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**Standard Method of Test for**

# **Flexural Strength of Concrete (Using Simple Beam with Third- Point Loading)**

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**AASHTO Designation: T 97-22**

Technically Revised: 2022

**Technical Subcommittee: 3c, Hardened Concrete**

**ASTM Designation: [C78/C78M-21](#)**



**American Association of State Highway and Transportation Officials  
555 12<sup>th</sup> Street NW, Suite 1000  
Washington, DC 20004**

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## 1. SCOPE

- 1.1. This test method covers determination of the flexural strength of concrete by the use of a simple beam with third-point loading.
- 1.2. The values stated in 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 nonconformance with the standard.
- Note 1**—For methods of molding concrete specimens, see [R 39](#) and [R 100](#).
- 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.*
- 1.4. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of [R 18](#) are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with [R 18](#) alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of [R 18](#) or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*

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## 2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- [R 18](#), Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
  - [R 39](#), Making and Curing Concrete Test Specimens in the Laboratory
  - [R 100](#), Making and Curing Concrete Test Specimens in the Field
  - [T 22M/T 22](#), Compressive Strength of Cylindrical Concrete Specimens
  - [T 24M/T 24](#), Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
  - [T 177](#), Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
  - [T 231](#), Capping Cylindrical Concrete Specimens

- 2.2. *ASTM Standards:*
- [C125](#), Terminology Relating to Concrete and Concrete Aggregates
  - [C670](#), Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
  - [E4](#), Standard Practices for Force Verification of Testing Machines
  - [E6](#), Terminology Relating to Methods of Mechanical Testing

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### 3. TERMINOLOGY

- 3.1. *Definitions:*
- 3.1.1. For definitions of terms used in this test method, refer to [ASTM C125](#) and [ASTM E6](#).
- 3.2. *Definitions of Terms Specific to This Standard:*
- 3.2.1. *flexural strength*—maximum resistance of a specimen subjected to bending.
- 3.2.1.1. *Discussion*—In this test method, *flexural strength* is reported as *modulus of rupture*.
- 3.2.2. *flexural testing apparatus*—fixture used to apply force to the beam specimen and consisting of loading and support blocks.
- 3.2.3. *loading block*—component of the testing apparatus in the shape of a portion of a cylinder that is used to apply a force to the beam specimen.
- 3.2.4. *modulus of rupture*—calculated stress, assuming linear-elastic behavior, in the tensile face of a beam specimen at the maximum bending moment during a standard test method.
- 3.2.5. *span length*—distance between lines of support, or reaction, for the beam specimen; equal to three times the nominal depth of the beam.
- 3.2.5.1. *Discussion*—For example, for a 100-mm (4-in.) nominal depth beam, the span length is 300 mm (12 in.) and for a 150-mm (6-in.) nominal depth beam, the span length is 450 mm (18 in.). See Section 3.2.6.1 for discussion of *reaction block*.
- 3.2.6. *support block*—component of the testing apparatus in the shape of a portion of a cylinder that is used to provide a reaction to the force applied to the beam specimens.
- 3.2.6.1. *Discussion*—If the testing apparatus applies force to the top of the beam, this block supports the beam. If the testing apparatus applies force to the bottom of the beam, the support block may be considered a reaction block because it provides a line of reaction at the top of the beam and does not support the beam.
- 3.2.7. *testing machine*—mechanical device for applying force to a specimen,

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### 4. SIGNIFICANCE AND USE

- 4.1. This test method is used to determine the flexural strength of specimens prepared and cured in accordance with [T 24M/T 24](#), [R 39](#), or [R 100](#). Results are calculated and reported as the modulus of rupture. The strength determined will vary where there are differences in specimen size, preparation, moisture condition, curing, or where the beam has been molded or sawed to size.