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Fiber Reinforcement to Increase the Strength of Concrete using Fly Ash A Review

Asif Rasool Malik[1], Jitender Kumar[2]
[1]*MTech Scholer,* [2]*Asstt. Professor*
[1,2]*Department of Civil Engineering ICL College Sountli, Ambala (Haryana)*
[1]asif03631@gmail.com

Abstract: In this paper that we have prepared, we are going to mention an important thing which is about Fly ash and Fiber Reinforcement. Which is about giving more strength to our concrete, when both in use while we preparing concrete and cast. This concrete includes some percentages of fly ash and some percentage of fiber reinforcement. Which reduce cost in some extent, and provide high tensile strength also increase workability.
Keywords: - Fly Ash, Concrete, Fibre, Strength.

Fly Ash
We can say that it is friendly with an environment. Use as an admixture and produce high strength It uses as prime material in many cement products like bricks, concrete blocks etc. Its use in wide range in pcc or Portland cement concrete pavements
Fiber reinforce
It is used in place of steel in concrete blocks. They are nonhazardous and renewable. We can use natural fibers like bamboo, jute, coconut husk, elephant grass etc.

1 INTRODUCTION

When the coal is burnt in the power plant it turns into a fine powder and this is produced in the power plant which we call as fly ash. It contains aluminum and silicious products, which when mixed with water takes the form of cement. In this calculation it can equal Portland cement so we can say when it is mixed with water. Whenever it is added to the concrete mix, it imparts strength and can help to improve it.

Fibre Reinforced Concrete :- The concrete contains fine or fine and coarse aggregates prepared with hydraulic pressure, provide brittleness while applying tensile load. The mechanical properties of concrete can be improved as reinforcement with randomly oriented short discrete fibers that prevent the propagation of cracks or prevent propagation. Its performance obviously depends on how the fiber is found, such as the fiber geometry, concentration, orientation, and distribution of the fiber.

Some applications of fly ash and Fiber reinforce

Types of Fly Ash

- Class – C
- Class - F

Type of Fibre:-

- Good adhesion within the matrix.
- Adaptable elasticity modulus (sometimes higher than that of the matrix)
- Compatibility with the binder, which should not be attacked or destroyed in the long term.

Being sufficiently short, fine and flexible to permit mixing, transporting and placing.

2 LITERATURE REVIEW

Literature survey is the gathering of available document on the topic which contains records, ideas, data and evidence written from a particular area.

Muhammad U. Rashid, **Liaqat A.** Qureshi et.al. (2019) The primary aim of this study was to explore the effect of adding polypropylene and steel fibers on flexural behavior of strengthened concrete girders. In spite of the fact that

the construction industry is regularly using strengthened concrete for increasing the load carrying capacity of the structures, but it can be further boosted by using the fibers. In this study, the experimental work was carried out for motivating the construction industry in utilizing fibres in strengthened concrete for improving the mechanical properties.

Piotr Smarzewski (2019) This study presents the experimental results obtained with the non-contact three-dimensional deformation measuring system ARAMIS and finite element analysis performed using ANSY Sof three slabs made of high-performance concrete (HPC) and hybrid (steel/STandpolypropylene/PP) fibre reinforced high performance concrete (FRHPC). The research was performed on reinforced concrete (RC) slabs with a web mesh of φ8mm bars. All the slabs had an identical amount of steel bars and differed by the fibre volume content. The main aim of this study was to determine the impact of adding polypropylene and steel fibres on the carrying capacity and ductility of HPC slabs.

Dongyeop Han, Yong-Jun Park et.al. (2019) The aim of this research is to evaluate the protecting performance of hybrid fiber reinforced concrete against lateral forces such as explosives or flying objects. The objective of this research is to better prepare this concrete for use in the ready-mix concrete industry. Even though the fiber addition gives it strong mechanical properties, it also decreases workability due to the inefficient dispersion of fibers. Therefore, it has been difficult to apply to the ready-mix concrete plant's mixing, delivery and on-site placement. The authors have developed a combined steel and polyaramid fiber that gives the favorable protection needed against high-impact forces and provides a suitable workability for the ready-mix concrete system.

Tian-Feng Yuan, **Jin-Young** Lee et.al (2019) This paper presents experimental investigations on the mechanical properties of no-slump high-strength concrete (NSHSC), such as the compressive and flexural strength. First, to determine the proper NSHSC mixtures, the compressive and flexural strength of three different water-to-binder ratios (w/b) of specimens with and without polyethylene (PE) fiber was tested at test ages. Then, the effect of hybrid combinations of PE fiber and steel fiber (SF) on the compressive strength, flexural strength, flexural toughness, and flexural energy dissipation capacity was experimentally investigated. Furthermore, the various hybrid fiber-reinforced NSHSCs were evaluated, and their synergy was calculated, after deriving the benefits from each of the individual fibers to exhibit a synergetic response.

Swapnil K. Shirsath (2019) This study reports the performance of thermally deteriorated concrete with and without fibres. Attempts have been made to find the suitable performance of steel polypropylene (PP) hybrid fibre combination that could significantly enhance the performance of mechanical properties at elevated temperatures.

H.Oucief, M.F.Habita, B.Redjel (2019) Investigated that the most cases, fiber reinforced self-compacting concrete (FRSCC) contains only one type of fiber. The use of two or more types of fibers in a suitable combination may potentially not only improve the overall properties of self-compacting concrete, but may also result in performance synergie. The combining of fibers, often called hybridization, is investigated in this paper for a cimentetious matrix. Control, single, two fibers hybrid composites were cast using different fiber type steel and polypropylene with different sizes. Flexural toughness tests were performed and results were extensively analysed to identify synergy, if any, associated with various fiber combinations. Based on various analysis schemes, the paper identifies fiber combinations that demonstrate maximum synergy in terms of flexural toughness.

Sebastjan Kravanja, Radoslav Sovják (2018) *Found the* Semi-infinite targets of Ultra-High-Performance Fibre-Reinforced Concrete with various fibre volume fractions were subjected to the high-velocity projectile impact using in-service bullets. In this study, a variety of empirical and semi-analytical models for prediction of the depth of penetration and mass ejection were evaluated with respect to the experimental results. Models for the depth of penetration and spalling mass ejection were revisited and applied both with deformable and non deformable projectiles parameters. The applicability of the prediction models was assessed through a statistical comparison of values from models with experimental results. The evaluation of the applicability was made through the newly proposed measure of a relative prediction accuracy for model selection and model estimation, which was verified with established statistical accuracy evaluations, such as accuracy ratio, logarithmic standard deviation and correlation coefficient.

Mr. Shelke A. S, Ms. Kognole R. S (2018) This study as per the Indian standard a beam shall be considered as deep beam when the ratio of effective span to overall depth is less than 2 for simply supported & 2.5 for continuous beam. Deep beam transfer the load by shearing action rather than flexural action. Shear strength of concrete beam is not well defined as it is complex phenomenon. To

improve shear strength & deformation of cement matrix mixed (Crimped steel - Polypropylene) fibers are used. By adding steel fiber it is observed that crack resistance and crack control is improved.

Soner Guler , Demet Yavuz et,al. (2018) This paper proposes new strength models to predict compressive, splitting tensile and flexural strengths of steel, synthetic and hybrid fiber reinforced concretes. The strength models depending on fiber reinforcing index, concrete compressive strength, and fiber volume fraction have been developed by multiple regression analyses of the experimental results obtained from a comprehensive experimental program. Twenty-five concrete batches, one control and 24 fiber reinforced concrete with target compressive strength of 40 MPa were produced. Steel and synthetic fibers namely hooked-end steel (HF) and polyamide (PA) synthetic fibers of total volume of 0.25, 0.5, and 0.75% were added in single and hybrid forms to concrete mixes. Moreover, the predictions of the proposed strength models have been compared with the existing strength models in the literature.

Jun Feng, Weiwei Sun, Hongzhou Zhai, et.al (2018) In this paper, the impact energy potential of hybrid fiber reinforced concrete (HFRC) was explored with different fiber mixes manufactured for comparative analyses of hybridization. The uniaxial compression and 3-point bending tests were conducted to determine the compressive strength and flexural strength. The experimental results imply that the steel fiber outperforms the polypropylene fiber and polyvinyl alcohol fiber in improving compressive and flexural strength.

Dr. A.S.S. Sekar, D. Kesavan (2018) This paper focuses on the experimental investigation carried out on hybrid fibre reinforced concrete (combination of hooked end dramix steel fibre and a non-metallic recron‘3s - polyester fibre) up to a total fibre volume fraction of 0.5%, 1%, 1.5% and 2% which was prepared using normal mixing, compaction and curing conditions. The workability studies and the mechanical properties namely, compressive strength on cubes and cylinders, modulus of rupture, modulus of elasticity, flexural strength, the load–deflection curve and stress-strain relationships were studied for concrete prepared using different proportions of hybrid fibre combinations hooked end dramix steel fibre and recron 3s fibre.

Eliza Edison , Alester Joseph Vanreyk (2018) This paper presents an experimental study on the strength properties of plain geopolymer concrete, fibre reinforced geopolymer concrete and hybrid fibre reinforced geopolymer concrete made with low calcium flyash. The strength parameters considered in this study are compressive strength, split tensile strength and flexural strength. The polypropylene fibre incorporation in 8M alkali activated geopolymer was performed by 0.5, 1, 1.5 and 2% of total volume of concrete.

Hajrah Nosheen, Liaqat A. Qureshi et.al.(2018) This Paper is on Failure due to shear is brittle in nature, and inherent lesser concrete tensile strength is a main contributing factor. During loading before the shear reinforcement could start functioning, cracking in concrete starts. Use of fibers in concrete had proven improved impact on tensile strength of concrete. Active reinforcement role initiates after concrete cracking starts. This paper investigates into the shear behavior of fiber reinforced, pretensioned concrete I-section beam specimens.

Athira Anand and Manish Jose(2018) In the present study the effect of using hybrid microfiber reinforcement on the mechanical properties of concrete is studied. Concrete is an important construction material which has low tensile strength and flexural strength. It is proved that addition of fibers improve different properties of concrete like tensile strength and ductility. Improvement in performance by the use of more than one fibre in same concrete is studied here. Hooked steel fibers and Hybrid microfibers (6mm and 12 mm) are used in this experimental study.

Karthikeyan. T. V, Dinesh. P et.al.(2018) This paper for Hybrid Fiber Reinforced Concrete (Hy-FRC) is formed from a combination of two or more different types of fibres, which differ in material properties, remain bonded together when added in concrete and retain their identities and properties. The combining of fibers, often called hybridization, is investigated for a M20 grade concrete at a fraction of 0.5% in this paper.

3 CONCLUSION

Hybrid Fibre Reinforced Concrete being a relatively new construction material is considered as a special type of fibre reinforced concrete. Laboratory and Field experiments have shown HFRC to be a unique construction material possessing high compressive, flexural and tensile strength. Because of it’s higher strength and ductility, the composite has excellent potential for structural application in serve service situations where conventional concrete do not perform satisfactorily.

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