



# Standard Test Method for Measuring Length of Concrete Cores<sup>1</sup>

This standard is issued under the fixed designation C1542/C1542M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope\*

1.1 This test method is used to determine the length of a core drilled from concrete.

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. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

C42/C42M Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

C125 Terminology Relating to Concrete and Concrete Aggregates

C174/C174M Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores

C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

C1604/C1604M Test Method for Obtaining and Testing Drilled Cores of Shotcrete

## 3. Terminology

3.1 *Definitions:*

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

## 4. Significance and Use

4.1 This test method provides two procedures for determining the length of a core obtained in accordance with either Test

Method C42/C42M or Test Method C1604/C1604M. This length is used in conjunction with condition surveys, density and voids analysis, and other applications.

4.2 This procedure does not intend to include in the length measurement adhered particles not part of the concrete mixture.

4.3 Test Method C174/C174M also determines the length of concrete cores using a different measuring apparatus and procedure.

NOTE 1—Test Method C174/C174M uses an apparatus that establishes two parallel planes a known distance apart. The length of the core is determined by calculation using the known distance between the two parallel planes and the measured distance from the upper plane to the top of the core.

## 5. Apparatus

5.1 *Jaw Caliper*, minimum depth of jaw 65 mm [2.5 in.]. Measuring range 0 to 300 mm [0 to 12 in.]. Accuracy to 0.02 mm [0.001 in.] or better.

5.1.1 Offset points as part of caliper accessory kit to permit length measurements at points not on the core perimeter.

5.2 *Ruler*, 300 to 380 mm [12 to 15 in.] divided into 1 mm [ $\frac{1}{16}$  or 0.1 in.] graduations.

## 6. Test Specimens

6.1 Cores shall be obtained in accordance with Test Method C42/C42M or Test Method C1604/C1604M.

6.2 Cores shall be intact and be free of any coatings.

## 7. Procedure

7.1 *Jaw Caliper Procedure:*

7.1.1 Attach offset points to caliper jaws and initialize zero reading.

7.1.2 Hold the specimen and place the open jaws of the caliper midpoint between the center and edge of the specimen. Measure and record the value to the nearest 0.25 mm [0.01 in.]. Rotate the specimen 90°, 180°, and 270° and repeat procedure. Obtain one measurement along the axis of the specimen and record.

7.1.3 Re-zero the calipers. If the zero reading has changed by more than 0.25 mm [0.01 in.] take a new set of measurements as described in 7.1.2.

7.2 *Ruler Procedure:*

<sup>1</sup> 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 for Strength.

Current edition approved June 1, 2016. Published June 2016. Originally approved in 2002. Last previous edition approved in 2016 as C1542/C1542M – 16. DOI: 10.1520/C1542\_C1542M-16A.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

7.2.1 Position core with finished or formed face placed down against flat and level surface. Place ruler on flat surface against side of core and measure length to nearest 1 mm [ $\frac{1}{16}$  or 0.05 in.] (**Note 2**) and record. Rotate core and repeat measurements at approximately 90°, 180°, and 270°.

NOTE 2—If using a ruler with 0.1 in. divisions, estimate to the nearest half division.

7.2.2 If a core drilled from a pavement or structure placed on an aggregate base course includes particles of the base course bonded to the bottom surface of the concrete, the bonded material shall not be included in any measurements. Use the ruler procedure when measuring cores with adhering material. Measure from the end of the core to the interface of the concrete with any adhering material. If the concrete is placed on an open-graded aggregate base course, the mortar in the concrete may penetrate into the base and partially surround some particles. The penetrating mortar shall be measured but adhering particles shall not be included in any measurement.

## 8. Report

8.1 *Jaw Caliper*—Report the five individual measurements to the nearest 0.25 mm [0.01 in.]. Average five measurements and report to the nearest 1 mm [0.05 in.].

8.2 *Ruler*—Report the four individual measurements to the nearest 1 mm [ $\frac{1}{16}$  or 0.05 in.]. Average four measurements and report to the nearest 1 mm [0.05 in.].

## 9. Precision and Bias

### 9.1 Precision:

9.1.1 Single operator and between laboratory precision of the jaw caliper and ruler procedures was estimated from the

results of an interlaboratory study that included 12 laboratories, each measuring three times a core from each of three concretes. The length of the cores ranged approximately from 64 to 117 mm [2.5 to 4.6 in.]. A report of the results of the interlaboratory study is available from ASTM International Headquarters.<sup>3</sup>

9.1.2 *Jaw Caliper Procedure*—The single-operator coefficient of variation<sup>4</sup> has been found to be 1.02 %, therefore, two measures of the same core should not differ by more than 2.89 % (d2S %)<sup>4</sup> of the mean length of the core.

9.1.3 The between-laboratory coefficient of variation<sup>4</sup> has been found to be 1.60 %, therefore, two measures of the same core by two different laboratories should not differ by more than 4.23 % (d2S %)<sup>4</sup> of the mean length of the core.

9.1.4 *Ruler Procedure*—The single-operator coefficient of variation<sup>4</sup> has been found to be 1.94 %, therefore, two measures of the same core should not differ by more than 5.43 % (d2S %)<sup>4</sup> of the mean length of the core. The between-laboratory coefficient of variation<sup>4</sup> has been found to be 4.35 %, therefore, two measures of the same core by two different laboratories should not differ by more than 12.18 % (d2S %)<sup>4</sup> of the mean length of the core.

9.2 *Bias*—Because there are no reference cores suitable for determining the bias of these procedures, no statement on bias is being made.

## 10. Keywords

10.1 concrete; core; jaw caliper; ruler; length measurement

<sup>3</sup> Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:C09-1024. Contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org).

<sup>4</sup> As described in Practice C670.

## SUMMARY OF CHANGES

Committee C09 has identified the location of selected changes to this standard since the last issue (C1542/C1542M – 16) that may impact the use of this standard. (Approved June 1, 2016.)

(1) Rewrote **Note 1**.

Committee C09 has identified the location of selected changes to this standard since the last issue (C1542/C1542M – 14) that may impact the use of this standard. (Approved Feb. 1, 2016.)

(1) Revised Section **4**.

(2) Added Section **6**.

(3) Added **7.1.3**.

(4) Revised **7.2.1** and added **Note 2**.

(5) Added **7.2.2**.

(6) Revised Section **9**.

(7) Revised Section **10**.



## **C1542/C1542M – 16a**

*ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.*

*This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or [service@astm.org](mailto:service@astm.org) (e-mail); or through the ASTM website ([www.astm.org](http://www.astm.org)). Permission rights to photocopy the standard may also be secured from the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923, Tel: (978) 646-2600; <http://www.copyright.com/>*