Designation: ~~C873/C873M – 15~~ C873/C873M – 23

Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds[1]

This standard is issued under the fixed designation C873/C873M; 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.

1. Scope*

1.1 This test method covers the determination of strength of cylindrical concrete specimens that have been molded in place using special molds attached to formwork. This test method is limited to use in slabs where the depth of concrete is from ~~125~~125 mm to 300 mm ~~[5~~[5 in. to 12 in.].

1.2 The text of this standard refers to notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.

1.3 *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~~are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the ~~other.~~ other, and values from the two systems shall not be combined. Combining values from the two systems may result in non-conformance with the standard.

1.4 *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 ~~consult and~~ establish appropriate ~~safety and health~~safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* (**Warning**—Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.[2])

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[3]

C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens
C42/C42M Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C470/C470M Specification for Molds for Forming Concrete Test Cylinders Vertically
~~C617~~C617/C617M Practice for Capping Cylindrical Concrete Specimens
C670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials

[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 for Strength.

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[2] Section on Safety Precautions, Manual of Aggregate and Concrete Testing, *Annual Book of ASTM Standards*, Vol 04.02.

[3] 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.

***A Summary of Changes section appears at the end of this standard**

C1231/C1231M Practice for Use of Unbonded Caps in Determination of Compressive Strength of Hardened Cylindrical Concrete Specimens

3. Summary of Test Method

3.1 A concrete cylinder mold assembly consisting of a mold and a tubular support member is fastened within the concrete formwork prior to placement of the concrete as shown in Fig. 1. The elevation of the mold upper edge is adjusted to correspond to the level of the finished slab surface. The mold support prevents direct contact of the slab concrete with the outside of the mold and permits easy removal of the mold from the slab. The mold is filled at the time its location is reached in the normal course of concrete placement. The specimen in the "cured-in-place" condition is removed from its in-place location immediately prior to de-molding, capping, and testing. The reported compressive strength is corrected on the basis of specimen length-diameter ratio using correction factors provided in the section on calculation of Test Method C42/C42M.

4. Significance and Use

4.1 Cast-in-place cylinder strength relates to the strength of concrete in the structure due to the similarity of curing conditions because the cylinder is cured within the slab. However, due to differences in moisture condition, degree of consolidation, specimen size, and length-diameter ratio, there is not a unique relationship between the strength of cast-in-place cylinders and cores of the same age. When cores can be drilled undamaged and tested in the same moisture condition as the cast-in-place cylinders, the strength of the cylinders can be expected to be on average 10 % higher than the cores at ages up to 91 days for specimens of the same size and length-diameter ratio.[4]

4.2 Strength of cast-in-place cylinders may be used for various purposes, such as estimating the load-bearing capacity of slabs, determining the time of form and shore removal, and determining the effectiveness of curing and protection.

5. Apparatus

5.1 Cast-in-place molds shall have a diameter at least three times the nominal maximum aggregate size. The length-diameter ratio (*L/D*) of the specimen after capping shall not be less than 1.0 (see Note 1). Molds (inner member) shall be constructed in one piece in the form of right circular cylinders at least 100 mm [4 in.] in inside diameter with the average diameter not differing from the nominal diameter by more than 1 % and no individual diameter differing from any other diameter by more than 2 %. The plane of the rim of the mold and the bottom shall be perpendicular to the axis of the mold within 0.5° (approximately equivalent to 1 mm in 300 mm [⅛ in. in 12 in.]).

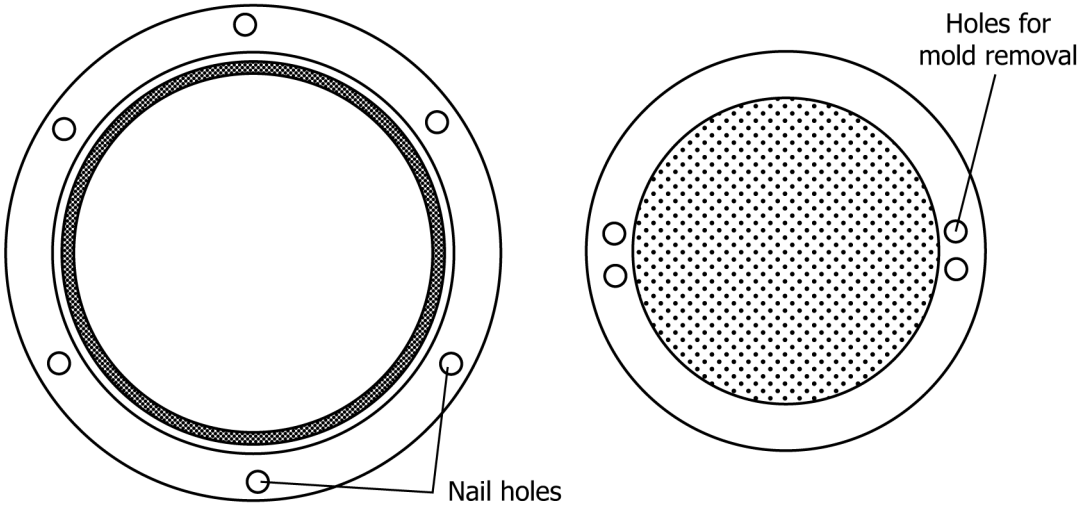
NOTE 1—The length-diameter ratio should preferably be between 1.5 and 2.0.

5.2 Molds shall be watertight and meet the criteria of the section on water leakage of Specification C470/C470M. Molds and auxiliary apparatus shall be made of nonabsorbent material that does not react with concrete containing portland or other hydraulic cements. Molds shall be sufficiently strong and tough to permit use under normal construction conditions without tearing, crushing, or otherwise deforming permanently when filled with fresh concrete. Molds shall resist permanent deformation to the extent that they produce hardened concrete cylinders such that two diameters measured at right angles to each other in any horizontal plane do not differ by more than 2.0 mm [1⁄16 in.].

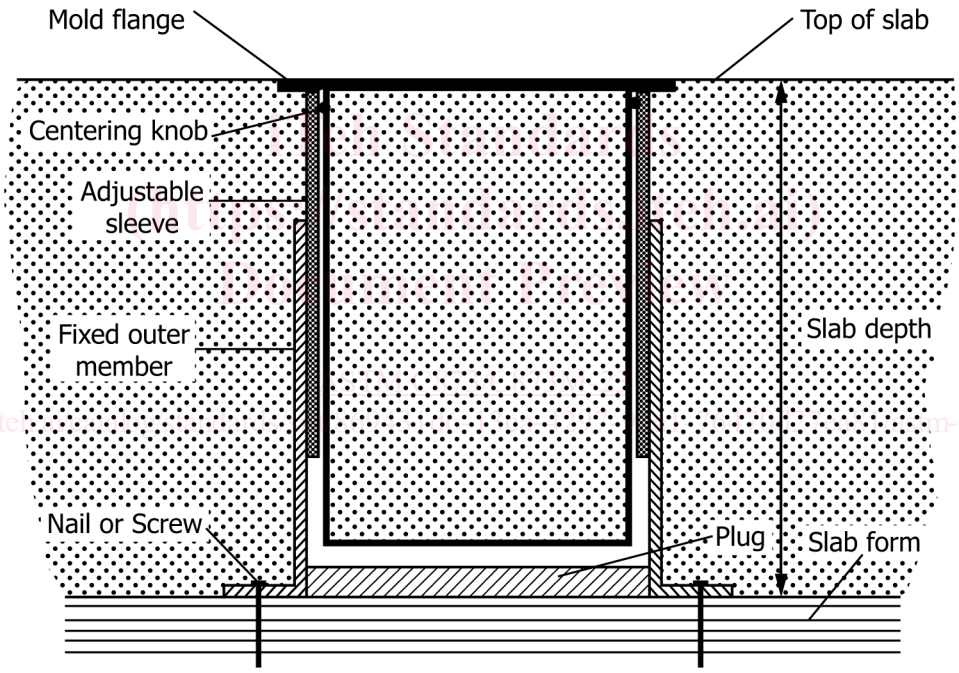
5.3 The exterior top of the mold shall have outwardly extending centering knobs and an annular flange to rest on top of the support member (5.4) and to seal the annular ring space between the mold and that support member. Means for twisting and vertical withdrawal of molds from the support member shall be provided in the annular flange (see Fig. 1).

5.4 Support members shall be right circular cylinders and shall be rigid tubes of diameter required to accommodate molds stipulated in 5.1 and to concentrically contact and support the annular flange of the mold. Support members shall be provided with a means for height adjustment and shall be fitted with exterior means to permit nailing or other firm attachment to slab forms in a manner preventing entry of concrete or mortar into the annular ring space between the support member and the mold.

[4] Bloem, D. L., "Concrete Strength in Structures," *Journal of the American Concrete Institute,* JACIA, March 1968, or *ACI Proceedings*, PACIA, Vol. 65, No. 3, pp. 169–248.



(a) Plan of support member **(b) Plan of mold**



(c) Elevation of support member and mold

FIG. 1 Schematic of Cast-in-Place Cylinder Mold Assembly