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Standard Practice for Molding Roller-Compacted Concrete in Cylinder Molds Using a Vibrating Hammer[1]

This standard is issued under the fixed designation C 1435; 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 practice covers molding cylindrical test specimens from concrete when the standard procedures of rodding and internal vibration, as described in Practice C 31/C 31M and Practice C 1176, are not practicable. This practice is applicable to freshly-mixed concrete, prepared in the laboratory and the field.

1.2 Freshly-mixed concrete is molded in cylindrical molds using an electric vibrating hammer equipped with a shaft and circular plate.

1.3 The values stated in either inch-pound units or SI 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 may not be exact equivalents, therefore, each system must be used independently of each other without combining in any way.

1.4 The text of this practice references notes and footnotes, which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of this practice.

1.5 *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:*

C 31/C 31M Practice for Making and Curing Concrete Test Specimens in the Field[2]

C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens[2]

C 172 Practice for Sampling Freshly-Mixed Concrete[2]

C 192/C 192M Practice for Making and Curing Concrete Test Specimens in the Laboratory[2]

C 470 Specification for Molds for Forming Concrete Test Cylinders Vertically[2]

C 496 Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens[2]

C 1170 Test Methods for Determining Consistency and Density of Roller-Compacted Concrete Using Vibrating Table[2]

C 1176 Practice for Making Roller-Compacted Concrete in Cylinder Molds Using a Vibrating Table[2]

2.2 *ACI Documents:*

207.5R Report on Roller-Compacted Concrete[3]

211.3 Practice for Selecting Proportions for No-Slump Concrete[3]

3. Summary of Practice

3.1 This practice describes molding cylindrical concrete test specimens using a vibrating hammer. Test specimens are molded vertically in cylindrical molds by compacting the stiff to very dry concrete mixture in three lifts using a vibrating hammer.

4. Significance and Use

4.1 This practice, intended for use in testing roller-compacted concrete, may be applicable to testing other types of cementious material such as coarse-grained, soil-cement. This practice provides standardized requirements for molding stiff to very dry consistency concrete mixtures commonly used in roller compacted concrete construction. This practice is used instead of rodding or internal vibration, which cannot properly consolidate concrete of this consistency (Note 1).

NOTE 1—Further description of roller compacted concrete consistency is given in ACI 207.5R and 211.3. The consistency of concrete using a vibrating table may be determined in accordance with Test Methods C 1170.

4.2 This practice is used to mold cylindrical test specimens commonly used for testing compressive or tensile strength of concrete. Specimens tested for compressive strength and splitting tensile strength shall be in accordance with Test Methods C 39 and C 496, respectively. Test specimens also may be used to determine density of fresh concrete. Specimens tested for density of fresh concrete shall be in accordance with Test Methods C 1170.

5. Apparatus

5.1 *Molds*:

[1] This practice is under the jurisdiction of Committee C-09 on Concrete and Concrete Aggregates and are the direct responsibility of Subcommittee C09.45 on Roller-Compacted Concrete.

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[2] *Annual Book of ASTM Standards*, Vol 04.02.

[3] *ACI Manual of Concrete Practice, Part 1, Materials and General Properties of Concrete*, American Concrete Institute, Farmington Hills, MI.

5.1.1 *Type A Reusable Mold*—A cylindrical mold conforming to the requirements of Specification C 470 for 150-mm [6-in.] diameter by 300-mm [12-in.] high reusable molds.

5.1.2 *Type B Single-Use Mold*—A single-use plastic, cylindrical mold 150-mm [6-in.] diameter and 300-mm [12-in.] in height. The mold specifications shall conform to Specification C 470 for single-use, plastic molds.

5.1.2.1 *Mold Sleeve*—A Type B cylindrical mold shall be inserted into a rigid cylindrical sleeve. The mold sleeve shall be made of steel or other hard metal resistant to cement paste corrosion. The sleeve shall be capable of firmly and vertically holding the plastic mold in place without deformation and shall be slotted vertically with adjustable clamps for tightening around the mold. The sleeve shall be constructed so that it can be opened to remove the single-use, plastic mold and also shall have permanently affixed metal brackets so the sleeve may be held stationary during compaction. The mold sleeve shall have a minimum wall thickness of 3 mm [⅛ in.], and a minimum base plate thickness of 6 mm [¼ in.]. The inside diameter of the mold sleeve shall be 3 ± 1 mm [⅛ ± 1⁄16 in.] larger than the outside diameter of the Type B mold and have a height 13 ± 6 mm [½ ± ¼ in.] less than the height of the Type B mold. A 50-mm [2-in.] high collar shall be attached to the top of the mold to contain concrete and guide the vibrating plate during compaction of the final lift.

5.2 *Vibrating Hammer*—A vibrating compaction hammer having a minimum mass (without tamping plate) of 10 ± 0.2 kg [22 ± 0.4 lb]. It also shall have a minimum power input of 900 W and be capable of providing at least 2000 impacts/min.

NOTE 2—The vibrating hammer used to compact the specimens, such as shown in Fig. 1, is of the type used typically for breaking up concrete and masonry. It provides oscillatory motion in the axial direction that makes the hammer an effective vibratory compactor. Hammers that have been found suitable for this purpose include the Kango 900 and Hilte TE-804.

5.3 *Tamping Plate*—A circular steel plate attached to a metal shaft, which inserts into the vibrating hammer chuck. The diameter shall be 140 ± 3 mm [5 ¾ ± ⅛ in.] and a mass of 3 ± 0.1 kg [6.5 ± 0.2 lb].

5.4 *Small Tools*—Trowels, square-ended shovel and hand

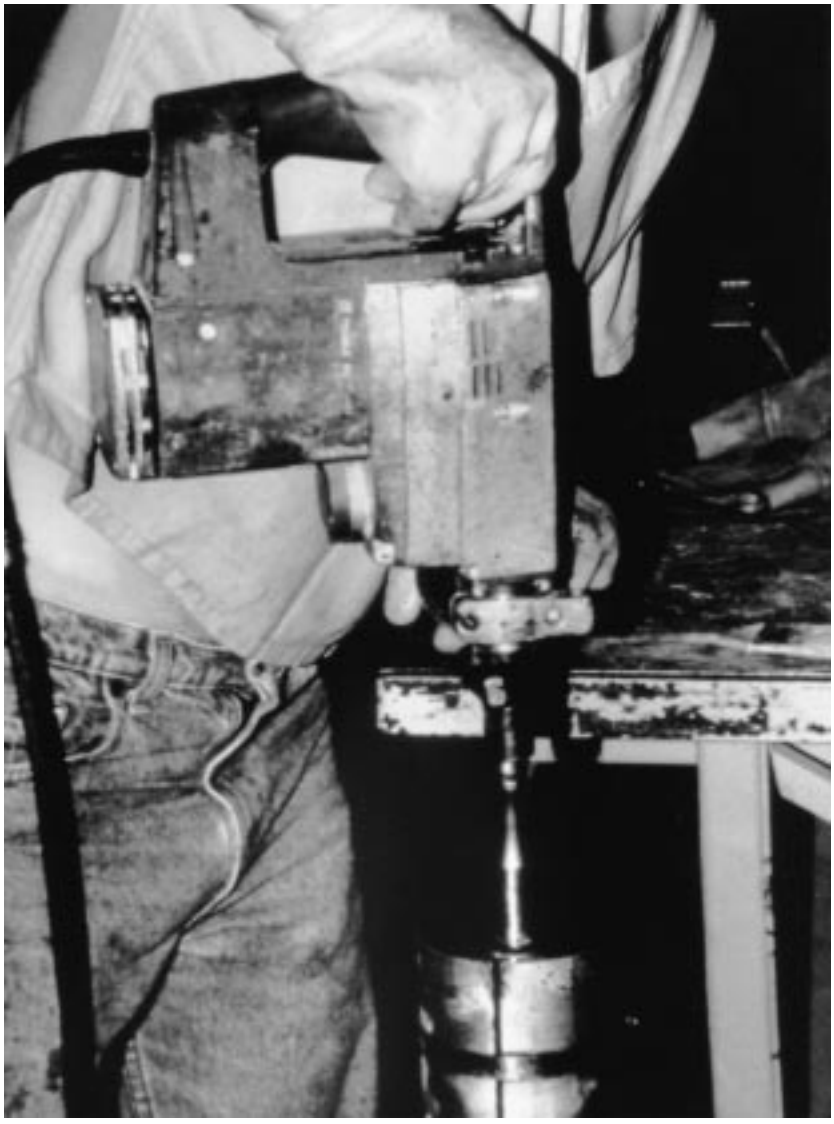

FIG. 1 Vibrating Hammer for Molding RCC Samples

scoops, steel trowel, wood float, steel straight edge wrench, and a tamping rod, as required in Practice C 31/C 31M.

6. Sampling

6.1 Samples of freshly-mixed concrete shall be obtained in accordance with Practice C 172.

6.2 Concrete samples shall have a maximum size aggregate of 50 mm [2 in.] or less. If the concrete has aggregate larger than 50 mm [2 in.] samples shall be obtained by wet sieving over a 50-mm [2-in.] sieve in accordance with Practice C 172.

6.3 Concrete test specimens shall be molded within 45 min after the completion of mixing unless otherwise specified.

6.4 *Technical Precautions*:

6.4.1 When obtaining samples, ensure that the samples are representative of the bulk production.

6.4.2 Concrete with stiff to very dry consistency is highly susceptible to segregation during handling. To minimize segregation, use care in obtaining samples and during transporting, remixing, and preparation of the specimens.

7. Calibration

7.1 Calibrate the vibrating hammer after any event, including repairs, that might affect its operation, after 300 h of service, or at least one time per year.

8. Molding Specimens

8.1 *Method A, Type A Molds*:

8.1.1 Coat Type A molds with a suitable lubricant or bond breaker prior to casting the test specimens to facilitate removal from the mold.

8.1.2 Hold the mold stationary either by clamping to a rigid, flat base or standing on the foot brackets and center the vibrating hammer so that the edges of the tamping plate do not touch the walls of the mold. Lower the vibrating hammer into the mold to check for proper clearance.

8.1.3 Place enough concrete in the mold so that the mold will be filled to one-third of its volume after consolidation, approximately 4.5 kg [10 lb]. Use a tamping rod to distribute the loose concrete as it is added. During filling use square-ended shovels and scoops to obtain representative samples and handle the concrete in such a manner that larger sized coarse aggregates do not separate from the mortar.

8.1.4 Place the vibrating hammer with tamping plate onto the concrete (Fig. 1).

8.1.5 Start the vibrating hammer and allow the concrete to consolidate under the tamping plate. Observe the concrete in the annular space between the edge of the tamping plate and the inside wall of the mold. As the concrete consolidates, mortar should fill in the annular space between the outer edge of the tamping plate and the inside mold wall. Observe the mortar until it forms a ring around the total perimeter of the tamping plate. When the mortar ring forms completely around the tamping plate, stop the vibrating hammer.

8.1.6 If a rock pocket prevents the mortar ring from forming at one small location, even though it has formed in all other locations, the vibrating hammer can be stopped and the next layer of concrete added.

8.1.7 If a significant portion of the mortar ring does not form after 20 s, the vibrating hammer shall be stopped and the next layer of concrete added. This situation may be a result of insufficient mortar due to either improper sampling, segregation, or improper mixture proportioning. In these instances, the concrete should be inspected visually after stripping from the mold to determine if there is adequate mortar distribution and a decision made whether to accept or reject the specimen.

8.1.8 Repeat the procedure in 8.1.3-8.1.7 for the second lift of concrete, filling the mold to approximately two-thirds of its volume. For the third lift, overfill the mold by mounding the concrete above the top of the mold. Again, place the tamping plate on the loose concrete and consolidate. If the tamping plate consolidates concrete below the top level of the mold, turn off the vibrating hammer. Place additional concrete in the mold so that, when consolidated, the concrete will be about 3 mm [⅛ in.] above the top of the mold.

8.1.9 Strike off the concrete with a steel straight edge or hand-held float so it is level with the top of the mold. Finish the top surface of the specimen with a steel trowel or wood float. Avoid tearing the surface of the concrete.