STRENGTH OF DURABILITY PROPERTIES OF CONCRETE USING RECRON 3s

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Abstract—Fiber Reinforced Concrete (FRC) is a composite material consisting of cement based matrix with an ordered or random distribution of fibers that exhibits a synergistic response. In this paper, an experimental investigation on strength of concrete by addition of recron 3s fibers at a dosage of 0-1% by weight of cement has been carried out. Recron 3s acts as "secondary reinforcement" in concrete which arrests shrinkage cracks resistance to impact/abrasion & greatly improves quality of construction. The studies were conducted on M_{30} mix and tests have been carried out. The compressive strength, split tensile strength, flexural strength, capillary and porosity test of concrete sample was determined and the dosage of fiber varies from 0%, 0.2%, 0.4%, 0.6%, 0.8% and 1%. Finally, the results were compared with the conventional concrete.
Keywords— synergistic, Recron 3s fibers, secondary reinforcement, capillary , porosity.

1. INTRODUCTION

Concrete is a man made building material. Combining cement with aggregate and sufficient water makes concrete. Concrete is normally reinforced with a use of rods or steel mesh before it is poured into moulds. Concrete is a material synonymous with strength and longevity.Recron 3s is a state of art reinforcing material which is used to increase strength in a variety of applications. Recron 3s acts as "secondary reinforcement" in concrete which arrests shrinkage cracks, increases resistance to impact/abrasion & greatly improves quality of construction. It results in saving of cement and sand and helps completing targeted job earlier. Recron-3s does not replace structural and load bearing reinforcement materials.

Recron 3S prevents the micro shrinkage cracks developed during hydration, making the structure/plaster/component inherently stronger. Further, when the loads imposed on concrete approach that of failure, cracks will propagate rapidly.

2.LITERATURE REVIEW

E.A.Bobadilla – sanchezlet al (2009)

They studied the mechanical behaiver of concrete by the influence of polyester fiber which are subjected to gamma irradiation and concluded that the compressive strength decreases with higher does of irradiation & percentage of polyester but,there are no details of behavior of polyester fibers when reinforced in concrete subjected to elevated temperature**.**

Mahesh K Maroliya et al (2010)

They investigated the compressive strength and flexural strength of plain reactive powder concrete with corrugated steel fiber and recron 3s fibers.they observed that the comosition of RPC which is optimized by trail and error nethod in previous work by varying different ingredient is used with a water cement ratio of 0.22.They incorporated corrugated steelfibers

(0.4mm diameter and 13mm long) and recron3s fiber of triangular shape (12mm length)in the concrete**.**

Dharani.n al (2013)

They studied the various mechanical properties of concrete containing hypo sludge and recron 3s fibers.hypo sludge was used as a replacement cement.replacement percentages used during the present study were 10%,20%,30%,40%,50%.for each replacement percentage of cement with hypo sludge, 0.2%,0.3%,0.4% of recron 3s fiber were added and specimens were cast to determine the mechanical properties.compressive strength of cubes were found on the 28 days**.**

Nija Benny (2014)

He observed that using recron fiber from 0.2% to 0.225% the compressive strength is not incresed but as the fiber percentage was incresed from 0.25% to 0.35% the compressive strength was incresed and on further increment of fiber content the strength reduces.From0.25% to 0.35% of fiber content,7days and 28 days compressive strength of concrete is higher at with 0.325% fiber compare to other fiber composition**.**

3.MATERIAL COLLECTION

Materials

The materials used for this experimental work are cement,sand, water, coarse aggregate, recron3s fiber.

Cement: Materials Ordinary Portland cement of 43 grade Portland cement is most common type of cement in general used around the world because it is a basic ingredient of mortar, mortar , stucco and most non- specially grout. It is manufactured in the form of different grade.

Fine aggregate : Locally available natural sand with 2.36 mm size was used as fine aggregate in this project. The sand is sieved to remove all pebbles and impurities in the soil.

Coarse aggregate :

Machine crushed blue granite stone angular in shape was used as coarse aggregate. Two size of coarse is used; one 16mm passing through 12.5 mm retained and other 20 mm passing through 20mm retained.

Water:

Water is an important ingredient of concrete,pH is between 6 and 8 the water is accepted to be suitable,Potable water was used for the experimentation.

Recron3s Fiber:

Recron3s is for improving the quality of construction. It also results in saving of cement and sand and helps completing targeted job earlier. Recron-3s does not replace structural and load bearing reinforcement materials. Recron3s prevents the micro shrinkage cracks developed during hydration, making the structure/plaster/component inherently stronger

Mix proportions

In this study, the normal strength concrete of M30 grade was considered. BIS code procedure as per IS: 10262-1982 was followed for finding the mix proportions of the concrete specimen. Water binder ratio was considered for M30 grade as 0.45.

Cement (kg)/m^3	F.A (kg)/m^3	C.A (kg)/m^3	Water (kg)/m^3	
413	706	1117	186	

4. EXPERIMENTAL WORKS

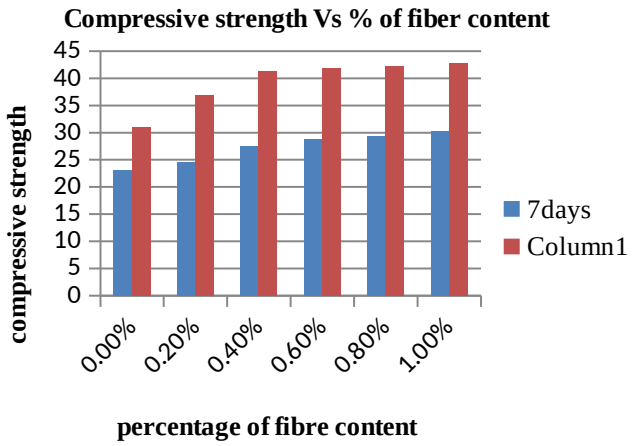
Casting: For compressive strength test, cube specimens of dimensions 150 mm × 150 mm × 150 mm were cast using M30 grade of concrete with various percentage of recron 3s fibre proportion of mix design.

The concrete cubes after 7, 14 and 28 days of curing, these cubes were tested on compression testing machine. The failure load was noted. In each category, three cubes were tested and their average value is reported.

4.1.Compressive Strength Test:

Results of compressive strength for M30 grade of concrete on cube specimens are determined .There is a significant improvement in the compressive strength of concrete.

Trial no	Adding recron 3s	7 days N/mm^2	28 days N/mm^2	
1	Conventional	23.11	30.92	
2	0.2%	24.58	36.78	
3	0.4%	27.68	41.16	
4	0.6%	28.89	41.85	
5	0.8%	29.42	42.11	
6	1%	30.22	42.68	

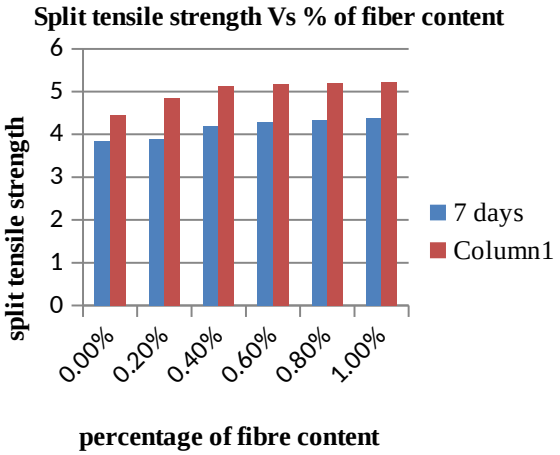


4.2 Split Tensile Strength:

Three specimens of cylindrical shape of diameter 150 mm and length 300 mm were tested under a compression testing machine of 2000 KN capacity under a compressive load across the diameter along its length till the cylinder splits.

Trail No	Adding recron 3s	7 days N/mm^2	28 days N/mm^2
1	Conventional	3.85	4.47
2	0.2%	3.92	4.85

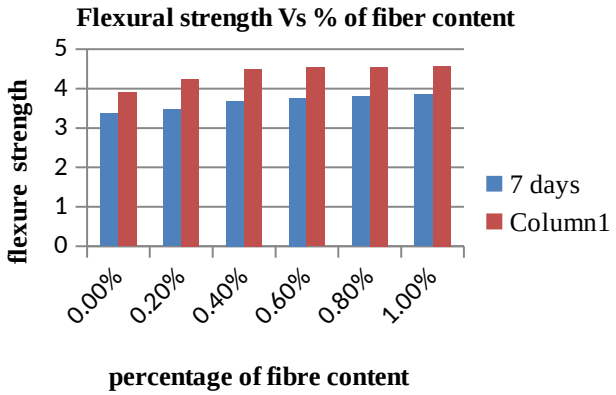
3	0.4%	4.22	5.13
4	0.6%	4.31	5.23
5	0.8%	4.32	5.26
6	1%	4.39	5.27



4.3.Flexural strength test:

The determination of flexural tensile strength is essential to estimate the load at which the concrete members may crack. The flexural tensile strength at failure is called modulus of rupture.

Trail No	Adding recron 3s	7 days N/mm^2	28 days N/mm^2
1	Conventional	3.41	3.87
2	0.2 %	3.48	4.32
3	0.4 %	3.70	4.52
4	0.6 %	3.81	4.59
5	0.8 %	3.73	4.64
6	1.0 %	3.90	4.66



5.DURABILITY TEST ON CONCRETE

Durability test includes Rapid chloride penetration test (RCPT), Water absorption test, carbonation test and Water permeability test.

5.1.Rapid chloride penetration test (RCPT)

Rapid chloride penetration test is done to estimate the amount of chloride penetration in concrete**.**

- Cylindrical concrete specimen of size 100 mmlong and 50mmdia is casted and cured 28 days in chloride free water,
- The test consists of two cells,One filled with NaCl cathode and other one filled with NaOH anode.Power source 0f 60 V direct current is supplied for 6 hours.
- The result is observed the charge passed in to the specimen measured in coulombs. The rate of rapid chloride penetration

Charge passed (coulombs)	Chloride iron permeability	
Greater than 4000	High	
2000 - 4000	Medium	
1000 - 2000	Low	
100 - 1000	Very low	
Less than100	Negligible	

5.2.Water Absorption Test

- Moisture penetration is one of the factors affecting the durability of concrete, The concrete as a porous material**.**
- It is a predominant factor to determine the concrete quality, concrete cube casted and immersed in water 28 days, the result taken in to over dried specimen for 24 hours and temperature of 110^{o}c.

5.3. Carbonation Test

- It is related with corrosion of steel reinforcement and shrinkage,the depth of carbonation of concrete.
- Concrete cube casted with 0%, 4%,8% and 12% of alccofine, Phenolphthalein is used as indicator and specimen turns pink colour it was denotes as Un-carbonated , Colorless was is carbonated.

5.4.water permeability test

- Concrete against the penetration of water under hydrostatic pressure is determined by water permeability test. Depth of water penetration is measure by using permeability test apparatus.
- Casted Concrete cubes against penetration of water under 0.5N/mm^2 pressure for

48 hours and testing the depth of water penetration is measured.

6.CONCLUSION

The addition of recron 3s fibers into concrete mixes marginally improve the compressive strength at 28 days. There is an increase from 3% to 9% in split tensile strength for fiber mixes when compared with that of control mix. The volume fraction of fiber concrete mix gives better strength values on par with control mix. The recron3s fiber used inconcrete to give more compressive strength, split tensile strength and flexural strength when compared to that of nominal concrete.

The capillary absorption coefficient and porosity increase with addition of fibers. The increase is more pronounced after 0.2% fiber addition. Considering the above observations, it is concluded that within the range of tests conducted, fiber addition with concrete would improve the dampening or seeping action of water in concrete besides satisfying other conventional criteria.

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