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IMPROVEMENT OF STRUCTURAL PROPERTIES OF CONCRETE BY USING E-CLASS GLASS FIBER

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ABSTRACT: Plain cement concrete is composed of cement, sand, aggregates and water, The resulting concrete possesses a very high compressive strength but lacks the tensile strength ,ductile properties, resistance to cracking and many other structural properties Internal micro cracks are inherently present in the concrete and its poor tensile strength is due to propagation of such micro cracks, eventually leading to brittle fracture of the concrete. This weakness can be curbed by inclusion of the fibers in the mix , The fibers help to transfer loads at the internal micro cracks In this particular study improvement of structural properties of concrete such as Compressive strength, Split tensile strength, Flexural strength are studied at different percentages 0.3%,0.6% and 0.9% of E-class Glass fiber by using 20 mm of coarse aggregate in concrete .The results of concrete contaning glass fiber is compared to those of standard M25 grade concrete

Key words: Glass Fiber Reinfrced Concrete, E-class glass fiber, Compressive strength, split Tensile strength, Flexural strength

I. INTRODUCTION

Fiber reinforced concrete (FRC) is composite mixture of hydraulic cement, aggregates and discrete reinforcing fibers either natural or artificial which are randomly distributed in it. Fibers are the materials when used for the construction purposes increases the structural integrity and also its stability. These fibers when mixed properly in the concrete in definite proportion improves the properties of concrete in all directions The resulting concrete is very superior in a number of ways as compared to conventional concrete.

II. MATERIAL INVESTIGATION

2.1 Cement

2.1.1 Initial setting time

Initial Setting time is the time consumed from addition of water into dry cement to the instant at which needle of 1 mm^2 section fails to pierce the test sample to a depth of 5 mm from the bottom. For Ordinary Portland Cement, the intial setting time is greater than 30 minutes.

Result: The initial setting time was found to be 41 min and 20 seconds

2.1.2 Final setting time

Final setting time is the time consumed from addition of water into dry cement to the instant at which needle of 1 mm^2 and 5 mm diameter attachment makes an impression on the sample but attachment fails to make it. For ordinary portland cement, the final setting time is less than 600 minutes (10 hrs)

Result : The final setting time of cement was found to be 180 min and 10 seconds or 2hr.30min.10sec

2.2 TEST FOR COARSE AGGREGATE

2.2.1 Specific gravity test

Specific gravity of aggregates is used in calculation of the solid volume of aggregates in the concrete mix designs by virtue of which concrete per unit volume can be calculated

Formula used to calculate specific gravity is :

Specific gravity =

Result: The specific gravity of coarse aggregate was found to be 2.68

2.2.2 Fineness Modulus

The basic objective of determining the fineness modulus is to grading the aggregate.

Fineness Modulus =

Fineness Modulus of coarse aggregate

Weight of coarse aggregate taken (20 mm) = 10 kg

Sieving duration = 15 minutes

Fineness modulus of (20mm) aggregates =7.89 i.e, average size of the particle of given coarse aggregate sample is between 7th and 8th sieves,tthat means size of aggregate is between 10 mm to 20 mm.

Result:

Water required = 49 % by weight of cement according to the mix design

Plasticizer = 0.3% - 0.4% by weight of cement

III. COMPRESSIVE STRENGTH TEST

Fiber content (%)	7th Day			28th Day		
	Load (KN)	Mean Load (KN)	Compressive strength (N/mm^2)	Load (KN)	Mean Load (KN)	Compressive strength (N/mm^2)
0%	568.5	569.25	25.3	755.6	756.67	33.63
	569.75			757.74		
	570			756.67		
0.3%	611.21	612.25	27.21	816.32	817.42	36.33
	613.29			818.52		
	612.37			817.42		
0.6%	646.2	647.1	28.76	875.32	876.37	38.95
	648			877.42		
	647.1			876.37		
0.9%	496.23	497	22.12	766.9	760.95	33.82
	497.77			755.6		
	497.1			760.35		

Table No. 1 Compressive Strength of M25 Grade Concrete Cubes

SPLIT TENSILE STRENGTH TEST

Fiber content (%)	7th Day Load (KN)	7th Day Mean Load (KN)	7th Day Split Tensile strength (N/mm^2)	28th Day Load (KN)	28th Day Mean Load (KN)	28th Day Split Tensile strength (N/mm^2)
0%	177.3	178.4	2.53	236.3	237.42	3.363
	179.5			238.54		
	178.4			237.42		
0.3%	192.1	192.23	2.721	255.32	256.48	3.633
	192.36			257.64		
	192.2			256.4		
0.6%	202.4	203.04	2.876	281.2	282.04	3.995
	203.68			282.88		
	203.04			282		
0.9%	155.6	156.16	2.212	237.3	238.93	3.382
	156.72			240.56		
	156.16			238.9		

Table No.2 Split Tensile Strength of M25 Grade Concrete Cylinders

FLEXURAL TENSILE STRENGTH

sample	Fiber % age	Age (Days)	Load (KN)	Mean load (KN)	Flexural strength , N/mm^2 Average
C 0	0 %	7	9.56	9.625	3.85
			9.69		
			9.625		
		28	12.85	13.025	5.21
			13.2		
			13		
C 1	0.3 %	7	11.92	12.125	4.85
			12.33		
			12.1		
		28	18.1	17.8	7.12
			17.5		
			17.8		
C 2	0.6 %	7	13.2	13.5	5.21
			13.01		
			14.29		
		28	19.23	19.62	7.85
			20.01		
			19.6		
C 3	0.9%	7	11.23	11.87	4.75
			12.51		
			11.8		
		28	16.7	16.575	6.63
			16.45		
			16.5		

Table No .3 Flexural Strength of M25 Grade Concrete Cylinders

IV. CONCLUSION

- A significant increase in the compressive strength, split tensile strength and flexural strength was observed in M25 grade concrete after the addition of E-glass fiber upto an optimum percentage of glass fiber
- The optimum value of fiber content of E class reinforced concrete was found to be 0.6 %

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