



Designation: D 1324 – 83 (Reapproved 1993)<sup>ε1</sup>

## Standard Specification for Modified Wood<sup>1</sup>

This standard is issued under the fixed designation D 1324; 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.

<sup>ε1</sup> NOTE—Section 14 was added editorially in October 1993.

### 1. Scope

1.1 This specification covers the material known as modified wood. It is intended to be applicable to wood in the form of solid lumber or veneer (Note 1), or an assembly of lumber or veneer, or both, the properties of which have been changed by physical or chemical methods (Note 2). This specification is not intended to cover those products to which preservatives have been added for the primary purpose of enabling the wood to resist decay and those products to which chemicals have been added for the primary purpose of improving the fire-resistant properties of wood.

NOTE 1—For the purpose of this specification, veneer is considered to be a thin layer or sheet of wood under  $\frac{5}{16}$  in. (7.9 mm) in thickness. Layers or sheets of wood  $\frac{5}{16}$  in. or over in thickness are considered to be lumber.

NOTE 2—Modified woods have been growing steadily in importance because of the unusual properties and beauty of the finished product. The properties and even the appearance of the modified wood are largely dependent on the actual physical and chemical methods used in manufacture. An almost infinite number of products are possible. For example, the density of material produced by compression can be varied from that of the normal wood to a specific gravity of almost 1.40, which is about the density of wood substance itself. Because of these possible variations, the specifications which follow are general rather than specific in nature. Specifications for a specific type of product must be based on the actual needs of the user and should be developed jointly by the user and the producer.

Some of the types of modified wood that have been developed are briefly described in the appendix to this specification.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- D 143 Methods of Testing Small Clear Specimens of Timber<sup>2</sup>
- D 2395 Test Methods for Specific Gravity of Wood and Wood-Base Materials<sup>2</sup>
- D 3043 Methods of Testing Structural Panels in Flexure<sup>2</sup>
- D 3499 Test Method for Toughness of Structural Panels<sup>2</sup>
- D 3503 Test Method for Swelling and Recovery of Compressed Wood Products Due to Moisture Absorption<sup>3</sup>

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee D-7 on Wood and is the direct responsibility of Subcommittee D07.91 on Technical Service.

Current edition approved Feb. 25, 1983. Published April 1983. Originally published as D 1324 – 54T. Last previous edition D 1324 – 60 (1977).

<sup>2</sup> Annual Book of ASTM Standards, Vol 04.10.

<sup>3</sup> Discontinued; see 1983 Annual Book of ASTM Standards, Vol 04.10.

### 3. Significance and Use

3.1 The test methods included herein are intended to provide a means for evaluating certain strength and physical properties of modified wood. Because of the variety of types of modified wood, the tests are general rather than specific in nature.

### 4. Ordering Information

4.1 The purchaser shall specify in the inquiry, contract, and order, the density range and type of material desired and any exceptions, modifications, or agreements with regard to the provisions of this specification.

### 5. Species of Wood

5.1 Any species of wood may be used in the manufacture of modified wood. The species to be used shall be specified by the purchaser.

### 6. Defects

6.1 Material that would adversely affect the strength or appearance of the completed product shall not be used. Veneer or lumber shall, therefore, be free of decay, wane, shakes, open splits, loose knots, worm holes, knot holes, or other holes or openings. Veneer shall be tightly cut, with slope of grain not steeper than 1 in 5. Permissible slope of grain in lumber shall not exceed 1 in 10.

### 7. Veneer Thickness

7.1 Veneers used in the construction of any one panel shall be of the same nominal thickness, which shall not exceed  $\frac{5}{16}$  in. (7.9 mm).

### 8. Lumber Thickness

8.1 Modified wood made from lumber shall conform to the detailed requirements of the purchaser.

### 9. Impregnation

9.1 Phenol formaldehyde resin or equivalent shall be used in those products requiring resin impregnation, unless otherwise agreed upon between the purchaser and the producer.

### 10. Fabrication

10.1 Modified wood manufactured from veneer shall be either parallel or cross-laminated, as specified by the purchaser.

# ASTM D 1324



FIG. 1 Apparatus for Hardness-Penetration Test

Veneer shall be free of patching or inlay of any kind, but edge joints parallel to the grain to make up pieces of required width shall be permitted, provided that (1) no individual piece is less than one fourth the built-up width, (2) there shall be not more than two joints per piece, (3) the edges shall be joined straight and square, (4) the joints shall be free of any gaps or chipped edges, and (5) there shall be no joints in the veneer at right angles to the grain.

## 11. Test Methods

11.1 Determine the properties of modified wood in accordance with ASTM methods for testing plywood, or as described in Section 12 of this specification.

11.2 Tests of primary importance in evaluating the properties of modified wood are the following:

- 11.2.1 Static bending (Methods D 3043),
- 11.2.2 Hardness (Section 12),
- 11.2.3 Swelling and recovery of compressed wood products due to moisture absorption (Test Method D 3503),
- 11.2.4 Moisture content and specific gravity (Test Methods D 2395), and
- 11.2.5 Toughness or other suitable impact test (Test Method D 3499).

## 12. Hardness Test

12.1 *Scope*—The wide range of densities possible in the manufacture of modified woods makes difficult the selection of a single hardness test method satisfactory for all types of

material. The modified ball hardness test described in Methods D 143 has been found satisfactory for the less dense modified woods. The hardness-penetration test described in 12.2-12.6 has found general acceptance in the industry and can be used successfully for determining the hardness of modified woods varying in density from very light to those of maximum density.

12.2 *Test Specimen*—The test specimen shall be a minimum of 2 in. (51 mm) in width and 6 in. (152 mm) in length, and equal to the thickness of the material.

NOTE 3—When the hardness of a thin material is required, it may be necessary to build up the thickness of the test specimen by placing several layers of the same material under the test specimen.

### 12.3 Apparatus:

12.3.1 *Testing Machine*, of the constant-rate-of-crossheadmovement type and of suitable capacity.

12.3.2 *Penetrating Tool* (see Fig. 1), identical with that specified in Section 84 of Methods D 143, except that the collar for determining one-half depth penetration shall be removed. This tool shall have a 0.444-in. (11.28-mm) diameter (100-mm<sup>2</sup> projected area) penetrating ball.

12.3.3 *Dial Gage* (see Fig. 1), reading to 0.001 in. (0.025-mm) penetration shall be used.

### 12.4 Procedure:

12.4.1 Mount the dial page on the penetrating tool in such a manner (see Fig. 1) that the depth of penetration can be determined, and mount the penetrating tool on the testing machine. Make simultaneous readings of load and penetration, at least ten points or equivalent plotted data, at sufficient intervals to permit the determination of a straight-line relationship. Make at least two such determinations on each specimen.

12.4.2 Make all penetrations far enough from the edge to prevent splitting or chipping of the specimen.

12.5 *Speed of Testing*—Apply the load to the specimen throughout the tests by a uniform motion of the movable head of the testing machine at a rate of 0.02 (±0.05 in.) (0.5 (±0.13 mm))/min.

12.6 *Test Data and Report*—Report the hardness of the material as the load to cause an arbitrarily selected depth of penetration or as a hardness modulus calculated as follows:

$$H_m = P/2\pi rh \quad (1)$$

where:

- $H_m$  = load per unit of spherical area of penetration, psi (or MPa),
- $r$  = radius of penetration ball 0.222 in. (5.6 mm),
- $P$  = arbitrarily selected load, lbf (or N),
- $h$  = depth of penetration, in. (or mm), at the selected load.

## 13. Precision and Accuracy

13.1 The precision and accuracy of the methods for testing hardness are being established.

## 14. Keywords

- 14.1 modified wood; veneer