

REPORT

MECHANICAL PROPERTIES OF POLYPROPYLENE FIBRE REINFORCED CONCRETE (PPFRC) AND STRUCTURAL APPLICATIONS

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ABSTRACT

The Polypropylene fibre reinforced concrete (PPFRC) contains randomly distributed short discrete Polypropylene fibres which act as internal reinforcement so as to enhance the properties of the cementitious composite (concrete). The principal reason for incorporating short discrete fibres into a cement matrix is to reduce cracking in the elastic range, increase the tensile strength and deformation capacity and increase the toughness of the resultant composite. These properties of PPFRC primarily depend upon length and volume of propylene fibres (PPF) used in the concrete mixture.

In Pakistan the polypropylene fibre reinforced concrete (PPFRC) has seen limited applications in several structures. The applications are primarily to inhibit the cracking. However due to the lack of awareness, design guidelines and construction specifications, its uses are limited by the local construction industry. Therefore there is a need to develop information on the properties of Polypropylene Fibre Reinforced Concrete (PPFRC) in which indigenous polypropylene fibres are used in the concrete mixture.

A combined experimental and analytical study was undertaken. For the study, fibrillated polypropylene fibres of two different lengths (l_f) of 25 mm (1.00 in) and 38 mm (1.50 in) with 0.2%, 0.4% and 0.8% volume fractions (V_f) of were used. The research reported in this study includes an experimental investigation for measurement of workability of PPFRC using two standard test methods to characterize consolidation and four methods for flow property of PPFRC, an experimental investigation to characterize selected mechanical properties of PPFRC and to study the effect of volume fraction of (PPF) and length of PPF on the mechanical properties and; development of an analytical model for predicting the stress-strain curves for PPFRC in compression. The comparison of the analytical model for compressive stress-strain curve of PPFRC with the experimental results is judged to be good.