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BRIEF REVIEW ON EXPERIMENTAL STUDY AND INVESTIGATION ON BEHAVIOUR OF POLYPROPYLENE AND CRIMPED STEEL FIBER IN CONCRETE

***SALAI KARTHIK R, **ELWIN GURU CHANTH S**

**P.G.Scholar , Department of Civil Engineering,PRIST University ,Thanjavur, Tamil Nadu*

*** Assistant Professor, Department of Civil Engineering,PRIST University ,Thanjavur, Tamil Nadu*

ABSTRACT

Both steel and polymeric fibers have been used to reinforced concrete and consequently increase its toughness and crack resistance. Fiber reinforced concrete can be used in some structural applications with a reduced amount or even without any conventional reinforcement. One of the application for fibers is to increase the load-carrying capacity of concrete subjected to shear. Several design methods have been proposed to increase the shear strength due to fibers. Each of the methods accounts for the fiber contribution by means of an index based on the toughness of the material. However, each formula uses a different index, obtained from different types of test configurations. Thus the application of the design methods can be difficult. Moreover, most of the design methods and test procedures have been developed only for the evaluation of steel fiber reinforced concrete.

Keywords— Reinforced concrete, Crimped steel fiber, Polypropylene fiber, Strength and Durability, Application.

INTRODUCTION

Concrete mixture design is vast and generally based on performance criteria. The wet mixture used was prepared first without the fibers. The slump of the concrete before fiber addition should be (50 to 76 mm) greater than the final slump desired. Normally, the mixture would be prepared using the water-cement ratio found to give the best results and meeting the specifications of the research. The use of high-range water-reducing admixture can be advantageous, but was not essential. With the mixes operating at normal charging speed, add the individual fibers, ball-free to the mixer.

After all the required fibers were introduced into the mixer, the mixer should be slowed to the rated mixing speed and mixed for approximately 10 to 15 revolutions to obtain the uniform concrete mix.

LITERATURE SURVEY

WAI HOE KWAN [1]investigated the "Flexural strength and impact resistance study of fiber reinforced concrete in simulated aggressive environment" They concluded that it is a new method of measuring impact energy absorption of FRC panels. Ductile and high tensile strength properties of BF have contributed to the highest degree of improvements on flexural and impact resistance performance of concrete compared with coconut fiber and glass fiber.

SOON POH YA [2] discussed about the "Flexural toughness characteristics of steel–polypropylene hybrid fiber-reinforced oil palm shell concrete" They concluded that the addition of 1% steel fiber and 0.9% steel and 0.1% PP hybrid fibers enhanced the compressive and tensile strengths of the OPSFRC significantly splitting tensile and flexural strengths showed an improvement by up to 83% and 34% for the mixes with 0.9% steel fiber and 0.1% PP hybrid fiber.

NEMKUMAR BANTHIA [3] investigated the "Sustainable fiber reinforced concrete for repair applications" They concluded that it is able to bond properly with the old concrete and restore structural integrity and it is durable and is able to withstand severe climatic conditions and then, it has chemical, electrochemical, permeability and dimensional compatibility with the old substrate being repaired.

GONZALO RUANO [4] discussed about the "Shear retrofitting of reinforced concrete beams with steel-fiber reinforced concrete" They concluded that the fiber reinforced concrete improves structural properties, and moreover, the compatibility between the base and the retrofitting materials but thinner cracking pattern, prevents the income of aggressive agents increasing the durability of the reinforcement.

FLORES MEDINA.N [5] investigated the "Enhancement of durability of concrete composites containing natural pozzolans blended cement through the use of Polypropylene fibers" They concluded that PPF showed early age cracking control ability, reducing the total cracked area and the length of cracks. The maximum cracking control ability among the fiber VF tested was measured for mixtures with 600 g/m3of PPF (0.07% fiber VF).Larger amounts of PPF did not improve cracking controlability and the reduction of cracked area measured at the exposed concrete surface has been more decisive than the internal porous structure.

CUENCA.E [6] reported the "Shear behavior of prestressed precast beams made of self-compacting fiber reinforced concrete" They concluded that Steel fibers positively interact with traditional transverse reinforcement (additive effect).These results are in agreement with the fact that the flange factor in shear (k_f) does not vary for b_f> 400 mm, according to RILEM.

CHEN G.M [7] investigated the "Compressive behavior of steel fiber reinforced recycled aggregate concrete after exposure to elevated temperatures" They concluded that the normal concrete (NC), color change was observed on the surface of RAC specimens after exposure to 200C, 400C and 600C due to chemical and physical changes and then theeffects of elevated temperature on the degradation mechanism of steel fiber reinforced RAC (SFRAC) and how the inclusion of the steel fiber contributes to alleviate the degradation should be further studied by examining the change in the microstructures of concrete in the future.

Advantages of Polypropylene Fibers

- Increases abrasion resistance by over 40% thereby increasing life of roads.
- Reduces pitting of floor.
- Improved long-term serviceability of the structure or product.
- High ductility.
- Prevents the occurrence of large crack widths.
- Increases matrix tensile strength at high volume percentages of fibers. Results in saving of expansive mortar, cement and sand.

Advantages of Crimped Steel Fibers

- Target Crimped Steel Fiber Concrete can give comparable performance at a lower cost or improved performance at a slight increase in cost when compared to conventionally reinforced concrete.
- Concrete volume requirements may be reduced.
- Improved toughness.
- Greatly improved impact, fatigue, and spall resistance.
- Resistance to salt scaling equal to or better than that of regular concrete.
- Increased flexural strengths.

CONCLUSION

It has been observed that the incorporation of fibers to the mix increases the material toughness both in tension and compression, as represented by the toughness indexes of the ASTM and JSCE standards.

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