



Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials¹

This standard is issued under the fixed designation D1037; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

INTRODUCTION

The test methods presented herein have been developed and are presented to serve two distinct purposes. They are divided into two parts.

Part A. General Test Methods for Evaluating the Basic Properties of Wood-Base Fiber and Particle Panel Materials—Part A is for use in obtaining basic properties suitable for comparison studies with other materials of construction. These refined test methods are applicable for this purpose to all materials covered by Definitions **D1554**.

Part B. Acceptance and Specification Test Methods for Hardboard—Part B is for specific use in specifications for procurement and acceptance testing of hardboard. These test methods are generally employed for those purposes in the industry. By confining their intended use as indicated, it has been possible to achieve adequate precision of results combined with economy and speed in testing, which are desirable for specification use.

The choice between a particular test method and its alternative should be made with a full understanding of the intended purpose of each, because values obtained from tests may, in some cases, differ. Of the test methods presented in both parts, some have been in generally accepted use for many years, some are modifications and refinements of previously developed test methods, and some are more recent developments. Where test methods are suitable for more than one of the purposes, they are delineated in Part A, but not repeated in Part B. It is the intent that reference to the appropriate section of the test method shall suffice in specifications developed for the different materials.

1. Scope

1.1 *Part A—General Test Methods for Evaluating the Basic Properties of Wood-Base Fiber and Particle Panel Materials.* These test methods cover the determination of the properties of wood-base fiber and particle panel materials that are produced as mat-formed panels such as particleboard, medium-density fiberboard, hardboard, and oriented strand board.

¹ These test methods are under the jurisdiction of ASTM Committee **D07** on Wood and are the direct responsibility of Subcommittee **D07.03** on Panel Products.

Current edition approved May 1, 2012. Published June 2012. Originally approved in 1949. Last previous edition approved in 2006 as D1037 – 06a. DOI: 10.1520/D1037-12.

	Section
Significance and Use	3
Apparatus	4
Test Specimens	5
Moisture Content and Conditioning Requirements	6
Accelerated Aging	7
Size, Physical Properties and Appearance of Panels	8
Static Bending	9
Tension Parallel to Surface	10
Tension Perpendicular to Surface	11
Compression Parallel to Surface	12
<i>Fastener Holding Tests:</i>	
Lateral Nail Resistance	13
Nail Withdrawal	14
Nail-Head Pull-Through	15
Direct Screw Withdrawal	16
Hardness	17
Hardness Modulus	18

	Section
Shear in the Plane of the Panel	19
Glue-Line Shear (Block Type)	20
Falling Ball Impact	21
Abrasion Resistance by the U.S. Navy Wear Tester	22
<i>Moisture Tests:</i>	
Water Absorption and Thickness Swelling	23
Linear Expansion with Change in Moisture Content	24
Cupping and Twisting	25
Interlaminar Shear	26
Edgewise Shear	27
Compression-Shear	28

1.2 *Part B—Acceptance and Specification Test Methods for Hardboard.* The methods for Part B provide test procedures for measuring the following properties of hardboard:

	Section
Thickness	32
Modulus of Rupture	33
Tension Strength Parallel to Surface	34
Tension Strength Perpendicular to Surface	35
Water Absorption and Thickness Swelling	36
Moisture Content and Specific Gravity	37

1.3 There are accepted basic test procedures for various fundamental properties of materials that may be used without modification for evaluating certain properties of wood-based fiber and particle panel materials. These test methods are included elsewhere in the *Annual Book of ASTM Standards*. The pertinent ones are listed in **Table 1**. A few of the test methods referenced are for construction where the wood-base materials often are used.

1.4 The values stated in inch-pound units are to be regarded as the standard. The SI equivalents are approximate in many cases. 1 in. = 25.4 mm, 1 lbf = 4.45 N.

1.5 *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

- [C273 Test Method for Shear Properties of Sandwich Core Materials](#)
- [D143 Test Methods for Small Clear Specimens of Timber](#)
- [D905 Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading](#)
- [D1554 Terminology Relating to Wood-Base Fiber and Particle Panel Materials](#)
- [D2395 Test Methods for Density and Specific Gravity \(Relative Density\) of Wood and Wood-Based Materials](#)
- [D2915 Practice for Sampling and Data-Analysis for Structural Wood and Wood-Based Products](#)
- [D3043 Test Methods for Structural Panels in Flexure](#)
- [D3501 Test Methods for Wood-Based Structural Panels in Compression](#)
- [D4442 Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials](#)

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.

TABLE 1 Basic Test Procedures for Evaluating Properties of Wood Base-Fiber and Particle Panel Materials

ASTM Designation	Test Methods for
C177	Steady-State Heat-Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus ^A
C209	Cellulosic Fiber Insulating Board ^A
C236	Steady-State Thermal Performance of Building Assemblies by Means of the Guarded Hot Box ^A
C384	Impedance and Absorption of Acoustical Materials by the Impedance Tube Method ^A
C423	Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method ^A
D149	Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies ^B
D150	A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials ^B
D257	D-C Resistance or Conductance of Insulating Materials ^B
D495	High-Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation ^B
D1666	Conducting Machining Tests of Wood and Wood-Base Materials ^C
D1761	Mechanical Fasteners in Wood ^C
E72	Conducting Strength Tests of Panels for Building Construction ^D
E84	Surface Burning Characteristics of Building Materials ^D
E90	Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions ^A
E96	Water Vapor Transmission of Materials ^A
E97	Directional Reflectance Factor, 45-deg 0-deg, of Opaque Specimens by Broad-Band Filter Reflectometry ^E
E119	Fire Tests of Building Construction and Materials ^D
E136	Behavior of Materials in a Vertical Tube Furnace at 750°C ^D
E152	Fire Tests of Door Assemblies ^D
E162	Surface Flammability of Materials Using a Radiant Heat Energy Source ^D
E661	Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads ^D
E662	Specific Optical Density of Smoke Generated by Solid Materials ^D
E906	Heat and Visible Smoke Release Rates for Materials and Products ^D

^A *Annual Book of ASTM Standards*, Vol 04.06.

^B *Annual Book of ASTM Standards*, Vol 10.01.

^C *Annual Book of ASTM Standards*, Vol 04.10.

^D *Annual Book of ASTM Standards*, Vol 04.07.

^E *Annual Book of ASTM Standards*, Vol 14.02.

- [E4 Practices for Force Verification of Testing Machines](#)
- [E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

PART A—GENERAL TEST METHODS FOR EVALUATING THE BASIC PROPERTIES OF WOOD-BASE FIBER AND PARTICLE PANEL MATERIALS

3. Significance and Use

3.1 These test methods cover small-specimen tests for wood-base fiber and particle panel materials that are made to provide:

3.2 Data for comparing the mechanical and physical properties of various materials,

3.3 Data for determining the influence on the basic properties of such factors as raw material and processing variables, post-treatments of panels, and environmental influences, and

3.4 Data for manufacturing control, product research and development, and specification acceptance.

3.5 Not all the tests outlined in these test methods may be necessary to evaluate any particular panel for any specified use. In each instance, therefore, it will be necessary to determine which tests shall be made.

4. Apparatus

4.1 *Testing Machine*—For strength and fastener holding tests, any standard testing machine (see **Note 1**) capable of applying and measuring the load with an error not to exceed $\pm 1.0\%$ shall be used as provided in Practices **E4**.

NOTE 1—Some testing machines operated at speeds allowed in these test procedures without proper damping devices or in need of adjustment may yield values in error because of “follow-through” due to mass inertia effects in the weighing system. Care must be exercised in the selection of testing machines so that values obtained from test are not in error more than the amount stipulated.

5. Test Specimens

5.1 The number of specimens to be chosen for test and the method of their selection depend on the purpose of the particular tests under consideration, so that no general rule can be given to cover all instances. It is recommended that whenever possible, a sufficient number of tests be made to permit statistical treatment of the test data (see **Note 2**). In the evaluation of a panel material, specimens for test should be obtained from a representative number of panels. In properties reflecting differences due to the machine direction of the panel, specimens from each panel shall be selected both with the long dimension parallel to the long dimension of the panel, and with the long dimension perpendicular to the long dimension of the panel.

NOTE 2—Guidance on statistical sampling is provided in Practice **D2915**.

6. Moisture Content and Conditioning Requirements

6.1 The physical and mechanical properties of building panels depend on the moisture content at time of test.

6.2 The moisture conditioning selection for each test procedure within this standard depends upon the purpose of the particular tests under consideration. All specimens within each test sample shall be conditioned as required to meet the specific test objectives.

6.3 The following moisture conditioning regimens are commonly employed with the test procedures of this standard:

6.3.1 *Dry “As Received”*—Specimens to be tested “as received” shall be tested without supplemental conditioning to alter the moisture content.

6.3.2 *Dry “Conditioned”*—Specimens to be tested air-dry shall be conditioned to a constant weight and moisture content in a conditioning chamber maintained at a relative humidity of $65 \pm 5\%$ and a temperature of $68 \pm 6^\circ\text{F}$ ($20 \pm 3^\circ\text{C}$) (See **Note 3**).

NOTE 3—This conditioning regime represents a common standard for wood and wood-based materials.

6.3.3 *Water Soaked*—Specimens to be tested in the soaked condition shall be submerged in water at $68 \pm 2^\circ\text{F}$ ($20 \pm 1^\circ\text{C}$) for 24-h (see **Note 4**) before the test and shall be tested within 30 minutes upon removal from the water.

NOTE 4—When it is desired to obtain the effect of complete saturation, the specimens shall be soaked for a longer period.

6.3.4 *Accelerated Aging*—Accelerated aging cycles shall be completed per Section **7** of this standard.

6.3.5 *Other*—Other conditioning methods that are designed to meet the test objectives may be employed provided that they are clearly described in the test report.

6.4 Specimens shall be subjected to the conditioning regimens of section **6.3** after they have been cut to the final dimensional sizes required for the test procedures within this standard.

6.5 When water soaked conditioning (section **6.3.3**), accelerated aging conditioning (section **6.3.4**) or other conditioning method is employed to simulate an application moisture exposure:

6.5.1 The sample dimensions and weights shall be recorded before and after conditioning. Any computed properties shall be reported based upon both the pre-conditioned dimensions or weight, or both, and upon the dimensions or weight, or both, after the moisture conditioning treatment.

6.5.2 If the objective is to estimate the relative change in a property due to the moisture conditioning treatment, a matched set of material shall be tested in the dry (section **6.3.1** or **6.3.2**) condition. The conditioning treatment selected for the matched set shall be based upon the test objectives.

6.6 For all testing within this standard, the moisture conditioning method selected and resulting test sample moisture contents shall be reported.

7. Accelerated Aging

7.1 Scope and Significance

7.1.1 The accelerated aging treatment is one possible conditioning treatment (see Section **6**) and is used to obtain a measure of the inherent ability of a material to withstand severe exposure conditions and maintain its mechanical and physical properties. Appropriate specimens shall be prepared and subjected to the six cycles of accelerated aging before the property is evaluated. The cycling exposure is a simulated condition developed to evaluate how a material will stand up under aging conditions.

NOTE 5—All of the tests listed in this standard may not be required for any specific investigation or specification. Static bending (Section **9**), nail-holding (Sections **13 – 15**), and water absorption and thickness swelling (Section **23**) tests are usually sufficient to evaluate the resistance of a wood-base panel material to aging. In some instances it may be desirable to evaluate the effect of accelerated aging on some other property, including properties outside the scope of this standard.

7.2 Test Specimens

7.2.1 The test specimens shall be cut to size for testing and dimensions or weight measured, or both, as specified in the pertinent sections of this standard before being subjected to the cyclic exposure listed in section **7.3**. When tests involving fasteners are made, the fasteners shall be driven prior to the aging exposure. Corrosion-resistant fasteners shall be used because extractives or other materials present will corrode ordinary steel fasteners.

7.3 Accelerated Aging Cycles