

## Effect of Strength Class of Concrete and Curing Conditions on Capillary Absorption of Self-Compacting and Conventional Concrete

**Authors :** Emine Ebru Demirci, Remzi Şahin

**Abstract :** The purpose of this study is to compare Self Compacting Concrete (SCC) and Conventional Concrete (CC), which are used in beams with dense reinforcement, in terms of their capillary absorption. During the comparison of SCC and CC, the effects of two different factors were also investigated: concrete strength class and curing condition. In the study, both SCC and CC were produced in three different concrete classes (C25, C50 and C70) and the other parameter (i.e curing condition) was determined as two levels: moisture and air curing. Beam dimensions were determined to be 200 x 250 x 3000 mm. Reinforcements of the beams were calculated and placed as 2Ø12 for the top and 3Ø12 for the bottom. Stirrups with dimension 8 mm were used as lateral rebar and stirrup distances were chosen as 10 cm in the confinement zone and 15 cm at the central zone. In this manner, densification of rebars in lateral cross-sections of beams and handling of SCC in real conditions were aimed. Concrete covers of the rebars were chosen to be equal in all directions as 25 mm. The capillary absorption measurements were performed on core samples taken from the beams. Core samples of Ø8x16 cm were taken from the beginning (0-100 cm), middle (100-200 cm) and end (200-300 cm) region of the beams according to the casting direction of SCC. However core samples were taken from lateral surface of the beams. In the study, capillary absorption experiments were performed according to Turkish Standard TS EN 13057. It was observed that, for both curing environments and all strength classes of concrete, SCC's had lower capillary absorption values than that of CC's. The capillary absorption values of C25 class of SCC are 11% and 16% lower than that of C25 class of CC for air and moisture conditions, respectively. For C50 class, these decreases were 6% and 18%, while for C70 class, they were 16% and 9%, respectively. It was also detected that, for both SCC and CC, capillary absorption values of samples kept in moisture curing are significantly lower than that of samples stored in air curing. For CC's; C25, C50 and C70 class moisture-cured samples were found to have 26%, 12% and 31% lower capillary absorption values, respectively, when compared to the air-cured ones. For SCC's; these values were 30%, 23% and 24%, respectively. Apart from that, it was determined that capillary absorption values for both SCC and CC decrease with increasing strength class of concrete for both curing environments. It was found that, for air cured CC, C50 and C70 class of concretes had 39% and 63% lower capillary absorption values compared to the C25 class of concrete. For the same type of concrete samples cured in the moisture environment, these values were found to be 27% and 66%. It was found that for SCC samples, capillary absorption value of C50 and C70 concretes, which were kept in air curing, were 35% and 65% lower than that of C25, while for moisture-cured samples these values were 29% and 63%, respectively. When standard deviations of the capillary absorption values are compared for core samples obtained from the beginning, middle and end of the CC and SCC beams, it was found that, in all three strength classes of concrete, the variation is much smaller for SCC than CC. This demonstrated that SCC's had more uniform character than CC's.

**Keywords :** self compacting concrete, reinforced concrete beam, capillary absorption, strength class, curing condition

**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development

**Conference Location :** Chicago, United States

**Conference Dates :** December 12-13, 2020