



Standard Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores¹

This standard is issued under the fixed designation C174/C174M; 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.

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

1. Scope*

1.1 This test method covers the determination of the thickness of a concrete pavement, slab, or structural element by measuring the length of a core drilled from a concrete structure.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the inch-pound units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other.

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. Significance and Use

2.1 This test method is used to determine the compliance of concrete construction with design specifications. It is especially important in determining the thickness of pavements and other slab construction.

3. Apparatus

3.1 The apparatus shall consist of a 3-point caliper device that will measure the length of axial elements of the core. While the details of the mechanical design are not prescribed, the apparatus shall conform to the requirements of 3.2 to 3.6.² An example of the apparatus is illustrated in Fig. 1.

3.2 The apparatus shall be so designed that the specimen will be held with its axis in a vertical position by three symmetrically placed supports bearing against the lower end. These supports shall be short posts or studs of hardened steel, and the ends that bear against the surface of the specimen shall be rounded to a radius of not less than 6 mm [$\frac{1}{4}$ in.] and not more than 13 mm [$\frac{1}{2}$ in.].

3.3 The apparatus shall provide for the accommodation of specimens of different nominal lengths over a range of at least 100 to 250 mm [4 to 10 in.].

3.4 The caliper device shall be so designed that it will be possible to make a length measurement at the center of the upper end of the specimen, and at eight additional points spaced at equal intervals along the circumference of a circle whose center point coincides with that of the end area of the specimen and whose radius is not less than one half nor more than three fourths of the radius of the specimen.

3.5 The measuring rod or other device that makes contact with the end surface of the specimen for measurement shall be rounded to a radius of 3 mm [$\frac{1}{8}$ in.]. The scale on which the length readings are made shall be marked with clear, definite, accurately spaced graduations. The spacing of the graduations shall be 1.0 mm [0.10 in.] or a decimal part thereof.

3.6 The apparatus shall be stable and sufficiently rigid to maintain its shape and alignment without a distortion or deflection of more than 0.25 mm [0.01 in.] during all normal measuring operations.

3.7 *Verification gages:* Suitable gages for verification are right circular cylinders with flat ends and a diameter approximately equal to the diameter of cores intending to be measured and a length in the range of the required measurements. To accommodate various core lengths, gages are available in several lengths. To minimize uncertainty of measurement, the length of the cylinder at the perimeter shall be determined accurately to 0.05 mm [0.002 in.] using calibrated measuring instruments. The flatness of the ends shall not depart from a plane by more than 0.02 mm [0.001 in.] in any 150 mm [6 in.]

¹ This test method is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.69 on Miscellaneous Tests.

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² For further information relating to the development of this test method and apparatus, reference should be made to the "Project Report on a Study of Methods of Measurement of the Length of Cores Drilled from Concrete Structures," prepared by L. W. Teller for Subcommittee VII on Methods and Apparatus for Testing Concrete, of Committee C09, see *Proceedings*, Am. Soc. Testing Mats., ASTM, Vol 42, 1942.



FIG. 1 Core Measuring Apparatus

of cylinders 150 mm [6 in.] in diameter or larger, or by more than 0.02 mm [0.001 in.] in the diameter of any smaller cylinder.

4. Test Specimens

4.1 Cores used as specimens for length measurement shall be in every way representative of the concrete in the structure from which they are removed. The specimen shall be drilled with the axis normal to the surface of the structure, and the ends shall be free from all conditions not typical of the surfaces of the structure. Cores that show abnormal defects or that have been damaged appreciably in the drilling operation shall not be used. If a core drilled from a pavement or structure placed on dense-graded aggregate base course includes particles of the aggregate bonded to the bottom surface of the concrete, the bonded particles shall be removed by wedging or by chisel and hammer applied so as to expose the lower surface of the concrete. If the concrete is placed on an open-graded aggregate base course, the mortar in the concrete may penetrate into the base and surround some particles. Use sufficient force with a wedge or chisel and hammer to remove bonded particles but not such force as to fracture particles substantially surrounded by mortar. If during the removal of bonded aggregate the concrete is broken so that the instructions of 5.4 cannot be followed, the core shall not be used for length measurement.

5. Procedure

5.1 Before any measurements of the core length are made, verify the apparatus with suitable gages, as defined in 3.7, so that errors caused by mechanical imperfections in the apparatus are known. If the difference between the length measured with the apparatus and the known length of the verification gage exceeds 0.25 mm [0.01 in.], apply suitable corrections to the core length measurements.

5.2 Place the specimen in the measuring apparatus with the smooth end of the core, that is, the end that represents the upper surface of a pavement slab or a formed surface in the case of other structures, placed down so as to bear against the three hardened-steel supports. So place the specimen on the supports that the central measuring position of the measuring apparatus is directly over the midpoint of the upper end of the specimen.

5.3 Make nine measurements of the length on each specimen, one at the central position and one each at eight additional positions spaced at equal intervals along the circumference of the circle of measurement. Read each of these nine measurements to the nearest 1.0 mm [0.05 in.].

5.4 If, in the course of the measuring operation, it is discovered that at one or more of the measuring points the surface of the specimen is not representative of the general plane of the core end because of a small projection or depression, the specimen shall be rotated slightly about its axis and a complete set of nine measurements made with the specimen in the new position. With cores from pavements placed over open-graded aggregate bases the foregoing provisions frequently cannot be met because of the great number of projections or voids on the bottom surface.

6. Report

6.1 The individual observations shall be recorded to the nearest 1.0 mm [0.05 in.], and the average of the nine measurements expressed to the nearest 1.0 mm [0.05 in.] shall be reported as the length of the concrete core.

7. Precision and Bias

7.1 Precision:

7.1.1 *3-Point Caliper*—No statement is made about the precision of this test procedure. An interlaboratory test program for the determination of core length by this procedure is being studied by Subcommittee C09.69 and will be included in a later revision of this test method.

7.2 *Bias*—Since there are not acceptable reference cores suitable for determining the bias of these procedures, no statement on bias is being made.

8. Keywords

8.1 3-point caliper; concrete; cores; length measurement; thickness measurement



SUMMARY OF CHANGES

Committee C09 has identified the location of selected changes to this test method since the last issue, C174/C174M–12, that may impact the use of this test method. (Approved August 1, 2013)

(1) Changed section 6.1.

(2) Changed section 5.1 and added section 3.7.

Committee C09 has identified the location of selected changes to this test method since the last issue, C174/C174M–06, that may impact the use of this test method. (Approved July 1, 2012)

(1) Deleted Footnote 3.

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