Designation: C1176/C1176M – 20

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

This standard is issued under the fixed designation C1176/C1176M; 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 procedures for making cylindrical test specimens from concrete when the standard procedures of rodding and internal vibration, as described in Practice C31/C31M, are not practicable. This practice is applicable to freshly mixed concrete, prepared in the laboratory and the field, having a nominal maximum size aggregate of 50 mm [2 in.] or less. If the nominal maximum size aggregate is larger than 50 mm [2 in.], the practice is applicable only when performed on the fraction passing the 50-mm [2-in.] sieve with the larger aggregate being removed in accordance with Practice C172. This practice, intended for use in testing roller-compacted concrete, may be applicable to testing other types of concrete such as cement-treated aggregate and mixtures similar to soil-cement.

1.2 Two methods are provided for making concrete cylinders using a vibrating table:

1.2.1 Method A is a procedure for making test specimens in steel reusable molds attached to a vibrating table.

1.2.2 Method B is a procedure for making test specimens in single-use plastic molds that have been inserted into a metal sleeve attached to a vibrating table.

1.3 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 exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.4 The text of this practice 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 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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:*[2]

C31/C31M Practice for Making and Curing Concrete Test Specimens in the Field

C39/C39M Test Method for Compressive Strength of Cylindrical Concrete Specimens

C172 Practice for Sampling Freshly Mixed Concrete

C192/C192M Practice for Making and Curing Concrete Test Specimens in the Laboratory

C470/C470M Specification for Molds for Forming Concrete Test Cylinders Vertically

C496/C496M Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens

C1170/C1170M Test Method for Determining Consistency and Density of Roller-Compacted Concrete Using a Vibrating Table

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

3. Summary of Practice

3.1 This practice describes methods for making cylindrical concrete test specimens using a vibrating table. Test specimens are made in cylindrical molds that are attached to the vibrating table under a 9-kg [20-lb] surcharge to facilitate consolidation.

4. Significance and Use

4.1 This practice is intended to be used for stiff to extremely dry concrete mixtures commonly used in roller-compacted concrete construction. This practice is used instead of rodding

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

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[2] 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

or internal vibration, which cannot properly consolidate concrete of this consistency (Note 1).

NOTE 1—Further description of this concrete consistency is given in ACI 207.5 Roller-Compacted Mass Concrete[3] and 211.3 Guide for Selecting Proportions for No-Slump Concrete[3]. The consistency of roller-compacted concrete may be determined in accordance with Test Method C1170/C1170M.

5. Apparatus

5.1 *Molds:*

5.1.1 *Type A Mold*—A cylindrical mold conforming to the requirements of Specification C470/C470M for 150-mm [6-in.] diameter by 300-mm [12-in.] high reusable molds. Molds shall be made of steel or other hard metal not readily attacked by the cement paste. Aluminum molds shall not be used. Molds shall be equipped with permanently affixed metal slotted brackets on the baseplate so the molds can be rigidly clamped to a vibrating table. The top rim of the mold shall be smooth, plane, and parallel to the bottom of the mold. The bottom of the mold shall provide a watertight seal.

5.1.2 *Type B Mold*—A single-use plastic, cylindrical mold 150 mm [6 in.] in diameter and 300 mm [12 in.] in height. The mold specifications shall conform to Specification C470/C470M for single-use plastic molds.

5.1.2.1 *Mold Sleeve*—A Type B cylindrical mold shall be inserted into a rigid cylindrical sleeve with a bottom baseplate that is clamped to the vibrating table. The mold sleeve shall be made of steel or other hard metal that does not react with concrete containing portland or other hydraulic cement. The sleeve shall hold firmly the plastic mold without deforming it so that it is vertical and shall be slotted vertically with adjustable clamps for tightening around the mold. The sleeve shall be hinged so that it can be opened to remove the mold (Fig. 1) and shall also have permanently affixed slotted metal brackets so the sleeve may be rigidly clamped to the vibrating table. The mold sleeve shall have a minimum wall thickness of 3 mm [⅛ in.], and a minimum baseplate thickness of 6 mm [¼ in.]. The inside diameter of the mold sleeve shall be 3 ± 1.5 mm [⅛ ± 1/16 in.] larger than the outside diameter of the Type B mold and have a height 6 to 13 mm [¼ to ½ in.] less than the height of the Type B mold.

5.2 *Vebe Table*—A vibrating table with a 20-mm [¾-in.] thick steel deck with dimensions of approximately 380 mm [15 in.] in length, 250 mm [10 in.] in width, and 300 mm [12 in.] in height. The vibrating table shall be constructed in such a manner as to prevent flexing of the table during operation. The table deck shall be activated by an electromechanical vibrator. The total mass of the vibrator and table shall be approximately 90 kg [200 lb]. The table shall be level and clamped to a concrete floor or base slab that has sufficient mass to prevent displacement of the apparatus during specimen preparation (Note 2).

NOTE 2—The recommended vibrating table for these procedures is the Vebe table. Testing to date has been performed using this apparatus. An alternative vibrating table may be substituted for the Vebe apparatus provided it meets the specifications for the sinusoidal vibration given in 7.1.

5.3 *Swivel Arm and Guide Sleeve*—A metal guide sleeve with a clamp assembly or other suitable holding device mounted on a swivel arm. The swivel arm and guide sleeve must be capable of holding a metal shaft attached to a 9-kg [20-lb] cylindrical mass in a position perpendicular to the vibrating surface and allowing the shaft to slide freely when the clamp is released. The swivel arm must be capable of maintaining the guide sleeve in a locked position directly over the center of the specimens to be vibrated. The swivel arm shall also be capable of being rotated away from the center of the table (Note 3).

NOTE 3—The Vebe vibrating table comes equipped with the swivel arm and guide sleeve.

5.4 *Surcharge*—A cylindrical steel mass with a metal shaft at least 460 mm [18 in.] in length and 16 ± 2 mm [⅝ ± 1/16 in.] in diameter attached perpendicularly to and embedded in the center of the mass. The shaft shall slide through the guide sleeve without binding. The surcharge shall have a diameter of 145 ± 3 mm [5¾ ± ⅛ in.]. The surcharge assembly shall have a mass of 9.0 ± 0.25 kg [20 ± 0.5 lb] including the mass of the metal shaft (Fig. 1). If the surcharge is to be hand held, the length of the shaft may be reduced to about 300 mm [12 in.] and fabricated with a "T" or "D" handle for gripping the surcharge shaft to avoid slipping.

5.5 *Sieve*—A 50-mm [2-in.] sieve conforming to Specification E11.

5.6 *Small Tools*—Trowels, square-ended shovel and hand scoops, steel trowel, wooden float, wrench, tamping rod, and flashlight as required.

6. Sampling

6.1 Samples of fresh concrete shall be obtained in accordance with Practice C172.

6.2 Concrete samples shall have a nominal 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 C172.

6.3 Concrete test specimens shall be made within 45 min after the completion of mixing concrete unless otherwise stipulated.

7. Calibration and Standardization

7.1 The vibrating table shall produce a sinusoidal vibratory motion with a frequency of at least 60 ± 2 Hz [3600 ± 100 vibrations per min] and a double amplitude of vibration of 0.43 ± 0.008 mm [0.0170 ± 0.0030 in.] when a 27.0 ± 1.0-kg [60.0 ± 2.5-lb] surcharge is rigidly bolted to the center of the table.

7.1.1 Determine the frequency and double amplitude[4] of the vibrating table under simulated test conditions prior to initial

[3] *ACI Manual of Concrete Practice, Part 1*, Materials and General Properties of Concrete, 2005, American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333.

[4] Kaufman, L.P., Strickland, E.A., and Benavidez, A.A. "Suggested Method for the Calibration of Vibrating Tables for Maximum Index Density Testing," *Geotechnical Testing Journal*, GTJODJ, Vol 2, No. 3, September 1979, pp. 152–157.

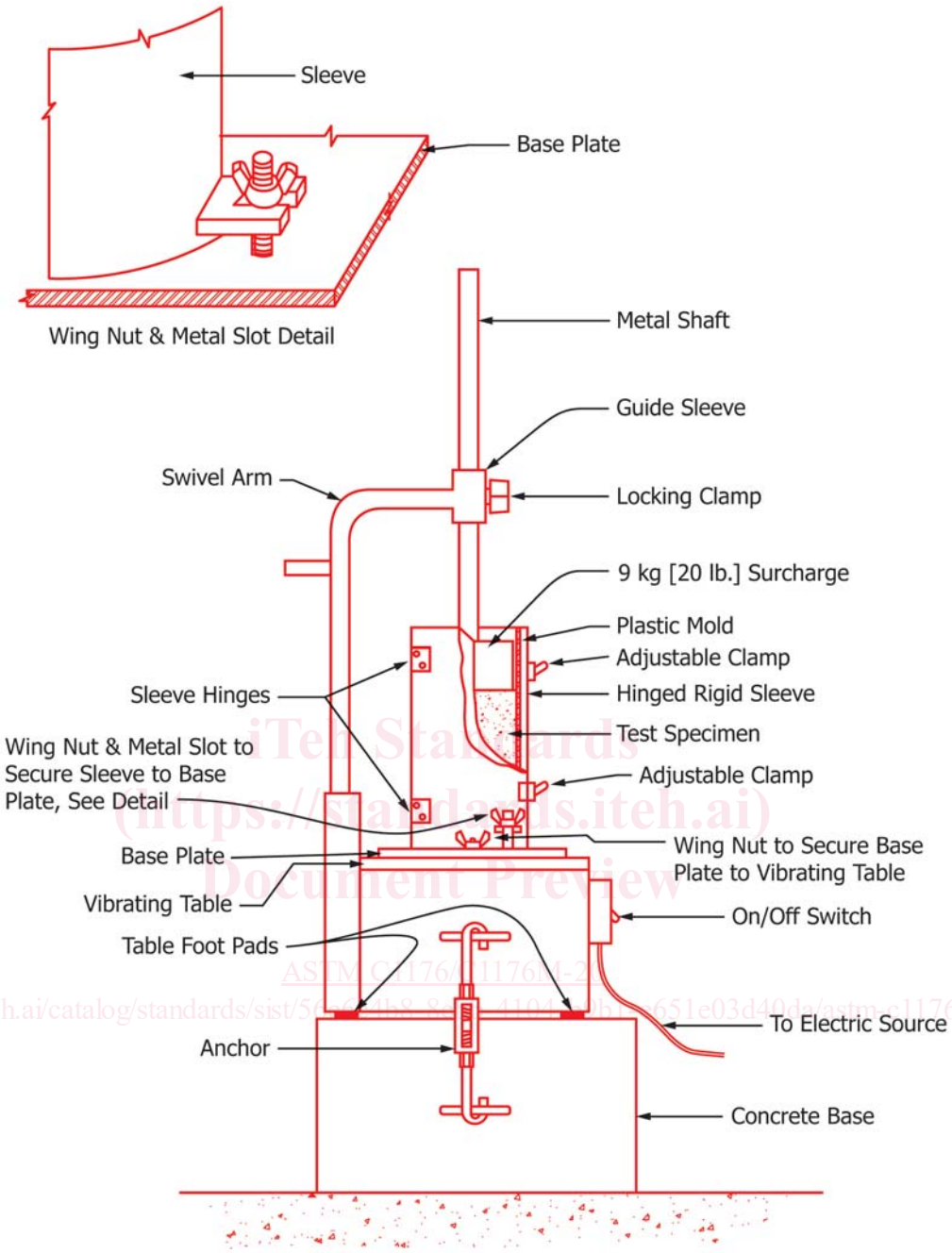

FIG. 1 Vibrating Table—Cylinder Preparation (Type B Mold)

use and annually thereafter. A vibrating reed tachometer should be used to check the frequency of vibration.

7.2 Recalibrate the vibrating table after any event (including repairs) that might affect its operation, or whenever test results are questionable.

8. Technical Precautions

8.1 When obtaining samples, ensure that the samples are representative of the material being sampled.

8.2 Concrete with stiff to extremely dry consistency is highly susceptible to segregation during handling. To minimize segregation, use care in obtaining samples and during transporting, remixing, and testing of the concrete.

8.3 After at least every three months of continued use, inspect and clean the underside of the vibrating table top of any hardened concrete or cement paste which may interfere with free movement of the table top.