



## **Adhesive Performance Requirements of Bonded FRP and Non-FRP Assemblies**

### **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 specification defines the performance requirements of production parts made by bonding Fiber Reinforced Plastics (FRP) substrates, such as Sheet Molding Compound (SMC), and non-FRP substrates, such as Xenoy, Bexloy or Structural Reaction Injection Molded (SRIM).

**1.2 Symbols.** Not applicable.

**1.3 Applicability.** Requirements apply to all structural plastics and painted metallic substrates.

**1.4 Remarks.** The substrate supplier is responsible for evaluating both in-house applied adhesives (production intent) as well as any adhesives that will be applied to the substrates at a GM assembly facility.

### **2 References**

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

#### **2.1 External Standards/Specifications.**

ISO 10365

#### **2.2 GM Standards/Specifications.**

|          |          |          |          |
|----------|----------|----------|----------|
| GMW3059  | GMW14270 | GMW15921 | GMW16966 |
| GMW3221  | GMW14444 | GMW16853 |          |
| GMW14124 | GMW15625 | GMW16940 |          |

### **3 Requirements**

**3.1 Requirements on Test Specimens.** Reference GMW3221.

**3.1.1 Sample Conditioning.** All samples are to be conditioned per GMW3221, Code A, prior to each requirement test per 3.11, 110 °C test temperature is required for non-FRP samples only.

**3.1.2 Surface Preparation.** All bond surfaces must be free of in-mold coatings, paint primer, mold release, or other contaminants. Adhesive primers shall be applied using production intent parameters.

**3.1.3 Adhesion Requirements.** Adhesive must satisfy the requirements of GMW15921 on production intent substrates and cured using production intent curing parameters.

**3.1.3.1** The adhesive bonding process shall be documented on the Adhesive Bonding Process Sheet per in GMW15625.

**3.1.3.2 Bond-line Dimensions.** For FRP substrates, bond line acceptance criteria per GMW16940.

**3.1.3.3 Bond-line Read Through.** No visible bond-line read through is acceptable.

**3.2 Emissions Testing of Interior Materials and Parts.** For all Code E designated parts per GMW14444, reference GMW16853 for emissions testing of interior materials and parts.

**3.3** 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.

**3.4 Destructive Crowbar Test per GMW16966.** Adhesive testing of an assembled part shall yield the following, when tested per the environments in Table 1:

- No more than 50 mm in 250 mm of continuous bond-line shall yield an unacceptable separation mode.
- Voids or unintentional skips in the bond-line as shown on the part drawing are unacceptable
- The separation mode is evaluated per ISO 10365
- Unacceptable separation modes include:
  - Adhesive Separation
  - Delamination
  - Substrate break outside of the bond area
- Calculate the percentage of each separation mode as follows, e.g.:

$$\text{Percent Cohesive Separation} = \frac{\text{Area of Cohesive Separation}}{\text{Area of Design Bondline}} \times 100$$

A minimum of three (3) samples shall be tested per environment. The sample can be a full part or sections cut from a full part. Contact GM Materials Engineering for authorization to use sections cut from an assembly.

**Table 1: Test Environments**

| Environment                  | Notes                                                                             |
|------------------------------|-----------------------------------------------------------------------------------|
| 23 °C, 50% Relative Humidity | Condition the sample at ambient conditions for 48 h prior to test                 |
| -30 °C                       | Equilibrate the sample at temperature for 4 h, test at temperature                |
| 82 °C                        | Equilibrate the sample at temperature for 4 h, test at temperature                |
| Water Soak - Wet             | 168 h immersed in water at 55 °C, test within 1 h after removal from environment. |
| GMW14124, Cycle G, 30 Cycles | Samples without metallic substrates may omit the salt spray step                  |

## 4 Manufacturing Process

Not applicable.

## 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.