval must be approved by GM Materials Engineering and noted per Appendix C and final approval as meeting the requirements of this specification. Additionally, final certified submission approval data shall include any agreed upon deviations for time lapse between pretreatment and painting or other circumstances noted. Any loss of adhesion or other properties associated to the metallic surface in accelerated testing associated to any field warranty issue will be considered a violation to the requirements of this specification.

3.1.2 Paint Thickness. Topcoats must meet all specified appearance and durability requirements at a minimum film of 25 µm (1.0 mil) for exterior applications. Film build for shall be "report only" for interior. Individual BC colors or monocoats may have higher minimum film builds than the technology minimum, due to hiding, color match capability, ultraviolet opacity, or other performance characteristics. The acceptable range for specific colors will be established during color approval (see Appendix A, Table A1 and Appendix B, Table B1).

3.1.3 Appearance Criteria.

3.1.3.1 Appearance for visual approvals for color, pattern, aesthetics, and other related qualities shall be approved by the appropriate Design Appearance Quality department as an acceptable match to the standard when viewed under the conditions set forth in GMW6992.

3.1.3.2 Visual approvals for limited and final approved trim transmittals are controlled by GM Global Design Quality. For new part launch approvals, an Appearance Approval Report (AAR) from the Design Quality Launch Lead is also required.

3.1.3.3 Appearance boundary determinations must be established for each new part per GMW6992.

3.1.3.4 Final determination of visual acceptance is always determined through the guidelines set forth by GM Global Design Quality. Contact GM Global Design Quality for additional information. However, if no other

direction is given by Design Appearance Quality (DAQ), appearance requirements for all visible surface shall default to those listed in GMW15777, Zone A.

3.1.3.5 Visual evaluation of the tested part by the responsible GM Appearance Engineer shall override measured values in the case of disagreement.

3.1.3.6 Visual evaluations for color and other appearance criteria of parts is required to initiate any applicator approval. A limited approval for can be granted based upon surrogate parts of lesser complexity than the intended application types. Final approval is based upon submission of parts to the anticipated part types and complexity for the applicator. For tint coat applications, due to the metallic surface under tint coated parts, defects such as dirt, color gradients and orange peel in the painted surface are significantly magnified and are considered relevant in the final appearance quality determinations.

3.1.4 Bake. For GM approved paint systems, all bakes must comply with the GM approved cure latitude chart for each specific paint product. Record and report surface temperature during baking using systems such as a Datapaq system or equivalent.

For new coatings, cure latitude charts must be developed as specified in GMW3005 to define technology limits for each product. Once developed and approved, the bake chart is signed by GM Materials Engineering and is the only acceptable document for defining cure.

It is then the responsibility of the applicator to follow these GM approved cure latitude charts for bake and cure time requirements. The applicator is also responsible for conditioned holding of any parts until acceptable performance has been achieved before shipping.

3.2 Performance Requirements. The following requirements define the process for approval of materials and painting facilities to this specification. For reference, see Appendix A, Figure A1.

3.2.1 Applicator Approval and Performance Requirements. Appendix A, Table A1 (Types A1 and A2) and Appendix B, Table B1 (Types B1 and B2) describe the testing performance data required for any GM approved paint system (or process) for new applicator (paint line) approvals. This data must be provided using an ISO 17025 certified laboratory with full scope for each test described. Prior to commencing testing, the process for new paint applicator and system as detailed in form CG6346 must be provided to and approved by the GM material engineer.

3.2.2 Requirements for New Paint Materials Systems. For new paint systems or technology approvals, additional performance requirements must be met related to the paint system's long-term durability and weatherability. For these new developments, testing on plaques per Appendix A, Table A1 (Types A1 and A2) or Appendix B, Table B1 (Types B1 and B2) is required, A minimum of 1 year of Florida or comparable natural weathering (alternate sites will be judged per GMW16847) is required for full approval. The determination of what weathering will be required for limited initial approval rests with the responsible GM Material Engineer. The full construction for any new paint systems must be provided to the GM material engineer as in CG6346; full and detailed information about the paint system, including but not limited to any required pretreatments or other surface treatment, primers, topcoat, monocoat, BC/CC, or powder coat must be defined.

3.2.2.1 Requirements for Material System with New Pretreatments or Primers. Qualification of new pretreatment or primer materials integral to adhesion with SS. For these materials, testing per Appendix A, Table A1 (Types A1 and A2) or Appendix B, Table B1 (Types B1 and B2) is required for at least two (2) types of SS per GMW15614, one (1) Ferritic (such as SS Type 436M2) and Austenitic (such as SS Type 304). Exceptions must be pre-approved before proceeding with a test plan.

3.2.3 Robustness Requirements. For new applicator (paint line) approvals, part level testing is preferred whenever feasible, but when necessary, plaque data will be accepted if the samples were prepared on the painting line to be considered for usage. Laboratory or pilot prepared samples will not be acceptable for any listings within GM Materials Approve Source List (GMMASL). This enables a determination of the paint system's robustness within the production setting. Part submissions are then required for any limited or final approvals from the applicator (this testing can be used for Validation Test Complete (VTC) requirements, formerly required at Production Part Approval Process (PPAP), if program timing allows). Effort will be made to take plaque data provided into consideration for any limited or final applicator approvals as it pertains to new paint system usage. However, applicator approval will be revoked if the applicator cannot demonstrate capability to meet validation requirements on parts.

3.2.4 Part Performance Requirements for Validation. In order to meet VTC requirements (formerly required at PPAP) on GM production parts at an approved applicator, the supplier shall perform all tests as proscribed in Appendix A, Table A2 (Types A1 and A2) or Appendix B, Table B2 (Types B1 and B2), which lists the VTC testing requirements for all new parts.

3.2.4.1 Gasoline Resistance. The suffix “-GD” shall be used on the paint performance specification when the production part is in a location where gasoline exposure risk is high (i.e., body side moldings or rocker moldings).

3.2.5 Periodic Quality Control Performance Requirements. Whenever GM production parts are made at the applicator, the supplier shall perform all test as proscribed in Appendix A, Table A3 (Types A1 and A2) and Appendix B, Table B3 (Types B1 and B2), which lists the minimum required testing frequency for production parts.

3.2.6 Color Development for Approved Systems. New colors utilizing an approved paint technology must be approved through to requirements on Appendix A, Table A1 (Types A1 and A2) or Appendix B, Table B1 (Types B1 and B2), as applicable, or as directed by GM Materials Engineering. Plaques are required for this level of testing.

3.3 All materials supplied to this standard must comply with GMW3059, Restricted and Reportable Substances. For raw materials, non-dimensional materials (e.g., fluids, greases) and/or bulk materials that require approval into the GM Materials Approved Source List (GMMASL), an International Material Data System (IMDS) submission must be made by the material supplier as a material Material Data Sheet (mMDS). After the mMDS is approved by the GM IMDS team, the materials supplier is to provide a “Header only report” to the responsible GM Materials Engineer. Further guidance can be found in the GM-specific instructions on the IMDS website.

4 Manufacturing Process

Not applicable.

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations.

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 Safety Data Sheets. Safety Data Sheets (SDS) for chemicals supplied to GM for internal production processes, must be submitted to GM Manufacturing in compliance with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements or other country-specific SDS requirements.

6 Approved Sources

Materials supplied to this specification must be approved by GM Materials Engineering.

The appropriate GM Materials Engineering Department (Product Engineering or Manufacturing Engineering) must confirm materials as meeting the requirements of this specification. Only materials/sources listed in the GM Materials Approved Source List under this standard number have been qualified by Engineering as meeting the requirements of this standard. To access this list, reference GMW14270 for latest location.

7 Notes

7.1 Glossary.

Topcoat: A paint system consisting of a basecoat (BC) and a clearcoat (CC).

7.2 Acronyms, Abbreviations, and Symbols.

+	plus
#	number
AAR	Appearance Approval Report
BC	Basecoat
CC	Clearcoat
DAQ	Design Appearance Quality
DRE	Design Responsible Engineer
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
GMMASL	GM Materials Approved Source List
GSSLT	Global Subsystem Leadership Team
HF	High Film Thickness
ID	Identification
IMDS	International Material Data System
LF	High Film Thickness
LLB	Lower Limit Bake (Bake at Highest Time and Temperature)
mMDS	material Material Data Sheet
N/A	Not Applicable
PPAP	Production Part Approval Process
Prep	Preparation
req'd	required
SDS	Safety Data Sheets
sp	sprays (as per usage statement in GMW14872)
Spec	Specification
SS	Stainless Steel
Sys.	System
TB	Target Bake (Bake at Targeted or Recommended Time and Temperature)
tech.	technical
TF	High Film Thickness
ULB	Upper Limit Bake (Bake at Highest Time and Temperature)
Veh	Vehicle
VTC	Validation Test Complete
Y/N	Yes/No

8 Coding System

8.1 This standard shall be referenced in other documents, drawings, etc., as follows:

GMW18365 Type XX-GD

Where:

XX denotes type per Table 1.

Note: The -GD suffix is only required if the part is located where fuel resistance is required, see 3.2.4.1.

9 Release and Revisions

This standard was originated in December 2020. It was first approved by Materials - Finishes and Coatings Global Subsystem Leadership Team (GSSLT) in May 2021. It was first published in May 2021.

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1	MAY 2021	Initial publication.