



Standard Test Method for Bond Strength of Fiber-Reinforced Polymer Matrix Composite Bars to Concrete by Pullout Testing¹

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1. Scope

1.1 This test method covers the determination of the bond strength of fiber-reinforced polymer (FRP) composite bars used as reinforcing bars or pre-stressing tendons in concrete.

1.2 Two procedures for casting test specimens are provided. The first procedure aligns the bar with the concrete casting direction. The second procedure aligns the bar's transverse to the concrete casting direction.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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:²

- A944 Test Method for Comparing Bond Strength of Steel Reinforcing Bars to Concrete Using Beam-End Specimens
- C33/C33M Specification for Concrete Aggregates
- C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens
- C143/C143M Test Method for Slump of Hydraulic-Cement Concrete
- C150/C150M Specification for Portland Cement
- C192/C192M Practice for Making and Curing Concrete Test

Specimens in the Laboratory

- C293/C293M Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)
- C511 Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
- C617/C617M Practice for Capping Cylindrical Concrete Specimens
- D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- D883 Terminology Relating to Plastics
- D3878 Terminology for Composite Materials
- D5229/D5229M Test Method for Moisture Absorption Properties and Equilibrium Conditioning of Polymer Matrix Composite Materials
- D7205/D7205M Test Method for Tensile Properties of Fiber Reinforced Polymer Matrix Composite Bars
- D7705 Test Method for Alkali Resistance of Fiber Reinforced Polymer (FRP) Matrix Composite Bars used in Concrete Construction
- E4 Practices for Force Verification of Testing Machines
- E6 Terminology Relating to Methods of Mechanical Testing
- E83 Practice for Verification and Classification of Extensometer Systems
- E122 Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process
- E456 Terminology Relating to Quality and Statistics
- E1012 Practice for Verification of Testing Frame and Specimen Alignment Under Tensile and Compressive Axial Force Application
- F2203 Test Method for Linear Measurement Using Precision Steel Rule

3. Terminology

3.1 Terminology in D3878 defines terms relating to high modulus fibers and their composites. Terminology in D883 defines terms relating to plastics. Terminology in E6 defines terms relating to mechanical testing. Terminology in E456 and in Practice E122 define terms relating to statistics and the selection of sample sizes. In the event of a conflict between terms, Terminology in D3878 shall have precedence over the other terminology standards.

¹ This test method is under the jurisdiction of ASTM Committee D30 on Composite Materials and is the direct responsibility of Subcommittee D30.10 on Composites for Civil Structures.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.