METHOD OF TEST FOR EVALUATION OF FRESHLY MIXED SELF-CONSOLIDATING CONCRETE WITH THE L-BOX

1. SCOPE

This test method covers procedure for determining the L-box blocking ratio of self-consolidating concrete (SCC). The procedure is suitable for use in the laboratory or in the field, and is used as a measure of passing ability and flowability of SCC.

Note 1: This method is based on the test method outlined in the Precast/Prestressed Concrete Institute and EFNARC (European Federation of Producers and Contractors of Specialist Products for Structures) guidelines.

Note 2: If the SCC flows as freely as water, the height of H 1 and H 2 will be equal and the blocking ratio will be 1.0. The closer the actual blocking ratio is to 1.0, the better the flow of the SCC.

2. RELEVANT DOCUMENTS

2.1 Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants, Precast/Prestressed Concrete Institute, TR-6-03, April 2003

2.2 Specification and Guidelines for Self-Compacting Concrete, EFNARC, February 2002

3. DEFINITIONS

3.1 Flowability: A measure of SCC's ability to completely fill formwork without entrapped air pockets.

3.2 Passing Ability: A measure of the SCC's ability to pass between reinforcement and through constrictions in the form without bridging or blocking.

3.3 Self-Consolidating Concrete (SCC): Highly flowable yet stable concrete that can spread readily into place, fill the formwork, and encapsulate the reinforcement without any mechanical consolidation and without undergoing segregation or excessive bleeding.

4. APPARATUS

4.1 L-BOX: Made of a stiff, non-absorbing material and of dimensions shown in Figure 1.

4.2 REINFORCEMENT PANELS: To fit in L-box as shown in Figure 1. The panels shall consist of 15 M bars spaced at 50 mm centres, unless the SCC being evaluated is to be used in prestressed girders, in which case 10 M bars spaced at 25 mm shall be used.

4.3 TROWEL

4.4 SCOOP OR A SMALL BUCKET

4.5 STOPWATCH: Capable of measuring to the nearest second

4.6 LEVEL

4.7 RULER: Capable of measuring to the nearest 1 mm

5. PROCEDURE

5.1 Obtain a sample size of about 14 L of SCC.

5.2 Set the L-box apparatus on firm ground and ensure it is level. Insert the required reinforcement panel in the slot.

5.3 Ensure that the gate opens and closes freely, and that it is restrained against premature flow of concrete out of the vertical section.

5.4 Moisten the inside surfaces of the L-box apparatus with water, and remove any surplus water.

5.5 Ensure that the gate is closed.

5.6 Use the scoop or small bucket to fill the vertical section of the L-box with the SCC sample. Ensure that concrete is deposited into the L-box from a height of 150 mm or less above the top of the L-box. Do not tap or rod the SCC. Use the trowel or strike off bar to finish the top of the SCC level with the top of the vertical section.

5.7 Immediately after the completion of filling, open the gate fully and simultaneously start the stopwatch.

5.8 When the SCC stops flowing, record the time.

5.9 Take the measurement of the height of the concrete remaining in the vertical section (H 1) at 3 positions equally spaced across the width of the box, to the nearest 1 mm.

5.10 Take the measurement of the height of the concrete at the far end of the horizontal section, H 2 at 3 positions equally spaced across the width of the box to the nearest 1 mm.

5.11 Observe and record the nature of the flow, including any abnormalities such as segregation of aggregate and paste, blocking of coarse aggregate at the reinforcement, presence of bleed water, etc., if occurring.

6. CALCULATIONS

6.1 Calculate values of H 1 and H 2 by averaging the individual measurements obtained in steps 5.9 and 5.10.

6.2 Calculate the blocking ratio:

$$\text{Blocking ratio} = H\,2/H\,1$$

Where:

H 1 = the height of the concrete remaining in the vertical section, and

H 2 = the height of the concrete at the far end of the horizontal section.

7. REPORT

7.1 Height of concrete in the vertical section at the completion of the test to the nearest 1 mm.

7.2 Height of concrete at the far end of the horizontal section at the completion of the test to the nearest 1 mm.

7.3 Blocking ratio to 2 decimal places.

7.4 Any observations indicating poor passing ability or stability of the mix, e.g. segregation of aggregate and paste, blocking of coarse aggregate at the reinforcement, presence of bleed water, etc.

Figure 1