Designation: C 995 – 94

Standard Test Method for Time of Flow of Fiber-Reinforced Concrete Through Inverted Slump Cone[1]

This standard is issued under the fixed designation C 995; 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.

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 the inverted slump-cone time of fiber-reinforced concrete, both in the laboratory and in the field.

1.2 This test method is considered applicable to freshly mixed concrete having coarse aggregate up to 1½ in. (38 mm) in size. It is not applicable to concrete that flows freely through the cone.

1.3 The values stated in inch-pound units are to be regarded as the standard. SI units are for information only.

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

2. Referenced Documents

2.1 *ASTM Standards:*

C 29/C29M Test Method for Unit Weight and Voids in Aggregate[2]

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

C 143 Test Method for Slump of Hydraulic Cement Concrete[2]

C 172 Practice for Sampling Freshly Mixed Concrete[2]

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

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials[2]

3. Summary of Test Method

3.1 This test method determines the time required for fiber-reinforced concrete to flow through an inverted slump cone under internal vibration.

4. Significance and Use

4.1 This test method provides a measure of the consistency and workability of fiber-reinforced concrete.

4.2 The inverted slump-cone time is a better indicator than slump of the appropriate level of workability for fiber-reinforced concrete placed by vibration because such concrete can exhibit very low slump due to the presence of the fibers and still be easily consolidated.

4.3 The results may be used for mixture proportioning, quality control both in the laboratory and in the field, and in development and research.

4.4 The results obtained using this test method may be influenced by vibrator diameter, amplitude, and frequency.

4.5 This test method may not be applicable to some concretes reinforced with fibers flexible and long enough to wrap around the vibrating element and dampen vibration.

5. Apparatus

5.1 *Cone*, shall be the mold specified in Test Method C 143.

5.2 *Bucket*—The container to receive the concrete shall be the 1-ft^3 (30-L) capacity bucket specified in Test Method C 29/ C 29M.

5.3 *Positioning Device*—A device of the type shown in Fig. 1 shall be provided to center the cone in the bucket, prevent it from tilting, and maintain the small end of the cone 4± ¼ in. (100 ± 5 mm) from the bottom of the bucket.

5.4 *Vibrator*, shall be of the internal type specified in Practices C 31 or C 192, except that the vibrating element shall be 1± ⅛ in. (25 ± 3 mm) in diameter.

5.5 *Stopwatch*—One that measures elapsed time to the nearest second or less.

5.6 *Screeding Rod*—The rod used for screeding shall be the tamping rod specified in Test Method C 143.

6. Sampling

6.1 The sample of concrete for the test shall be representative of the entire batch. It shall be obtained in accordance with Practice C 172, except that wet-sieving shall not be permitted.

7. Procedure

7.1 Dampen the bucket and place it on a level, rigid, horizontal surface free of vibration and other disturbances. Dampen the cone and place it in the positioning device, making sure it is level. From the sample obtained in accordance with Section 6, fill the cone in three layers, each approximately one

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[1] This test method is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregatesand is the direct responsibility of Subcommittee C09.42on Fiber-Reinforced Concrete.

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

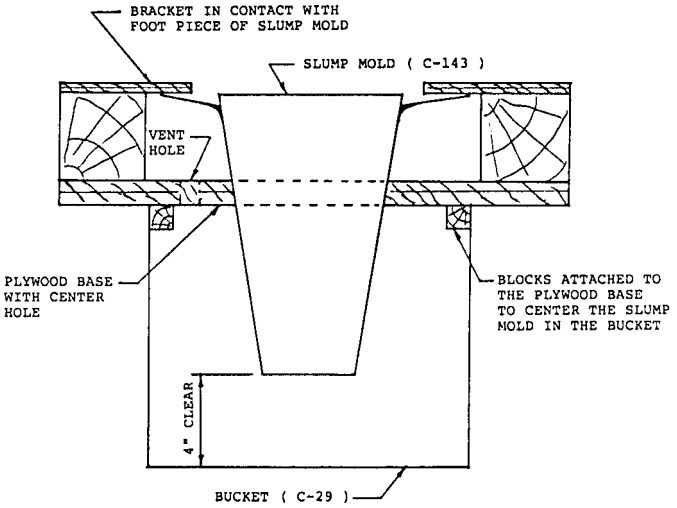

FIG. 1 Method of Positioning the Inverted Slump Cone in the Bucket

third of the volume of the cone. Avoid compacting the concrete, but lightly level each layer with a scoop or trowel to minimize the entrapment of large voids. Strike off the surface of the top layer by means of a screeding and rolling motion of the tamping rod. Protruding fibers which inhibit screeding may be removed by hand. One third of the volume of the cone corresponds to a depth of 5.875 in. (149 mm); two thirds of the volume corresponds to a depth of 9.375 in. (237 mm).

NOTE 1—A small amount of the sample may fall through the cone during the filling process. This effect is minimized by ensuring the volume of the first layer of concrete placed is large enough to bridge the opening in the cone.

7.2 Start the vibrator. Simultaneously start the stopwatch and insert the vibrating element centrally and vertically into the top of the sample in the cone. Let it descend at a rate such that it touches the bottom of the bucket in 3 ±1 s. Maintain the vibrating element approximately vertical and in contact with the bottom of the bucket. Avoid touching the cone with the vibrator. Stop the stopwatch when the cone becomes empty which occurs when an opening becomes visible at the bottom of the cone. Complete the portion of the test from the start of filling the cone through allowing the vibrating element to descend through the sample without interruption and within an elapsed time of 2 min. If the cone becomes plugged during the test, or fails to empty because of an excess of material that has fallen through during filling, disregard the result and make a new test on another portion of the sample.

7.3 Record the time in seconds.

8. Report

8.1 Report the following information:

8.1.1 The time in seconds from initial immersion of the vibrating element to when the cone first becomes empty as the inverted slump-cone time.

8.1.2 The diameter, frequency, and amplitude of the vibrating element.

9. Precision and Bias

9.1 Based on limited data, the single-operator one-sigma limit has been found to be 1.0 s or less, and the between-operator one-sigma limit 1.5 s or less.[3]

9.2 A multilaboratory statement of precision is not appropriate for this test method.

10. Keywords

10.1 fiber; inverted slump cone; reinforced concrete; time of flow; workability

[3] These are the 1s limits described in Practice C 670.