



Standard Test Method for Heat and Moisture Resistance of Wood-Adhesive Joints¹

This standard is issued under the fixed designation D 4502; 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 The purpose of this test method is to estimate the resistance of adhesive-bonded joints to thermal and hydrolytic degradation.

1.2 This test method is primarily for wood-to-wood joints but may be applied to joints of wood to other materials.

1.3 The effects of chemicals such as fire retardants, preservatives, and extractives in the wood upon joint degradation resistance can be estimated.

1.4 This test method does not account for the effects of stress, the other principal degrading factor, nor does it account for cyclic or variable temperature or moisture levels.

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

D 897 Test Method for Tensile Properties of Adhesive Bonds

D 905 Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading

D 907 Terminology of Adhesives

D 2304 Test Method for Thermal Endurance of Rigid Electrical Insulating Materials

D 2307 Test Method for Relative Thermal Endurance of Film-Insulated Round Magnet Wire

D 2339 Test Method for Strength Properties of Adhesives in Two-Ply Wood Construction in Shear by Tension Loading

2.2 IEEE Standard:

IEEE No. 1, General Principles for Temperature Limits in the Rating of Electrical Equipment³

3. Terminology

3.1 Definitions

3.1.1 For definitions of terms used in this test method, refer to Terminology D 907.

3.2 *shear strength, n*—in an adhesive joint, the maximum average stress when a force is applied parallel to the joint.

3.2.1 *Discussion*—In most adhesive test methods, the shear strength is actually the maximum average stress at failure of the specimen, not necessarily the true maximum stress in the material.

4. Summary of Test Method

4.1 The degradation of adhesive joints is a physicochemical process. The speed of degradation is related to the levels of temperature, moisture (and other chemicals), and physical stress to which the joint is exposed. This test method is based on the principles of chemical kinetics and uses the Arrhenius temperature dependence relationship to estimate the long-term effects of heat and moisture at the service temperature.

4.2 Specimens whose unaged properties have been estimated by control tests are subjected to an accelerated thermal or hydrolytic aging environment in groups. Aging is accelerated by using elevated temperature. Periodically, a group of specimens is removed from the aging environment and tested. The estimated property after aging and the time of aging are recorded. After several groups have been tested in this manner, the rate of property loss in the aging environment can be estimated. This basic experiment is repeated at several other elevated temperatures, and the rates of property loss at those temperatures estimated. The rate of property loss relationship to temperature is estimated. This relationship can be extrapolated to lower service temperatures for estimating service life.

4.3 This test method employs a smaller version of the Test Method D 905 block shear specimen, but other shear strength or tensile strength specimens may also be used.

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 Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08854-1331