****THIS IS A NEW IM. – PLEASE READ CAREFULLY.****

METHOD OF TEST
SLUMP FLOW AND VISUAL STABILITY INDEX (VSI) OF SCC

SCOPE

This procedure provides instructions for determining the slump flow of self consolidating concrete in accordance with ASTM C 1611.

SIGNIFICANCE

The slump flow test is used to determine the filling ability of self consolidating concrete (SCC). The filling ability gives an indication of the SCC ability to fill a form under it own weight. SCC mix must be able to fill a form, passing around reinforcement, without segregation. The Visual Stability Index gives an indication of the SCC mixes potential for segregation.

PROCEDURE

A. Apparatus

1. Slump Cone. The slump cone shall conform to AASHTO T 119: The mold shall be provided with foot pieces and handles. The mold may be constructed either with or without a seam. The interior of the mold shall be relatively smooth and free from projections such as protruding rivets. The mold shall be free of dents.

2. Funnel.

3. Scoop.

4. Tape Measure or Ruler. These should have at least 1/8 in. (5 mm) gradations.

5. Flow Board. A ¾" (20 mm) plywood board, construction form board (or other stiff, flat, smooth material) cut 32" X 32" (800mm x 800mm) with surface sealed to have a non-absorbent face. Draw two centerlines on the board and two concentric circles, the first circle has a diameter of 20 inches (500mm). The second circle has a larger diameter, which may be 26 inches (700 mm) in diameter. (Figure 1)

6. Stop Watch.

B. Test Procedure

1. Obtain the sample in accordance with IM 327.

2. Check that the board is on a stable, horizontal surface

3. Moisten the surface of the board (wipe off excess water)

4. Place the slump cone in the center of the flow board. Cone may be placed either in the inverted or upright position. Stand on the foot pieces to prevent leakage when placed in the upright position.

5. Fill the slump cone in one lift using a funnel. Slightly overfill the concrete above the top of the mold. No rodding is required since concrete should flow easily.

6. Trowel off excess concrete from the top of the slump cone, and remove any concrete that has fallen onto the board around the cone.

7. Raise the mold 9 ± 3 in (225 ± 75 mm) in 3 ± 1 seconds by a steady upward lift with no lateral or torsional motion being imparted to the concrete. Hold in center position until all concrete has exited the slump cone.

   The entire operation from the start of the filling through removal of the mold shall be carried out without interruption and shall be completed within an elapsed time of 2 1/2 minutes.

8. Measure, to the nearest ¼ inch (5mm), the final flow across the diameter at two points, 90^0 apart. The two diameter measurements should not be greater than two inches in difference (if they are it may indicate a sloping board). Report the slump flow as the average of the two diameter readings.

9. The concrete should flow out to final slump diameter with no segregation. (Figure 2) Check the edge of the concrete on the board for excessive bleed water called a mortar halo. (Figure 3) The mix should appear uniform, with the coarse aggregate visible and evenly dispersed. Report the Visual Stability Index (VSI) as shown in the table below.

VSI	**Criteria**
0	No evidence of segregation in slump flow patty or in the wheelbarrow or container.
1	No mortar halo or aggregate pile in the slump flow patty but some slight bleed or air popping on the surface of the concrete in the wheelbarrow or container.
2	A slight mortar halo (<3/8 inch) and/or aggregate pile in the slump flow patty and highly noticeable bleeding in the wheelbarrow or container.
3	Clearly segregating by evidence of a large mortar halo (>3/8 inch) and/or large aggregate pile in the center of the concrete patty and a thick layer of paste on the surface of the resting concrete in the wheelbarrow or container.

10. Viscosity may be checked by performing the "Time to T_{20} test". To perform this test, a second person times the flow with a stopwatch. Start timing as the cone is lifted, stop timing when slump flow reaches the 20 inch (500 mm) mark.

11. For most SCC applications the concrete should flow out to the T_{20} (500 mm) mark in 2 to 7 seconds. If T_{20} is less than 2 seconds, the mix may be too thin (low viscosity) and may segregate. If T_{20} is greater than 7 seconds, the mix may be too thick (high viscosity) and may not flow through the reinforcing.

Figure 1. Flow Board

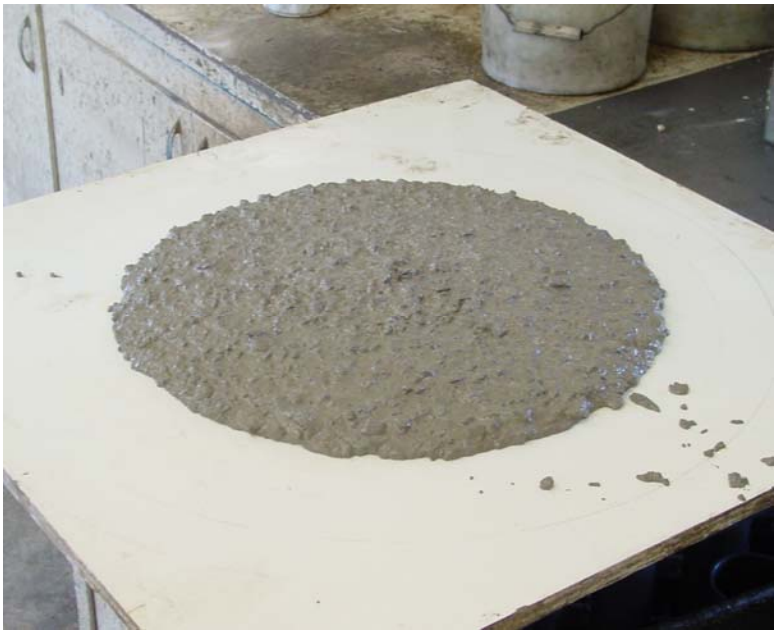

Figure 2. Slump Flow Visual Stability Index of 0 – This is a high quality SCC with a Visual Stability Index of 0. There is no indication of segregation or separation. Aggregate distribution is good and particles are carried to the outer edge of the slump flow.

Figure 3. Mortar Halo