



Adhesion Requirements for Bonding Exterior Fiber Reinforced and Non-Fiber Reinforced Plastics

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 standard is intended to cover the material and performance requirements of structural adhesive candidates that are used to bond plastic automotive body substrates. These substrates include thermoset Fiber Reinforced Plastics (FRP) such as Sheet Molding Compound (SMC) and Structural Reaction Injection Molded (SRIM), and non-fiber reinforced plastics in structural exterior applications.

1.2 Symbols. Not applicable.

1.3 Applicability. Exterior structural applications of all vehicles.

1.4 Remarks.

1.4.1 It is anticipated that assemblies bonded with these types of adhesives will incorporate a mechanical means of attachment or special fixturing to maintain dimensional accuracy of the assembly until the adhesive has attained enough strength for handling.

1.4.2 It is further anticipated that this specification shall cover “true” structural bonding applications, that is cases where substrates are joined primarily by adhesives and the joint must maintain an acceptable strength level throughout the life of the vehicle.

1.4.3 For bonding performed at a tier supplier, the supplier is responsible for evaluating in-house approved adhesives on production intent substrates for compliance to this specification.

2 References

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

2.1 External Standards/Specifications.

ASTM D570	ASTM D1875	ASTM D3418	ISO 4587
ASTM D1144	ASTM D2369	ASTM D5573	ISO 10365
ASTM D1338	ASTM D3163	ASTM E502	SAE J243

2.2 GM Standards/Specifications.

GMW3059	GMW14124	GMW14729	GMW18173
GMW3221	GMW14270	GMW15288	

2.3 Additional References. Not applicable.

3 Requirements

3.1 Requirements on Test Specimens. Reference GMW3221. All samples are to be conditioned prior to testing to GMW3221, Code A.

3.2 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.

3.3 Physical Properties (Uncured Adhesive System). See Table 1.

Table 1: Materials Properties; Uncured Adhesives ^{Note 1}

Property	Value	Test Method
Color	As specified by the GM approving Materials Engineer. Two (2) component systems shall have contrasting colors	Visual
Moisture Absorption	< 2%	ASTM D570
Solids Content	> 99%	ASTM D2369
Viscosity Initial	Report	25 mm parallel plate rheometer, 15 °C, 0.450 mm gap, 3 s ⁻¹ shear rate, take reading at 180 s
Viscosity Aged 90 d at 35 °C	Report	25 mm parallel plate rheometer, 15 °C, 0.450 mm gap, 3 s ⁻¹ shear rate, take reading at 180 s
Density	Report	ASTM D1875
Flash Point	> 200 °C	ASTM E502
Homogeneity	Material must be homogeneous and free of lumps or air bubbles	Visual
Sag Resistance	< 5 mm	SAE J243, ADS-10
Mix Ratio	Report by weight and by volume	Visual
Working Life	Report	ASTM D1338, Method A, 23 °C, dew point > 10 °C, 10 mm diameter bead
Time to Handling Strength	Report	ASTM D1144, 23 °C
Time to Peak Exotherm	Report	ASTM D3418
Cure Time, 23 °C	Report	ASTM D1144

Note: Each component of a two (2) component adhesive shall meet the requirements in Table 1.

3.4 Requirements (Cured Adhesive System).

3.4.1 Paint Compatibility. The adhesive system must be compatible with the proposed production paint systems and processes.

3.4.2 Process Compatibility. The cured adhesive system must meet all performance criteria specified in this standard after going through the production process for the intended application.

3.5 Lap Shear and Side Impact Samples.

3.5.1 Specimens shall be prepared per ASTM D3163.

Caution: Cure must be compatible with the intended plant cure schedule. This includes initial cure and oven exposures at the sub assembler as well as the GM assembly plant.

3.5.2 A sample set shall consist of a minimum of five (5) specimens.

3.5.3 Lap shear specimens shall be tested per ISO 4587.

3.5.4 Side impact specimens shall be tested per GMW18173.

3.5.5 Failure mode per ISO 10365. All samples must demonstrate cohesive failure within the adhesive or fiber tear of the substrate in all test conditions. Unacceptable failure modes include adhesive failure and delamination failure.