

METHODS OF SAMPLING AND TESTING
MT 116-08
METHOD OF TEST FOR SLUMP FLOW OF
SELF-CONSOLIDATING CONCRETE
(Montana Modified Method)

1 Scope:

- 1.1 This test method covers the determination of slump flow of self-consolidating concrete.
- 1.2 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. (**WARNING** – Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure).

2 Referenced Documents:

2.1 ASTM Standards:

C 143/C 143M Test method for Slump of Hydraulic Cement Concrete

MT Materials Manual:

MT 105 Sampling Fresh Concrete

MT 104 Slump of Portland Cement Concrete

3 Terminology:

- 3.1 *halo* – an observed cement paste or mortar ring that has clearly separated from the coarse aggregate, around the outside circumference of concrete after flowing from the slump cone.
- 3.2 *spread* – the distance of lateral flow of concrete during the slump-flow test.
- 3.3 *stability* – the ability of a concrete mixture to resist segregation of the paste from the aggregates.
- 3.4 *viscosity* – resistance of material to flow under an applied shearing stress.

4 Summary of Test Method:

- 4.1 A sample of freshly mixed concrete is placed in a mold shaped as the frustum of a cone. The concrete is placed in one lift without tamping or vibration. The mold is raised, and the concrete is allowed to spread. After spreading ceases, two diameters of the concrete mass are measured in approximately orthogonal directions, and slump flow is the average of the two diameters.

5 Significance and Use:

- 5.1 This test method provides a procedure to determine the slump flow of self-consolidating concrete in the laboratory or the field.
- 5.2 This test method is used to monitor the consistency of fresh, unhardened self-consolidating concrete and its unconfined flow potential.

5 Significance and Use: (continued)

5.3 It is difficult to produce self-consolidating concrete that is both flowable and non-segregating using coarse aggregates larger than 1 in. (25 mm). Therefore, this test method is considered applicable to self-consolidating concrete having coarse aggregate up to 1 in. (25 mm) in size.

5.4 The rate at which the concrete spreads is related to its viscosity.

6 Apparatus:

6.1 *Mold* – The mold used in this test method shall conform to that described in MT 104.

6.2 *Base Plate* – The base plate on which the mold rests shall be nonabsorbent, smooth, rigid, and have a minimum diameter of 36 in. (915 mm).

Note 1 – Field experience and results from a round robin test program have shown that base plates made from sealed/laminated plywood, acrylic plastic, or steel are suitable for performing this test.

6.3 *Strike-Off Bar* – A flat, straight steel bar at least 1/8 in. by 3/4 in. by 12 in. (3 by 20 by 300 mm) or a flat, straight high-density polyethylene bar, or other plastic of equal or greater abrasion resistance, at least 1/4 in. by 3/4 in. by 12 in. (6 by 20 by 300 mm).

7 Sample:

7.1 The sample of concrete from which test specimens are made shall be of the entire batch. It shall be obtained in accordance with MT 105.

8 Procedure:

8.1 The slump-flow test shall be performed on a flat, level, nonabsorbent surface such as a pre-moistened concrete floor or a base plate. The base plate shall be used in conditions where a flat, level surface is not available, such as on a construction job site. When the base plate is used, position and shim the base plate so that it is fully supported, flat, and level. When performing the slump flow test for a given study or project, do not change the base plate surface type for the duration of the study or project.

8.2 *Filling the mold* – The user has the option of filling the mold by following either Procedure A or Procedure B.

8.3 *Procedure A (Upright Mold)* – Dampen and place the mold, with the larger opening of the mold facing down, in the center of a flat, moistened base plate or concrete surface. Firmly hold the mold in place during filling by the operator standing on the two foot pieces. From the sample of concrete obtained in accordance with Section 7, immediately fill the mold in one lift. Slightly overfill the concrete above the top of the mold.

8.4 *Procedure B (Inverted Mold)* - Dampen and place the mold, with the smaller opening of the mold facing down, in the center of a flat, moistened base plate or concrete surface. From the sample of concrete obtained in accordance with Section 7, immediately fill the mold in one lift. Slightly overfill the concrete above the top of the mold.

Note 2 – During the development of this test method, it was found that some of the users preferred to perform the test with the large opening of the mold facing down. The provision of a collar to the top of the mold is useful to reduce the probability of concrete

8 Procedure: (continued)

spilling over the mold and on to the base plate. Other user preferred to place the mold with the smaller opening face down, which facilitates the ease of filling. Both procedures have been found to be suitable for performing this test.

- 8.3** Strike off the surface of the concrete level with the top of the mold by a sawing motion of the strike-off bar. Remove concrete from the area surrounding the base of the mold to preclude interference with the movement of the flowing concrete. Remove the mold from the concrete by raising it vertically. Raise the mold a distance of 9 ± 3 in. (225 ± 75 mm) in 3 ± 1 seconds by a steady upward lift with no lateral or torsional motion. Complete the entire test from the start of the filling through removal of the mold without interruption within the elapsed time of $2 \frac{1}{2}$ minutes.
- 8.4** Wait for the concrete to stop flowing and then measure the largest diameter of the resulting circular spread of concrete to the nearest $\frac{1}{4}$ in. (5 mm). When a halo is observed in the resulting circular spread of the concrete, it shall be included as part of the diameter of the concrete. Measure a second diameter of the circular spread at an angle approximately perpendicular to the original measured diameter.
- 8.5** If the measurement of the two diameters differs by more than 2 in. (50 mm), the test is invalid and shall be repeated.

9 Calculation:

- 9.1** Calculate the slump-flow using the following equation:

$$\text{Slump-flow} = (d_1 + d_2)/2$$

Where:

d_1 = the largest diameter of the circular spread of the concrete, and

d_2 = the circular spread of the concrete at an angle approximately perpendicular to d_1 .

- 9.2** Record the average of the two diameters to the nearest $\frac{1}{2}$ in. (10 mm).

10 Report:

- 10.1** Report which procedure was used to fill the mold.
- 10.2** Report the slump-flow to the nearest $\frac{1}{2}$ in. (10 mm).