Designation: C 1399 – 02

Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete[1]

This standard is issued under the fixed designation C 1399; 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 residual strength of a fiber–reinforced concrete test beam. The average residual strength is computed using specified beam deflections that are obtained from a beam that has been cracked in a standard manner. The test provides data needed to obtain that portion of the load–deflection curve beyond which a significant amount of cracking damage has occurred and it provides a measure of post–cracking strength, as such strength is affected by the use of fiber–reinforcement.

1.2 *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.*

1.3 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

C 31 Practice for Making and Curing Concrete Test Specimens in the Field[2]

C 42 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete[2]

C 78 Test Method for Flexural Strength of Concrete (Using Simple Beam with Third–Point Loading)[2]

C 172 Practice for Sampling Freshly Mixed Concrete[2]

C 192 Practice for Making and Curing Concrete Test Specimens in the Laboratory[2]

C 823 Practice for Examination and Sampling of Hardened Concrete in Constructions[2]

C 1018 Test Method for Flexural Toughness and First Crack Strength of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading)[2]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *deflection*—mid–span deflection of the test beam obtained in a manner that excludes deflection caused by the following: (*1*) the flexural test apparatus, (*2*) crushing and seating of the beam at support contact points, and (*3*) torsion of the beam; sometimes termed net deflection.

3.1.2 *initial loading curve*—the load–deflection curve obtained by testing an assembly that includes both the test beam and a specified steel plate (Fig. 1); plotted to a deflection of at least 0.25 mm (0.010 in.) (Fig. 3).

3.1.3 *reloading curve*—the load–deflection curve obtained by reloading and retesting the pre-cracked beam, that is, after the initial loading but without the steel plate. (Fig. 3)

3.1.4 *reloading deflection*—deflection measured during the reloading of the cracked beam and with zero deflection referenced to the start of the reloading.

3.1.5 *residual strength*—the flexural stress on the cracked beam section obtained by calculation using loads obtained from the reloading curve at specified deflection values (see Note 1).

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

3.1.6 *average residual strength*—the average stress–carrying ability of the cracked beam that is obtained by calculation using the residual strength at four specified deflections.

4. Summary of Test Method

4.1 Cast or sawed beams of fiber–reinforced concrete are cracked using the third–point loading apparatus specified in Test Method C 78 modified by a steel plate used to assist in support of the concrete beam during an initial loading cycle (Fig. 1). The steel plate is used to help control the rate of deflection when the beam cracks. After the beam has been cracked in the specified manner, the steel plate is removed and the cracked beam is reloaded to obtain data to plot a reloading load–deflection curve. Load values at specified deflection values on the reloading curve are averaged and used to calculate the average residual strength of the beam.

5. Significance and Use

5.1 This test method provides a quantitative measure useful in the evaluation of the performance of fiber–reinforced concrete. It allows for comparative analysis among beams

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

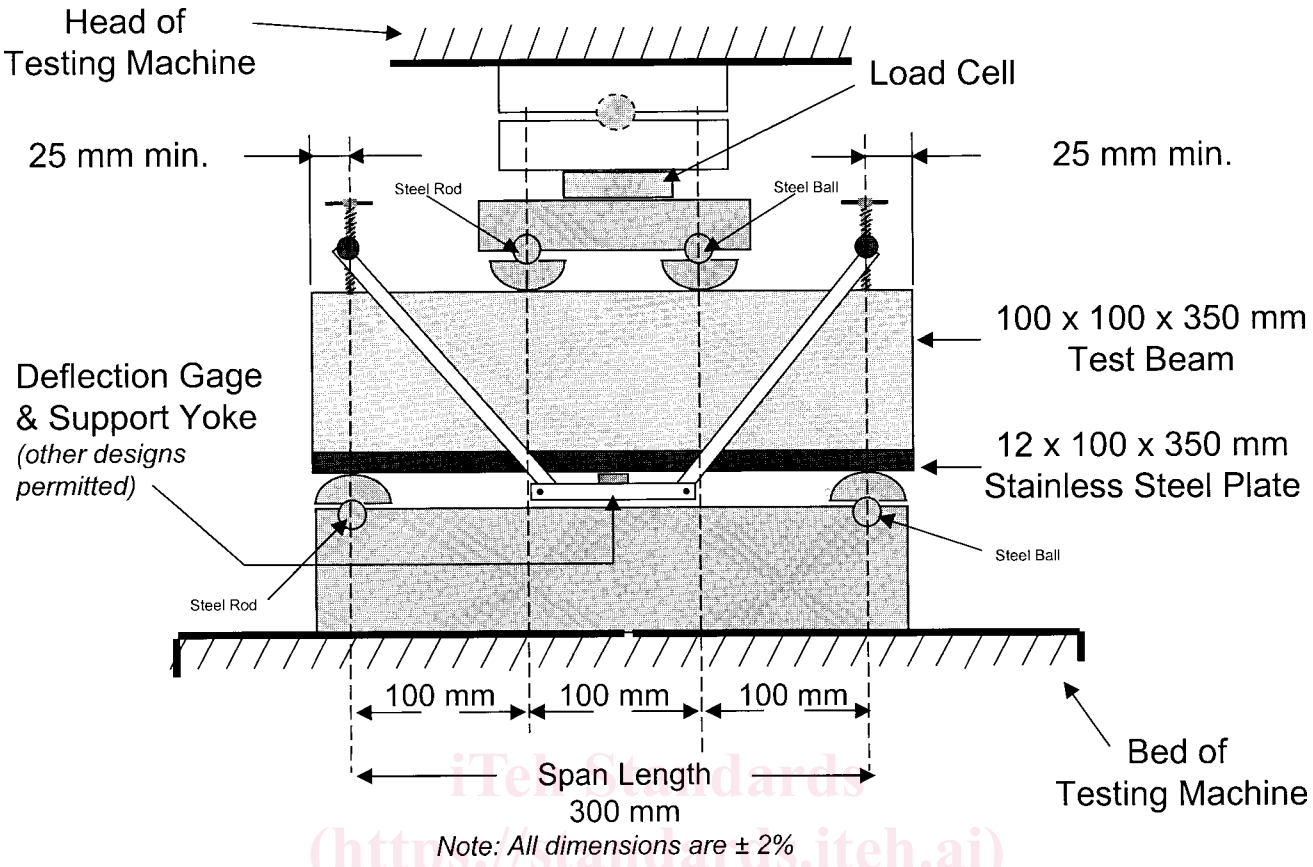

FIG. 1 Schematic of a Suitable Apparatus Where the Deflection Gage Support Frame is Seated on the Beam

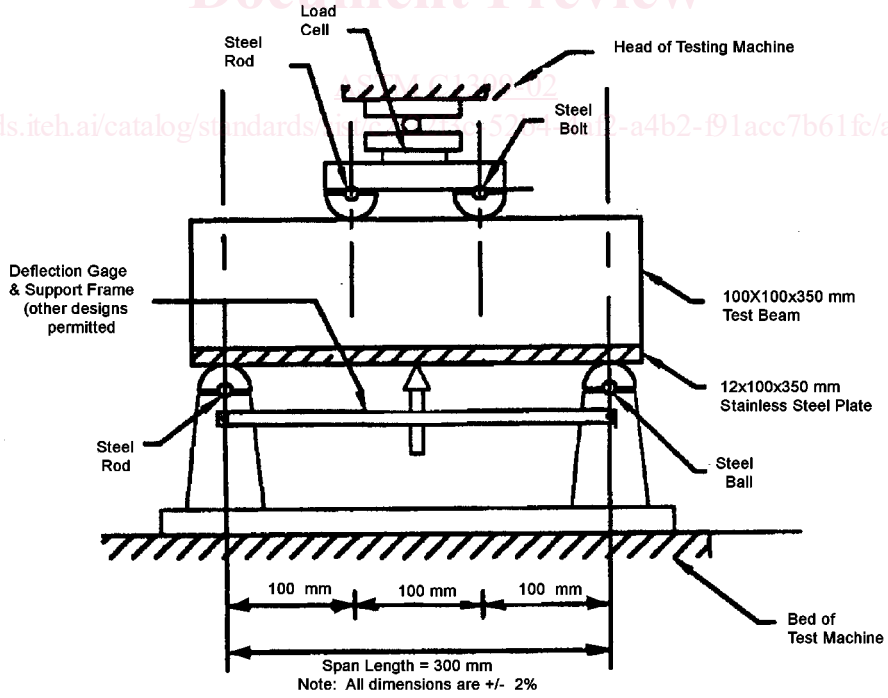

FIG. 2 Schematic of a Suitable Apparatus Where the Deflection Gage Support Frame is Clamped to the Beam Supports

containing different fiber types, including materials, dimension and shape, and different fiber contents. Results can be used to optimize the proportions of fiber–reinforced concrete mixtures, to determine compliance with construction specifications, to