

STRENGTH STUDIES ON CONCRETE WITH PARTIAL REPLACEMENT OF FINE AGGREGATE BY FLY ASH WITH STEEL FIBERS

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Abstract— Concrete plays a major role in the construction industry. Natural sand is a prime material used for the preparation of the concrete and also plays an important role in mix design. Now a day's river erosion and other environment issues have led to the scarcity of river sand. So we partial replace a substitute by product named fly ash in place of fine aggregate. With varied percentage of fiber reinforced concrete were studied and it has been found that there is significant strength improvement in steel fiber reinforced concrete. The purpose of this research is based on the investigation of the use of steel fibres 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 fibres and concrete with fibres. This investigation was carried out using several tests such as compressive test, split tensile test. Specimens were tested for compressive strength test at the age of 7, 14, 28 & split tensile test at the age of 28 days. The Cement used in this project is Ordinary Portland Cement of 53 grade confirming to IS 12269 – 1987..

Introduction

Concrete plays a major role in the construction industry. Natural sand is a prime material used for the preparation of the concrete and also plays an important role in mix design. Now a day's river erosion and other environment issues have led to the scarcity of river sand. So we partial replace a substitute by product named fly ash in place of fine aggregate. With varied percentage of fiber reinforced concrete were studied and it has been found that there is significant strength improvement in steel fiber reinforced concrete. The purpose of this research is based on the investigation of the use of steel fibres 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 fibres and concrete with fibres. This investigation was carried out using several tests such as compressive test, split tensile test. Specimens were tested for compressive strength test at the age of 7, 14, 28 & split tensile test at the age of 28 days. The Cement used in this project is Ordinary Portland Cement of 53 grade confirming to IS 12269 – 1987.

Non-industrial nation like India has assumed a significant liability of building the frameworks like express thruways, power projects and mechanical constructions and so on, to meet the necessities of globalization. In the development of structures and different designs substantial assumes a significant part and an enormous amount of it is being utilized. Stream sand, which is exceptionally costly and furthermore scant, is one of the principle segment utilized in the getting ready of regular concrete, the openness of sand as a fine total for minimal price alternative is beyond the realm of imagination. Hence there is a need of an hour to look for an elective material. Scientists and Agents considered utilizing Quarry rock dust as a fine aggregate(sand) in concrete the Fly ash is a waste material that is created from the stone pounding industry which is an amassed material as residue and is bounteously accessible to the degree of 200 million tons for each annum. It is unloaded as pointless material causing air contamination. Reusing such squanders by joining them into building materials is a reasonable answer for contamination issue and can turn into an elective structure material as incomplete substitution for concrete to make the substantial more conservative and furthermore to have higher usefulness alongside long haul strength.

There are a few kinds of steel filaments that have been utilized before. Aside from other blend constituents, there are four significant highlights of steel fiber that are found to affect the properties of the composite, in particular: type (for example shape), volume part, perspective proportion (the proportion of length to the distance across of the steel fiber) and direction of strands in the network. As of late, streamlining of these boundaries have been concentrated to improve the fiber network security qualities and to upgrade fiber superfluity (Soroushian and Bayasi, 1991).

It was discovered that SFRC containing snared end tempered steel wires has prevalent actual properties looked at to straight strands. This was ascribed to the improved jetty gave and higher compelling viewpoint proportion than that of the same length of the straight fiber (Ramakrishnan, 1985) The capacity of steel filaments to oppose break proliferation is basically dependent on the connection between the substantial and strands just as fiber conveyance (for example separating and direction). The connection between the substantial and strands is the instrument whereby the pressure

I. FINENESS MODULUS OF FINE AGGREGATE

S.NO	SIEVE SIZE	ZONE 1	ZONE 2	ZONE 3	ZONE 4
1	10 mm	100	100	100	100
2	4.75 mm	90-100	90-100	90-100	95-100
3	2.36 mm	60-95	75-100	85-100	95-100
4	1.18 mm	30-70	55-90	75-100	90-100
5	0.6 mm	15-34	35-59	60-79	80-100
6	0.3 mm	5-20	8-30	12-40	15-50
7	0.15 mm	0-10	0-10	0-10	0-15
8	Fineness modulus	4.0-2.71	3.37-2.1	2.78-1.71	2.25-1.35

TABLE-1- FINENESS MODULUS OF FINE AGGREGATE

II. BULKING OF SAND

S.NO	Initial height In the cylinder (ml)	Percent of water added	Height of sand after addition of water (ml)	Percentage of bulking	IS code of practice	Units
1	300	0	300	0	IS:2386 (Part 3)	No units
2	300	1	360	20		
3	300	2	426	42		
4	300	3	438	46		
5	300	4	340	13.3		
6	300	5	320	6.6		

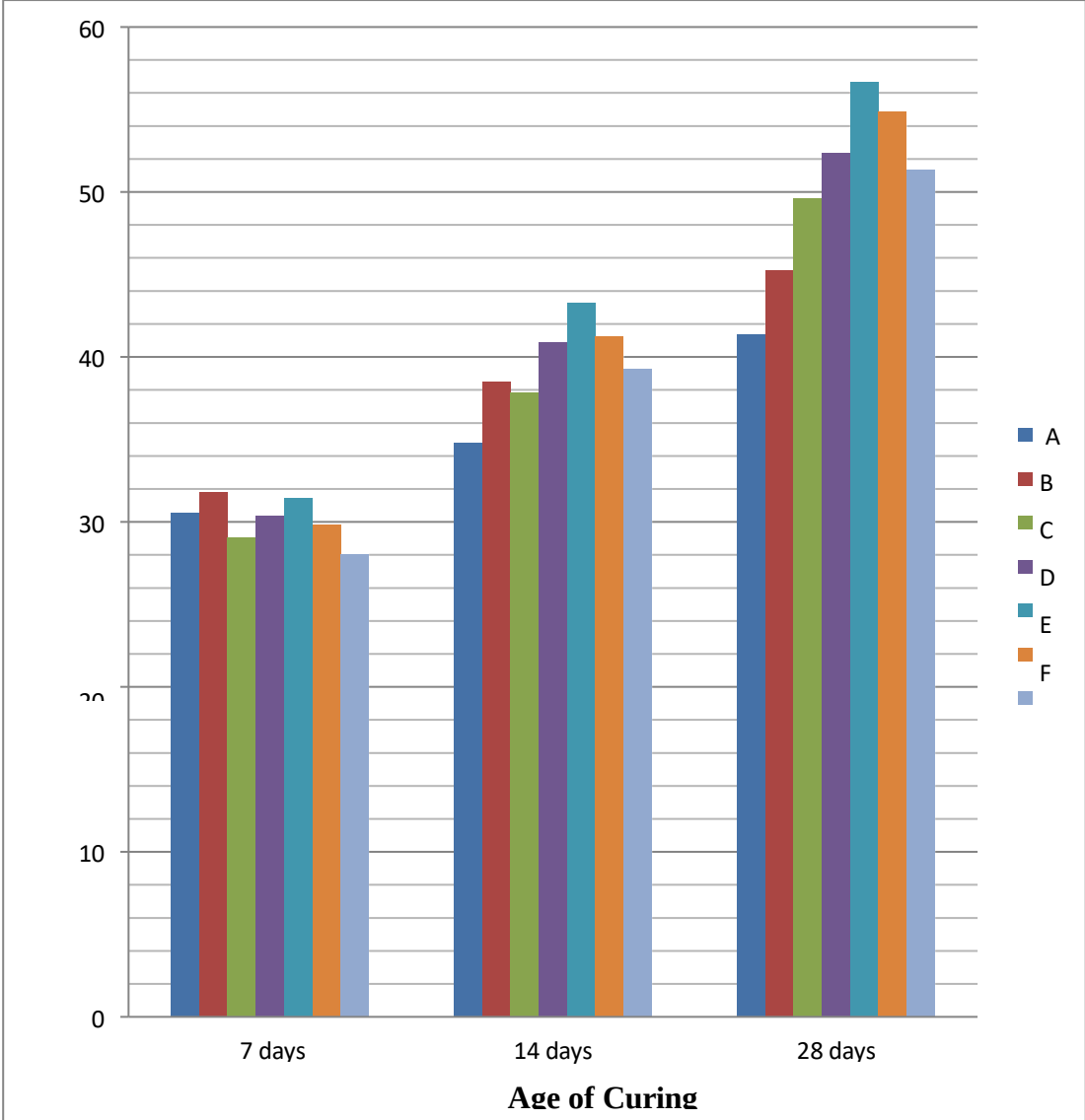
TABLE-2- BULKING OF SAND

III.COMPRESSIVE STRENGTH COMPARISON FOR ALL PROPORTION OF CONCRETE

S.NO	Concrete Mix	Compressive strength test 7days	Compressive strength test 14days	Compressive strength test 28days
1	A	30.56	34.82	41.36
2	B	31.8	38.52	45.26
3	C	29.08	37.86	49.63
4	D	30.36	40.87	52.35
5	E	31.47	43.29	56.64
6	F	29.86	41.28	54.86

7	G	28.08	39.29	51.35
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TABLE-3- COMPRESSIVE STRENGTH COMPARISON FOR ALL PROPORTION OF CONCRETE



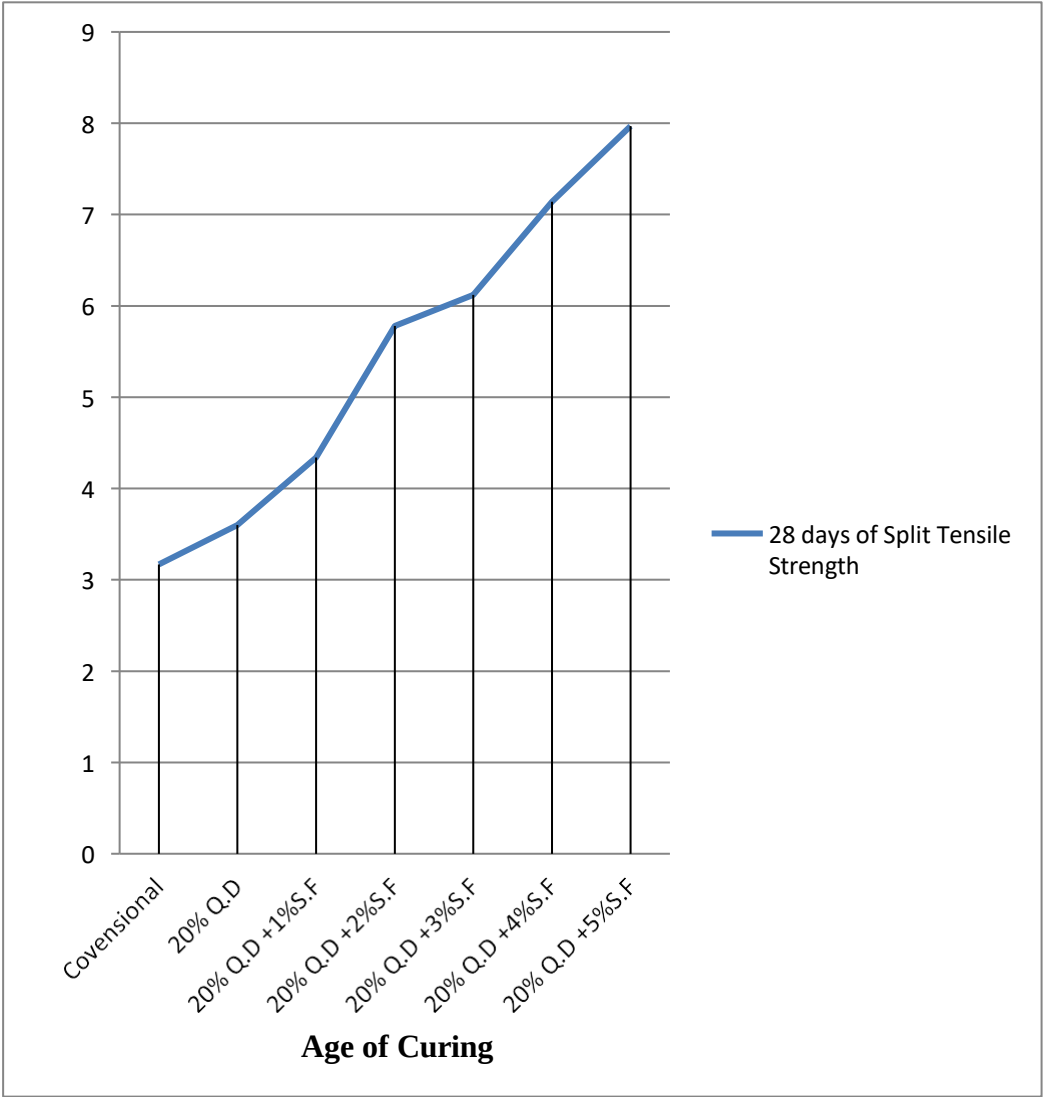
GRAPH-1 COMPRESSIVE STRENGTH COMPARISON FOR ALL PROPORTION OF CONCRETE

IV.SPLIT TENSILE STRENGTH FOR ALL PROPORTIONS OF CONCRETE

AGE OF CONCRETE	PROPORTIONS	AVERAGE SPLIT TENSILE STRENGTH(N/mm2)
	Conventional concrete of grade M25	3.17

28 DAYS	20%Fly ash	3.60
	20%Fly ash and 1%of Steel Fiber	4.34
	20%Fly ash and 2%of Steel Fiber	5.78
	20%Fly ash and 3%of Steel Fiber	6.12
	20%Fly ash and 4%of Steel Fiber	7.14
	20%Fly ash and 5%of Steel Fiber	7.97

TABLE-4- SPLIT TENSILE STRENGTH FOR ALL PROPORTIONS OF CONCRETE



GRAPH-2- SPLIT TENSILE STRENGTH FOR ALL PROPORTIONS OF CONCRETE

V. CONCLUSIONS

CONCLUSIONS

In the present investigation on the partial replacement of fine aggregate was found to be more effective. Desired strength test results were obtained by using steel fibers. The investigation on the waste construction materials is very important because, construction materials are gradually increasing with the increase in population and urban developments. The reason that many researchers conducted experiments have been on waste material like fly ash and this material is less cost, and highly available. So, by using of this material we get so many benefits in the construction industry. The main aim of this investigation work is to find out the high strength properties of concrete. Based on the experimental results obtained results, the following conclusions were drawn.

- ✓ In this investigation, curing of 7, 14 & 28 days concrete strength were determined.
- ✓ From the compressive strength results, it was found that curing is improved workability.
- ✓ When compared to controlled concrete to 7, 14 & 28 days, partial replacements of concrete specimen strengths is more.
- ✓ The target mean strength is achieved for 28 days of curing-concrete.
- ✓ At 28 days strength, 3% steel fiber & 20 % fly ash has resulted in maximum compressive strength of intensity is 56.64 Mpa.
- ✓ Compared to conventional concrete the partial replacements steel fibers at 3% are higher.
- ✓ Split tensile strength 3% steel fiber with 20% fly ash we noticed 4.28 N/mm² when compared to controlled concrete.

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