



Standard Practice for Conducting Creep Tests of Metal-to-Metal Adhesives¹

This standard is issued under the fixed designation D 1780; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This practice covers the determination of the amount of creep of metal-to-metal adhesive bonds due to the combined effects of temperature, tensile shear stress, and time.

NOTE 1—Since the characteristics that render a material resistant to creep under the condition of test are not yet completely known, the details of the procedure considered herein are those known to have important influences. Since other equally important characteristics may be discovered in the future, the recommended details are largely advisory in nature.

1.2 Test periods depend upon the reasonable life expected from the material in service. The uncertainties of extrapolation should be considered in deciding upon the length of the test.

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

1.4 *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

3. Terminology

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

3.2 *Descriptions of Terms Specific to This Standard:*

3.2.1 *creep*—the time-dependent part of the strain that results from exposure to a constant temperature and load (Note 2). That is, the creep at a given elapsed time is equal to the total strain at the given time minus the instantaneous strain (Note 3)

on loading. The creep extension is expressed as a percentage, that is, the extension divided by the initial unstretched length multiplied by 100.

NOTE 2—Constant-stress creep tests are desirable. The usual one is a constant deadweight load test. Creep tests made by means of spring loading or fixtures which involve deflection or strain measurements in the fixture for the application of load are unsatisfactory. However, if the total deformation or extension in the adhesive is large, corrections must be made to compensate for the decrease in stress because of the extension in the adhesive.

NOTE 3—Since the time-dependent strain develops rapidly even during the application of the load, the instantaneous strain for recovery is usually difficult to determine, except in the arbitrary manner given in the definitions of instantaneous strain and instantaneous recovery.

3.2.2 *deformation*—the total strain at any specific time.

3.2.3 *failure*—rupture of the specimen, or exceeding the strain requirements of a specific design.

3.2.4 *instantaneous recovery*—the decrease in strain occurring immediately upon unloading a specimen. As in instantaneous strain, a more reproducible value is obtained if the decrease in strain is measured after a given small increment of time (such as 1 min) following unloading. The increment of time used shall be specified. The instantaneous recovery shall be expressed in the same units as strain, that is, the decrease in length divided by the gage length usually, in inches per inch.

3.2.5 *instantaneous strain*—the strain occurring immediately upon loading a creep specimen. Since it is nearly impossible to obtain strain readings at the instant of loading, the strain after a given small increment of time (such as 1 min) after loading is a more reproducible value. The increment of time used shall be specified. The instantaneous strain shall be expressed in the units as strain, that is, the extension divided by the gage length, usually in inches per inch.

3.2.6 *recovery*—the time-dependent portion of the decrease in strain following unloading of a specimen at the same constant temperature as the initial test. Recovery is equal to the total decrease in strain minus the instantaneous recovery (see Note 3). The recovery shall be expressed in the same units as instantaneous recovery.

4. Significance and Use

4.1 This practice provides information on the creep of

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² *Annual Book of ASTM Standards*, Vol 15.06.