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RESEARCH ARTICLE OPEN ACCESS

Review on Steel Fiber Enriched Reinforced Concrete

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ABSTRACT:
In the construction of any industry or structure there is a common material used as concrete. And concrete is is used in very huge amount in the construction and industries. Many property of the the concrete like brittleness sometimes fails to bear tensile load which is the cause of brittle failure. Since the fibre have the property to increase the toughness of the concrete. In many experiments it is found that, steel fibre reinforced concrete have high resistance to cracking so the reason behind the increasing uses of steel fibre reinforced concrete to increase the hardness or toughness and to reduce the crack deformation characteristics. So I present this paper for theoretical discussion on the subject of of steel fibre reinforced concrete. And here we discuss use terms and models of behaviour that form ambitious for understanding material performance without mathematical details. Here we shown that flexural strength of steel fibre reinforced concrete is directly proportional to the the steel fibre content and inversely proportional to the water cement ratio. Why the different references from early and old authors are included as a means of tying the subject together along a timeline. In the current time by the historical review to build a background for what is currently understood about steel fibre reinforced concrete.
Keywords: Steel Fibers, Fiber reinforced concrete, Cement, Ductility, Strength, Toughness

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I. INTRODUCTION

Fibres are made of steel, glass and polymers for from natural materials and it is used in cement based composites. In comparison of conventional reinforcing steel bars fibres behave strong and control cracking more efficiently and effectively due to their tendency t to be more closely and spaced. Steel fibre are also used in plastic and drying shrinkage control or prevent in concrete. In this paper we are reviewing the effect of steel fibre binding in concrete investigates the the chemical and mechanical properties and steel fibre reinforced concrete's application. One more thing that when we added steel fibres in mortar, Portland cement concrete aura factory concrete depending on the the proportion of fibres add and mix design, its flexural strength of the composite is is increase from 26% to 100%. This technology (steel fibre) prawns forms in more ductile material from brittle material. Because the fibre continue supporting the load after cracking occurs therefore catastrophic failure of concrete is virtually eliminated. The steel fibres are available in many lengths like from 31mm to 60 mm and aspect ratio between 21 and 100 and it manufactured either deformed or hook. The steel fibre concrete is the material which is castable or sprayable material and it is of fine and coarse aggregates, fine aggregate, hydraulic cement with the rectangular cross section of discrete steel randomly dispersed throughout the matrix. The main work of the steel fibre are to strengthen the concrete in tensile tracking for registering such type of cracks. In comparison of without reinforcement concrete and and 'concrete with reinforcement' with welded wire fabric, the fibre reinforcement concrete has a higher flexural strength. But unlike conventional reinforcement which strengthen in one or two direction, steel fibre reinforced isotropically, improve the resistance of concrete to fragmentation, spalling, cracking and fatigue.

When any bheem which is on rainforest is stressed by bending, the deflection, deflection increases as the load increases by which failure occurs and the beam breaks apart. In the beam where the the first crack acres is called the first crack strength. The first crack strength is depend on concrete mix design and the amount of fibre in the mix, and is directly proportional to the the amount of of fibre in mix design and concrete mix design.

There are two theories have been

proposed and to explain the strengthening mechanism. The first proposes the fibre are better to stop the propagation of micro cracks in the matrix. The second theory said that the strengthening mechanism of reinforcement fibre makes the bond between the fibre and the cement. By this it is shown that by the small loads microcracking of the cement matrix comes into existence. The steel fibres feel and extended across the the tracks. Show the bond between the fibre and cement matrix combined and steel fibre can carry the tensile load. One more bond strength is the surface area of the fibre. In many e variety of sizes the steel fibres can also been enhanced with the use of of deformed steel fibres.

1.1 Different Types ofFibers

On the basis of modulus of elasticity there are two types of fibre in basic categories first one is soft intrusion. Those fibres having lower elastic modulus then the concrete mix is known as "soft intrusion". The second one is is "hard intrusion", in this there are those fibre which have higher elastic modulus than concrete mix. Some low elastic modulus fibres like glass, carbon and steel have higher elastic modulus than polypropylene, cement mortar matrix and vegetable fibres and we can improve the impact resistance of concrete but do not contribute so long in its flexural strength whereas high elastic modulus fibres simultaneously can improve both impact resistance as well as flexural. Fibres can be classified into three categories according to the origin of fibres, first one is metallic fibres (such as steel, stainless steel and carbon steel), the second one is mineral fibres (such as glass fibres and asbestos), and the third one is organic fibre. The organic fibre can be divided into two parts natural fibre and man-made fibres.

1.2 Reinforcement Mechanisms in Fiber Reinforced(FRC):

In the cracks it is state when the fibres are wanted properly the fibre interacted at the level of macrocracks and feel this cracks and works as bridge this cracks that's why providing stress transfer that increase the strength, delay the coalescence and another that is delay the unstable growth. If the amount of the fibre is high then it will increase the the tensile strength of the the matrix. In increasing in in high fractional volume fibre composite resulting the tensile flexural strength of the matrix reports increases. When the tensile strength of the composite is is the collision and conversion of micro cracks to micro cracks filled with fibres depending on their length width and bonding characteristics will continue restrain crack opening and crack growth by bridging macrocracks effectively. This macro crack reaching is the primary reinforcement mechanisms in the maturity of commercial fibre rain force concrete composites. The fibre bridging for post macro crack have increase by increasing the fibre reinforcement

II. LITERATUREREVIEW

- **Er Gulzar Ahmad, Er kshipra Kapoor (2016) et al** Fthis research carried out test on steel fiber reinforced concrete to check the influence of fibers on strength of concrete. According to various research papers, it has been found that steel fibers give the maximum strength in comparison to glass and polypropylene fibers. Now a days there exists many reinforcement techniques for improving the strength of those materials which lacks load carrying and less durable capacity. Use of steel fiber to enhance the strength and reduce maintenance is an effective technology established in recent times. Fiber reinforced concrete has been successfully used in slabs on grade, shotcrete, architectural panels, precast products, offshore structures, structures in seismic regions, thin and thick repairs, crash barriers, footings, hydraulic structures and many other applications. The usefulness of fiber reinforced concrete in various Civil Engineering applications is thus indisputable. This review study is a trial of giving some highlights for inclusion of steel fibers especially in terms of using them with new types of concrete.

- **Dr.K.Vidhya (2017) et al** in this experimental it is shown that concrete is a relatively brittle material, when subjected to normal stresses and impact loads. As a result for these characteristics, plain concrete members could not support loads and tensile stresses that occurred, on concrete beams and slabs. Concrete members are reinforced with continuous reinforcing bars to withstand tensile stresses and compensate for the lack of ductility and strength. The addition of steel reinforcement significantly increases the strength of concrete, and results in concrete with homogenous tensile properties; however the development of micro cracks in concrete structures must be checked. The introduction of fibers is generally taken as a solution to develop concrete in view of enhancing its flexural and tensile strength. M40 grade of concrete are arrived with the following ingredients such as Cement, Fine aggregate, Coarse aggregate, Water, Steel fiber, Fly ash, Silica fumes and Superplasticizers. Then variables in this study include the steelfiber (Hooked end and crimpled) percentage in addition to the weight of cement. The Compressive strength,

tensile strength and flexural behavior of steel fiber reinforced concrete beam with the varying percentage of fiber of M40 grade of concrete.

- **Vasudev R, Dr. B G Vishnuram (2013) et al** this paper aims to have a comparative study between ordinary reinforced concrete and steel fiber reinforced concrete. The fibers which were used in the study were the turn fibers. They were the scraps from the lathe shops. Experimental investigations and analysis of results were conducted to study the compressive & tensile behaviour of composite concrete with varying percentage of such fibers added to it. The concrete mix adopted were M20 and M30with varying percentage offibers ranging from 0, 0.25, 0.5, 0.75 & 1%. On the analysis of test results the concrete with turn steel fibers had improved performanceas compared to the concrete with conventional steel fibers which were readily available in market. These sustainable improvements or modifications could be easily adopted by the common man in their regular constructions

- **Vikrant S Vairagade (2012) et al** this paper deals with Experimental investigation for M-20 grade of concrete to study the compressive strength, and tensile strength of steel fiber reinforced concrete (SFRC) containing fibers of 0% and 0.5% volume fraction of hook end Steel fibers of 50 and 53.85 aspect ratio were used. A result data obtained has been analyzed and compared with a control specimen (0% fiber). A relationship between Compressive strength vs. days, and tensile strength vs. days represented graphically. Result data clearly shows percentage increase in7 and 28 days Compressive strength and Tensile strength for M-20 Grade of Concrete.

- **Milind V Mohod (2012) et al** in this experimental investigation for M30 grade of concrete to study the compressive strength and tensile strength of steel fibers reinforced concrete containing fibers varied by 0.25%, 0.50%, 0.75% 1% 1.5% and 2% by volume of cement cubes of size 150mmX150mmX150mm to check the compressive strength and beams of size 500mmX100mmX100mm for checking flexural strength were casted. All the specimens were cured for the period OF 3, 7 and 28 days before crushing the result of fibers reinforced concrete 3 days, 7 days, and 28 days curing with varied percentage of fiber were studied and it has been found that there is significant strength improvement in steel fiber reinforced concrete. The optimum fiber content while studying the compressive strength of cube is found to be 10% and 0.75% for flexural strength of the beam. Also it has been observed that with the increase in fiber content up to the optimum value increase the strength of concrete.

- **Prasad Karunakaran.R. (2017) et al** This paper deals with experimental study on behaviour of steel fiber reinforced concrete for M25 grade having mix proportion of 1:1:2 with 0.44 water cement ratio to studythe Compressive strength, Split tensile strength, Flexural strength of steel fiber reinforced concrete (SFRC) containing fibers of 0.5% volume fraction of hook end Steel fibers of 50 aspect ratio were used. A result data obtained has been analyzed and relationship between Compressive strength, Split tensile strength, Flexural strength vs. days represented graphically.

- **Abdul Ghaffar (2014) et al** this research is based on the investigation of the use of steel fibers in structural concrete to enhance the mechanical properties of concrete. The objective of the study was to determine and compare the differences in properties of concrete containing without fibers and concrete with fibers. This investigation was carried out using several tests, compressive test and flexural test. A total of eleven mix batches of concrete containing 0% to 5% with an interval of 0.5% by wt. of cement. 'Hooked' steel fibers were tested to determine the enhancement of mechanical properties of concrete. The workability of concrete significantly reduced as the fiber dosage rate increases.

- **A.M. Shende (2012) et al** Critical investigation for M-40 grade of concrete having mix proportion 1:1.43:3.04 with water cement ratio 0.35 to study the compressive strength, flexural strength, Split tensile strength of steel fiber reinforced concrete (SFRC) containing fibers of 0%, 1%, 2% and 3% volume fraction of hook tain. Steel fibers of 50, 60 and 67 aspect ratio were used. A result data obtained has been analyzed and compared with a control specimen (0% fiber). A relationship between aspect ratio vs. Compressive strength, aspect ratio vs. flexural strength, aspect ratio vs. Split tensile strength represented graphically. Result data clearly shows percentage increase in 28 days Compressive strength, Flexural strength and Split Tensile strength for M-40 Grade of Concrete.

- **Pramod Kawde (2017) et al,** in this research it is shown thart ordinary cement concrete possesses very low tensile strength, limited ductility and less resistance to cracking. The

concrete shows the brittle behaviour and fails to handle tensile loading hence leads to internal micro cracks which are mainly responsible for brittle failure of concrete. In this era, RCC constructions have their own structural and durability requirements, every structure has its own intended purpose and hence to meet this purpose, modification in traditional cement concrete has become mandatory. It has been proved that different type of fibers added in specific percentage to concrete improves the mechanical properties, durability and serviceability of the structure. As compared to other fibers it is now established that one of the important properties of Steel Fiber Reinforced Concrete (SFRC) is its superior resistance to cracking and crack propagation. In this paper Past studies based on the Steel fiber concrete is studied in detail.

III. CONCLUSIONS

There are the some following conclusions obtained.

- It is found that the adding of steel fibre in concrete increases the the strength and toughness as compared to to plain concrete.
- Steel fibre reinforced concrete give results for improve abrasion, flexural strength, impact resistance, high flexural and fatigue flexural with durability.
- Steel fibre reinforced concrete is very economical design alternative in this time.
- By addition of steel fibres in concrete increases the ductility.

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