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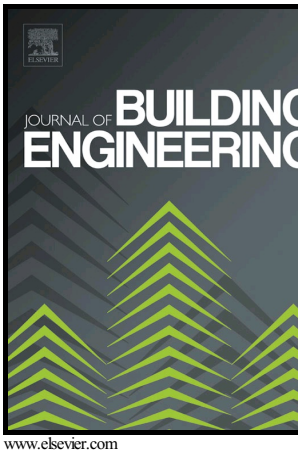

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Mechanical properties of self-consolidating concrete containing lightweight recycled aggregate in different mixture compositions

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Abstract

The fresh and mechanical properties of self-consolidating concrete (SCC) with different mixture compositions and lightweight coarse aggregate were investigated in this study. The investigation included 28 normal-weight SCC (NWSCC) mixtures with varied coarse-to-fine (C/F) aggregate ratios (0.7–1.2), coarse aggregate size (10–20 mm), binder content (450–500 kg/m^3), air content (5–7%), and different supplementary cementitious materials (SCMs) (metakaolin, silica fume, and ground granulated blast-furnace slag). The investigation also included 11 semi-lightweight normal vibrated concrete (SLWNVC) and semi-lightweight self-consolidating concrete (SLWSCC) mixtures with a density ranging from 1933 to 2077 kg/m^3. These mixtures were developed with different binder content (450–500 kg/m^3), SCMs (metakaolin and fly ash), and varied C/F aggregate ratios (0.7–1.5). The results indicated that using metakaolin greatly enhanced the mixture viscosity, particle suspension, and mechanical properties of NWSCC and SLWSCC mixtures. In NWSCC mixtures the mechanical properties were not significantly affected by increasing the aggregate size. However, increasing the binder content of NWSCC from 450 to 500 kg/m^3 improved all the mechanical properties, and adding 5% entrained air resulted in an 8%, 10%, 11%, and 8% reduction in the 28-day compressive strength, flexural strength, splitting tensile strength, and modulus of elasticity, respectively. The results also indicated that it is not recommended to develop