



Designation: D 6958 – 03

Standard Test Methods for Evaluating Side-Bonding Potential of Wood Coatings¹

This standard is issued under the fixed designation D 6958; 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 describe an evaluation procedure for the determination of undesirable side-bonding of coatings for wood flooring. They provide two mechanical properties tests for the quantitative determination of the cohesive strength of wood coatings (tensile and lap shear); they also provide a wood floor simulation test for the qualitative determination of side-bonding potential of wood coatings.

1.2 *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:

D 9 Terminology Relating to Wood

D 2370 Test Method for Tensile Properties of Organic Coatings

D 4444 Test Methods for Use and Calibration of Hand-Held Moisture Meters

2.2 British Standards:

BS1204 British Standard Test for Synthetic Resin Adhesives²

2.3 *Maple Flooring Manufacturers Association (MFMA):*³
Guide Specification for Double Plywood Floor System
Guide Specification for Sleeper and Sleeper with Plywood Floor Systems

2.4 *National Oak Flooring Association (NOFMA):*⁴
Cracks in Hardwood Floors

2.5 *National Wood Flooring Association (NWFA):*⁵
Hardwood Floors Trouble Shooting Manual

¹ These test methods are under the jurisdiction of ASTM Committee D07 on Wood and are the direct responsibility of Subcommittee D07.01 on Fundamental Test Methods and Properties.

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³ MFMA, 60 Revere Dr., Suite 500, Northbrook, IL 60062.

⁴ NOFMA, P.O. Box 3009, Memphis, TN 38173-0009.

⁵ NWFA, 111 Chesterfield Industrial Boulevard, Chesterfield, MO 63005.

3. Terminology

3.1 Definitions used in these test methods are in accordance with terminology used in Terminology D 9. A few related terms not covered in these test methods are as follows:

3.1.1 *panelization*—adjacent boards acting as a composite panel instead of individual strips when subjected to changes in temperature and humidity as well as other site conditions.

3.1.2 *panelization failure*—the condition where localized excessive gaps beyond specified limits develop between some strip flooring boards due to panelization.

3.1.3 *percent wood failure*—the rupturing of wood fibers in strength tests on bonded specimens usually expressed as the percentage of total area involved, which shows such failure. The inverse of adhesive failure.

3.1.4 *side-bonding*—the bonding of adjacent strips of wood flooring caused by the floor coating resulting in panelization. This is one possible cause of panelization failure.

3.1.5 *side-bonding wood failure*—the failure of the wood within a strip, as in classic wood failure, when the movement of the strip within the floor is restrained from moisture-related movement by excessive side-bonding. In this situation, the toughness or “work-to-break” of the side-bonding is sufficient to overcome the tensile strength perpendicular to the grain of the wood strip.

3.1.6 *tensile stress (nominal)*—as used in Test Method D 2370, the load per original unit area at which a specimen fails or yields in a tension (pull) test.

SECTION I—MECHANICAL PROPERTIES TESTS

TEST METHOD A—MAPLE BLOCK TENSILE STRENGTH TEST

4. Significance and Use

4.1 This test method was originally designed as a means of quantitatively measuring the level of adhesion of the wood-wood interface caused by a wood coatings system applied to the substrate. The tensile test is useful in measuring bonding strength of coatings, such as gymnasium coatings, in which the wood strip flooring primarily expands or contracts in response to changes across the cross-sectional width of the strip floor.

4.2 This test method was further designed as a means of measuring the side-bonding potential of wood coating systems.

5. Apparatus

5.1 *Tensile Tester*, of the constant rate of jaw separation type, equipped with load cells having capacities of 100 to 1000 lb (445 to 4452 N), and equipped with an indicating device such as an electronic constant speed chart recorder, a digital device that displays numerical values, or a printer that records the numerical values and suitably sized grips to hold the test specimens in place during testing. The machine must be capable of maintaining a cross head velocity during testing of 0.1 in./min (2.54 mm/min), and if using a strip chart recorder, a chart speed during testing of 10 in./min (254 mm/min).

5.2 *Clamp Assembly*, capable of holding assembled test specimen and maintaining a clamp pressure of 100 psi (690 kPa).

5.3 *Moisture Meter*, meeting the requirements of Test Method D 4444.

5.4 *Foam Polybrushes*, 1 in. (25.4 mm) wide.

6. Procedure

6.1 Material for testing shall be #2 or better, MFMA certified hard maple (*Acer saccharum*) tongue and groove strip flooring, $2\frac{1}{4} \pm 0.03$ in. (57.2 ± 0.8 mm) in width by $2\frac{5}{32} \pm 0.01$ in. (19.8 ± 0.3 mm) in thickness.

6.2 Test stock shall be prepared by cutting off the tongue and planing the edge smooth. Blocks for testing shall be cut to a length of 3.00 ± 0.01 in. (76.2 ± 0.3 mm).

6.3 Test blocks shall be conditioned at $75 \pm 5^\circ\text{F}$ ($24 \pm 3^\circ\text{C}$) and $50 \pm 2\%$ relative humidity for a minimum of 7 days. These conditions equate to an Equilibration Moisture Content (EMC) of $\sim 9\%$ (see X1.3). After equilibrating, use a moisture meter to determine the EMC of all test blocks, calculate and report the average EMC.

6.4 A minimum of twenty test blocks shall be used to prepare a minimum of ten assemblies for testing of each coating to be evaluated (see Fig. 1).

6.5 Test assemblies consist of two test blocks “edge-glued” using the floor coating as an adhesive (see Fig. 1). The coating to be evaluated shall be applied using a polybrush to the smooth edge of both test blocks at a rate of 500 ± 5 ft²/gal (12.3 ± 0.1 m²/L) or as specified by the coating manufacturer. After a 5 min open time the test block pairs shall be assembled by placing the coated surfaces together and clamping the joint at 100 psi (690 kPa) pressure. Test assemblies shall remain clamped for a minimum of 48 h.

6.6 Test assemblies shall be cured at $75 \pm 5^\circ\text{F}$ ($24 \pm 3^\circ\text{C}$) and $50 \pm 2\%$ relative humidity for a minimum of 7 days including the clamp time. After equilibrating, use a moisture meter to determine the EMC of all test assemblies, and calculate the average EMC.

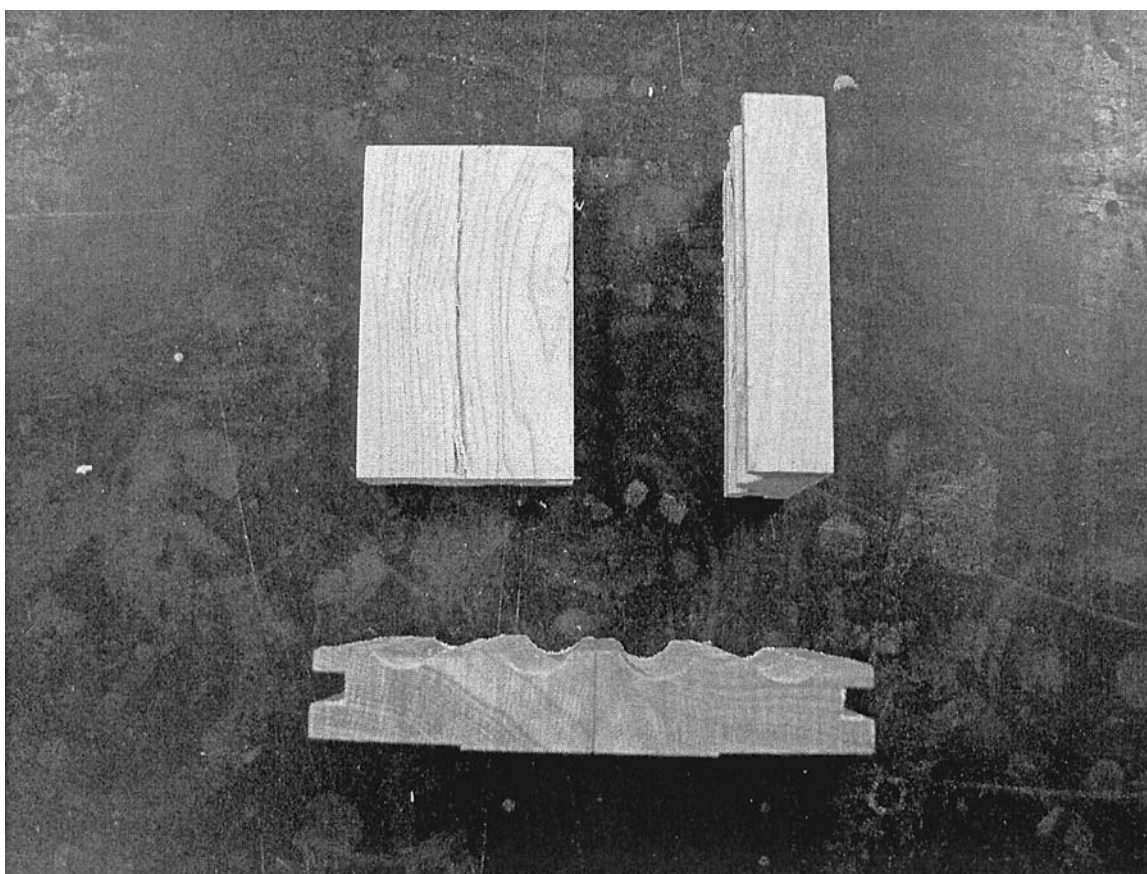


FIG. 1 Test Method A, Maple Block Tensile Strength Test-Test Blocks (top), Test Assembly (bottom)

6.7 Measure and record the length and width of the test assembly to the nearest 0.01 in. (0.3 mm). Calculate the test area of each test assembly.

6.8 Test assemblies shall be secured in a test machine (see Fig. 2) and pulled apart in tension at a rate of 0.1 in./min (2.54 mm/min).

6.9 Record the ultimate load, location of failure (coating-coating interface, coating-wood interface, within wood), an estimate of the percent wood failure and the average EMC.

7. Report

7.1 Report the number of samples tested, the location of failure (coating-coating interface, coating-wood interface, within wood), an estimate of the percent wood failure, and the average EMC.

8. Precision and Bias

8.1 Until sufficient data are available as a result of performing these tests, no specific precision and bias statement can be expressed.

TEST METHOD B—MAPLE STRIP LAP SHEAR TEST

9. Significance and Use

9.1 This test method was originally designed as a means of quantitatively measuring the level of adhesion of the wood-wood bond interface caused by a wood coatings system applied to the substrate. The lap shear test is useful for measuring bonding strength of coatings used on parquet or other similar types of flooring, where longitudinal movement of the flooring

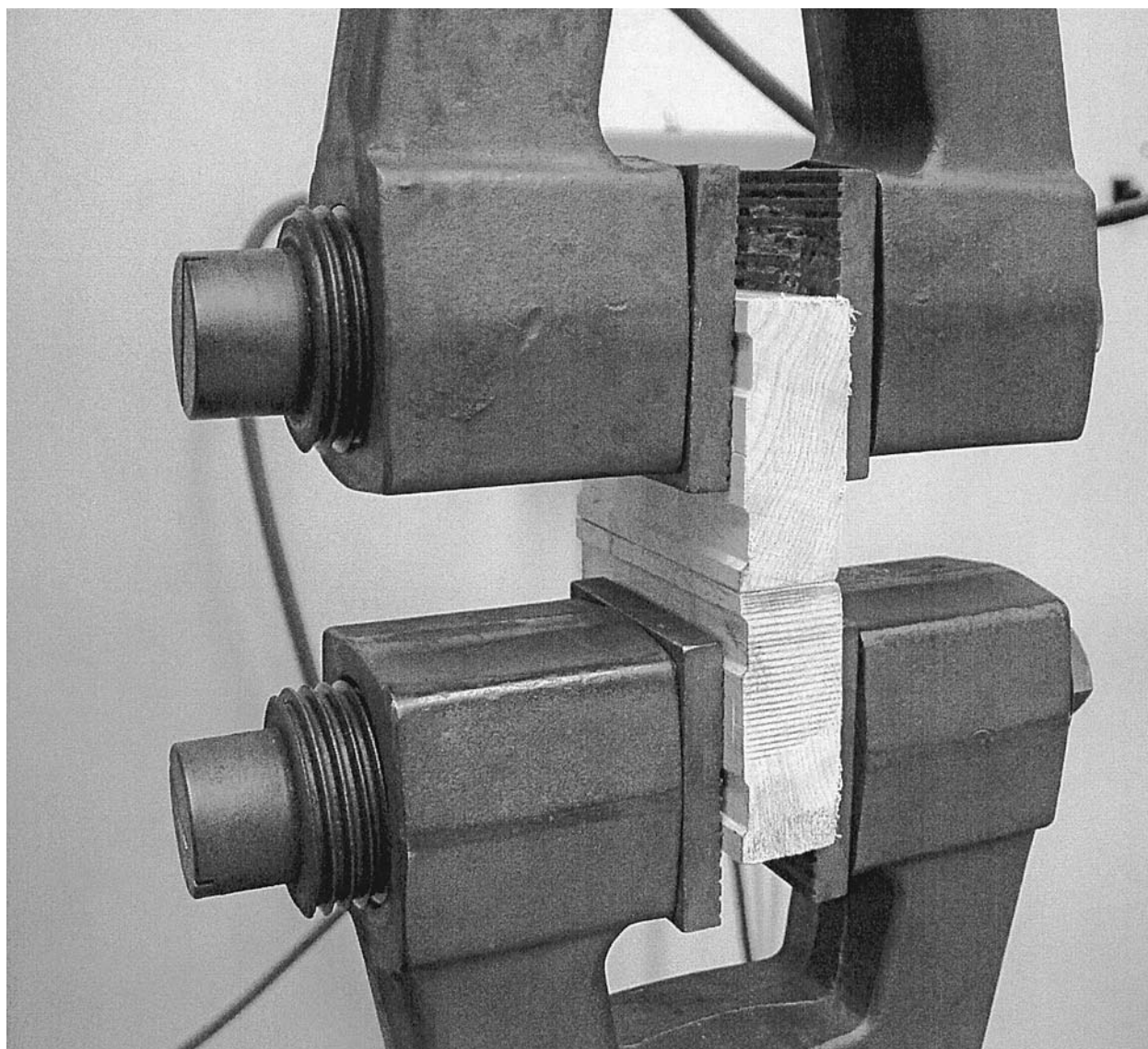


FIG. 2 Assembly Secured in Testing Machine