



## Standard Test Method for Torque Strength of Adhesives Used on Threaded Fasteners<sup>1</sup>

This standard is issued under the fixed designation D 5649; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method is used to make comparative assessments of the securing or locking effect of adhesives used in threaded assemblies.

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 907 Terminology of Adhesives<sup>2</sup>

D 2651 Guide for Preparation of Metal Surfaces for Adhesive Bonding<sup>2</sup>

E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods<sup>3</sup>

E 691 Practice for Conducting an Interlaboratory Test Program to Determine the Precision of a Test Method<sup>3</sup>

### 3. Terminology

3.1 *Definitions*—For technical terms pertaining to adhesives, see Terminology D 907.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *breakaway torque*—the initial torque required to break the bond measured at the first movement between the nut and the bolt when unscrewing an unseated assembly.

3.2.2 *on torque*—the maximum torque required to screw the nut onto a preapplied adhesive-coated bolt.

3.2.3 *prevailing torque*—the torque measured after the initial breakage of the bond measured at 180° rotation of the nut.

### 4. Summary of Test Method

4.1 This test method consists of determining the torque required to unscrew a bonded nut and bolt assembly. Breakaway torque and prevailing torque are determined.

### 5. Significance and Use

5.1 This test method provides reasonably accurate informa-

tion with regard to the determination of the securing or locking effect of adhesives used in threaded fasteners. This test method may also be used to determine the degree of cure and the effect of environment on torque strength.

5.2 The accuracy of the test results depends to a large degree on the thread clearance of the test fasteners and the inclusion of air bubbles in the bond line. Data generated by this test method should be safety-factored accordingly if used as quality assurance acceptance or rejection.

### 6. Apparatus

6.1 *Electronic Recording*—Test machine consisting of a clamping device to secure the bolt head, and a device for turning the nut with simultaneous measurement and registration of the torque as a function of the angle of turning by direct analog or digital means.

6.2 *Direct Reading*—A clamping device to secure the head of the bolt, and a torque wrench accurate to  $\pm 5\%$ .

### 7. Test Specimens

7.1 Any size and substrate fasteners may be used upon agreement between the supplier and the user of adhesives.

7.2 Unless otherwise agreed upon between the user and the adhesive manufacturer, all non-plated nuts and bolts shall be degreased (refer to Guide D 2651), stored in an atmosphere of low humidity, and kept clean.

7.3 Where desired, and if agreed upon between the user and the adhesive manufacturer, non-plated nuts and bolts may be used as received, reoiled, or after other special treatments.

7.4 Plated nuts and bolts do not normally require any special cleaning prior to assembly.

### 8. Assembly

8.1 Assemble not less than five specimens for each test as follows:

8.1.1 Nuts and bolts shall be preassembled prior to application of adhesive. Any pairs showing sticking due to burrs or damaged threads shall be discarded. Disassemble the parts.

8.1.2 For liquid adhesives, apply sufficient adhesive to the bolt to completely cover an area equal to the height of the nut plus three threads. Also, apply adhesive to the threads of the nut. Follow the adhesives manufacturer's instructions for application of preapplied adhesives.

8.1.3 Screw the nut onto the bolt by hand, allowing three threads to protrude. For preapplied adhesives, screw the nut

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-14 on Adhesives and is the direct responsibility of Subcommittee D14.80 on Metal Bonding Adhesives.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 15.06.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.02.