



Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading)¹

This standard is issued under the fixed designation C1609/C1609M; 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 test method evaluates the flexural performance of fiber-reinforced concrete using parameters derived from the load-deflection curve obtained by testing a simply supported beam under third-point loading using a closed-loop, servo-controlled testing system.

1.2 This test method provides for the determination of first-peak and peak loads and the corresponding stresses calculated by inserting them in the formula for modulus of rupture given in [Eq 1](#). It also requires determination of residual loads at specified deflections, the corresponding residual strengths calculated by inserting them in the formula for modulus of rupture given in [Eq 1](#) (see [Note 1](#)). It provides for determination of specimen toughness based on the area under the load-deflection curve up to a prescribed deflection (see [Note 2](#)) and the corresponding equivalent flexural strength ratio.

NOTE 1—Residual strength is not a true stress but an engineering stress computed using simple engineering bending theory for linear elastic materials and gross (uncracked) section properties.

NOTE 2—Specimen toughness expressed in terms of the area under the load-deflection curve is an indication of the energy absorption capability of the particular test specimen, and its magnitude depends directly on the geometry of the test specimen and the loading configuration.

1.3 This test method utilizes two preferred specimen sizes of 100 by 100 by 350 mm [4 by 4 by 14 in.] tested on a 300 mm [12 in.] span, or 150 by 150 by 500 mm [6 by 6 by 20 in.] tested on a 450 mm [18 in.] span. A specimen size different from the two preferred specimen sizes is permissible.

1.4 *Units*—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.

1.5 *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:²

- C31/C31M Practice for Making and Curing Concrete Test Specimens in the Field
- C42/C42M Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- C78 Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
- C125 Terminology Relating to Concrete and Concrete Aggregates
- C172 Practice for Sampling Freshly Mixed Concrete
- C192/C192M Practice for Making and Curing Concrete Test Specimens in the Laboratory
- C823 Practice for Examination and Sampling of Hardened Concrete in Constructions
- C1140 Practice for Preparing and Testing Specimens from Shotcrete Test Panels

3. Terminology

3.1 *Definitions*—The terms used in this test method are defined in Terminology [C125](#).

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *end-point deflection, n* —the deflection value on the load-deflection curve equal to $1/150$ of the span length, or a larger value as specified at the option of the specifier of tests.

3.2.2 *first-peak load, P_f , n* —the load value at the first point on the load-deflection curve where the slope is zero.

3.2.3 *first-peak deflection, δ_f , n* —the net deflection value on the load-deflection curve at first-peak load.

¹ This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.42 on Fiber-Reinforced Concrete.

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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.