



Designation: D 4562 – 90 (Reapproved 1995)<sup>ε1</sup>

## Standard Test Method for Shear Strength of Adhesives Using Pin-and-Collar Specimen<sup>1</sup>

This standard is issued under the fixed designation D 4562; 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.

<sup>ε1</sup> NOTE—Section 11 was added editorially in May 1995.

### 1. Scope

1.1 This test method covers the determination of the shear strength of curing liquid adhesives used for retaining cylindrical assemblies or for locking and sealing threaded fasteners.

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:

- A 108 Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality<sup>2</sup>
- D 907 Terminology of Adhesives<sup>3</sup>
- D 2651 Guide for Preparation of Metal Surfaces for Adhesive Bonding<sup>3</sup>
- E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods<sup>4</sup>
- E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method<sup>4</sup>

### 3. Terminology

3.1 *Definitions*—Many of the terms in this standard are defined in Terminology D 907.

### 4. Summary of Test Method

4.1 This test method consists of bonding a metal pin inside a metal collar and determining the force required to shear the adhesive joint.

### 5. Significance and Use

5.1 This test method provides reasonably accurate information with regard to the ability of an adhesive to withstand

shearing forces. It may also be used to determine degree of cure and the effect of environment on shear strength.

### 6. Apparatus

6.1 *Universal Test Machine*, or equivalent, for applying force to the specimen. Details of the test specimen (pin-and-collar) are given in Fig. 1.

6.2 *Specimen Curing Rack*, as shown in Fig. 2, or equivalent.

### 7. Preparation of Test Specimens

7.1 Assemble five specimens for each test as described in the following paragraphs:

7.1.1 Each specimen shall be comprised of a pin 0.498 to 0.499 in. (12.65 to 12.675 mm) in diameter and a slip collar 0.500 to 0.501 in. (12.7 to 12.725 mm) inside diameter by 0.435 to 0.439 in. (11.05 to 11.15 mm) wide, both components finished to 32 to 64  $\mu$ m (0.8 to 1.6  $\mu$ m) with 0.001 to 0.003 in. (0.025 to 0.075 mm) diametral clearance between the pin and collar (see Fig. 1). The pin and collar, by agreement, may be made of any material (see Appendix X1), but the most common material is steel, as specified in Specification A 108.

7.1.2 Vapor degrease all pins and collars (refer to Practice D 2651), store in an atmosphere of low humidity (20 % relative humidity), and keep them clean. Use degreased specimens within four days or discard. (Oxidation affects the test results after this time. Prior to vapor degreasing, it is permissible to soak or wash hard-greased or waxed parts in solvent.) Do not prime or activate unless specified for the material to be tested.

7.1.3 To apply the adhesive, assemble the parts to be sure that there are no nicks that will cause them to stick or drag. Disassemble the parts. Apply sufficient adhesive to the circumference of the pin, beginning at one end, to completely cover an area the width of the collar in its final position. Also apply sufficient adhesive to completely cover the interior of the collar 360°. Slip the collar over the coated end of the pin with at least 180° of rotation as the collar travels over the adhesive. Repeat a back-and-forth rotation three times, or until the collar exhibits a smooth, consistent resistance to rotation.

7.1.4 Rack the assembly with the fillet up so that the collar does not slip out of the bond area. Take care that the rack is at

<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.

Current edition approved Aug. 31, 1990. Published October 1990. Originally published as D 4562 – 86. Last previous edition D 4562 – 86.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 01.05.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 15.06.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.02.