



SURFACE VEHICLE RECOMMENDED PRACTICE

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Overlap Shear Test for Sealant Adhesive Bonding of Automotive
Glass Encapsulating Material to Body Opening

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Foreword—This Document has not changed other than to put it into the new SAE Technical Standards Board Format.

1. **Scope**—This recommended practice defines a procedure for the construction of a lap shear specimen for the purpose of testing the bondability of an automotive sealant adhesive to the elastomeric material used in automotive encapsulating.

The present practice of encapsulating automotive glass is described as molding elastomeric material onto the outer edge of the glass using thermoplastic or thermosetting material that quickly sets in the mold. The glass is removed from the mold with cured elastomeric material bonded to the perimeter of the glass. This encapsulated glass module can now be bonded with a sealant adhesive into the body opening of a vehicle.

2. References

- 2.1 **Applicable Publication**—The following publication forms a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 ASTM PUBLICATION—Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 1002—Test Method for Strength Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)

3. Test Substrates

- 3.1 **Substrates**—The substrates used for the construction of the lap shear specimen should be coupons made from automotive sheet metal or any other rigid substrate such as plastic composites used in automotive. The other coupon should be made from elastomeric material used in automotive glass encapsulation.
- 3.2 **Dimensions**—The metal test substrate and metal support substrate shall be cut into coupons 25.4 x 102.0 mm (1.0 x 4.0 in) at a nominal thickness of 0.8 mm (0.032 in). The elastomeric material shall be cut from molded sheets into 25.4 x 102.0 mm (1.0 x 4.0 in) coupons at a nominal thickness of 3.2 mm (0.125 in). All test coupons shall be free of flaws such as nicks and splinters that could give erroneous test results.
- 3.3 **Surface Coatings**—The coating used for painting the metal or any other rigid substrate shall be recommended by automotive engineers.

3.4 Surface Preparation—Surface preparation with respect to cleaning and primer application should be in accordance with sealant adhesive suppliers, or automotive engineers recommendation.

4. Preparation of Test Joints

4.1 The final joint geometry is as shown in Figure 1 with tolerance specified under 4.3.

The lap shear specimen should be constructed without the metal backing as illustrated in Figure 2. The metal support should be bonded onto the back of the elastomeric coupon just prior to testing. The adhesive should be of suitable type to have good bondability to the metal and elastomeric coupon in order to minimize stretching or premature ripping of the elastomeric coupon while testing.

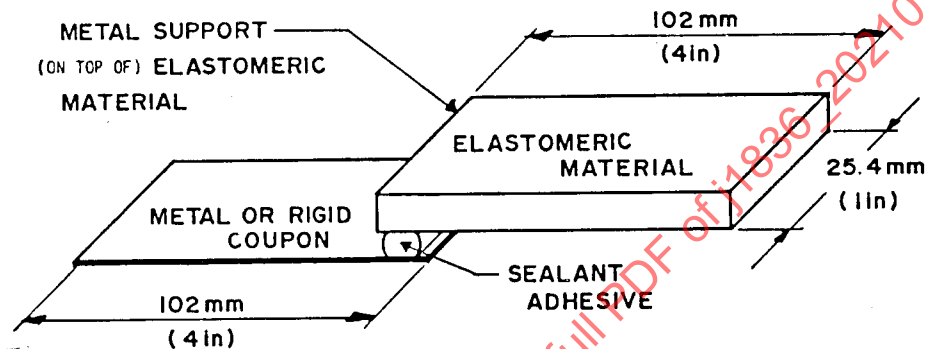


FIGURE 1—THREE DIMENSIONAL VIEW OF OVERLAP SHEAR TEST SPECIMEN

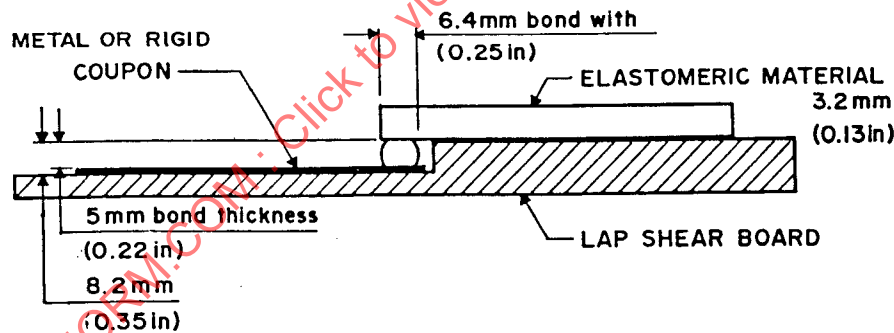


FIGURE 2—SIDE VIEW OF OVERLAP SHEAR SPECIMEN

The lap shear board should be constructed as in Figure 2, to give the proper dimensions for the lap shear as described in Figure 1. The elastomeric coupons should be taped onto the board so that the one in side is approximately 3.0 to 6.0 mm (0.12 to 0.24 in) from the edge of the board. Coupons can be laid side-by-side on the board to make multiple lap shear specimens.

4.2 Replacement of Metal with Other Substrates—The rigid substrates that are used to replace the metal coupons on the top section of the board in Figure 2 should be of a thickness designated by automotive engineers.

4.3 Sealant Adhesive Bond Tolerance—Final bond tolerance should be 25.4 ± 1.0 mm (1.0 ± 0.04 in) long, 6.4 ± 1.0 mm (0.25 ± 0.04 in) wide, and a height of 5.0 ± 1.0 mm (0.2 ± 0.04 in).

- 4.4 Sealant Adhesive Application**—The sealant adhesive wet bead dimensions can be controlled to give the cured bond dimensions specified in Figure 1. The sealant adhesive shall be extruded using a 6.4 mm (0.250 in) wide bead along the one in side of the elastomeric coupon. The bead should also be high enough so that when the metal coupon is placed down on the wet sealant adhesive, the required 5 mm (0.200 in) height shall be achieved. The sealant adhesive open time should be prescribed by adhesive supplier or automotive engineer's recommendation.
- 4.5 Sealant Adhesive Cure**—The lap shear composite should remain fixed to lap shear board at humidity, temperature and time recommended by automotive engineers or adhesive supplier.
- 4.6 Sample Preparation**—After recommended cure cycle, the lap shear specimen should be removed from the board by cutting excess cured sealant away from the side of each lap shear specimen. This trimming will assure that the lap shear specimen will have the bond line length of 25.4 mm as described in Figure 1.
- 4.7 Conditioning**—Bonded lap shear specimens should be environmentally conditioned according to supplier's or automotive engineers recommendation before being tested.
- 5. Testing**
- 5.1 Apparatus**—Tensile tester as described in ASTM D 1002.
- 5.2 Sample Fixture**—The sample fixture described in Figure 3 should be used when testing lap shear specimens on the tensile tester. The elastomeric coupon with the metal support should fit into the space provided with the lap shear specimen resting on the shoulder of the fixture. This will permit the metal or rigid coupon part to hang down to allow clamping to the lower jaw of the tensile tester.

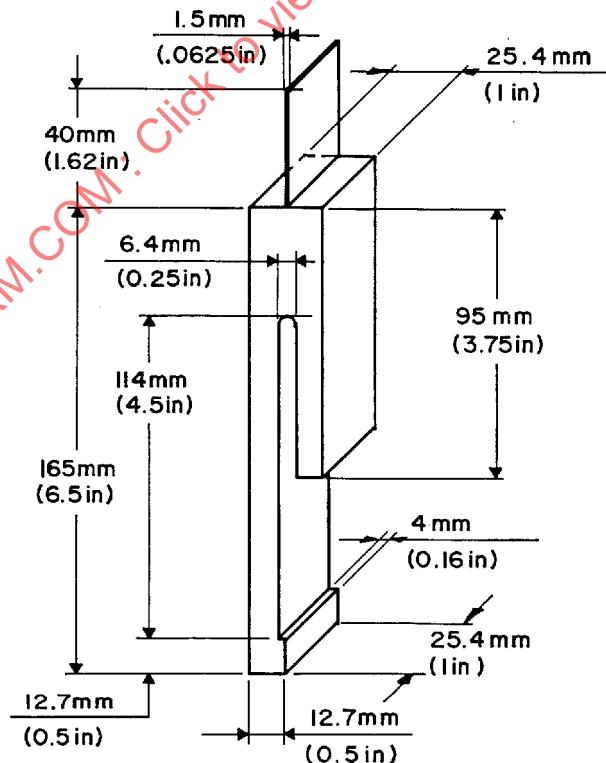


FIGURE 3—FIXTURE USED FOR TESTING OVERLAP SHEAR TEST SPECIMEN

- 5.3 Sample Clamping**—The elastomeric coupon should be clamped onto the front end of the fixture to prevent bending and ripping of the elastomer away from the metal support. The sample clamping distance between bottom edge of the elastomeric supported coupon composite in fixture and clamping jaw on metal should be 38 mm (1.5 in) as illustrated in Figure 4.

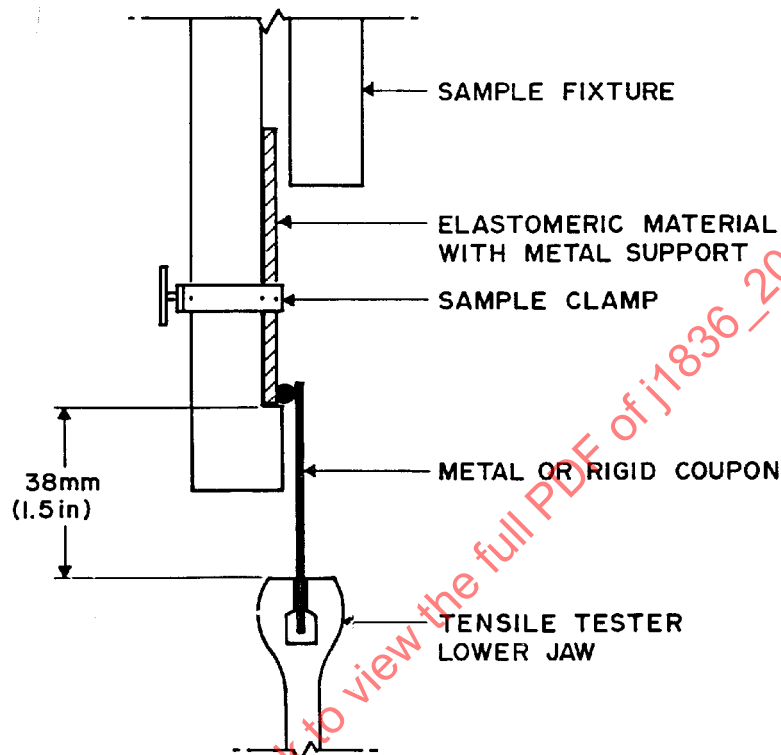


FIGURE 4—PLACEMENT OF OVERLAP SHEAR TEST SPECIMEN INTO TEST FIXTURE

- 5.4 Test Rate**—Lap shear specimens should be tested at a pull rate of 50.8 mm (2 in)/minute.
- 5.5 Test Quantity**—A minimum of five lap shear specimens should be prepared for each test condition.
- 6. Report**
- 6.1** Complete identification and application of adhesive sealant and primer(s) used, including type and manufacturer's description.
- 6.2 Complete Identification of the Elastomeric Material**
- 6.2.1 Type of elastomeric material should be described with its generic name (such as Urethane, VINYL, etc.) and manufacturer's product identification.
- 6.2.2 The physical properties of the material such as the elongation, tensile strength, flexural modulus, etc.
- 6.2.3 Description of surface treatment such as paint, mold release, cleaning conditions, etc.
- 6.3** Complete identification of test metal coupon or rigid substrate including thicknesses, description of rigid substrate and paint system.