SURFACE VEHICLE STANDARD

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Superseding J315 MAR2010

Fiberboard Test Procedure

RATIONALE

SAE J315 is being revised to remove a duplicate footnote, remove a footnote referencing a now-discontinued product, and edit one footnote to reflect a change in the vendor's name.

1. SCOPE

This SAE Standard provides test methods for determining the critical characteristics of basic or finished fiberboard products. Where applicable, methods of test developed by SAE and ASTM have been referenced.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J361 Procedure for Visual Evaluation of Interior and Exterior Automotive Trim

SAE J365 Method of Testing Resistance to Scuffing of Trim Materials

SAE J369 Flammability of Polymeric Interior Materials - Horizontal Test Method

SAE J912 Test Method for Determining Blocking Resistance and Associated Characteristics of Automotive Trim Materials

SAE J913 Test Method for Wicking of Automotive Fabrics and Fibrous Materials

SAE J947 Glossary of Fiberboard Terminology

SAE J948 Test Method for Determining Resistance to Abrasion of Automotive Bodycloth, Vinyl, and Leather, and the Snagging of Automotive Bodycloth

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
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SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/J315_202208/

SAE J949 Test Method for Determining Stiffness of Interior Trim Materials and Substrates by a Three Point Bending Test

SAE J1885 Accelerated Exposure of Automotive Interior Trim Components Using a Controlled Irradiance Water Cooled Xenon-Arc Apparatus

SAE J2412 Accelerated Exposure of Automotive Interior Trim Components Using a Controlled Irradiance Xenon-Arc Apparatus

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D95 Method of Test for Water in Petroleum Products and Other Bituminous Materials

ASTM D644 Method of Test for Moisture in Paper

ASTM D645 Standard Test Method for Thickness of Paper and Paperboards

ASTM D747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam

ASTM D774 Method of Test for Bursting Strength of Paper

ASTM D5420 Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight

ASTM D5628 Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Dart

3. FIBERBOARD TERMINOLOGY

Refer to SAE J947.

4. RECOMMENDATIONS

Fiberboard fabrication and finishing techniques, such as crease bending, scoring, forming, perforating, and the application of barrier coatings or paints, will modify the characteristics of the producer's basic material. Consequently, it is recommended that separate but related specifications be established for (1) the properties of the basic product and (2) the finished processed material.

5. CONDITIONING

Tests for material classification and for arbitration purposes shall be made on material conditioned to a constant weight in a controlled atmosphere of 21 °C ± 1 °C (70 °F ± 2 °F) and 50 or 65% relative humidity (as specified by the user). Quality control tests can be conducted on unconditioned specimens unless otherwise specified by the user.

6. THICKNESS

Thickness shall be measured by a micrometer having two plane, parallel faces, the smaller of which should be circular and 161 to 212 mm^2 (0.25 to 0.33 in^2) in area. When the specimen is clamped between the faces, it should be under a steady pressure of 48.23 to 62.0 kPa (7.0 to 9.0 psi). The graduations of the dial face should be such as to permit estimating the thickness to at least 0.013 mm (0.0005 inch).

The sample should be comprised of at least three representative specimens, each of which should be tested in four separate places. The test should be made by placing the specimen between the jaws of the micrometer and lowering the pressure foot gently upon the surface of the specimen, taking care that the edge of the foot is at least 6.3 mm (0.25 inch) from the edge of the specimen. The average thickness should be reported to the nearest 0.013 mm (0.0005 inch) and may be supplemented by maximum and minimum readings.

Fundamental technique and apparatus used shall be similar to those of ASTM D645.

NOTE: Specimens cut for dimensional stability tests are satisfactory for these measurements.

7. WEIGHT

The weight shall be determined by weighing 305 × 305 mm (1 × 1 foot) of material to the nearest 0.10 gram. Dimensions shall be measured accurately to the nearest 0.25 mm (0.01 inch). Three representative specimens shall be weighed and the average weight per area computed and reported in grams per square meter. This calculated weight per area can also be converted to and expressed in pounds per 1000 ft^2.

8. DENSITY

Density in kilograms per cubic meter (pounds per cubic foot) shall be computed using data obtained from the average thickness and weight report.

9. BURSTING STRENGTH

The bursting strength shall be determined using the conventional power-driven hydraulic type machine. The average value to the nearest 34.5 kPa (5 psi) obtained by making five bursts on each side of three specimens is to be reported. Fundamental technique and apparatus used shall conform to ASTM D774, Method of Test for Bursting Strength of Paper.

10. COHESIVE STRENGTH

This test is designed to measure the force required to rupture a sample of paperboard at the weakest layer.

10.1 Apparatus

Jumbo Mullen Tester (Figure 1):

a. Brass disks, 1.6 mm (0.063 inch) thick and 60.71 mm (2.390 inch) diameter

b. Annular brass disks, 1.6 mm (0.063 inch) thick, 76 mm (3 inch) outer diameter, and 34.93 mm (1.375 inch) inner diameter

c. Steel sleeve, approximately 69.9 mm (2.75 inch) inside diameter, 13 mm (0.5 inch) high, and 3.18 mm (0.125 inch) thick

d. Means of cleanly cutting an annular sample of 60.71 mm (2.390 inch) outer diameter and 34.93 mm (1.375 inch) inner diameter

10.2 Procedure

Cut a 356 × 76 mm (14 × 3 inch) sample of the board to be tested. Cover each side with a strip of 76 mm (3 inch) double-face, pressure-sensitive tape or equivalent without peeling the protective liner, and die cut four annular specimens for testing. Peel one of the protective liners from each sample and press lightly to one of the solid disks; then peel the other liner and place an annular disk on the other side, using the hole in each for alignment.

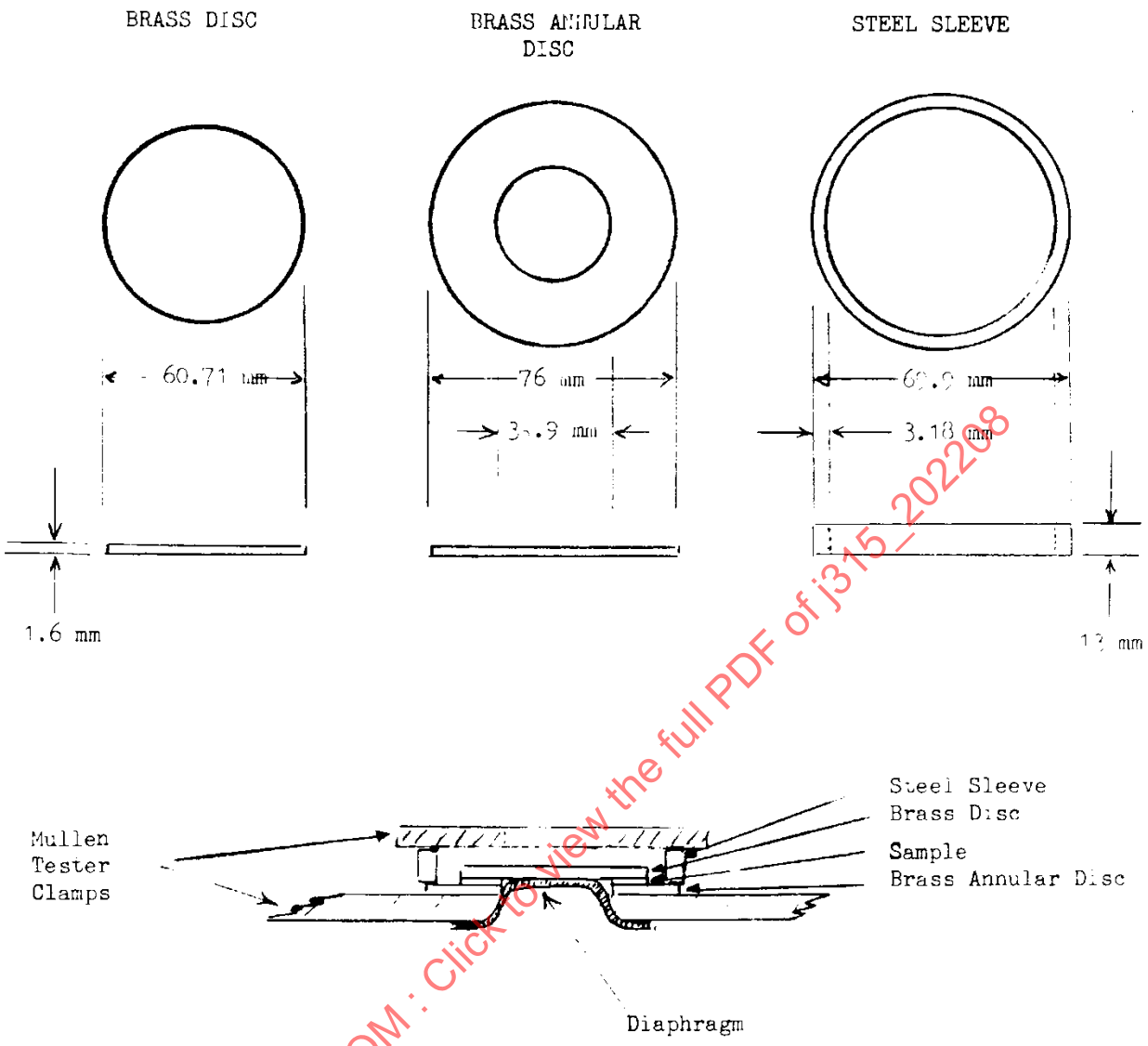

Figure 1

Press the sample between the disks under about 690 kPa (100 psi). This can be done using the sample clamp of the Mullen tester itself. A pile of a dozen samples may be pressed at one time.

Place one sample on the lower platen of the Mullen tester with the annular disk down and centrally located so that the hole in the disk is aligned with the hole in the platen. Place the steel sleeve upon the annular disk and clamp in place with the upper platen. Operate the tester until the expansion of the diaphragm against the solid disk ruptures the sample. Use the 0 to 1380 kPa (0 to 200 psi) scale.

Record the maximum pressure and note the location of the rupture. Failure of the tape bond invalidates a test.

Since the area of contact between diaphragm and solid disk varies according to the pressure, do not calculate the pressure per square inch of sample, but report the results as gage readings, in kPa (psi). However, the area of the sample is exactly 19.4 cm^2 (3 in^2) if the user desires to calculate kPa (psi).

11. MOISTURE CONTENT

The moisture content shall be determined by observing the loss in weight of a 100 × 100 mm (4 × 4 inch) specimen (the test specimen may be delaminated to facilitate moisture removal), upon drying in an air circulating oven maintained at 102 °C ± 3 °C (215 °F ± 5 °F) until a constant weight is obtained. The weight loss shall be expressed as percent moisture on the basis of the initial weight of the specimen. For reference purposes, refer to ASTM D644. In cases where appreciable volatile material other than water is known to exist, the Dean and Stark apparatus may be used. Refer to ASTM D95.

12. WATER ABSORPTION

The percent of water absorption shall be determined by observing the gain in weight of each of three 100 × 100 mm (4 × 4 inch) specimens upon immersion in distilled or deionized water. The test specimens shall be cut with a paper cutter or band saw to prevent delamination of the edges. The specimens shall be weighed to the nearest 0.01 g and then submerged horizontally under 25 mm (1 inch) of water maintained at 21 °C ± 1 °C (70 °F ± 2 °F) and at a pH of 7.0 ± 0.5. The samples are removed after periods of 2.5 and 24 hours, ±5% and visible surface water is removed by wiping or blotting. The specimens shall be immediately reweighed to the nearest 0.01 g. The weight of absorbed water shall be calculated and the water absorption expressed as percent by weight based on the initial weight. The average value for each time period is reported.

13. THICKNESS SWELL

The thickness shall be determined to the nearest 0.025 mm (0.001 inch) by averaging four readings taken at the center of each side of the water absorption specimen and 25 mm (1 inch) from the edge. The caliper reading shall be taken using the same apparatus as described in Section 6. The specimen shall be soaked and treated in the same manner as established in Section 12. Immediately following the tests, the specimen shall be recalipered in the same location and manner, and the average reading established for each soaked specimen. The following formula shall be used when calculating the percent of swelling:

$$S = \left[\frac{T_2 - T_1}{T_1}\right] 100 \qquad \text{(Eq. 1)}$$

where:

S = swelling, %

T1 = average thickness before soaking, mm (in)

T2 = average thickness after soaking, mm (in)

14. WARPAGE

The original, wet, and dry warpage shall be determined by the following test methods:

14.1 Original Warpage

Prepare three test specimens 305 × 305 mm (12 × 12 inch) from three different samples of fiberboard which are representative of a shipment.

Lay a specimen on a flat horizontal surface, and hold a straight edge so that it bridges the specimen in the area of maximum bow. Do not allow the weight of the straight edge to bear on the specimen.

Using a steel scale, graduated in 0.25 mm (0.01 inch), measure the distance X at the midpoint of the straight edge bridging the bow. This distance must be measured on a perpendicular line to the straight edge (see Figure 2).

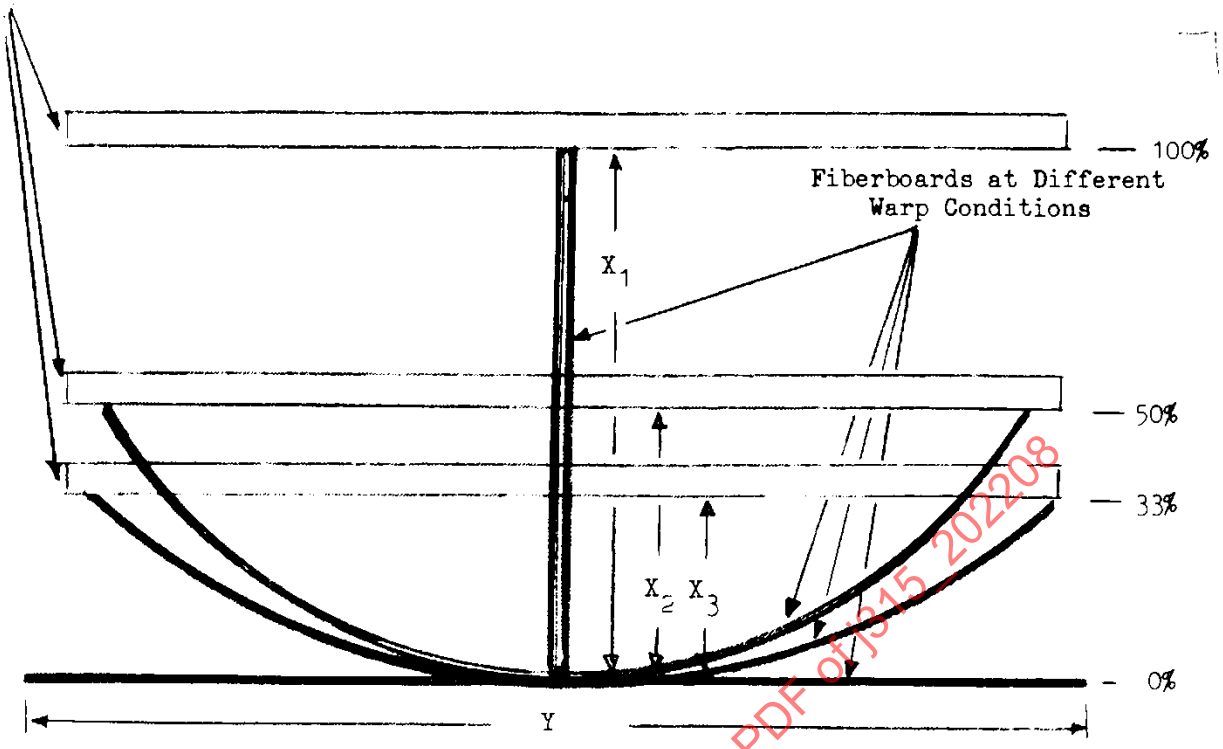

Figure 2

Calculate the original warpage by substituting in the following equation:

$$\frac{2X}{Y} \times 100 = \%\text{warpage} \qquad \text{(Eq. 2)}$$

where:

X = the dimensions in inches (millimeters) as measured previously

Y = the dimensions in inches (millimeters) of the specimen before warpage (the measurement for Y must be in the exact same line in which the straight edge was laid to measure X)

14.2 Wet Warpage

Expose specimen(s) horizontally on a sheet of perforated metal[1] so that air can contact specimen(s) on both sides for 24 hours at 38 °C ± 1 °C (100 °F ± 2 °F) and 98% ± 2% RH.

Remove conditioned specimen(s) and perforated metal sheet and allow specimen(s) to remain on perforated metal surface to dry for 30 minutes at room temperature. Calculate wet warpage as in 15.1.

[1] Perfex" perforated metal—40% open area or equivalent.

14.3 Dry Warpage

Allow specimen(s) to dry 24 hours on the flat perforated metal surface under conditions described in Section 5. Calculate dry warpage as in 15.1.

15. DIMENSIONAL STABILITY

The linear expansion and contraction shall be determined in the following manner:

Cut three 305 × 305 mm (12 × 12 inch) test specimens from three different samples of fiberboard which are representative of a shipment.

Inscribe a 254 × 254 mm (10 × 10 inch) square on one side of each test specimen. Follow Method A and/or Method B, as required by the material specification, followed by Method C. Method C may also be used individually as a drying test. At the end of the specified exposure period the test specimen shall be removed and the gage lines measured to the nearest 0.25 mm (0.01 inch) both with machine direction and across machine direction. Calculate and report the average percent expansion or contraction of the three specimens.

15.1 Method A—Expansion

Hang the test specimen(s) in a vertical position in a humidity cabinet maintained at a temperature of 38 °C ± 1 °C (100 °F ± 2 °F) and a relative humidity of 98% ± 2% for a period of 24 hours. On highly water resistant board, the exposure period may be continued to 7 days.

NOTE: The test specimens shall be protected from condensation water droplets by a slanted rustproof metal shield.

15.2 Method B—Expansion

Place each test specimen between two 305 × 305 mm (12 × 12 inch) fine mesh stainless steel screens. Then immerse the specimen(s) horizontally in a tank 25 mm (1 inch) below the surface of water maintained at 21 °C ± 1 °C (70 °F ± 2 °F) for periods of 2.5 and 24 hours. On highly water resistant boards, the immersion may be continued to 48 hours.

15.3 Method C—Contraction

Place the three test specimens in an air circulating oven maintained at 88 °C ± 3 °C (190 °F ± 5 °F) for 24 hours.

At the end of the specified exposure period, the test specimen shall be removed and the gage lines measured to the nearest 0.25 mm (0.01 inch) in both with-machine direction and across-machine direction. Calculate and report the average percent expansion or contraction of the three specimens.

16. SPEW TEST

Two test methods are used to evaluate the tendency of colored extractable materials to stain automotive trim when such trim is cleaned.

16.1 Method A—Solvent Extractable Discoloration

A 25 × 50 mm (1.0 × 2.0 inch) specimen of the fiberboard is completely immersed for 10 minutes in a petri dish (approximately 97 × 13 mm) containing sufficient naphtha solvent (HI-Flash VM and P—distillation range 116 to 149 °C) using 6.35 mm (0.25 inch) hardware cloth both below and above the test specimen to assure wetting on both sides. Remove the test specimen from the solvent allowing excess solvent to drip off. Then sandwich the test specimen between two sheets of No. 40, 11 cm Whitman Filter Paper. Place test specimen and filter paper between two clean glass plates and apply a pressure of 6.9 kPa (1 psi) including weight of top glass plate, for 5 minutes.