



Standard Practice for Bearing Fatigue Response of Polymer Matrix Composite Laminates¹

This standard is issued under the fixed designation D 6873; 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 provides instructions for modifying static bearing test methods to determine the fatigue behavior of composite materials subjected to cyclic bearing forces. The composite material forms are limited to continuous-fiber reinforced polymer matrix composites in which the laminate is both symmetric and balanced with respect to the test direction. The range of acceptable test laminates and thicknesses are described in 8.2.

1.2 This practice supplements Test Method D 5961/D 5961M with provisions for testing specimens under cyclic loading. Several important test specimen parameters (for example, fastener selection, fastener installation method, and fatigue force/stress ratio) are not mandated by this practice; however, repeatable results require that these parameters be specified and reported.

1.3 This practice is limited to test specimens subjected to constant amplitude uniaxial loading, where the machine is controlled so that the test specimen is subjected to repetitive constant amplitude force (stress) cycles. Either engineering stress or applied force may be used as a constant amplitude fatigue variable. The repetitive loadings may be tensile, compressive, or reversed, depending upon the test specimen and procedure utilized.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text the inch-pound units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

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:

- D 883 Terminology Relating to Plastics²
- D 3878 Terminology for Composite Materials³
- D 5229/D 5229M Test Method for Moisture Absorption Properties and Equilibrium Conditioning of Polymer Matrix Composite Materials³
- D 5961/D 5961M Test Method for Bearing Response of Polymer Matrix Composite Laminates³
- E 4 Practices for Force Verification of Testing Machines⁴
- E 6 Terminology Relating to Methods of Mechanical Testing⁴
- E 122 Practice for Calculating Sample Size to Estimate, with a Specified Tolerable Error, the Average for Characteristic of a Lot or Process⁵
- E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods⁵
- E 456 Terminology Relating to Quality and Statistics⁵
- E 467 Practice for Verification of Constant Amplitude Dynamic Forces in an Axial Fatigue Testing System⁴
- E 739 Practice for Statistical Analysis of Linear or Linearized Stress-Life (S-N) and Strain-Life (e-N) Fatigue Data⁴
- E 1309 Guide for Identification of Fiber-Reinforced Polymer-Matrix Composite Materials in Databases³
- E 1434 Guide for Recording Mechanical Test Data of Fiber-Reinforced Composite Materials in Databases³
- E 1823 Terminology Relating to Fatigue and Fracture Testing⁴

3. Terminology

3.1 **Definitions**—Terminology D 3878 defines terms relating to high-modulus fibers and their composites. Terminology D 883 defines terms relating to plastics. Terminology E 6 defines terms relating to mechanical testing. Terminology E 1823 defines terms relating to fatigue. Terminology E 456 and Practice E 177 define terms relating to statistics. In the

¹ This practice is under the jurisdiction of ASTM Committee D30 on Composite Materials and is the direct responsibility of Subcommittee D30.05 on Structural Test Methods.

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² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vol 15.03.

⁴ *Annual Book of ASTM Standards*, Vol 03.01.

⁵ *Annual Book of ASTM Standards*, Vol 14.02.