

Abstract

This paper presents the results of an experimental study which investigates the effect of the use of marble powder (MP), as partial cement substitution, on the fresh and hardened properties of fibre-reinforced self-compacting concrete (FRSCC) of non-uniform size (length) and aspect ratio of fibres used. For each length of steel fibre (25, 30 and 50 mm), three percentages (.5, .8 and 1%) were used to improve the performance of FRSCC. All mixtures of concrete specimens prepared with 30% of MP were evaluated. Slump flow time and diameter, sieve stability and L-Box were performed to assess the fresh properties of the (FRSCC). Compressive strength, splitting tensile strength, flexural strength and ultrasonic pulse velocity of the FRSCC and self-compacting concrete (SCC) were determined for the hardened properties. The results were compared with ordinary concrete (without steel fibre) containing 30% of MP (SCC). The results suggest that the incorporation of steel fibre in the SCC requires the use of high volume of superplasticiser to overcome the workability loss resulting from the elongated shape and large surface area of fibres. The sieve stability, Slump flow diameter, L-Box and Slump flow time for RSCC dropped to 1, 10, 12 and 65%, respectively. The workability loss is significant in the case of 1% and 50 mm length fibre which revealed the highest length and percentage. On the other hand, the use of steel fibre and MP has a significant effect on the mechanical performances. The increase in ultrasonic pulse velocity, compressive strength, splitting tensile strength and flexural strength reaches 2, 8, 16 and 29%, respectively. The addition of fibre enhanced the ductility significantly. The optimum volume fraction and aspect ratio of fibre for better performance in terms of strength was found to be .8% and 30 mm, respectively. The results indicated that high volume of MP can be used to produce FRSCC.