

Structural Performance Evaluation of Concrete Beams Reinforced with Recycled and Virgin Plastic Fibres

Authors : Vighnesh Daas, David B. Tann, Mahmood Dattoo

Abstract : The incorporation of recycled plastic fibres in concrete as reinforcement is a potential sustainable alternative for replacement of ordinary steel bars. It provides a scope for waste reduction and re-use of plastics in the construction industry on a large scale. Structural use of fibre reinforced concrete is limited to short span members and low reliability classes. In this study, recycled carpet fibres made of 95% polypropylene with length of 45mm were used for experimental investigations. The performance of recycled polypropylene fibres under structural loading has been compared with commercially available virgin fibres at low volume fractions of less than 1%. A series of 100 mm cubes and 125x200x2000 mm beams were used to conduct strength tests in bending and compression to measure the influence of type and volume of fibres on the structural behaviour of fibre reinforced concrete beams. The workability of the concrete mix decreased as a function of fibre content and resulted in a modification of the mix design. The beams failed in a pseudo-ductile manner with an enhanced bending capacity. The specimens showed significant improvement in the post-cracking behaviour and load carrying ability as compared to conventional reinforced concrete members. This was associated to the binding properties of the fibres in the concrete matrix. With the inclusion of fibres at low volumes of 0-0.5%, there was reduction in crack sizes and deflection. This study indicates that the inclusion of recycled polypropylene fibres at low volumes augments the structural behaviour of concrete as compared to conventional reinforced concrete as well as virgin fibre reinforced concrete.

Keywords : fibre reinforced concrete, polypropylene, recycled, strength

Conference Title : ICCEAE 2015 : International Conference on Civil, Environmental and Architectural Engineering

Conference Location : Paris, France

Conference Dates : December 30-31, 2015