



Standard Test Method for Measuring Strength and Shear Modulus of Nonrigid Adhesives by the Thick-Adherend Tensile-Lap Specimen¹

This standard is issued under the fixed designation D 3983; 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 This test method describes a method of measuring the shear modulus and rupture stress in shear of adhesives in bonded joints. The method employs lap-shear specimens with wood, metal, or composite adherends, with adhesives having shear moduli ranging up to 700 MPa (100 000 psi). This test method is suitable generally for joints in which the ratio of adherend tensile modulus to adhesive shear modulus is greater than 300 to 1. It is not suitable for adhesives that have a high shear modulus in the cured state and that also require elimination of volatile constituents during cure.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

1.3 *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

- D 143 Test Methods for Small Clear Specimens of Timber
- D 905 Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading
- D 907 Terminology of Adhesives
- D 1151 Practice for Effect of Moisture and Temperature on Adhesive Bonds
- D 2651 Guide for Preparation of Metal Surfaces for Adhesive Bonding
- E 6 Terminology Relating to Methods of Mechanical Testing

E 83 Practice for Verification and Classification of Extensometer System

E 104 Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions

E 229 Test Method for Shear Strength and Shear Modulus of Structural Adhesives³

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminologies E 6 and D 907.

3.1.1 *initial tangent modulus, n* —the slope of the stress-strain curve at the origin.

3.1.2 *nominal stress, n* —the stress at a point calculated on the net cross section by simple elastic theory without taking into account the effect on the stress produced by discontinuities such as holes, grooves, fillets, etc.

3.1.3 *normal stress, n* —the stress component perpendicular to a plane on which the forces act, that is, the plane of the bondline.

3.1.4 *proportional limit, n* —the maximum stress that a material is capable of sustaining without significant deviation from proportionality of stress to strain.

3.1.5 *secant modulus, n* —the slope of the secant drawn from the origin to any specified point on the stress-strain curve.

3.1.5.1 *Discussion*—Modulus is expressed in force per unit area (MPa, lb/in.², etc.).

3.1.6 *shear modulus, n* —the ratio of shear stress to corresponding shear strain below the proportional limit. (Compare *secant modulus*.)

3.1.6.1 *Discussion*—The term shear modulus is generally reserved for materials that exhibit linear elastic behavior over most of their stress-strain diagram. Many adhesives exhibit curvilinear or nonelastic behavior, or both, in which case some other term, such as secant modulus, may be substituted.

3.1.7 *shear strain, n* —the tangent of the angular change, due to force, between two lines originally perpendicular to each other through a point in the body.

3.1.7.1 *Discussion*—Shear strain equals adherend slip/adhesive layer thickness.

¹ This test method is under the jurisdiction of ASTM Committee D14 on Adhesives and is the direct responsibility of Subcommittee D14.70 on Construction Adhesives.

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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.

³ Withdrawn.

