

**ADHESIVE, TWO-PART, URETHANE, FRP-SMC, MIXTURE****9982247**

**1 SCOPE.** This specification covers the mixture of a two-part adhesive for primerless bonding of fiber reinforced plastic panels (FRP or SMC) to FRP, primed steel or primed aluminum.

1.1 The adhesive system is comprised of a resin component 9986073 and hardener component 9982246. The mixture of 9986073 and 9982246 is identified as 9982247.

1.2 This system must be capable of being metered, mixed and dispensed with current production equipment. It shall be compatible with production systems, including paint, and cannot be adversely affected by paint oven temperatures reaching 130°C.

1.3 KEY WORDS: Adhesive, two-part, urethane, SMC.

**2 REFERENCED STANDARDS.**

|         |            |            |
|---------|------------|------------|
| GM1000M | ASTM D570  | ASTM D3418 |
| GM3629M | ASTM D638  | ASTM D4065 |
| GM3653M | ASTM D790  | ASTM D4092 |
| GM9305P | ASTM D792  | ASTM D4339 |
| GM9828P | ASTM D1144 | ASTM E831  |
| 9982246 | ASTM D1338 | SAE J243   |
| 9986073 | ASTM D2240 |            |

**3 REQUIREMENTS.**

3.1 RESTRICTED AND REPORTABLE CHEMICALS (GM1000M). All materials supplied to this specification must comply with the requirements listed in GM1000M, "Restricted and Reportable Chemicals."

3.2 TOXICITY. The adhesive must not have any adverse effects on personnel handling it. In addition, the material must have full approval of the appropriate medical department prior to production use.

3.3 MIXED ADHESIVE. Material conditioned using potential storage conditions must be capable of passing all the requirements of this specification.

3.4 MIX RATIO. The ratio of PART A to PART B is 4.44 to 1.0 by volume (4.58 to 1.0 by weight) and shall be capable of being varied  $\pm 5\%$  and meet all the requirements of this specification.

3.5 COLOR. The 2 components shall be in contrasting colors. The colors shall be so picked, that, in instances of improper mixing, color striations shall be visible in the dispensed bead.

3.6 NONSMOKING (GM9828P). The adhesive shall not smoke up to 177°C and shall not be classified greater than a slight smoker at 200°C.

3.7 MATERIAL PROPERTIES - UNCURED ADHESIVE. See Table 1.

**TABLE 1**

| Properties                                                  | Values                                                                           | Test Methods                                         |
|-------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------|
| Odor                                                        | The material shall not have a noxious odor in either cured or uncured condition. | ASTM D4339                                           |
| Homogeneity                                                 | Material must be homogeneous and free of lumps or air bubbles.                   |                                                      |
| Sag Resistance                                              | 2 mm                                                                             | SAE J243, ADS-10, °C                                 |
| Working Life                                                | 2 - 3 1/2 minutes, min                                                           | ASTM D1338, A, 23°C, dew point >10°C, 10 mm dia bead |
| Moisture Resistance (Working Life at dew points up to 26°C) | 2 - 3 1/2 minutes                                                                | ASTM D1338                                           |
| Time to Handling Strength                                   | 8 - 11 minutes                                                                   | ASTM D1144, 23°C                                     |
| Time to Peak Exotherm                                       | N/A                                                                              | DSC Method                                           |
| Cure Time, 120°C                                            | 1.5 - 2 minutes                                                                  | ASTM D1144                                           |
| VOC                                                         | 0%                                                                               |                                                      |

3.8 MATERIAL PROPERTIES - CURED ADHESIVE  
See Table 2.

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TABLE 2

| Properties                       | Values                               | Test Methods         |
|----------------------------------|--------------------------------------|----------------------|
| Density                          | 1.22 kg/L                            | ASTM D792, ADS-10, C |
| Hardness                         | Shore D: 70 nominal                  | ASTM D2240, A        |
| Glass Transition*                | -52°C                                | ASTM D3418           |
| Coefficient of Thermal Expansion | 179µm/m/°C                           | ASTM E831            |
| Moisture Absorption              | <1%                                  | ASTM D570            |
| Elongation                       | 34%                                  | ASTM D638            |
| Tensile Strength*                | 20 500 kPa nominal                   | ASTM D638            |
| Flexural Strength                | 24 814 kPa nominal                   | ASTM D790            |
| Flexural Modulus                 | 1175 kPa nominal                     | ASTM D790            |
| Poisson's Ratio                  | 0.32 nominal                         | ASTM D638            |
| Young's Modulus                  | 432 003 kPa nominal                  | ASTM D638            |
| Bondline Readthrough             | No unacceptable bondline readthrough |                      |
| Shrinkage                        | < 1%                                 |                      |
| Fogging                          |                                      | GM9305P              |
| Shear Modulus                    | 215 747 kPa nominal                  | ASTM D4065ASTM D4092 |

**4 ADHESIVE PROPERTIES.** Test specimens, prepared as specified in the designated procedures, must meet the requirements of the following specifications.

4.1 (GM3629M). ADHESION PERFORMANCE REQUIREMENTS FOR BONDING EXTERIOR SHEET MOLDING COMPOUNDS (SMC).

4.1.1 Sample preparation. See GM3653M for procedure.

4.2 This procedure must be repeated for each bonding system under consideration for the application.

**5 OTHER TESTS MAY BE REQUIRED TO VALIDATE THE SPECIFIC APPLICATION.**

**6 INITIAL SOURCE APPROVAL.** No shipment shall be made by any supplier until a submission of representative initial production samples have been approved by engineering has been approved as meeting the requirements of this specification.

6.1 Completed copies of the Material Safety Data Sheet meeting GM information requirements must be submitted with

any new submissions or whenever a composition change has occurred.

**7 INSPECTION AND REJECTION.** All shipments of material or parts under contract or purchase order manufactured to this specification shall be equivalent in every respect to the initial samples approved by the purchaser. There shall be no changes in either formulation or manufacturing processes permitted without prior notification and approval by the purchaser. Lack of notification by the supplier constitutes grounds for rejection of any shipment. While samples may be taken from incoming shipments and checked for conformance to this specification, the supplier shall accept the responsibility for incoming shipments meeting this specification without dependence upon purchaser's inspection.

**8 APPROVED SOURCES.** Engineering qualification of an approved source is required for this specification. Only sources listed in the GM Corporate Materials File under this specification number have been qualified by the control division as meeting the requirements of this specification. Sources are available through the on-line MATSPC System.

**9 GENERAL INFORMATION.** This standard was originated by MCD in November 1996.