Designation: D7519 – 11

Standard Test Method for Internal Bond Strength and Thickness Swell of Cellulosic-Based Fiber and Particle Panels After Repeated Wetting[1]

This standard is issued under the fixed designation D7519; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 These test methods provide a measure of the moisture resistance of cellulosic-based fiber and particle panels (for example, medium-density fiberboard (MDF), particleboard, and hardboard). Resistance to moisture changes is measured by dimensional and internal bond changes and does not refer to decay/mold resistance or other performance aspects.

1.2 These test methods do not address structural properties or performance following moisture exposure. Panels are subjected to repeated cycles of water submersion and oven drying. After three cycles, the test specimens are tested for thickness swelling (TS) and internal bond (IB) strength.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1037 Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials

D4442 Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials

D4933 Guide for Moisture Conditioning of Wood and Wood-Based Materials

3. Significance and Use

3.1 These test methods provide a measure of the moisture resistance of cellulosic-based fiber and particle panels (for example, medium-density fiberboard (MDF), particleboard, and hardboard). This test methodology can be used to assess the thickness swelling and bond integrity characteristics of panels engineered for interior end-use applications involving exposure to cyclic temperatures and intermittent wetting environments.

4. Apparatus

4.1 The methods and test equipment used in Test Methods D1037 are used in these test methods.

5. Sampling and Test Specimens

5.1 Two samples taken from the same board measuring 6 × 6 in. (152 × 152 mm) shall be used for collection of thickness swelling (TS) data.

5.2 Three internal bond (IB) strips measuring 6 × 12 in. (152 × 305 mm) shall be cut from the same board as the TS samples.

6. Conditioning

6.1 Condition specimens to practical equilibrium at a relative humidity of 65 ± 3 % and a temperature of 68 ± 4°F (20 ± 2°C). Practical equilibrium is defined as the state of time change in which, for practical purposes, the specimen is neither gaining nor losing appreciable moisture content in a 24-h period. Guide D4933 provides further information on moisture equilibrium.

7. Procedure

7.1 *Thickness Swell (TS)*

7.1.1 After conditioning, the mass of the specimen shall be measured to an accuracy of ±0.2 %. The width, length, and thickness of the specimen shall be measured to an accuracy of ±0.3 % to compute the volume of the specimen.

7.1.2 The thickness shall be measured at four points midway along each side 1 in. (25 mm) away from the edge and the average of these four measurements shall be recorded as the initial thickness for each specimen. The thickness shall be measured over a surface with ¼-in. diameter on both sides of the specimen using a micrometer with ¼-in. (6.4-mm) anvils.

7.1.3 The specimens shall be submitted to three exposure cycles according to 7.2. The water soak tank parameters shall

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

conform to the requirements of paragraph 23.5.1 of Test Methods D1037. For drying, a forced air drying oven shall be used with an adequate internal volume to allow TS specimens to dry without being dead stacked.

7.1.4 After the third exposure cycle, remove excess water from the specimens using a paper towel and measure the final thickness of each specimen at the four marked points midway along each side according to 7.1.2.

7.1.5 After exposure, the specimens shall be dried in an oven at 217 ± 4°F (103 ± 2°C) to determine the moisture content in accordance with Test Methods D4442, Method B.

7.2 *Exposure Cycle*—The TS and IB specimens shall be submitted to the following exposure cycle three times.

7.2.1 16 h ± 5 min oven drying at 158 ± 2°F (70 ± 1°C),

7.2.2 Immediately followed by a 3 h ± 5 min water soak at 68 ± 2°F (20 ± 1°C),

7.2.3 Immediately followed by a 2 h ± 5 min oven drying at 158 ± 2°F (70 ± 1°C), and

7.2.4 Immediately followed by a 3 h ± 5 min water soak at 68 ± 2°F (20 ± 1°C).

7.2.5 If the exposure is to be interrupted, it shall be suspended following the 16-h oven-drying period in 7.2.1. In such a case, allow the specimens to cool to room temperature in an environment that restricts changes of the specimens' moisture content.

NOTE 1—Wrapping the specimens in polyethylene or using a desiccator have both been found satisfactory to minimize changes in moisture content.

7.3 *Internal Bond (IB)*

7.3.1 The IB strips shall be submitted to three exposure cycles according to 7.2.

7.3.2 After the third exposure cycle, immediately place the IB strips into the oven for 16 h at 158 ± 2°F (70 ± 1°C). Following the 16 h of drying, allow the IB strip to cool to room temperature for at least 1 h and cut four IB blocks 2 × 2 in. (50 × 50 mm) from the center of each of the three IB strips. If the IB block's surface is concave or convex, lightly sand until the surfaces are flat and parallel.

7.3.3 Test the IB specimens in accordance with Test Methods D1037, Section 11.

8. Calculation

8.1 The moisture content of TS specimens before and after submersion shall be calculated based on oven-dry mass. The amount of water absorbed by the specimen during the submersion shall be calculated from the increase in mass and expressed as the percentage by volume and by mass based on the volume and the mass, respectively, after conditioning. Assume the specific gravity of the water to be 1.00 for this purpose.

8.2 The TS shall be calculated as thickness after the third cycle minus the initial thickness expressed as a percentage of the initial thickness: TS = [(final thickness – initial thickness)/(initial thickness)] * 100 %.

8.3 The IB shall be calculated according to Paragraph 11.5.1 of test methods D1037.

9. Report

9.1 The report shall include the following:

9.1.1 Description of test material (for example, type of panel, density, production information, source, and so forth) and details of the exposure procedure;

9.1.2 The average moisture content of TS specimens before and after exposure;

9.1.3 Initial and final panel thickness, and the average TS of the two specimens expressed as a percentage;

9.1.4 The average IB of the twelve specimens.

NOTE 2—It might be helpful to note in the report the location of the IB break in the thickness, for example, peeled at surface or middle third, top third, or bottom third. Also note any pattern in test set up flaws or in an area of weakness in the product.

10. Precision and Bias

10.1 *Precision*—Subcommittee D07.03 on panel products is in the process of developing a precision statement for this method.

10.2 *Bias*—No bias statement is available for this test method because of the lack of an acceptable homogeneous reference material.

11. Keywords

11.1 cellulosic-based fiber and particle panels; internal bond; moisture resistance; thickness swelling