



Designation: C 293 – 00

Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)¹

This standard is issued under the fixed designation C 293; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method covers determination of the flexural strength of concrete specimens by the use of a simple beam with center-point loading. It is not an alternative to Test Method C 78.

1.2 The values stated in inch-pound units are to be regarded as standard. The SI equivalent of inch-pound units has been rounded where necessary for practical application.

1.3 *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 31 Practice for Making and Curing Concrete Test Specimens in the Field²

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

C 192 Practice for Making and Curing Concrete Test Specimens in the Laboratory²

C 617 Practice for Capping Cylindrical Concrete Specimens²

C 1077 Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation²

E 4 Practices for Force Verification of Testing Machines³

3. Significance and Use

3.1 This test method is used to determine the modulus of rupture of specimens prepared and cured in accordance with Practices C 31 or C 192. The strength determined will vary where there are differences in specimen size, preparation, moisture condition, or curing.

3.2 The results of this test method may be used to determine

compliance with specifications or as a basis for proportioning, mixing and placement operations. This test method produces values of flexural strength significantly higher than Test Method C 78 (Note 1).

NOTE 1—The testing laboratory performing this test method may be evaluated in accordance with Practice C 1077.

4. Apparatus

4.1 The testing machine shall conform to the requirements of the sections on Basis of Verification, Corrections, and Time Interval Between Verifications of Practices E 4. Hand operated testing machines having pumps that do not provide a continuous loading to failure in one stroke are not permitted. Motorized pumps or hand operated positive displacement pumps having sufficient volume in one continuous stroke to complete a test without requiring replenishment are permitted and shall be capable of applying loads at a uniform rate without shock or interruption.

4.2 *Loading Apparatus*—The mechanism by which forces are applied to the specimen shall employ a load-applying block and two specimen support blocks. It shall ensure that all forces are applied perpendicular to the face of the specimen without eccentricity. A diagram of an apparatus that accomplishes this purpose is shown in Fig. 1.

4.2.1 All apparatus for making center-point loading flexure tests shall be similar to Fig. 1 and maintain the span length and central position of the load-applying block with respect to the support blocks constant within ± 0.05 in. (± 1.3 mm).

4.2.2 Reactions shall be parallel to the direction of the applied load at all times during the test, and the ratio of the horizontal distance between the point of load application and nearest reaction to the depth of the beam shall be $1.5 \pm 2\%$.

4.2.3 The load-applying and support blocks shall not be more than $2\frac{1}{2}$ in. (64 mm) high, measured from the center or the axis of pivot, and shall extend at least across the full width of the specimen. Each hardened bearing surface in contact with the specimen shall not depart from a plane by more than 0.002 in. (0.05 mm) and shall be a portion of a cylinder, the axis of which is coincidental with either the axis of the rod or center of the ball, whichever the block is pivoted upon. The angle subtended by the curved surface of each block shall be at least 45° (0.79 rad). The load-applying and support blocks shall be maintained in a vertical position and in contact with the rod or

¹ This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.61 on Testing Concrete for Strength.

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

³ *Annual Book of ASTM Standards*, Vol 03.01.