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A EXPERIMENTAL STUDY ON M- SAND AND RECRON 3S FIBER FOR M30 CONCRETE

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ABSTRACT

It is generally seen that river sand are fast disappearing from river bed due to over exploitation. This has lead to a series of research efforts and soon enough engineers came out with a substitute that served equally well and in some cases much better than the river sand. As the same takes millions of years to form and is not replenished the price of river sand sky rockted making construction even more expensive.Robo or m sand sand is one of the most used among such material to replace river sands.

M-sand is the perfect substitute to river sand and is manufacture by crushing granite rocks using 3 stages vertical shaft impactor machinery. Which can be used as an alternative to fine aggregate in concrete. The major advantages are cubical particle shape, perfect gradation and absence of impurities. A study is carried out for concrete in two phases in first phase to find the effect of fresh properties of concrete like workability and hardened properties like compressive strength , split tensile & flexure strength of the concrete by replacing natural sand by robo sand in proportions of 0% and 50% & 100%with cubes 18cubes of 150mmx150mmx150mm, 18 cylinders of 150mmx300mm , 18prisms of 150mmx150mmx700mm were casted and tested at the age of 7 days and 28 days.is studied for M30 design mix. In second phase recron 3s was mixed in Concrete containing 100% m- sand at different percentages of 0%, 0.5%, 1%, 1.5% & 2% and cubes 27cubes of 150mmx150mmx150mm, 27 cylinders of 150mmx300mm , 27prisms of 150mmx150mmx700mm were casted and tested at the age of 7 days and 28 days..

I. INTRODUCTION

Concrete is a mix of cement , coarse aggregates , fine aggregates , sand and water . concrete is one of the most versatile material . It can be caste to fit any type of structures . The advantages of concrete is good compressive strength , good fire resistance , high water resistance . but the concrete is week in tensile strength . to overcome these disadvantages we use the reinforcement which is good in tensile strength . And the fibers are used to overcome these advantages .Fiber is good in flexural strength , tensile strength toughness and impact resistance . In our project recron 3s fiber is used.

II. OBJECTIVE OF THE PROJECT

The main objective of the project is the experimental study on fiber reinforced concrete using robosand for M30 grade mix (fiber 0% , 0.5%, 1%,1.5%,2%) with the following test results.

III. SCOPE OF THE PROJECT

As in the near future the cost of sand is increasing and water bodies are to be exploited so as a counter measure civil engineers are searching for alternative materials for construction. Which will be economical at the same time they will prevent the shrinkage cracks developed during curing making the structure plaster/component inherently stronger. So use of RECRON 3S is useful to prevent cracks on a structure.

To know the strengths of cubes , beams , and cylinders on addition of fiber replacing with cement of M30 grade concrete using robo sand

IV. LITERATURE REVIEW

In 2013 ,Dharani .N found that the optimal replacement percentage of cement with hypo sludge is found to be 30 % when recron 3s fibers are not added . On addition of recron 3s fiber with cement matrix , the compressive strength and split tensile strength decrease with increase in fiber content , however the flexural strength increases with increase in fiber content . Usage of recron 3s fibers will reduce the segregation , cost of maintenance by reducing the micro cracks and permeability and hence the durability will increase .

In 2012 , S.C. Patodi reported the experimental investigation on different volume fractions of recron 3s fibers and continuously crimped steel fibers to produce HFRC and gives its performance under compression , tension , flexural , shear and impact types of loading . The optimum fiber ratio of recron and steel fibers of HFRC matrix was found to be 0.3 : 0.7 for overall better performance in terms of strength and ductility .

K .Vamshikrishna and J .Venkateshwarrao done the experimental study on behaviour of fiber reinforced concrete for rigid pavements . This paper deals with experimental investigation on mechanical properties of M20 grade concrete by incorporating polysterfibers in the mix .Polysterfibers of 0.1 % , 0.2 % , 0.3 % , 0.4 % ,by weight of cement are added to the mix . A comparative analysis has been carried out for conventional concrete to that of the fiber reinforce in relation to compressive , split tensile , flexural strengths . As the fiber contents increases compressive , split tensile , flexural strengths are proportionally increasing. It is observed that 0.3 % fibers by weight of cement is optimum dosage . It is found that with 0.3 % fiber content results in 20 % reduction of pavement thickness .

,**Gurunathan k** The authors discussed that the addition of polypropylene fibers, fly ash and silica fume in different concrete mixes marginally improve the compressive strength at 28 days. The minimum percentage of fly ash and silica fume were added in concrete so that the performance of the concrete increases. There is an increase from 3% to 9% in split tensile strength for all fiber mixes when compared with that of control mix. Then from the test result the author concluded that the volume fraction of hybrid fiber concrete mix gives better strength values on par with control mix.

IN 2014 ,AvinashGornale Studied the strength aspects of glass fiber reinforced concrete.. the study had revealed that the increase in compressive strength, flexural strength, split tensile strength for M20,M30 and M40 grade of concrete at 3, 7 and 28 days were observe to be 20% to 30%, 25% to 30% and 25% to 30% respectively after the addition of glass fibers as compared to the plain concrete .

IN 2010 ,Chandramouli K conducted a study to investigate the mechanical properties of alkali resistant glass fiber reinforced concrete for M20 , M30 , M40 and M50 grades of concrete . The study concluded that the addition 0.03 % of glass fibers by volume of concrete increases the compressive strength for various grades of concrete from 20 to 25 % . Also this showed an increase in flexural and split tensile strength for 28 days from 15 to 20 % and addition of fibers lead to reduction in bleeding , which improves the surface integrity of concrete and also improves its homogeneity and reduces the probability of cracks .

H.S.Chore:- et.al, determined the compressive strength of fiber reinforced fly-ash concrete using the regression model. The compressive strength of the fiber reinforced concrete containing flu-ash was predicted by creating a mathematical model using statistical analysis for the concrete data obtained from the experimental work.

Ashish Kumar Dash:-et.al, used Recron 3s fiber and silica fume for making concrete. The compressive strength and the flexural strength of the concrete specimens were determined. The optimum strength was obtained at 0.2% fiber content.

Machine Hsie:-et.al, used polypropylene hybrid fiber for making concrete. It was reported that the strength of concrete with polypropylene hybrid fiber was better than that of the single fiber reinforced concrete.

R.Srinivasan:-et.al, determined the optimum percentage replacement of cement with hyposludge. The optimum replacement percentage was found to be 30%.

A Sivakumar and Manu Santhanam:-It found that among hybrid fiber combinations, only the steel polypropylene combination performed better in all respects compared to the mono-steel fiber concrete.

Qian and Stroeven :-Studied the fracture properties of concrete reinforced with polypropylene fiber and three sizes of steel fibers with fiber content ranging from 0 to 0.95% by volume of concrete. Wu, Li and Wu compared the mechanical properties of three different types of hybrid composite samples prepared by using the combinations of polypropylene- carbon, steel-carbon and polypropylene- steel fibers. Mechanical properties of hybrid composites produced by using carbon and aluminum whiskers in addition to polypropylene fibers were studied in detail by Mobasher and Li

Banthia and Sappakittipakron :-
Investigated three fiberhybrid with carbon and polypropylene micro fibers added to macro steel fibers and showed that steel macro fibers with highly deformed geometry produce better hybrids than those with a less deformed geometry. Also composites with a lower volume fraction of fiber reinforcement were seen as having a better prospect for hybridization than composites with a high volume fraction of fibers.

V. MATERIALS

The various materials are used in this experiment such as cement , water ,M-sand , coarse aggregates and Recron 3sfiber . Different tests are done on cement , fine aggregates , coarse aggregates and concrete .

VI. CEMENT

A cement is a binder , a substance used in construction that sets and harden and can bind other materials together . cement is a powdery substance made by calcining lime and clay .cement is mixed with water to form a mortar or mixed with sand , aggregates and water to form concrete . Ordinary portland cement (53 grade ultratech) confirming to IS : 12269 - 1987 is used and different tests are conducted to know the quality of cement

Selected fiber for project:-

RECRON 3S :
Recron 3s Fiberfill is India's only hollow Fiber specially designed for filling and insulation purpose. Reliance Industry Limited (RIL) has launched Recron 3s fibers with the objective of improving the quality of plaster and concrete.

Application of RECRON 3s fiber reinforced concrete used in construction. The thinner and stronger elements spread across entire section, when used in low dosage arrests cracking.

Addition of RECRON 3s in concrete and plaster prevents cracking caused by volume change (expansion & contraction).

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RECRON 3s
The aim of these project is to find the changes in the fresh state like workability, and hardened state like compressive strength, flexural strength and flexural tensile strength concrete.

VII. CHEMICAL ADMIXTURES:

. A typical plasticizer is lignosulfonate. Plasticizers can be used to reduce the water content of a concrete while maintaining workability and are sometimes called *water*-reducers due to this use.

Such treatment improves its strength and durability characteristics. Super plasticizers(also called high-range water-reducers) are a class of plasticizers that have fewer deleterious effects and can be used to increase workability more than is practical with traditional plasticizers. Compounds used as superplasticizers include sulfonated naphthalene formaldehyde condensate, sulfonated melamine formaldehyde condensate, acetone formaldehyde condensate and polycarboxylate ethers.

VIII. METHODOLOGY

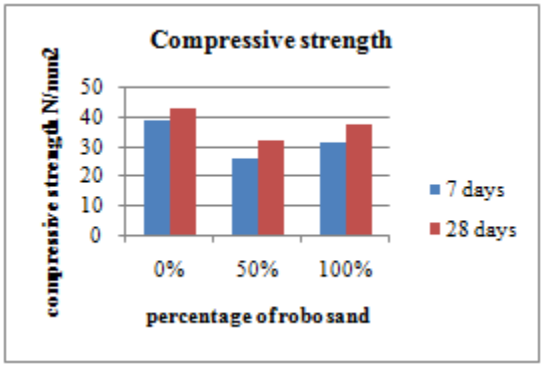
Mix design for M30 GRADE CONCRETE

- Type of cement=opc 53
- Aggregate= 20mm
- Water cement ratio=0.45
- Workability=100mm slump
- Exposure=moderate
- Min cement =320kg/m3
- Supervision=400d
- Maximum cement=450
- Chemical admixture= conplast =2ml
- Specific gravity cement=3.31
- Specific gravity coarse aggregate=2.68
- Specific gravity fine aggregate=2.69
- Water absorption of coarse aggregate =1%
- Water absorption of fine aggregate=.15%

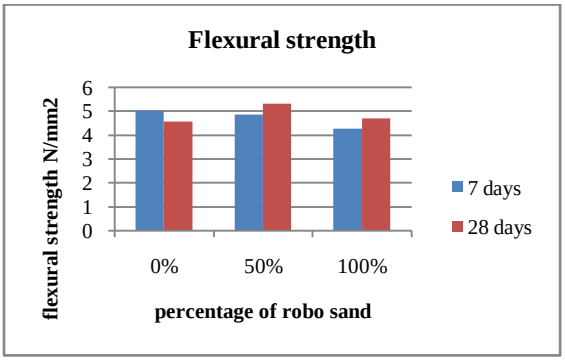
Mix ratio = cement : fine aggregate : coarse aggregate
= 344 : 726.66 : 1232
= 1: 2.11: 3.5

IX. TEST RESULTS AND DISCUSSION

Compressive strength
Compressive strength of concrete with riverRobo sand in M30



Flexure strength
Flexure strength of concrete with river sand and robo sand in M30
Split tensile strength

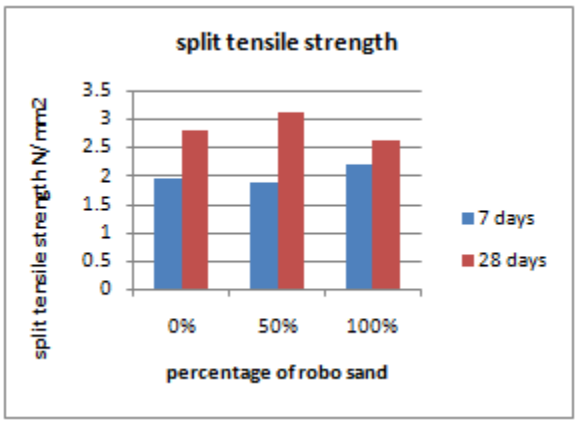


	7 days			28 days		
Specimens	0%	50 %	100%	0%	50 %	100%
1	16	4.4	4.4	4.0	5.3	5.3
2	15	5.3	3.5	4.4	4.6	3.5
3	14	4.9	4.9	5.3	6.2	5.3
Avg		4.8	4.26	4.5	5.3	4.7

	7 days			28 days		
specimens	0%	50%	100 %	0%	50 %	100 %
1	1.84	2.1	1.98	3.1	2.8	2.82
2	1.84	2.1	2.2	2.9	3.5	2.76
3	2.12	1.4	2.4	2.6	2.9	2.26
avg	1.94	1.8	2.19	2.8	3.1	2.61

Compressive strength

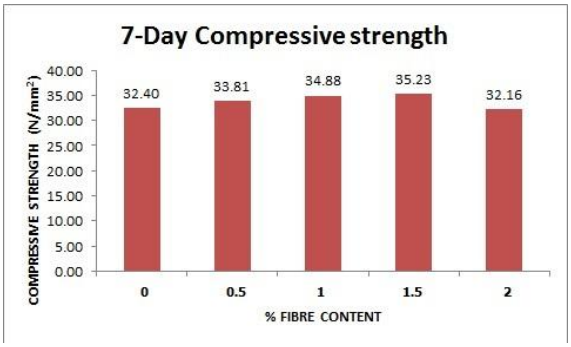
Specimens	7 days			28 days		
	0%	50%	100 %	0%	50%	100%
1	40.8	26.6	24.4	50	33.3	34.6
2	31.1	26	37.7	36.4	32	29.3
3	43.3	25.3	31.1	41.77	29.3	47.5
Avg	38.4	25.9	31.0	42.7	31.5	37.13

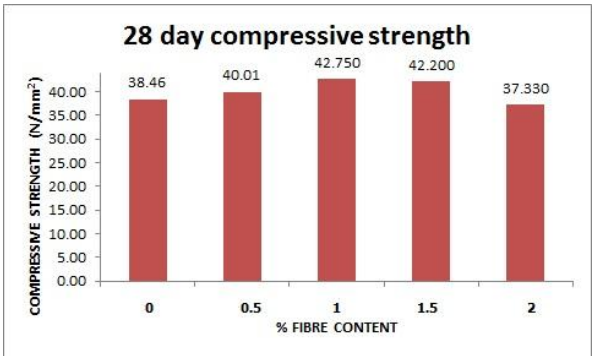


flexural strength of beam and split tensile strength on cylinder
Tests On Beam& cylinder

Compressive strength
Compressive strength of concrete with fiber reinforced concrete (recron 3s) of M30 grade using robo sand.

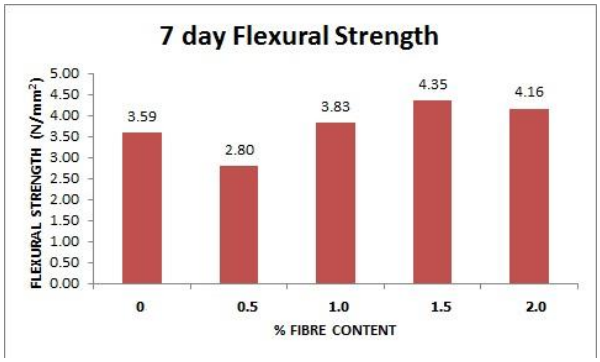
	7 days				28 days					
speci Robo sand	0%	0.5%	1%	1.5 %	2%	0%	0.5%	1%	1.5%	2%
1	29.4	30.1	32.6	35	31.	34.6	38.1	43.3	41	39. 0
2	36.7	36.8	35	34	33	36.3	40.85	42.15	42.5	37
3	31.1	35	37	36	34	44.5	41.10	42.8	43.1	36
Average	32.4	33.8	34.8	35.	32.	38.46	40.01	42.75	42.2	37. 3

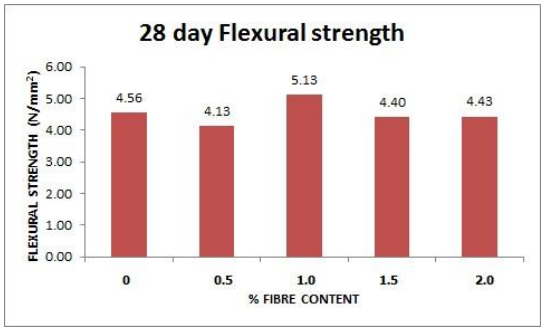




Flexural strength:
Flexural strength of concrete with fiber reinforced concrete (recron 3s) of M30 grade using robo sand.

	7 days					28 days				
Specimens	0%	0.5%	1%	1.5%	2%	0%	0.5%	1%	1.5%	2%
1	3.5	2.3	3.56	4.16	4.20	4	4.2	5.12	5.2	5.34
2	3.7	2.98	3.8	4.2	4.3	4.4	4.4	4.6	3.5	4
3	3.5	3.2	4.13	4.7	4	5.3	3.8	5.68	4.5	3.9
Average strength	3.59	2.80	3.83	4.35	4.16	4.56	4.13	5.13	4.4	4.43

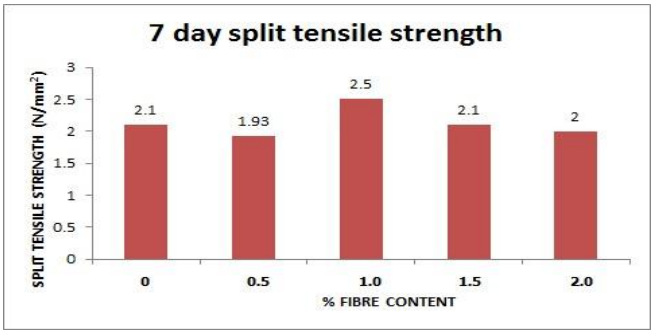


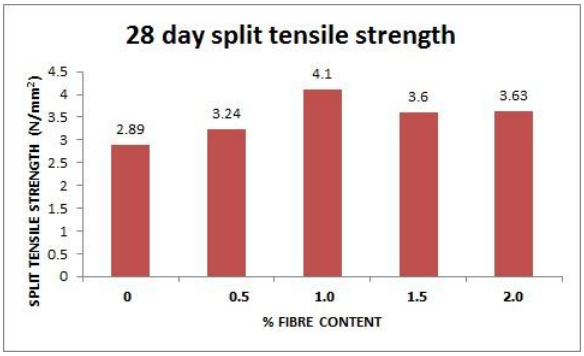


Split tensile strength

Spilt tensile strength of concrete with fiber reinforced concrete (recorn 3s) of M30 grade using robo sand.

	7 days					28 days				
Specimens	0%	0.5%	1%	1.5%	2%	0%	0.5%	1%	1.5%	2%
1	1.8	1.9	2.3	1.8	1.75	3.11	3.02	4.5	3.2	3.4
2	2.0	2.2	2.5	2.3	2.0	2.97	3.2	3.8	3.5	3.6
3	2.5	1.7	2.7	2.2	2.25	2.61	3.5	4.0	4.1	3.89
Average	2.1	1.9	2.5	2.1	2.0	2.89	3.24	4.1	3.6	3.63





X. CONCLUSION

- The compressive strength of concrete specimens made with 0% replacement of robo sand gives higher strength when compared with 50% and 100%
- The compressive strength of river sand 0% robo sand for M30
- The flexural strength of concrete specimens made with 50%replacement of river sand gives higher strength when compared with 0% and 100%
- The split tensile strength of concrete specimens made with 50% replacement of river sand gives Higher strength when compared with 0% and 100%
- The replacement of river sand with robosand ,the cost of construction can be reduced.
- The compressive strength of concrete specimens made with fiber 0% and 1% gives higher strength when compared with 0.5%, 1.5% for 1% of compressive strength is 42.750 N/mm^2
- The flexural strength of concrete specimens made with fiber 1% gives higher strength when compared with 0%, 0.5%, 1.5for 1%of flexural strength is 5.13 N/mm^2
- The spilt tensile strength concrete specimens made with fiber 1% gives higher strength compared with 0%, 0.5%, 1.5% for 1% of spilt tensile strength is 4.1 N/mm^2
- It is advised that the fiber content shall be used limited to 1% only beyond which the spilt tensile and flexural strength is reduces

After Demoulding Of Cubes

Curing Of Cubes

Cracks Developed On Cubes After Load Applied

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CYLINDERS

Cracks Developed On Cylinders After Load Applied

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REFERENCES

1. *IS 269:1989 – Specification for ordinary Portland cement, 33 grade*
2. *IS 383:1970 – Specification for coarse and fine aggregates from natural sources for concrete*
3. *IS 516:1959 Method of test for strength of concrete*
4. *IS 650:1991 Specification for standard sand for testing of cement*
5. *IS 2430:1986 Methods for sampling of aggregates for concrete*
6. *IS 3085:1965 Method of test for permeability of cement mortar and concrete*
7. *IS 5513:1996 Specification for vicat apparatus*
8. *IS 5515:1983 Specification for compaction factor apparatus*
9. *IS 5816:1999 Method of test for splitting tensile strength of concrete*
10. *IS 7320:1974 Specification for concrete slump test apparatus*
11. *IS 8112:1989 Specification for 43 grade ordinary Portland*
12. *IS 9103:1999 Specification for admixtures for concrete*
13. *IS 9399:1979 Specification for apparatus for flexural testing of concrete*
14. *IS 10080:1982 Specification for vibration machine for casting Oct standard cement mortar cubes*
15. *IS 10262:2009 Guidelines for concrete mix proportioning*