



Standard Test Method for Flexural Toughness of Fiber Reinforced Concrete (Using Centrally Loaded Round Panel)¹

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1. Scope*

1.1 This test method covers the determination of flexural toughness of fiber-reinforced concrete expressed as energy absorption in the post-crack range using a round panel supported on three symmetrically arranged pivots and subjected to a central point load. The performance of specimens tested by this method is quantified in terms of the energy absorbed between the onset of loading and selected values of central deflection.

1.2 This test method provides for the scaling of results whenever specimens do not comply with the target thickness and diameter, as long as dimensions do not fall outside of given limits.

1.3 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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

C31/C31M Practice for Making and Curing Concrete Test Specimens in the Field

C125 Terminology Relating to Concrete and Concrete Aggregates

C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

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.

3. Terminology

3.1 **Definitions**—For definitions of terms used in this test method, refer to Terminology C125.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 **central deflection**—the net deflection at the center of the panel measured relative to a plane defined by the three pivots used to support the panel; this is a conditioned deflection that excludes extraneous deformations of the load train and local crushing of the panel at the point of load application and points of support.

3.2.2 **compliance**—a measure of the tendency of a structure to deflect under load, found as the inverse of stiffness or deflection divided by the corresponding load.

3.2.3 **load train**—those parts of a testing machine that experience load and undergo straining during a mechanical test, including the actuator, frame, support fixtures, load cell, and specimen.

3.2.4 **toughness**—the energy absorbed by the specimen equivalent to the area under the load-deflection curve between the onset of loading and a specified central deflection.

4. Summary of Test Method

4.1 Molded round panels of cast fiber-reinforced concrete or fiber-reinforced shotcrete are subjected to a central point load while supported on three symmetrically arranged pivots. The load is applied through a hemispherical-ended steel piston advanced at a prescribed rate of displacement. Load and deflection are recorded simultaneously up to a specified central deflection. The energy absorbed by the panel up to a specified central deflection is representative of the flexural toughness of the fiber-reinforced concrete panel.

5. Significance and Use

5.1 The post-crack behavior of plate-like, fiber-reinforced concrete structural members is well represented by a centrally loaded round panel test specimen that is simply supported on three pivots symmetrically arranged around its circumference. Such a test panel experiences bi-axial bending in response to a central point load and exhibits a mode of failure related to the *in situ* behavior of structures. The post-crack performance of round panels subject to a central point load can be represented

*A Summary of Changes section appears at the end of this standard