



Surface Condition Requirements for Steel and Aluminum Sheet

1 Scope

This standard covers the surface condition requirements for uncoated and coated steel sheet, as well as aluminum, which will be cleaned, surface treated, primed and painted. These requirements apply to sheet metals stamped inside GM as well as by its parts and steel suppliers, processing centers and service centers.

The surface conditions covered by this specification include: Oxides, carbon and carbonaceous deposits, roughness, surface treatments such as passivation and conversion coatings and marking.

The intent of this specification is to ensure the surface condition of the metal surface is compatible with subsequent paint processing to provide a high-quality appearance and high durability that meet all of GM's global requirements. Due to the regional nature of manufacturing processes, suppliers must understand the different requirements in each region and must also meet the needs of the region using these materials.

1.1 Material Description. Not applicable.

1.2 Symbols. Not applicable.

1.3 Applicability. Materials covered by this specification include, but are not limited to, steel and aluminum stampings, roll formed parts, tubes, used in body structure, chassis, powertrain, interior and exterior applications where the surface condition is important prior to preparation for application of paints or passivation layers.

1.4 Remarks. None.

2 References

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

2.1 External Standards/Specifications.

EN 10049 SAE J911

2.2 GM Standards/Specifications.

GMW3011 GMW16170 GMW16546 GMW16721
GMW3059

2.3 Additional References.

Safety and Industrial Hygiene (S&IH) Technical Standard (TS), S&IH TS 3.4-160-02

3 Requirements

3.1 Surface Contaminants. Surface contaminants, oxides and carbonaceous deposits that may affect painting or joining are prohibited.

3.1.1 Metallic Oxides. Metallic surfaces shall be free of any oxides or contaminants that may negatively affect material processing, manufacturability or performance. Some examples of commonly found surface oxides and contaminants that are not considered acceptable are shown in Table 1.

Table 1: Surface Oxides and Contaminants for Steel and Aluminum

Substrate	Oxide
Steel	Red Rust Blue Oxidation (heat) Yellow Oxidation (heat) White Oxide (Zinc Oxide) Severe Water Stains
Aluminum	White Oxide (Aluminum Oxide) Severe Water Stains

3.1.2 Surface Carbon (Qualification Testing). Suppliers shall maintain processes such that the following requirements are met. For purposes of this specification, suppliers shall validate to this requirement for initial qualification. In cases where there is a question about carbon based surface contamination, this requirement shall be used as the basis for material evaluation.

The total surface carbon and carbonaceous deposits on coated and uncoated exposed (E) sheet steels shall not exceed 4 mg/m² (milligrams per square meter) for continuously annealed steels and 10 mg/m² for batch annealed steels. Testing shall be performed on samples that have been solvent cleaned to remove all surface oils. The measurement method used shall show acceptable repeatability and reproducibility (R&R) as agreed between supplier and purchaser.

Surface carbon can also affect the performance of paint films on uncoated structural steels in non-visible applications and, as a result, could affect corrosion performance and life expectancy of a part. The performance of structural steels will ultimately be determined by corrosion creep-back of scribed paint panels. Regions may determine based upon their specific materials, cleaning systems, paint processes, and the maximum level of surface carbon that is acceptable.

3.2 Surface Roughness. The arithmetic average surface roughness (Ra) and peak count (RPc) measured on flat, unformed panels, are shown for steel in Table 2 and aluminum in Table 3. Manufacturing locations not listed in the following tables shall use the surface roughness and peaks per centimeter (PCcm) requirements from one of the regions listed in Tables 2 and 3. See Appendix A, Table A1 for discontinued grades.

Table 2: Surface Roughness and Peaks/cm Requirements for Sheet Steel

Surface Type	Surface Roughness (Ra)			
	North America ^{Note 1}	Brazil ^{Note 2}	China ^{Note 1}	Korea ^{Note 1}
Exposed (E)	0.5 µm to 1.3 µm	0.7 µm to 1.5 µm	0.5 µm to 1.3 µm	0.7 µm to 1.3 µm
Temper Passed (T)	0.5 µm to 1.3 µm	0.7 µm to 1.5 µm	0.5 µm to 1.3 µm	0.7 µm to 1.3 µm
Unexposed (U)	Not required	Not required	Not required	Not required

Surface Type	Peak Count (RPc)			
	North America ^{Note 1}	Brazil ^{Note 2}	China ^{Note 1}	Korea ^{Note 1}
Exposed (E)	> 40	> 40	> 40	> 40
Temper Passed (T)	> 40	> 40	> 40	> 40
Unexposed (U)	Not required	Not required	Not required	Not required

Note 1: As measured by SAE J911. Ra and RPc shall be measured using a 0.8 mm filter cutoff with the appropriate traverse length as listed in SAE J911 for the type of instrument used for the measurement. Exposed surfaces (E grade) with a Ra roughness within the identified range are acceptable if the observed RPc exceeds 40 using a 1.25 µm measurement band for determining peaks per centimeter (PCcm).

Note 2: As measured by EN 10049.

Table 3: Surface Roughness and Peaks/cm (PCcm) Requirements for Aluminum Sheet

Surface Type	Surface Roughness ^{Note 1}
E, Electric Discharge Texture (EDT)	0.7 µm to 1.3 µm
E, Mill Finish (MF)	0.3 µm to 0.6 µm
U, EDT	0.7 µm to 1.3 µm
U, MF	0.3 µm to 0.6 µm

Surface Type	Peak Count (RPc) ^{Note 1}
E, EDT	> 40
E, MF	> 40
U, EDT	> 40
U, MF	Not required

Note 1: Aluminum surface roughness may be measured by a non-contact surface metrology system, or a scanning interferometer system, or with a contact profilometer. All parameters, including profile filters should be set up for Application Group 1, as defined in EN 10049.

3.2.1 Exposed (E) surface shall be free from scratches, mill marks, dross, and any other steel making or processing defects detrimental to a Class A finish. This finish is applicable to bare and coated products. Exposed surface shall be processed as the “prime” side only.

3.2.2 Unexposed (U) surface may be bare or coated and is to be used for Class C and/or Class B finishes. Surface defects detrimental to the part (lamination, flaking of zinc, excessive surface carbon, etc.) are not allowed. The maximum spangle size for hot dip free zinc product is 6 mm.

3.2.3 Temper Passed (T) surfaces (steel only) have been temper-passed to impart a minimum surface roughness and to reduce surface defects such as Lüders bands and strain.

3.3 Surface Treatments. The application of most surface treatments, with the exception of; pre-phosphate coatings, nickel flashing, passivation and chromate coatings, are generally not allowed on steel or aluminum surfaces. If a Titanium/Zirconium (Ti/Zr) passivation layer is required for aluminum sheet, the passivation layer composition and coating weight will be determined by GMW16721.

Note: For additional information regarding surface treatments for Brazil, see Deviations.

3.4 Surface Applied Lubricants and Conversion Coatings. Specific Requirements for lubrication, phosphate and thin film treatments required for painting are covered in GMW16546, GMW3011, and GMW16170.

3.5 Marking. If required, marking shall be carried out on the unexposed surface of full finish coils for outer panels and on the outer side of the coils for inner panels. The marking must be agreed upon between the supplier and purchaser. The purchaser must release the marking ink.

3.6 All materials supplied to this standard must comply with GMW3059, Restricted and Reportable Substances, including the requirement to obtain a GM-approved International Material Data System (IMDS) submission.

4 Manufacturing Process

Not applicable.