



Standard Test Method for Shear Modulus of Wood-Based Structural Panels¹

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1. Scope

1.1 This test method covers determination of the shear modulus of wood-based structural panels associated with shear distortion in the plane of the panels. The method is applicable to all types of wood-based structural panels. The grain direction or orientation of the individual plies, laminations, or layers shall be parallel or perpendicular to the edge of the test specimen. If the plies, laminations, or layers are of different material or elastic properties, the method gives the effective shearing modulus. Wood-based structural panels in use include plywood, waferboard, oriented strand board, and composites of veneer and of wood-based layers.

NOTE 1—This test method is primarily designed for material in which the grain or orientation of the individual plies, laminations, or layers is parallel or perpendicular to the edge of the specimen. It may be used, however, for plywood specimens in which the grain is at 45° to the specimen edges if a four-ply panel with all plies of the same thickness is used. The controlling condition is that the EI (modulus of elasticity $\times$ moment of inertia) values along both diagonals shall be equal.

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 2395 Test Methods for Specific Gravity of Wood and Wood-Base Materials²
- D 4442 Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials²

3. Summary of Test Method

3.1 The test consists of twisting a square plate of material by applying loads at the ends of one diagonal and supporting the plate at the ends of the other diagonal. From theory on the flexure of flat plates the deflections of the plate under this loading is related to the shear modulus of the plate. Deflections of the plate at points on the diagonal are measured relative to its center. The shear modulus of the specimen is determined

from load-deflection data. The shear modulus obtained is that associated with shearing distortion in the plane of the plate. A photograph of testing apparatus and a deflection measuring device is given in Fig. 1.

4. Significance and Use

4.1 This test method is most useful for determining the moduli of rigidity of orthotropic materials for which moduli of rigidity cannot be computed from elastic moduli and Poisson's ratios. The shear modulus determined by this method appears in the equation governing the bending of a plate. This is the modulus that is needed in discussing the deflection and buckling of plates.

5. Control of Moisture Content

5.1 The structural panel samples to be tested at specific moisture contents or equilibrium relative humidities shall be conditioned to approximately constant mass in controlled atmospheric conditions. For approximating moisture conditions of panels used under dry conditions, a relative humidity of $65 \pm 2\%$ at a temperature of $68 \pm 6^\circ\text{F}$ ($20 \pm 3^\circ\text{C}$) is recommended. Specimens shall be tested without undue delay after conditioning. Testing in similarly controlled atmosphere is recommended whenever possible.

6. Test Specimen

6.1 The test specimen shall be square, with the thickness equal to the thickness of the material, and the length and width not less than 25 nor more than 40 times the thickness. The thickness, length, and width of each specimen shall be measured to an accuracy of not less than $\pm 0.3\%$. Care shall be taken to avoid obtaining test specimens with initial curvature.

7. Loading Procedure

7.1 Support the test specimen on supports having a radius of curvature not greater than $\frac{1}{4}$ in. (6 mm) on the opposite ends of a plate diagonal, and loaded in a similar manner on the opposite ends of the other diagonal. In order that the loads are applied at the corners, first attach metal plates as shown in Fig. 1. Fig. 1 also shows suggested apparatus for applying load and measuring deflection. Apply the load with a continuous and uniform motion of the movable head at a rate of 0.012 times the length of the plate in inches or millimetres, expressed in inches or millimetres per minute, within a permissible variation of $\pm 25\%$.

7.2 The load applied shall be accurate to within 1 %.

¹ This test method is under the jurisdiction of ASTM Committee D-7 on Wood and is the direct responsibility of Subcommittee D07.03 on Panel Products.

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² Annual Book of ASTM Standards, Vol 04.10.