

An Experimental Study of Reinforced Concrete Beam with Artificial Aggregate Concrete Infill Under Impact Loads

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The aim of this paper is to examine the impact response of RC beam with artificial aggregate concrete block infill (RCAI) through experimental study and to propose the innovations of lightweight reinforced concrete (RC) utilizing polyethylene (PE) waste materials as an artificial aggregate. The study consists of; (a) determination the optimum percentage of PE waste material as coarse aggregate replacements in the concrete mix (b) dynamic testing where an approximately 100 kg of impact weight dropped onto several beam specimens. Four concrete cube mixes with 0%, 3%, 6% and 9% PE aggregate for 14 and 28 days respectively are prepared and tested under compression tests. Meanwhile, eight beam specimens are categorized as normal reinforced concrete (NRC), RCAI and beam specimen that consists 6% polyethylene waste material as a coarse aggregate (RC6A) are prepared and tested under low velocity impact loads under 1.54 m drop height of impact weight (5.5 m/s velocity). The behavior of the beam specimens are studied in terms of crack patterns (shear and flexural), crushing beneath the impact region and residual displacement at the mid-span. As results, it is observed that the 6% of PE waste material in the concrete mix influence the strength of concrete about 10%. Based on the failure mode results, all the beams are failed under drop height of 1.54 m. In addition, it is found that the residual displacement of RCAI is significantly lower than those of NRC and RC6A.

Impact loads; reinforced concrete beam; artificial aggregate concrete infill.