Designation: C 1550 – 03a

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

This standard is issued under the fixed designation C 1550; 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 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 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:*

C 125 Terminology Relating to Concrete and Concrete Aggregates[2]

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials[2]

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology C 125.

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 such as concrete slabs-on-grade, shotcrete tunnel linings, and shotcrete embankment stabilization linings. The post-crack performance of round panels subject to a central point load can be represented by the energy absorbed by the panel up to a specified central deflection. In this test method, the energy absorbed up to a specified central deflection is taken to represent the ability of a fiber-reinforced concrete to redistribute stress following cracking.

NOTE 1—The use of three pivoted point supports in the test configuration results in determinate out-of-plane reactions prior to cracking,

[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] *Annual Book of ASTM Standards*, Vol 04.02.

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

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