(Issued Dec. 2001)

CRD-C 53-01

Test Method for Consistency of No-Slump Concrete Using the Modified Vebe Apparatus

1. Scope

1.1 This method covers the procedure for determining the consistency of no-slump concrete when the slump test (CRD-C 5) is not applicable. This method is applicable in both the laboratory and the field.

1.2 This method is considered applicable to concrete containing 50-mm (2-in.) nominal maximum size aggregate or smaller. If the nominal maximum size of the aggregate is larger than 50 mm (2 in.), the method is applicable for that portion of a concrete sample which is wet-sieved over a 50-mm (2-in.) sieve in accordance with CRD-C 4.

2. Applicable Documents

2.1 Handbook Items.

CRD-C 2 Practice for Selecting Proportions for No-Slump Concrete
CRD-C 4 Method of Sampling Freshly Mixed Concrete
CRD-C 5 Test Method for Slump of Portland Cement Concrete

2.2 American Concrete Institute Committee Report[1]

ACI 207.5R Roller-Compacted Concrete

3. Summary of Method

3.1 This test method provides a measure of the consistency of concrete having no measurable slump. The consistency is measured as the time required for a given mass of concrete to be consolidated by external vibration in a cylindrical mold.

4. Significance and Use

4.1 This test method is applicable for no-slump structural or mass concrete which is consolidated by vibratory rollers. It is used instead of the slump test as a measure of the consistency of the concrete. Further description of concrete of this consistency is given in American Concrete Institute Committee Report, ACI 207.5R, and CRD-C 2.

[1] Available from American Concrete Institute, P.O. Box 19150, Detroit, MI 38219.

5. Apparatus

5.1 *Cylindrical Mold* – The cylindrical mold shall have an inside diameter of 9-1/2 ± 1/16 in., and a height of 7-3/4 ± 1/16 in. The mold shall be capable of being rigidly clamped to the Vebe vibrating table. The top rim of the mold shall be smooth, plane, and parallel to the bottom of the mold.

5.2 *Guide Sleeve* – The guide sleeve with clamp must be capable of holding a steel rod attached to the surcharge in a position perpendicular to the vibrating table, and centered over the sample, which will allow the rod to slide freely when the clamp is released. The Vebe vibrating table comes equipped with this guide sleeve.

5.3 *Surcharge* – The surcharge shall have a circular acrylic plate rigidly attached to its base and the steel rod at least 18 in. in length attached perpendicularly to the plate and positioned through the center of the surcharge. The acrylic plate shall be 1/4 ± 1/16 in. in thickness and have a diameter of 9 ± 1/8 in. The surcharge shall have a mass of 27.5 ± 1/8 lb including the mass of the acrylic plate and steel shaft.

5.4 *Balance* – The balance shall be of sufficient capacity to determine the total mass of the sample and mold, and have sufficient accuracy so that the mass of the concrete sample may be determined to the nearest 0.5 percent.

5.5 *Vebe Vibrating Table* – A steel vibrating table, approximately 15 in. long, 10-1/4 in. wide, and 12 in. high, having a mass of approximately 210 lb (See Fig. 1). The table shall be clamped to a level concrete floor or base slab having a mass of at least 1,000 lb to avoid movement during vibration. The vibrating table shall produce a sinusoidal vibratory motion with a frequency of at least 3,600 ± 100 vibrations per minute (60 ± 1.67 Hz) and an amplitude of 0.0170 ± 0.0030 in. when a 60 ± 2.5-lb surcharge is bolted to the center of the table.

5.6 *Miscellaneous Equipment* – Also required are a shovel, scoop, slump test rod, stopwatch, and flashlight.

6. Sampling

6.1 Samples of freshly mixed concrete shall be taken in accordance with CRD-C 4.

6.2 Concrete samples shall have nominal maximum size aggregate not exceeding 2 in. If the nominal maximum size of the aggregate is larger than 2 in., the sample shall be wet-seived over a 50-mm (2-in.) sieve in accordance with CRD-C 4.

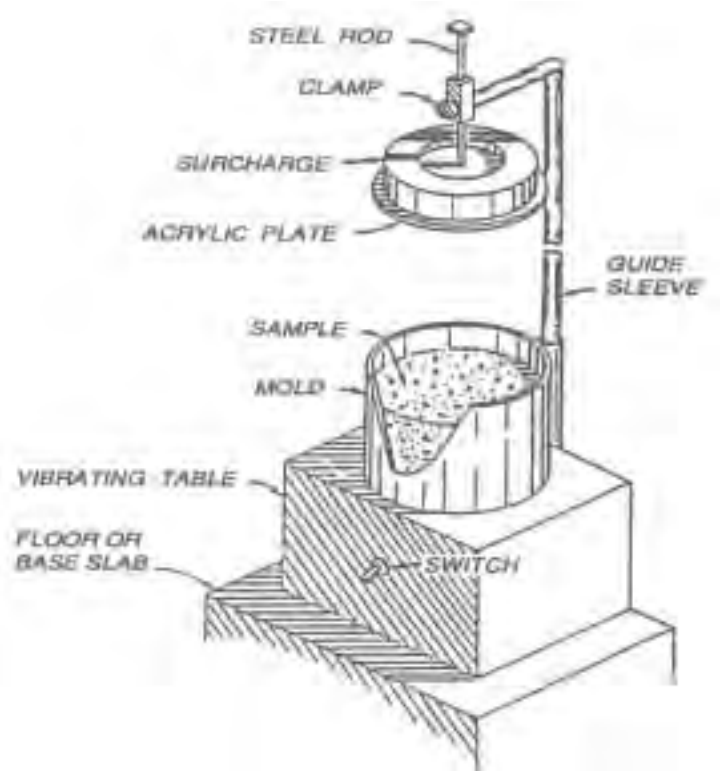

Fig. 1. Modified Vebe test apparatus

7. Procedure

7.1 Obtain a representative sample of freshly mixed concrete in accordance with CRD-C 4, having a minimum mass of 150 lb.

7.2 Remix the sample carefully to correct for any segregation that may exist.

7.3 Concrete having no-slump consistency is highly susceptible to segregation during handling. To minimize this tendency, care should be exercised in obtaining, transporting, remixing, and testing the samples. Square-ended shovels and scoops should be used to obtain a representative sample. The concrete should be handled in such a malU1er that large-sized aggregate does not separate from the mass.

7.4 Dampen the interior of the mold and fill with 29 ± 0.2 lb of concrete. Level the surface of the concrete in the mold. A square-edged scoop or slump rod should be used to place and distribute the concrete evenly, being careful to minimize segregation and rock pockets.

7 .5 Attach the mold on the vibrating table, then lower the surcharge to rest on the sample.

7.6 Turn the vibrating table on and begin timing the test. Using the flashlight as necessary, observe the concrete around the edge of the surcharge and the wall of the mold. As the test progresses, mortar will migrate between the surcharge and the wall of the mold. Observe the formation of this ring of mortar until it migrates around the complete periphery of the mold. When the ring is completely formed, stop the test and determine the elapsed time to the nearest second. Record this as the Vebe Consistency Time. If a ring does not form after 1 min. of vibration, stop the test, and make an appropriate note on the test report.

7.7 Occasionally, a rock pocket in the loose sample will prevent the mortar ring from forming at one small location even though it has formed in all locations. If the elapsed time required to form the partial ring is similar to previous readings made on the same mixture, note that time and also record the final elapsed time. Retest if deemed necessary.

8. Report

8.1 Report the Vebe Consistency Time to the nearest second.

9. Precision and Bias

9.1 Data are being compiled and developed that will be suitable for use in developing precision and bias statements for this method.