SLUMP FLOW OF SELF-CONSOLIDATING CONCRETE (SCC)
FOP FOR AASHTO T 347
VISUAL STABILITY INDEX (VSI) OF SELF-CONSOLIDATING CONCRETE (SCC)
FOP FOR AASHTO T 351

Scope

This procedure provides instruction for determining the slump flow and the visual stability index (VSI) of self-consolidating concrete (SCC), in accordance with AASHTO T 347-13 and AASHTO T 351-14, both in the laboratory and in the field.

The slump flow assesses the horizontal free flow, filling ability of self-compacting concrete in the absence of obstructions and may give some indication of resistance to segregation. It does not indicate the ability of the SCC to pass between reinforcement without blocking.

The Visual Stability Index (VSI) is used to assess the stability of SCC. The stability (or segregation resistance) of an SCC mixture is the ability of the mixture to remain homogeneous during transport, during placement, and after placement. The VSI determination is useful for quality control and consistency testing.

Warning—Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.

Apparatus

- Mold: meeting the requirements of the FOP for AASHTO T 119.
- Base plate: made of stiff nonabsorbent material, at least 820 mm (32 in.) square, marked with a circle indicating the central location for the mold, and a concentric circle with a diameter of 500 mm (20 in.).
- Pouring vessel or scoop: a water-tight container large enough so each amount of concrete obtained from the sampling receptacle is representative and small enough, so it is not spilled during placement in the mold.
- Strike-off bar: a flat straight steel bar or other suitable metal at least 3 mm (1/8 in.) thick and 20 mm (¾ in.) wide by 300 mm (12 in.) long.
- Tape measure or ruler with 5 mm (¼ in.) increments
- Stopwatch

Procedure

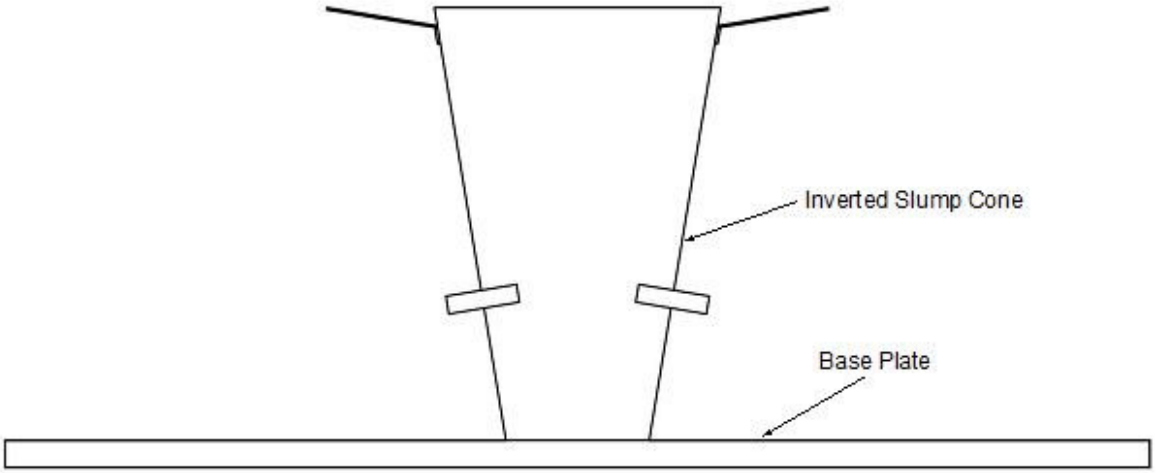
1. Obtain the sample according to the FOP for WAQTC TM 2.

   Begin testing within five minutes of obtaining the sample.

Note 1: Approximately 6 L (0.2 ft^3) of SCC is needed to perform the slump flow and VSI tests.

2. Dampen the inside of the mold and base plate.
3. Place the base plate on a level, stable surface,
4. Invert the mold and place in the center of the base plate. Hold down firmly.

Figure 1- Mold (Inverted) and Base Plate



5. Use the pouring vessel or scoop to slightly overfill the mold. Do not rod or tamp the SCC. Do not tap or vibrate the mold.
6. Use the strike-off bar to strike off the SCC level with the top of the mold.
7. Clean off all SCC from around the base of the mold to prevent interference with the flowing SCC.
8. Start the stopwatch.
9. Immediately raise the mold vertically 230 ± 75 mm (9 ± 3 in.) above the base plate with no lateral or torsional motion in 3 ± 1 second, allowing the SCC to flow out freely from within.

   Complete the entire operation within 2 1/2 minutes from the start of the filling through removal of the mold.
10. Determine and record the time required for the SCC slump flow patty to first contact the 500 mm (20 in.) ring on the base plate. Designate this as T-50.
11. After the concrete flow has stopped, measure the diameter of the SCC in two directions, the largest diameter (d_1) and the diameter perpendicular to the largest diameter (d_2), to the nearest 5 mm (1/4 in.). Include any border without coarse aggregate or a bleed water 'halo' in the diameter measurements.
12. The slump flow is the average of the two measured diameters. If the two measured diameters differ by more than 50 mm (2 in.), the test is invalid and must be repeated.

Note 3: A difference in the measured diameter more than 50 mm (2 in.) is likely due to the mold being raised with lateral motion.

13. Use the guidelines in Table 1 to rate the stability of the mixture in 1.0 increments by visual examination of the SCC on the base plate and in the wheelbarrow or mixer.

    See Figures 2 through 8 for reference in assignment of VSI.

Note 4: In the case of severe segregation, most of the coarse aggregate may remain in the center of the slump flow patty of SCC. A border of mortar without coarse aggregate or a bleed water "halo" may occur at the edge of the slump flow patty of SCC.

Table 1
Criteria of Visual Stability Index

Rating	Criteria
0	No evidence of segregation in slump flow patty or mixer drum or wheelbarrow
1	No border of mortar without coarse aggregate in the slump flow patty, but some slight bleed or air popping on the surface of the concrete in the mixer drum or wheelbarrow.
2	A slight border of mortar without coarse aggregate (<10 mm (3/8 in.)) or aggregate pile in the slump flow patty, or both, and highly noticeable bleeding in the mixer drum or wheelbarrow.
3	Clearly segregating by evidence of a large border of mortar without coarse aggregate (>10 mm (3/8 in.)) or large aggregate pile in the center, or both, of the slump flow patty and a thick layer of paste on the surface of the resting concrete in the mixer drum or wheelbarrow.

Figure 2
Visual Index = 0

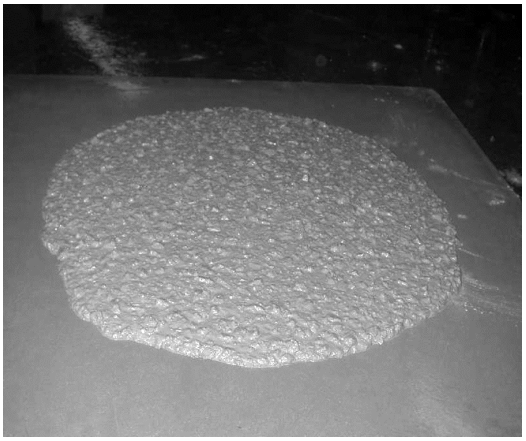


Figure 3
Visual Stability Index = 1

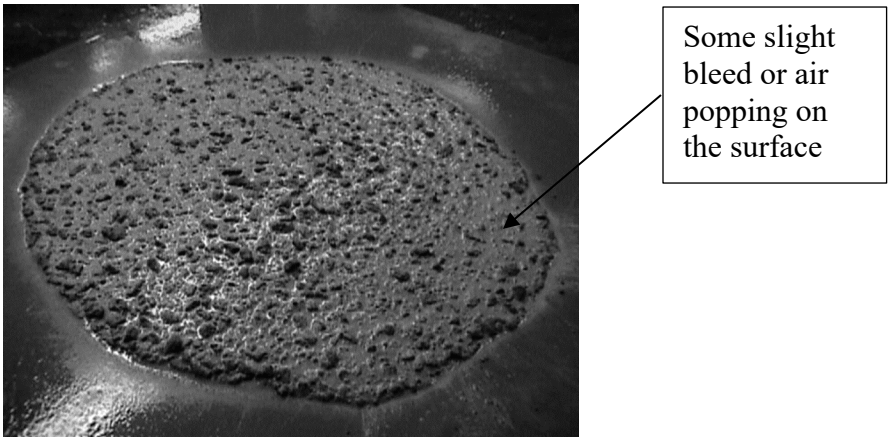


Figure 4
Visual Stability Index = 1

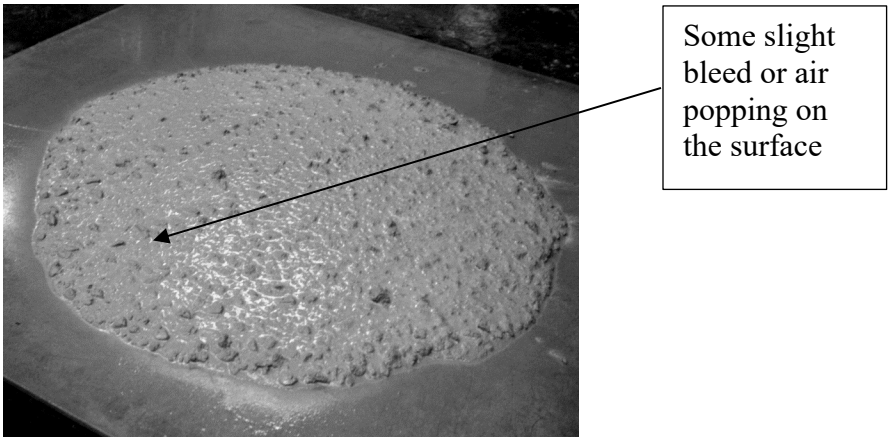


Figure 5
Visual Stability Index = 2

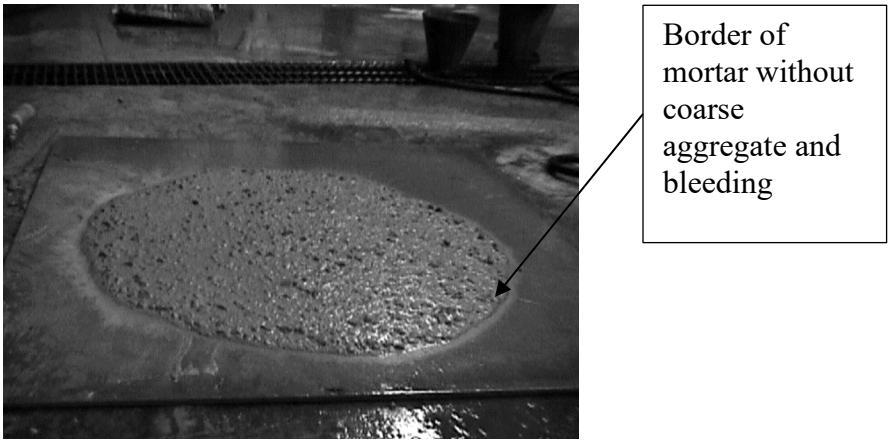


Figure 6
Visual Stability Index = 2

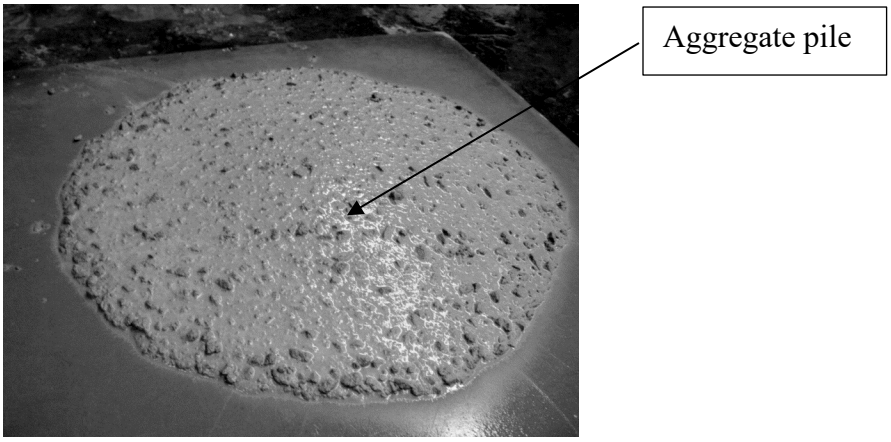


Figure 7
Visual Stability Index = 3

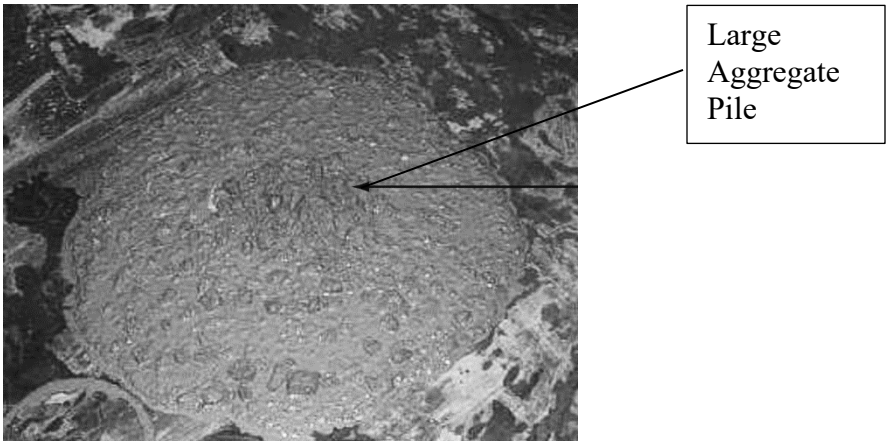
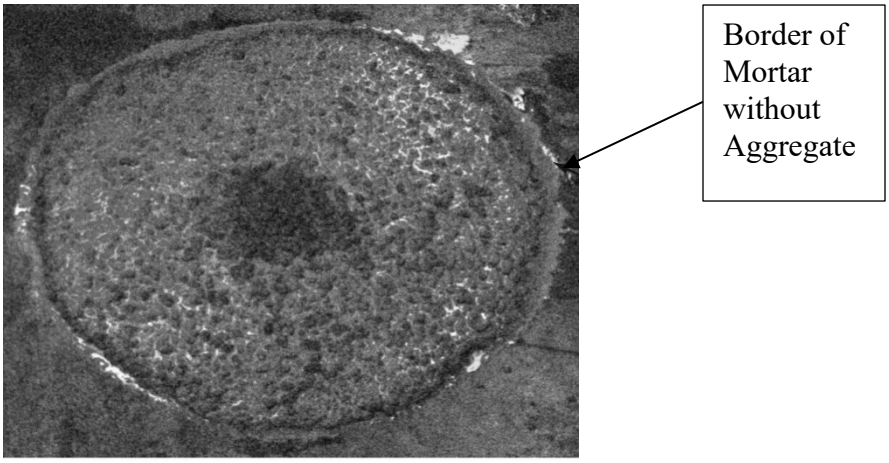


Figure 8
Visual Stability Index = 3



Calculations

$$slump\ flow = \frac{(d_1 + d_2)}{2}$$

Given:

d_1 = the largest diameter of the circular spread of SCC

d_2 = the diameter perpendicular to the largest diameter (d_1)

Example

$$slump\ flow = \frac{655\ mm\ +\ 615\ mm}{2} = 635\ mm$$

$$slump\ flow = \frac{25\frac{3}{4}\ in. + 24\frac{1}{4}\ in.}{2} = 25\ in.$$

Given:

d_1 = 655 mm (31 ¾ in.)

d_2 = 615 mm (30 ¼ in.)

Report

- On forms approved by the agency
- Sample ID
- Slump flow to the nearest 5 mm (¼ in.)
- T-50
- Visual Stability Index of mixture:
  - of the slump flow patty
  - in the wheelbarrow or mixer