2nd International Conference on Advanced Research in Biology, Engineering, Science and Technology (ICARBEST'16)
Organized by
International Journal of Advanced Research in Biology, Engineering, Science and Technology (IJARBEST)
19th February 2016

STUDY ON STRENGTH OF CONCRETE ADDED WITH STEEL FIBRE, ZEOLITE AND FLYASH

S.BALAJI[1], M.KARTHICK[2], J.PREMKUMAR[3], R.UDHAYAKUMAR[4]

U.G. Scholars, Department of Civil Engineering, PSN College of Engineering and Technology (Autonomous), Tirunelveli, India [1,2,3,4]

Abstract— **Steel fibre have generated great interest for their potential as reinforcement in high performance wire composites. Zeolites decreases larger porous in the cement concrete. Fly ash is a filing material in concrete so fly ash fills small voids in concrete. . The specimen are prepared to 1:1.5:3 by adding 1% of fly ash, 1% of zeolite and 0.5%,1%,1.5%,2% of steel fibre to the weight of concrete with constant water cement ratio 0.45%. Then the specimens are tested with regular intervals 7 days, 14 days, 28days. There was compression test conducted on concrete specimen. And finally the result is compared to the ordinary concrete specimen. The specimen was preferred in 150mm X150 mm X150mm. The 28th day compressive strength of mortar was increased to 10 % for steel fibre 0.5%, 22 % for steel fibre 1%, 32% for steel fibre 1.5%, and 55% for steel fibre 2%.**

Index Terms— Steel fibre, Zeolite, Fly ash, Compression test

I. INTRODUCTION

Steel Fibres in Concrete can improves crack, Impact and Fatigue Resistance. Shrinkage Reduction. Toughness- by preventing/delaying crack propogation from micro-cracks to macro-cracks. SFRC distributes localized stresses. Reduction in maintaince and repair cost. Provides tough and durable surfaces. Reduces surface permeability, dusting and wear. Cost saving. Increases tensile strength and toughness. Zeolites are highly reactive pozzolans. Pozzolans are siliceous-aluminous material which exhibit cement-like behavior when combined with Calcium Hydroxide. Experimentally, zeolites have been shown to reduce large pore content & increase smaller pores. Zeolites are thought to reduce the susceptibility of cement to corrosion . Zeolites are inherently resistive to acidic solutions. The decrease in permeability reduces the intrusion of corrosive agents and may help isolate the casing from the well bore environment. Zeolites are lighter than cement. The smaller specific gravity of zeolites will help in creating lighter cement blends. Zeolites have a higher water uptake allowing for more water in the slurry and a lighter cement.

Cement concrete - most widely used construction material in the world over, commonly consists of cement, aggregates (fine and coarse) and water. It is the material, which is used more than any other man made material on the earth for construction works. In the concrete, cement chemically reacts with water and produces binding gel that binds other component together and creates stone type of material.

Researchers like Goash et al (1989) studied tensile strength of SFRC and reported as inclusion of suitable short steel fibres increases the tensile strength of concrete even in low volume fractions. Optimum aspect ratio was found as 80 and the maximum increase in tensile strength was obtained as 33.14% at a fibre content of 0.7% by volume. Also it was reported that cylinder split tensile strength gave more uniform and consistent results than the modulus of rupture test and direct tension test.

Sabapathi and Achyutha (1989) stress – strain characteristics of steel fibre reinforced concrete under compression. Cube compressive strength and Initial Tangent Modulus of Elasticity were obtained and equation for stress-strain relation was also proposed. Christo Ananth et al. [3] proposed a system, this fully automatic vehicle is equipped by micro controller, motor driving mechanism and battery. The power stored in the battery is used to drive the DC motor that causes the movement to AGV. The speed of rotation of DC motor i.e., velocity of AGV is controlled by the microprocessor controller.This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

II. METHODOLOGY

The cement concrete mix will be prepared with the mix proportion of 1:1.5:3. The water cement ratio is constant of 0.45%.The steel fibre is varied by 0.5%,1%,1.5%.2% to the weight of concrete.1% of zeolite and fly ash are taken from the weight of the concrete. The mix proportions considered for experimental study are given in Table.

TABLE I

MIX PROPORTIONS CONSIDERED FOR EXPERIMENTAL STUDY

Where,

CEMENT CONCRETE RATIO 1:1.5:3											
MIX ID	CEMENT	FA	CA	WATER		STEEL FIBE		ZEOLITE		FLY ASH	
	Kg	Kg	Kg	w/c ratio	Water in Lit	Percentage	in Kg	Percentage	Kg	Percentage	Kg
C	36	54	108	0.45	16.2	-	-	-	-	-	-
T1	36	54	108	0.45	16.2	0.5%	0.990	0.1%	1.980	1%	1.98
T2	36	54	108	0.45	16.2	1%	1.980	0.1%	1.980	1%	1.98
T3	36	54	108	0.45	16.2	1.5%	2.970	0.1%	1.980	1%	1.98
T4	36	54	108	0.45	16.2	2%	3.960	0.1%	1.980	1%	1.98

C - Control mix Specimen
T1 - Trial mix Specimen 1
T2 - Trial mix Specimen 2
T3 - Trial mix Specimen 3
T4 - Trial mix Specimen 4

To determine the fineness of cement by dry sieving as per IS: 4031 (Part 1) - 1996. The principle of this is that we determine the proportion of cement whose grain size is larger than specified mesh size. The apparatus used are 901-1m IS Sieve, Balance capable of weighing 10g to the nearest 10mg, A nylon or pure bristle brush, preferably with 25 to 40mm, bristle, for cleaning .

A. PROCEDURE TO DETERMINE THE FINENESS OF CEMENT:

i. Weight approximately 10g of cement to the nearest 0.01 g and place it on the sieve.
ii. Agitate the sieve by swirling, planetary and linear movements, until no more fine material passes through it.
iii. Weigh the residue and express its mass as a percentage RI, of the quantity first placed on the sieve to the nearest 0.1 percent.
iv. Gently brush all the fine material off the base of the sieve. Repeat the whole procedure using a fresh 10g sample to obtain R2.
v. Then calculate R as the mean of R1 and R2 as a percentage, expressed to the nearest 0.1 percent. When the results differ by more than 1 percent absolute, carry out a third sieving and calculate the mean of the three values.

5.2.2 CONSISTENCY TEST

The basic aim is to find out the water content required to produce a cement paste of standard consistency as specified by the IS: 4031 (Part 4) — 1988. The principle is that standard consistency of cement is that consistency at which the Vicat plunger penetrates to a point 5-7mm from the bottom of Vicatmould. The apparatus used are Vicat apparatus conforming to IS: 5513 — 1976, Balance, whose permissible variation at a load of 1000g should be +1.0g, Gauging trowel conforming to IS: 10086 — 1982.

Fig.1. Fineness Test

TABLE II
COMPRESSIVE STRENGTH RESULTS FOR NORMAL CONCRETE

Days	Load (p) N	Area in mm^2	Compressive strength in N/mm^2
7th day	320000	22500	14.222
	340000	22500	15.111
	330000	22500	14.667
14th day	430000	22500	19.111
	420000	22500	18.667
	440000	22500	19.556
28th day	470000	22500	20.889
	470000	22500	20.889
	480000	22500	21.333

III. RESULTS AND DISCUSSION

The specimens were carefully casted and demouled after 24 hours, without disturbing the specimens, these were cured in the curing tank for 7 days, 14 days and 28 days.

Fig.2.Mortar filling and Compaction

Fig.3. Specimens

TABLE - III
COMPRESSIVE LOAD AT FAILURE IN NORMAL CONCRETE

SL NO	RATIO	COMPRESSIVE STRENGTH IN N/mm^2
1	7th day	14.663
2	14th day	19.106
3	28th day	21.032

IV. CONCLUSION

Steel fibre have generated great interest for their potential as reinforcement in high performance wire composites. Zeolites decreases larger porous in the cement concrete. Fly ash is a filing material in concrete so fly ash fills small voids in concrete. . The specimen are prepared to 1:1.5:3 by adding 1% of fly ash, 1% of zeolite and 0.5%,1%,1.5%,2% of steel fibre to the weight of concrete with constant water cement ratio 0.45%. Then the specimens are tested with regular intervals 7 days, 14 days, 28days. There was compression test conducted on concrete

specimen. And finally the result is compared to the ordinary concrete specimen. The specimen was preferred in 150mm X150 mm X150mm. The 28th day compressive strength of mortar was increased to 10 % for steel fibre 0.5%, 22 % for steel fibre 1%, 32% for steel fibre 1.5%, and 55% for steel fibre 2%.

REFERENCES

[1] Falah M.Wegian,Anwar A.Alanki,Hana M.Alsaeid,Fahad A.Alotaibi(2011),"Influence of Fly Ash on Behavior of Fiber Reinforced Concrete Structures", Journal of Applied Sciences,11(17):3185-3191.

[2] Falah A. Almottiri (2011), "Physical Properties of Steel Fiber Reinforced Cement Composites Made with Fly Ash", *Jordan Journal of Civil Engineering, Volume 5, No. 2*

[3] Christo Ananth, M.A.Fathima, M.Gnana Soundarya, M.L.Jothi Alphonsa Sundari, B.Gayathri, Praghash.K., "Fully Automatic Vehicle For Multipurpose Applications", International Journal of Advanced Research in Biology, Ecology, Science and Technology (IJARBEST), Vol 1,Special Issue 2,November 2015, pp: 8- 12.

[4] Christo Ananth, M.A.Fathima, M.Gnana Soundarya, M.L.Jothi Alphonsa Sundari, B.Gayathri, Praghash.K., "Fully Automatic Vehicle For Multipurpose Applications", International Journal of Advanced Research in Biology, Ecology, Science and Technology (IJARBEST), Vol 1,Special Issue 2,November 2015, pp: 8- 12.

[5] Sheidi haruna maihankuri, 'Investigation on properties of local zircon sand for sound casting' Research Journal in Engineering and Applied Sciences 1(6) 404-407.