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Influence of Fibre Length on the Behaviour of Polypropylene Fibre Reinforced Cement Concrete

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Abstract

Concrete being a mixture of cement, aggregates (fine and coarse) and water, can be used in vast range of applications. It has excellent durability and availability which are its main advantages. Though, concrete is strong in compression it is comparatively weak in tensile loading. Over the years various materials have been used to reinforce concrete to withstand the tensile stresses. Polypropylene fibre is one such fibre which comes in varied sizes, is nowadays being utilized to reinforce concrete. In this study, three PP fibres were used at 0.20%, 0.25% and 0.30% content by weight. The flexural and compressive strengths were determined. Based on the results, it was observed with increase in size of fibre the compressive strength decreased significantly though it was still higher than the controlled sample. The length of PP fibres had significant effect on the compressive strength and flexural strength of concrete. Short PP fibres showed relatively higher compressive strength but lower flexural strength when higher fibre content is used, while long PP fibres achieved lower compressive strength but higher flexural strength than shorter PP fibres. The optimum dosage for both PP fibre sizes was 0.25% at which it achieved increased strength as compared to control sample.

Keywords: Polypropylene (PP) Fibres; Compressive Strength; Flexural Strength; Fibres Reinforced Concrete (FRC).

1. Introduction

Through the last hundred years, Concrete has established itself as one of the major construction and building materials. This has been mainly due to its excellent durability and availability and ease of moulding concrete into any desired shape. Though concrete has various advantages, it is known to strong under compression but relatively weak under tensile stresses. Concrete possesses limited ductility while offering little resistance to abrasion and cracking [1]. Therefore, over the years, researchers have used various materials to reinforce the concrete to withstand such tensile stresses. Civil engineering structures such as houses, bridges, storage tanks, dams, etc. utilize Reinforced Concrete (RC) [2].

RC is a type of concrete in which steel bars are used to reinforce the concrete. Steel bars offer concrete to resist the tensile stresses. RC with steel bars has led to reduction in tensile stresses and improvement in behaviour of RC but it also leads to increased self-weight load on the structure due to the use of steel bars to reinforce concrete. Another disadvantage of steel bars in concrete is it can easily be affected by corrosion, causing the steel bars to loss its strength. Composite materials have gained much popularity due to their ductility and strain hardening properties and the

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