REVIEW ON APPLICATIONS OF FIBER REINFORCED CONCRETE (FRC) IN STRUCTURES

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Introduction

The conventional plain concrete possesses a very low tensile strength, limited ductility and little resistance to cracking. Plain concrete having poor strength due to cracks and it is leading to brittle failure of concrete. Development of such micro cracks is the main cause of inelastic deformation in concrete. It has been observed that the addition of small, closely spaced and uniformly dispersed fibres to concrete would act as a crack arrester and would significantly improve its static and dynamic tensile strength, energy absorbing characteristic and better fatigue strength.

Literature review

In the past years number of researches have been conducted to verify the whether normal concrete can be substituted with the FRC.Aim of all these research is to make structures more efficient, economic and sustainable. In 2016, Xing-wen Liang conducted an experiment on beam column joint, in that FRC is poured into different potential plastic hinge zone depth of beam – column joint and specimen is subjected to seismic loading. In 2013, Eva Azhra latifa conducted an experiment on Hardened concrete to find various properties of normal concrete by adding different quantity of steel fiber. In 2015, E. Garcia-Taengua conducted a pull out test on different specimens with different percentage of fiber content that shows variations in the bond strength. In 2014, Nemkumar Banthia conducted a comprehensive test program carried out to fully understand the benefits of fiber reinforcement in cement-based repair materials. In 2014, Eshan Ahmed conducted an experiment to show that the steel fiber is used as a replacement of minimum shear reinforcement for one-way thick bridge slab.

Review Analysis

RESEARCH PAPER TITLE	
(1) Seismic performance of fiber-reinforced Concrete Interior beam column joints	In this research polyvinyl alcohol fiber (PVA) is used to improve the beam-column joint seismic performance. two types of Beam-column joint specimens are made Some of regular concrete and some of regular concrete Poured with FRC into joint core zone, potential plastic hinge zone of joint and it is subjected to seismic loading. In results, it is found that the joint improved its load Carrying capacity and energy dissipation capacity.
(2) Bond of reinforcing bars to steel fiber Reinforced Concrete	In this research steel fibers are used to improve the bond strength between reinforcement and concrete. Authors have prepared three different types of concrete with various fiber content. The prepared specimens are subjected to loading pull out test. It is established from the result that the bond strength is improved in shorter fiber as compared to longer fiber at same fiber content.

(3) Performance of steel fiber concrete as Rigid Pavement	In this research hook shaped steel fibers are used to improve performance of concrete used as rigid pavement. In this work, samples are made with various percentage of Fibers in regular concrete. Samples are tested in lab on fresh and hardened concrete behaviour. In results, it is found that the best performance was achieved at 9% of Steel fiber at 0.5 w/c ratio.
(4) Sustainable fiber reinforced concrete for Repair applications	In this research cellulose and polyvinyl alcohol(PVA) fibers used as repair materials in regular concrete. In this, two types of Specimen are made with different volume of fiber. Cellulose specimens are subjected to permeability test to detect resistance against cracking and PVA speci--mens are subjected to corrosion test to detect resistance against climatic condition. In results, it is found that it is durable and strong.
(5) Steel fiber as replacement of minimum Reinforcement for one-way thick bridge Slab.	In this research steel fibers are used as a replacement of minimum shear reinforcement for one-way thick bridge slab. In this experimental program, it consist of three variables (i) presence of min. shear reinforcement (ii) Use of steel fiber reinforced concrete (iii) pre stress or no pre stress. These different types of specimens are subjected to loading and their behaviour is observed. In results, it is found that the load bearing capacity and ductility of FRC members is relatively higher than the regular concrete member which is reinforced with minimum shear reinforcement.

Conclusion

For the sustainable development, in the field of civil engineering structures, the continuous exploitation of natural resources used in the production of reinforcement can be significantly reduced, since the tensile strength property of reinforcement is substituted by FRC. From the established results it is obtained that concrete prepared using FRC is efficient, economic and sustainable as well. In this review analysis it is observed that the characteristics of normal concrete is improved because of adding fibers but standard dosage of fibers for particular concrete construction work is still in experimental zone.

References

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