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**(R) Test Method for Determining Stiffness (Modulus of Bending)
of Interior Trim Materials and Substrates**

1. **Scope**—This SAE Standard presents a method of determining the stiffness of interior trim materials, substrates, and composites by a three-point bending test.

2. **References**

2.1 **Applicable Publications**—The following publications form a part of the specification to the extent specified herein.

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

ASTM D 747—Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam

ASTM D 790—Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

3. **Test Specimens**—Cut three specimens each 76 x 305 mm (3 x 12 in) with the long dimension in the machine direction, if applicable. Cut three additional specimens each 76 x 305 mm (3 x 12 in), with the long dimension in the across-machine direction, if applicable.

4. **Conditioning**—Unless otherwise specified, the test specimens shall be conditioned to a constant weight in a controlled atmosphere of 23 °C ± 2 °C (73 °F ± 4 °F) and 50% ± 5% relative humidity. This test can also be conducted after soaking the specimens in water under specified conditions agreed upon by the customer and supplier to determine relative stiffness when wet.

5. **Procedure**

5.1 Measure the thickness of each specimen with a micrometer to the nearest 0.25 mm (0.01 in) at the point of load application (center of specimen) and at the support points (76 mm (3 in)) on each side of the center measured in the long direction of the specimen). Determine the average of these three readings and record.

5.2 Measure the width of the specimen to the nearest 0.25 mm (0.01 in) in the same locations as given in 5.1 and determine the average of the three readings and record.

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- 5.3 Support the flat surface of the specimen on parallel supports 152 mm (6 in) apart and apply the load on a bearing parallel to the end supports. The bearing and supports shall be rounded to a radius of 10 mm (3/8 in) and shall have a minimum length of 76 mm (3 in).
- 5.4 Apply the load at the rate of 13 mm /min (0.5 in/min) until the specimen is deflected 6.3 mm (1/4 in) at the midspan.
- 5.5 Calculate and report the average stiffness for each machine direction, if applicable, from the following formula:

$$E = \frac{PL^3}{4bd^3Y} \quad (\text{Eq. 1})$$

where:

- E = stiffness = modulus of bending, Pa (psi)
P = load, N (lb)
L = length of span, mm (in) = 152 mm (6 in)
b = width of specimen, mm (in)
d = thickness of specimen, mm (in)
Y = deflection of specimen at midspan = 6.3 mm (1/4 in)

6. **General Information**—This document is recommended for the quick, relative ranking of automotive trim materials and substrates. For more definitive determination of the flexural properties, use ASTM D 790. It should be noted that ASTM D 790 calls for a 16 to 1 thickness to span ratio. Direct comparisons of stiffness between this method and D 790 may only be valid at 10 mm (3/8 in) specimen thicknesses. There are also other technical differences. For determination of stiffness by the cantilever beam method, use ASTM D 747.
7. **Notes**
- 7.1 **Marginal Indicia**—The change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. An (R) symbol to the left of the document title indicates a complete revision of the report.

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