Properties of M20 Fiber Reinforced Concrete

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ABSTRACT

Now a days Concrete is most widely used material. Fiber reinforced concrete (FRC) is a concrete in which small discontinuous fiber are dispersed uniformly. The fiber used in FRC may be of different material like steel GI, carbon, glass, polypropylene, jute, Recron etc. as per different research the addition of these fiber into concrete mass increase the compressive strength, split tensile strength, flexural strength, and impact strength of concrete. FRC has found many applications in civil engineering field. Based on the survey experiment on fiber reinforced concrete (FRC) cylinder have been with Steel Fiber reinforced concrete (SFRC) containing fiber of 0.5%, 1% and 1.5% Steel Fiber and Recron Fiber composite with admixture. A grade M20 concrete control mixture of proportion 1:2.67:4 with w/c of 0.50 were designed. The effect of different fiber with percentage increase in splitting improvement of specimen at 14 and 28days, analyzed the sensitive of addition of fibers to concrete with different strength.

KEYWORD: *Split tensile strength, Steel fiber, Racron fiber*

1. Introduction

Concrete is the 2nd most used material on the earth after water.by adding the super plasticizer high range water reducers, are chemical admixtures used where well-dispersed particle suspension is required. These polymers are used as dispersants to avoid particle segregation (gravel, coarse and fine sands), and to improve the flow characteristics (Rheology) of suspensions such as in concrete applications. The addition of concrete or mortar allows the reduction of the water to cement ratio.as per research paper by adding the Steel fiber and Racron fiber it's improve the split tensile strength, compression strength, flexural strength, durability and shrinkage characteristics of concrete. Concrete has high compressive strength but, weak in tensile. So, to improve the behaviour of tensile in concrete we used stainless steel fibers and Racron fiber, The main reason for incorporating fiber with cement matrix is to increase the tensile strength, flexural strength of concrete and also it improves the cracking deformation characteristics of the concrete composite.

2. MATERIAL AND PROPERTIES

A. Cement: The cement used in this experimental work is coromandel king cement of 53 grade ordinary Portland cement. The specific gravity of cement is 3.15, Standard consistency of cement is 31.3%.All properties of cement are tested by references of IS 12269- 1987.

B. Steel Fiber: Concrete is characterized by brittle failure, the nearly complete loss of loading capacity, once failure is initiated. This characteristic, which limits the application of the material, can be overcome by the inclusion of a small amount of short randomly distributed fibers (steel, glass, synthetic and natural) and can be practiced among others that remedy weaknesses of concrete, such as low growth resistance, high shrinkage cracking, low durability, etc. Steel fiber reinforced concrete （SFRC） has the ability of excellent tensile strength, flexural strength, shock resistance, fatigue resistance, ductility and crack arrest. Therefore, it has been applied abroad in various professional fields of construction, irrigation works and architecture. There are currently 300,000 metric tons of fibers used for concrete reinforcement. Steel fiber remains the most used fiber of all (50% of total tonnage used) followed by polypropylene (20%), glass (5%) and other fibers (25%) (Banthia ,2012). Mechanical properties of high-strength steel fiber reinforced concrete were done by Song P.S. and Hwang S. They have marked brittleness with low tensile strength and strain capacities of high strength

concrete can be overcome by addition of steel fibers. Tdyhey investigated an experimental study were steel fibers added at the volume of 0.5%, 1.0% and 1.5%
Properties of Steel Fiber

Table 1: Properties of Steel fiber

Properties	**Dimension**
Length	25mm
Diameter	0.5mm
Appearance	Clear, Bright, and Straight
Aspect ratio L/D	50
Carbon content C (%)	0.002
Manganese content Mn (%)	1.40
Silicon content Si (%)	0.370
Nickel content Ni (%)	8.040
Chromium Cr (%)	18.180
Phosphate p (%)	0.039

C. Recron fiber:- Recron acts as "secondary reinforcement" in concrete which arrests cracks, increases resistance to impact/abrasion & greatly improves quality of construction in walls, foundations, tanks, roads and pre-cast products like blocks, pipes, tiles, manhole covers, and more. Reliance Industries Limited brings your Recron. The new generation fibre used in a variety of significant industrial applications such as paper, asbestos cement products, construction and lead acid battery.

Table.1 Properties of Recron fiber

Properties	Value
Cut length	6mm
Aspect ratio (l/d)	300
Specific gravity	0.91
Tensile strength	6000kg/cm^2
Melting point	<250◦c
Acid resistance	Excellent
Alkali resistance	Good
Dispersion	Excellent

D. Fine aggregate: Locally available sand passed through of 4.75mm IS sieve is to be used. The specific gravity of sand is 2.60 and fineness modulus of 2.84 is used. Water absorption of sand is 1.23%

E. Course aggregate: The coarse aggregates with the sizes of 20mm and 10 mm aggregates are used. Specific gravity of 20mm CA is 2.88 and for 10 mm it is 2.87. And fineness modulus is 7.38.

F. Water: Water should be free from all injurious amounts of acids, organic and inorganic impurities. And it should be used for proper mixing and curing of concrete.

G. Admixture: Super plasticizer is the one of the most popular chemical admixture used in concrete technology. This admixture is also known as the high range of water reducers. Sikament FF is a highly effective water, reducing agent and super plasticizer for promoting accelerated hardening and free flowing concrete.

3. EXPRIMENTAL WORK:

A. Mix proportion

The mix proportion shown in table 2.was made for a concrete with the slump of 33mm (25mm-50mm),the design of M20 OPC concrete as per IS:10262-2009

Table 3: Mix proportion

Material	Weight kg/m3
Cement	**297.6**
Fine aggregate	**863.63**
Course aggregate (20mm)	**1298**
Water	**148.8**
Admixture	**7.66**

B. Casting and Curing

The casting done as per Steel fiber and Recron fiber for concrete. 0.5% of steel fiber replacement by weight of cement and the 0.5% of Recron fiber replacement by weight of cement so the other mix proportion is as per above parameters. After mixing the concrete it was filled out with cylinder for the test. The specimen were removed out after 24 hour and install into curing tank. After curing time 14days and 28 days specimen were taken out for a test.

4. TESTING

To find out the mechanical properties of concrete 14days and 28day by mix proportion by split tensile strength.

SPLIT TENSILE STRENGTH

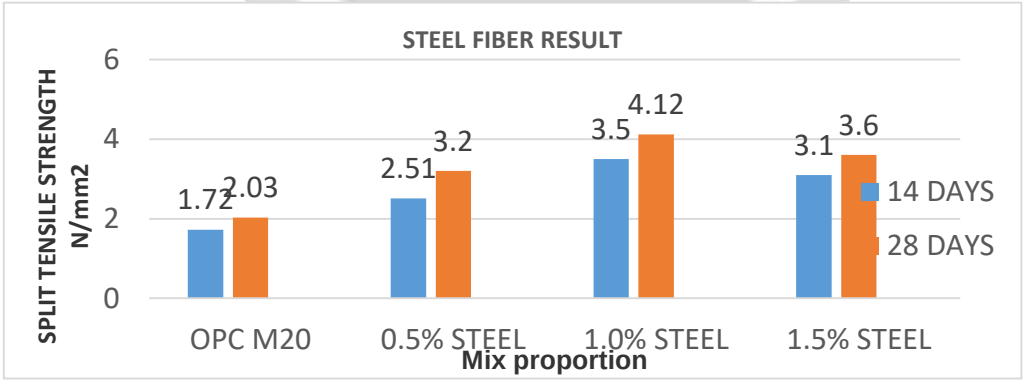
The result split tensile strength show in fig. The tensile strength of concrete is one of the basic and important properties. Split tensile strength test on concrete cylinder is a method to determine the tensile strength of concrete. The concrete is very week in tension due to its brittle nature and is not expected to resist the direct tension. The concrete develop crack when subjected to tensile force. Thus, it's necessary to determine the tensile strength of concrete to determine the load at which the members may crack.

Split tensile strength= $2P/\pi DL$

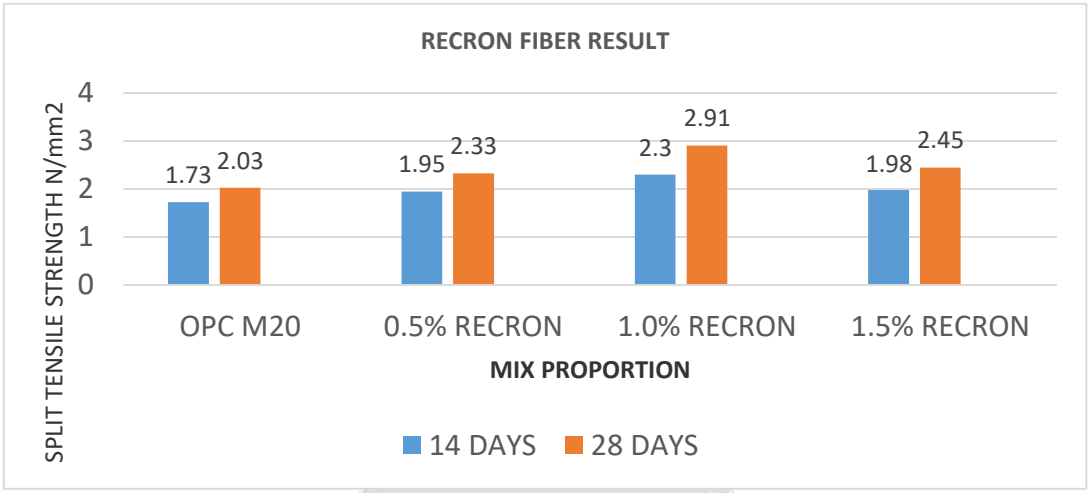
Where P= failure load (KN)

D= diameter of specimen (150mm)

L= length of specimen (300mm)



(FIG.1)



(FIG.2)

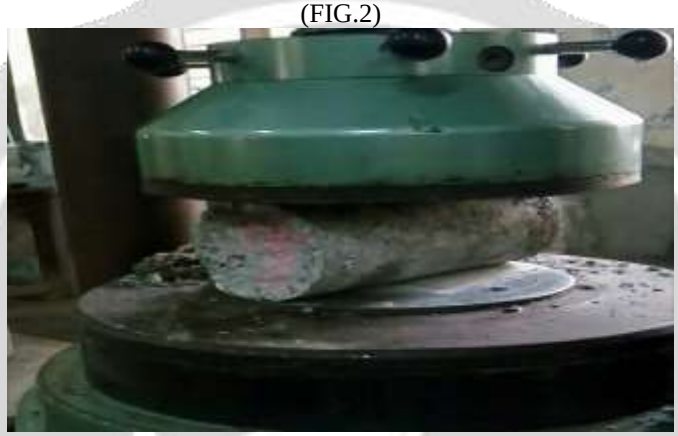


Fig.3 Split tensile strength test

4. CONCLUSION

- It is observed that he constant of 1% Steel Fiber and Recron Fiber it was increased split tensile strength. At the high strength is achieved at additional 1.0% Steel ad Recron Fiber at 14days and 28 days increase split tensile strength is 45.64%, 58.25% and 25.1%, 32.56 respectively.
- The Steel Fiber gives batter split tensile strength than Recron Fiber.
- The optimum strength is achieved in 1.0% of steel fiber in split tensile strength

5. REFERENCES

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