



Standard Practice for Determining Strength Development of Adhesive Bonds¹

This standard is issued under the fixed designation D 1144; 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 practice covers the determination of the strength development of adhesive bonds when tested on a standard specimen under specified conditions of preparation and testing. It is applicable to adhesives in liquid or paste form that require curing at specified conditions of time and temperature or specific substrate preparation. It is intended primarily to be used with metal-to-metal adherends; however, plastics, woods, glass, or combinations of these may be substituted.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are provided for information purposes 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:

D 907 Terminology of Adhesives²

D 1002 Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)²

D 1338 Test Method for Working Life of Liquid or Paste Adhesives by Consistency and Bond Strength²

3. Terminology

3.1 **Definitions**—Several terms in this practice are defined in accordance with Terminology D 907.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 **activator, or accelerator (surface)**—an adhesive curing agent that is applied to a bonding surface for the purpose of affecting or speeding, or both, the cure of an adhesive.

3.2.2 **fixture time (set time)**—the shortest time required by an adhesive to develop handling strength such that test specimens can be removed from fixtures, unclamped, or handled without stressing the bond, thereby affecting bond strength.

3.2.3 **handling strength**—a low level of strength initially obtained by an adhesive that allows specimens to be handled,

moved, or unclamped without causing disruption of the curing process or affecting bond strength.

4. Significance and Use

4.1 This practice contains suggested provisions for reporting strength values. Any ASTM test method for determining strength properties of adhesive bonds may be used. This practice is not intended to determine the pot or working life of two-component epoxy of similar type adhesives. Refer to Test Method D 1338. It should be noted that there are adhesives whose testing requires special techniques and whose properties are difficult to reproduce from tester to tester. These variables should be kept in mind when analyzing the data obtained using this practice.

5. Test Specimens

5.1 It is suggested that lap-type shear specimens in accordance with Test Method D 1002, be used. Other types of test specimens may be used with agreement between the manufacturer and the purchaser.

6. Preparation of Test Specimens

6.1 Prepare test specimens in accordance with Test Method D 1002, or other applicable test method. Prepare the bonding surface by a method mutually agreed upon between the manufacturer and the purchaser. Vapor phase degreasing, grit blasting, hand abrasion, or testing on oiled surfaces are some of the methods that are available. If a surface activator or accelerator is used, apply it in accordance with the instructions of the manufacturer. Use one- or two- surface activation as agreed upon between the manufacturer and the purchaser. Allow assembled specimens to cure at the temperature and period of time prescribed by the manufacturer to develop full strength. This is intended to determine if any post curing of the adhesive occurs that would cause a strength increase and decrease. Bond strength variability could be caused by embrittlement or a further hardening of the adhesive during the cure cycle.

6.2 In addition, prepare assemblies for curing at the same temperature and time intervals to determine fixture time and 20, 50, and 80 % strength. If the adhesive is cured by heat, heat the specimens at a predetermined rate such that a consistent temperature rise is obtained. Differences in heating rates will naturally occur between different types of test specimens due to different conductivities. Determine the temperature of the adhesive by means of a properly insulated thermocouple or

¹ This practice is under the jurisdiction of ASTM Committee D-14 on Adhesives and is the direct responsibility of Subcommittee D14.10 on Working Properties.

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² Annual Book of ASTM Standards, Vol 15.06.

