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

GUIDELINES FOR APPROVING AND TESTING SCC MIX DESIGNS

Description

Self consolidating concrete (SCC) is described as concrete that is able to flow under its own weight, completely filling the formwork, even in the presence of dense reinforcement, without the need of any vibration, and maintain a homogenous mixture.

The three most common methods of achieving a highly flowing SCC mix design are as follows:

1. High Fines – 700 to 1000 lbs./ yd³ (415 to 590 kg/m³) including cement, fly ash, slag, and limestone fines
2. Viscosity Modifying Admixture (VMA) – 550 to 700 lbs/yd³ (325 to 415 kg/m³)
3. Combination of High Fines and VMA

Typically aggregates are well graded with a maximum top size of ¾" (19 mm) or less. Aggregate angularity and shape can affect the slump flow. Typical sand to aggregate ratio is 0.40 to 0.50. Paste volume can range from 28 to 40% depending on slump flow required. Water to cementitious ratio is typically in the 0.25 to 0.44 range.

If the producer has no previous experience with SCC, it is recommended that a technical representative of the admixture company be present during initial trial batches.

Materials

Meet the requirements of Division 41 for the appropriate materials.

Use a high range water reducer (HRWR) from Material [IM 403 Appendix D](#). When a viscosity modifying admixture (VMA) is used, manufacturer shall provide documentation indicating compatibility with HRWR.

Mix Design

Mix designs will be approved by the District Materials Engineer (DME). New mix designs for SCC shall be verified through trial batches. Other mix designs will be qualified by previous performance. Field validation shall be required for all new mixes.

The contractor shall provide a slump flow appropriate for the application. Concrete may have different slump flow requirements for varying applications within the same job. The maximum slump flow shall not exceed 27 inches (685 mm). If a higher flow is required for the application, the DME may require a VMA. An acceptable tolerance range shall be +/- 2 inches (50 mm) of the target slump flow. The visual stability index shall be less than 2 tested in accordance with [Materials IM 389](#).

The DME may check static stability of the SCC mix using hardened cylinders in accordance with [Materials IM 390](#).

Producer shall submit material sources, proportions, individual gradations of each aggregate, combined aggregate gradation, slump flow, visual stability index, air content, and compressive strength for the proposed mix design.

Trial Batch Validation

When a new mix design is produced, the Engineer will witness the validation. An admixture representative shall be present. For mixers with maximum capacity less than 2 cubic yards (1.5 cubic meters), the minimum batch produced shall be a maximum of 1 cubic yard (1 cubic meter) or the maximum capacity of the mixer. For ready mix produced mixes, the minimum batch shall be 2 cubic yards (1.5 m3). Slump flow shall be within 1 inch (25mm) of that required for production.

Placement

Deposit concrete continuously or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified.

If deemed necessary by the Engineer, a mock-up of the section shall be constructed to verify placement procedures.

Re-tempering of SCC shall not be allowed.

Vibration of SCC shall not be allowed without permission of the Engineer. If Engineer approves vibration, the maximum insertion time shall be 2 seconds or less. The DME may approve other methods of consolidation, if necessary.

Drop distance shall be validated to demonstrate that separation does not occur.

Testing

Air content shall be performed in accordance with [Materials IM 318](#), except SCC shall be placed in one layer, without consolidation or tapping. Cylinders shall be cast in accordance with [Materials IM 315](#), except SCC shall be placed in one layer, without consolidation or tapping.

In addition to specified test frequencies for air and strength, the producer shall perform slump flow in accordance with [Materials IM 389](#) on the first load and every third batch thereafter. The visual stability index (VSI) shall be 1 or less. If the visual stability index (VSI) equals 2, the batch shall be retested to determine if it should be rejected or may be incorporated. A visual stability index of 3 shall be rejected.

Since SCC mixes are highly sensitive to moisture, the Producer shall perform aggregate moistures at a minimum of once per day prior to mixing. The DME may adjust moisture testing depending on weather conditions and aggregate storage.