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SURFACE VEHICLE STANDARD

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(R) CROSS PEEL TEST FOR AUTOMOTIVE TYPE ADHESIVES FOR FIBER-REINFORCED PLASTIC (FRP) BONDING

1. ***Scope***—This SAE Recommended Practice describes a cross peel test method for use in measuring the bonding characteristics of automotive-type adhesives for joining fiber-reinforced plastics to themselves and to metals.

2. ***References***

2.1 **Applicable Publications**—The following publications form 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 PUBLICATIONS—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)
ASTM D 5573

3. ***Test Substrate***

3.1 **Substrates**—Fiber-reinforced plastic as specified. Metal composition and roughness as specified.

3.2 **Dimensions**—Fiber-reinforced plastic parts shall be cut into flat coupons 25.4 mm x 75 mm (1.0 in x 3.0 in) at a nominal thickness of 2.5 mm (0.1 in). In the case of FRP to metal bonding, metal thickness will be nominally 1.5 mm (0.060 in) or as agreed upon by the automotive engineer. Shearing the FRP coupons is not recommended.

NOTE—If samples are cut with a diamond saw which is water cooled, the samples must be dry prior to bonding.

3.3 **Surface Preparation**—Surface preparation of FRP will be in accordance with the adhesives suppliers' recommendations. Surface roughening, solvent cleaning, and surface primers are acceptable provided they do not reduce FRP bulk properties. Any surface preparation must be adaptable to actual production situations. Metals will be machined to eliminate burrs or bevels. They will be clean and dry, or surface treated prior to bonding according to procedures prescribed by the adhesive manufacturer.

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4. Preparation of Test Joints

4.1 Application of Adhesive—Adhesive will be applied in accordance with the adhesive suppliers' recommendations. In the case of two-part adhesives, mixing will be in accordance with suppliers' suggested procedures.

4.2 Adhesive Cure—Adhesive will be cured at room temperature or elevated temperature using prescribed conditions determined by the adhesive supplier, provided they can be reasonably adapted to production situations.

4.3 Joint Geometry—Joint geometry will be as shown in Figure 1. Joint geometry will be controlled by appropriate fixturing using glass beads or other suitable means to control a 0.76 mm (0.030 in) adhesive bondline thickness. The amount of glass beads in the bondline will be the minimum number needed to hold bondline thickness. Fixturing pressure will be allowed.

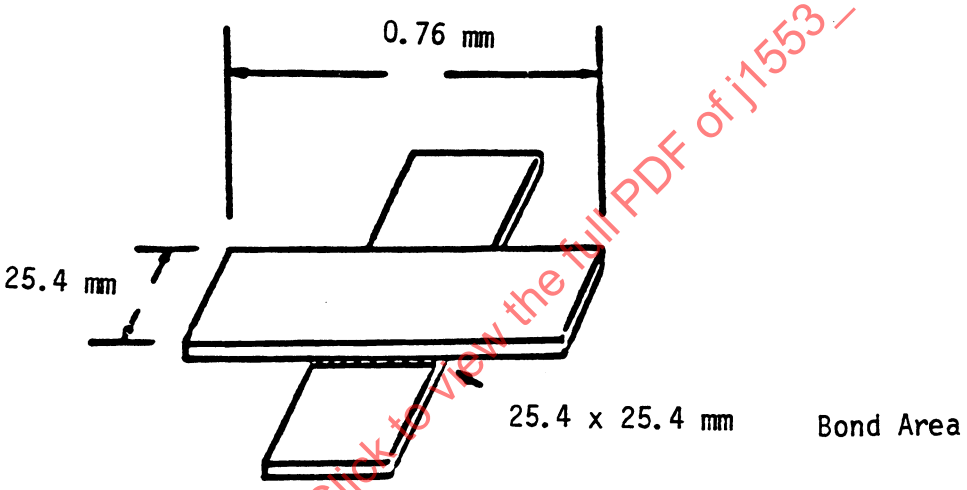

FIGURE 1—FIGURE JOINT GEOMETRY

4.4 Excess Adhesive—Excess adhesive (squeeze-out) will be removed from the bonded lap shear prior to testing without disturbing the bond area. If wire spacers are used, care should be taken not to disturb them when removing excess adhesive. Care should also be taken not to score the substrate, which will create a weak point.

4.5 Conditioning—Bonded parts will be allowed to return to ambient temperature for at least 1 h if elevated temperature cures are employed. If adhesive is room temperature cured, full cure time plus 10% will be allowed prior to testing.

5. Testing

5.1 Apparatus—The testing machine shall conform to the requirements of and have the capabilities of the machine prescribed in ASTM D 1002. It shall have a suitable pair of grips to hold the test fixture without allowing slip.

5.2 Test Rate—Fixture loading shall be in a consistent manner with a rate 13 mm (0.50 in)/min unless otherwise specified.

5.3 Test Samples—Five lap shear samples will be prepared in each case and tested.

5.4 Specimen Holding Grips—Grips as shown in Figures 2 and 3 shall be used to hold the test specimen. Parts C and D are designed to rotate out of the way and allow for easy insertion of the test specimen into the grips. Once the specimen is loaded, parts C and D are rotated back into position and the thumb screws are tightened to clamp the specimen in the grips.

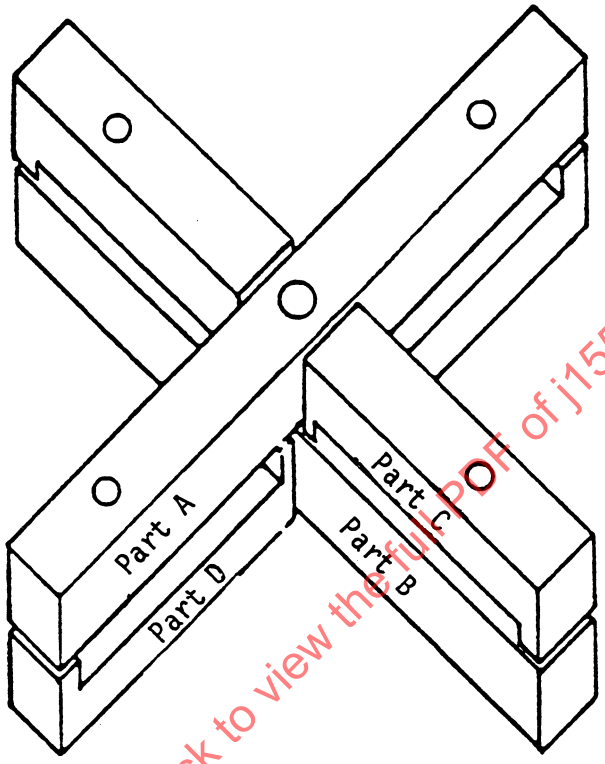

FIGURE 2—SPECIMEN HOLDING GRIP

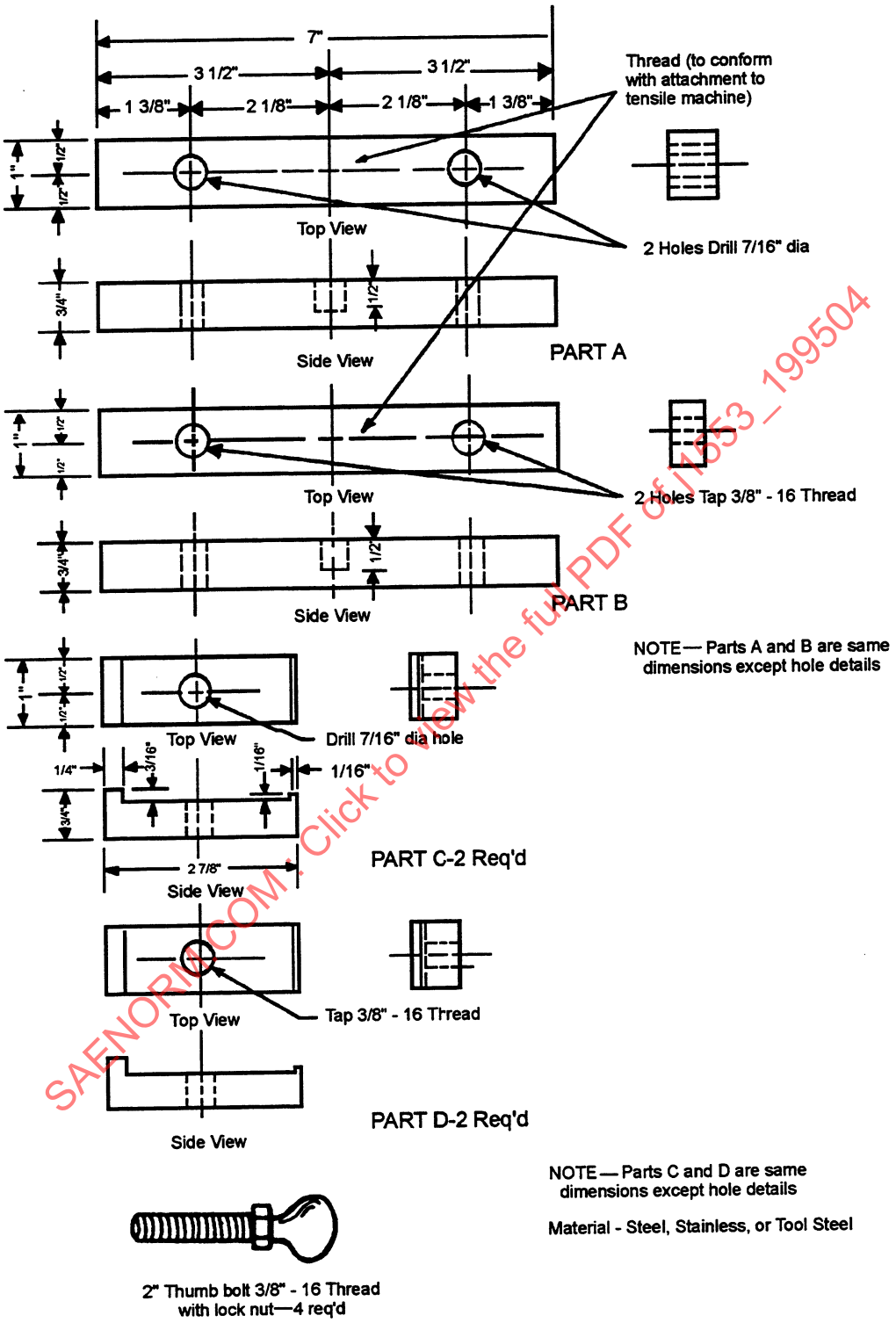

FIGURE 3—ADHESION TEST FOR ADHESIVES AND SEALANTS