Designation: ~~C1812 – 15~~ C1812/C1812M – 15^ε1

Standard Practice for
Design of Journal Bearing Supports to be Used in Fiber Reinforced Concrete Beam Tests[1]

This standard is issued under the fixed designation ~~C1812;~~C1812/C1812M; 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.

ε[1] NOTE—The designation was corrected editorially in June 2016 to conform with the units statement (1.2).

1. Scope

1.1 This practice prescribes the design of journal-bearing type rollers to support each end of fiber-reinforced concrete beams tested using Test Method C1399/C1399M or Test Method C1609/C1609M. The roller design is intended to provide a consistent and relatively low value of effective coefficient of friction at the beam supports. The bearing design incorporates metal-on-metal sliding surfaces lubricated with grease.

NOTE 1—During the progress of a test, a crack or cracks open on the underside of the beam between the loaded third points causing the underside of each portion of the beam to move away from the center. The design is intended to provide for unlimited rotation of the roller at the point of contact with the test beam in response to this motion.

NOTE 2—The design of the supporting rollers is a significant factor in determining the magnitude of the arching forces that cause error in flexural test results.[2] Improperly designed supporting rollers can influence the apparent flexural behavior of fiber-reinforced concrete beams.[3] The effective coefficient of friction can be determined using a method similar to that described by Bernard.[4]

1.2 *Units*—The values stated in either 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 non-conformance with the standard.

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:*[5]

C125 Terminology Relating to Concrete and Concrete Aggregates
C1399/C1399M Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete
C1609/C1609M Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading)
D4950 Classification and Specification for Automotive Service Greases

2.2 *SAE International Standard:*[6]

J 404 Chemical Composition of SAE Alloy Steels

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this practice, refer to Terminology C125.

3.2 *Definitions of Terms Specific to This Standard:*

---

[1] This practice 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.

Current edition approved July 1, 2015. Published September 2015. DOI: ~~10.1520/C1812-15.~~10.1520/C1812_C1812M-15E01.

[2] Zollo, R. F., 2013. "Analysis of Support Apparatus for Flexural Load-deflection Testing: Minimizing Bias," *Journal of Testing and Evaluation*, ASTM International, Vol. 41, No. 1, pp. 1-6.

[3] Wille, K. and Parra-Montesinos, G.J., 2012. "Effect of Beam Size, Casting Method, and Support Conditions on Flexural Behavior of Ultra-High-Performance Fiber-Reinforced Concrete," *ACI Journal of Materials*, Vol. 109, No. 3, pp. 379-388.

[4] Bernard, E.S., 2014. "Influence of friction in supporting rollers on the apparent flexural performance of third-point loaded fibre reinforced concrete beams," *Advanced Civil Engineering Materials*, ASTM International Vol. 2, No. 1, pp. 158-176.

[5] 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.

[6] Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, http://aerospace.sae.org.

3.2.1 *effective coefficient of friction, n*—a dimensionless ratio of the horizontal force required to initiate rotation of the roller support applied at the contact point between the roller and test beam divided by the normal force applied at the same point (see Fig. 1).

3.2.2 *roller, n*—a journal bearing capable of continuous rotation without exhibiting a significant variation in resistance to rotation.

4. Significance and Use

4.1 The presence of friction in the supporting rollers used when testing a fiber-reinforced concrete beam will increase the apparent load resistance of the beam. Roller supports designed in accordance with this practice will provide a relatively low and consistent value of friction at the supports.

4.2 Two types of rollers are used to support a beam. One includes a cylindrical bearing that allows the roller assembly to rotate along an axis parallel to the longitudinal axis of the beam and thereby accommodate any warping introduced during specimen fabrication. The other roller does not include the cylindrical bearing.

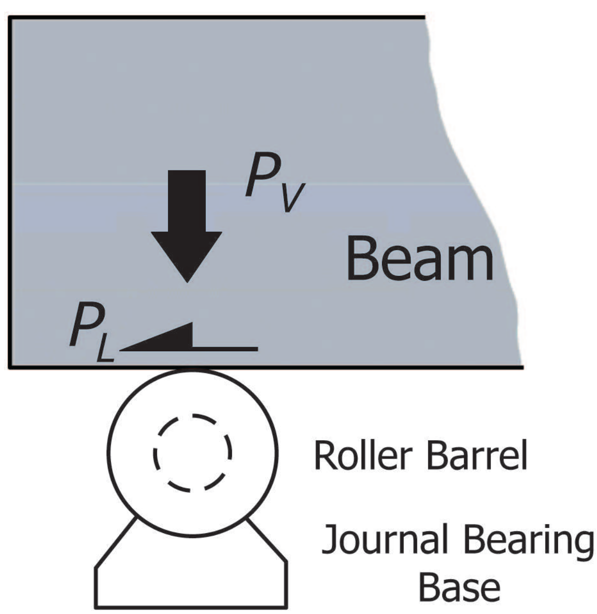
4.3 The rollers are designed for use with 150 mm [6 in.] or 100 mm [4 in.] deep beams of square cross-section.

4.4 A method is provided for correcting the apparent load resistance measured using the roller with a known value of the effective coefficient of friction of the roller supports to obtain an estimate of the load resistance in the absence of friction.

5. Apparatus

5.1 *Geometry*—A pair of rollers is required to support a beam during a test. The barrel of each roller, which is that portion of the roller in contact with the beam, shall be free to rotate about an axis perpendicular to the longitudinal axis of the beam to accommodate movement of the initial support point on the beam away from the center during a test. Friction between sliding surfaces within each roller will generate a small resistance to rotation of the barrel relative to the mounting (see Fig. 1). A roller fabricated in accordance with this practice will exhibit an effective coefficient of friction of about 0.10.[4] Journal bearing supports manufactured in conformance with this practice do not need to be tested to confirm that the effective coefficient of friction meets requirements.

5.1.1 One of the two rollers supporting the underside of the beam shall be able to rotate about an axis parallel to the longitudinal axis of the beam to accommodate a warped test beam surface that could induce torsion in the beam during testing (see Note 3 and Fig. 2). The other roller shall be fixed against rotation about a longitudinal axis to prevent the beam from overturning during installation and testing (see Fig. 3). Rotation about a longitudinal axis shall be accommodated by inclusion of a cylindrical bearing surface under the roller mount with a center of rotation that coincides with the plane of the contacting surface between roller and bottom of the beam. The base of the cylindrical bearing surface shall include bolt holes to facilitate fixing the roller to the testing machine. The roller that is fixed against rotation about a longitudinal axis (Fig. 3 and Fig. 6) shall incorporate a similar mounting so that the total height is the same as the roller assembly shown in Fig. 2 and Fig. 5 and the beam is maintained level during a



P_L = frictional force applied to the roller by the beam.
P_V = vertical force applied to the roller by the beam.

FIG. 1 Forces Acting on a Supporting Roller During a Test