



Designation: C 873 – 99

## Standard Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds<sup>1</sup>

This standard is issued under the fixed designation C 873; 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.

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

### 1. Scope

1.1 This test method covers the determination of strength of cylindrical concrete specimens derived by means of a cast-in-place mold technique using specimens molded in place in the concrete structural slab at the time the structural slab is cast. This test method is limited to use in slabs where the depth of concrete is from 5 to 12 in. [125 to 300 mm].

1.2 The values stated in either inch-pounds or SI units shall be regarded separately as standard. SI units are shown in brackets. The values stated may not be exact equivalents, therefore each system must be used independently of the other. Combining values of the two units may result in nonconformance.

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 consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

- C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens<sup>2</sup>
- C 42 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete<sup>2</sup>
- C 470 Specification for Molds for Forming Concrete Test Cylinders Vertically<sup>2</sup>
- C 617 Practice for Capping Cylindrical Concrete Specimens<sup>2</sup>
- C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials<sup>2</sup>

### 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

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregates, and is the direct responsibility of Subcommittee C09.61 on Testing for Strength.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 04.02.

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 plane of the finished slab surface. The mold support prevents direct contact of the slab concrete with the outside of the mold and permits its easy removal after the concrete has hardened. The mold is filled at the time its location is reached in the normal course of concrete placement. The specimen in the “as-cured” 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 to diameter ratio using correction factors provided in the section on calculation of Test Method C 42.

### 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 since the cylinder is actually cured within the slab. However, due to differences in moisture condition, degree of consolidation, specimen size, and length to diameter ratio, there is not a constant relationship between the strength of cast-in-place cylinders and cores. 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 an average 10 % higher than the cores at ages up to 91 days for specimens of the same size and length to diameter ratio.<sup>3</sup>

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 ratio of the length-to-diameter ( $L/D$ ) of the specimen after capping shall not be less than 1.0 and should preferably be between 1.5 and 2.0. Molds (inner member) shall be constructed in one piece in

<sup>3</sup> 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.

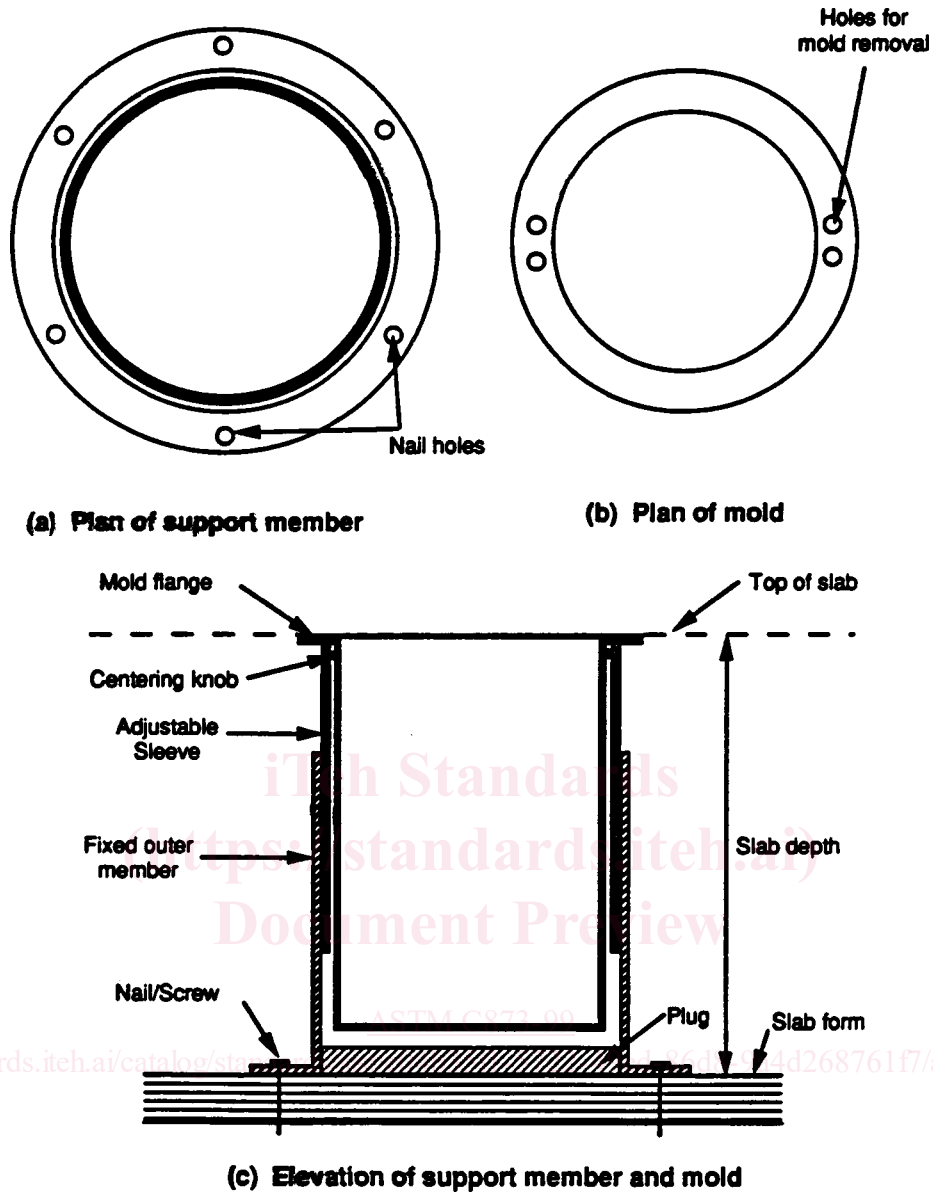


FIG. 1 Schematic of Cast-in-Place Cylinder Mold Assembly

the form of right circular cylinders at least 4 in. [100 mm] 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 1/8 in. in 12 in. [3 mm in 300 mm]).

5.2 Molds shall be watertight and meet the criteria of the section on water leakage of Specification C 470. Molds and auxiliary apparatus shall be made of nonabsorbent material, nonreactive with concrete containing portland or other hydraulic cements. They shall be sufficiently strong and tough to permit use under normal construction conditions without tearing, crushing, or otherwise deforming when filled with fresh concrete. They shall resist deformation to the extent that they produce hardened concrete cylinders such that two diam-

eters measured at right angles to each other in any horizontal plane do not differ by more than 1/16 in. [2.0 mm].

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 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 or reinforcing steel in a manner