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Experimental Study on Concrete by Partially Mixing Of Silica Fume and Synthetic Fibers

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ABSTRACT: The usage of concrete is increasing exponentially day by day , using fiber in concrete and obtaining best strength is still in research stage. Fibers and silica fume replacing or mixing some percentage in concrete can give good results and we can reduce the usage of coarse and fine aggregated little bit by using substitute. In order to check the strength and durability some mix ratios is considered in this project.M1,M2,M3,M4,M5,M6. With mixing of 0%,5%,20%,25%,30%,40% respectively. The effect of mixing of fibers and silica fume was using Compression test, split tensile test, The experimental results showed that the using fibers and silica fume as a partial substitute can give decent strength to concrete.

KEYWORDS: Silica fume, synthetic fibers, compression test, split tensile test, durability of concrete, mix proportions, mix ratios, conventional concrete.

I. INTRODUCTION

Concrete plays an important role in construction industry. It act as a key to the structure .From ancient times concrete is using as a binding material ,supporting material in the constructions , but the materials and compositions of concrete is developed now a days . in ancient times moor am soil and lime is used as mortar in the construction works.as years pass the usage of concrete is reach sky. expansion of construction field happen like jet speed day by day. Concrete strength varies from material to material. In early stage , the strength was not specific character as compare to present . Now a days we preferring more on strength. Many scientists ,engineers working on to improve more strength in less period of time.

FIBERS

Synthetic fibers or fibers are broad investigated by researchers to enhance normally happening animal and plant fibers. When researchers found positive results, synthetic fibers are made by extruding fiber framing materials through spinnerets into air and water, shaping a string.

With respect to asphalts, the most common use for FRC is at toll squares where nonmetallic strands are utilized as a part of lieu of metallic fortification since they can upset electronic toll per user signals.

SILICA FUME , otherwise called micro silica, is an undefined (non-crystalline) polymorph of silicon dioxide, silica. It is a ultrafine powder gathered as a by-result of the silicon and ferrosilicon compound creation and comprises of circular particles with a normal molecule distance across of 150 nm. The principle field of utilization is as pozzolanic material for elite concrete.

II. EXPERIMEMTAL INVESTIGATION MATERIALS

In construction field materials plays major role.so many types of materials are using to find best combination for concrete to attend high strength and durability. Many research is going on different material origins to find out replacement of fine and coarse materials due to shortage of materials . The following sections discuss constituent materials used for manufacturing of both conventional concrete (CC) and coal washery rejects (CWR) based concrete. Chemical and physical properties of the constituent materials are presented in this section.

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Particulars	Test result
Chemical Composition	
% of Silica(SiO_2)	**18.17**
%of Alumina(Al_2O_3)	**5.61**
% of Iron Oxide(Fe_2O_3)	**4.61**
% of Lime(CaO)	**61.59**
% of Magnesia(MgO)	**0.79**
% ofSulphuric Anhydride (SO_3)	**2.36**
% of Chloride content	**0.004**
Lime Saturation Factor $CaO-0.7SO_3/2.8SiO_2+1.2Al_2O_3+0.65Fe_2O_3$	**0.91**
Ratio of Alumina/Iron Oxide	**1.22**

Coarse aggregate

Crushed granite stones of 10mm and 20mm partical size are used as CA. The bulk specific gravity in oven dry condition and water absorption of the CA10 mm 20mm as per IS 2386 (Part III, 1963) are 0.3% and for 20mm 2.6. The bulk density, impact strength and crushing strength values of 20 mm aggregate are 1579 kg/m^3, 17.5% and 22.3% respectively.

Fine aggregate

Natural river sand is used as fine aggregate. The bulk specific gravity in oven dry condition and water absorption of the sand as per IS 2386 (Part III, 1963) are 2.6 and 1% respectively. The gradation of the sand was determined by sieve analysis as per IS 383 (1970) and presented in the Table 3.5. The grading curve of the fine aggregate as per IS 383 (1970) is shown in Fig. 3.3. Fineness modulus of sand is 2.26

Sieve No.	Cumulative percent passing	
	Fine aggregate	IS: 383-1970 – Zone III requirement
3/8” (10mm)	100	100

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No.4 (4.75mm)	100	90-100
No.8 (2.36mm)	100	85-100
No.16 (1.18mm)	99.25	75-100
No.30 (600µm)	65.08	60-79
No.50 (300µm)	7.4	12-40
No.100 (150µm)	1.9	0-10

III. RESULTS AND DISCUSSION

M1-(silica fume(SF) 0% and synthetic fiber (SYF)0%),
M2 –(SF 5% and SYF 5%),
M3-(SF 10% and SYF 10%)
M4-(SF20% and SYF20%)
M5-(SF 35%and SYF40%)
M6-(SF40% and SYF40%)

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Concrete Slump Test:

MIX	28days	56 days
M1	4.24	4.44
M2	4.27	4.31
M3	4.42	4.65
M4	4.21	4.46
M5	4.22	4.22
M6	4.13	4.15

Mix	Slump in mm
M1	68
M2	74
M3	76
M4	85
M5	91
M6	102

COMPRESSION TEST

MIX	7days	28days	56 days	90 days
M1	26.56	34.28	36.66	38.54
M2	27.97	36.73	37.16	38.98
M3	29.13	38.10	39.15	41.36
M4	29.57	39.46	41.89	43.25
M5	25.18	32.26	34.47	35.52
M6	22.19	29.75	29.36	30.26

Compressive strength results

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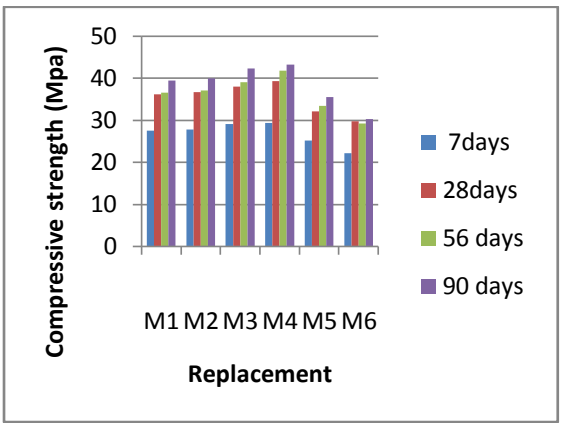
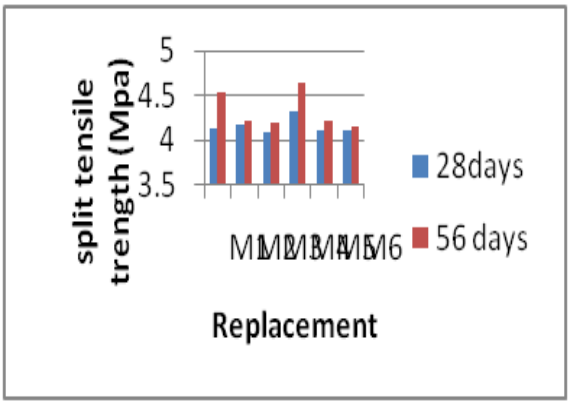


SPLITTING TENSILE STRENGTH :



FLEXURAL STRENGTH :

MIX	28days	56 days
M1	4.58	5.42
M2	4.57	5.38
M3	4.96	5.71
M4	3.79	4.45
M5	3.30	3.92
M6	3.24	3.68

IV. CONCLUSION

- The compression strength of the concrete increases with increase in the silica fume and synthetic fibers up to replacement and adding 20 % after that the values compressive strength decreases gradually.
- The flexure strength of the concrete is increased up to 10 % replacement of silica fume and adding of the synthetic fiber when compared with conventional concrete.
- The splitting tensile values are also increases up to 10 % replacements and after that gradually decreases.

REFERENCES

[1]. Ramasamy,V.; Biswas,S. "Mechanical properties and durability of rice husk ash concrete"(Report),International Journal of Applied Engineering Research December 1, 2008.

[2]. Bayasi, Zing, Zhou, Jing, (1993) "Properties of Silica Fume Concrete and Mortar", ACI Materials Journal 90 (4) 349 - 356.

[3]. Venkatesh Babu DL, Nateshan SC. Investigations on silica fume concrete, The Indian concrete Journal, September 2004, pp. 57-60.

[4]. Khedr, S. A., Abou - Zeid, M. N., (1994) "Characteristics of Silica-Fume Concrete", Journal of Materials in Civil Engineering, ASCE 6 (3) 357 - 375.
[5]. BhanjaSantanu, and Sengupta, Bratish, (2003) "Optimum Silica Fume Content and its Mode of Action on Concrete," ACI Materials Journal, V (100), No. 5, pp. 407-412.
[6]. SensualleGR , Strength development of concrete with rice husk ash, Cement and Concrete Composites 2006.
[7]. ACI234R – 96 "Guide for the use of silica fume in concrete" by ACI committee 234
[8]. Papayianni , G. Tsohos, N. Oikonomou, P. Mavria, "Influence of superplasticizer type and mix design parameters on the performance of them in concrete mixtures", Cement & Concrete Composite, Vol. 27, 2005, 217-222
[9]. V.Bhikshma, K.Nitturkar and Y.Venkatesham, "Investigations on mechanical properties of high strength silica fume concrete." Asian journal of civil engineering (building and housing) vol. 10, no. 3(2009) pp.335-346.
[10]. Aravindhan.C ,Anand.N ,Prince Arulraj.G "Development of Self Compacting Concrete with Mineral and Chemical Admixtures – State of the Art" IRACST – Engineering Science and Technology: An International Journal (ESTIJ), ISSN: 2250-3498, Vol.2, No.6, December 2012
[11]. Khayat, K.H., 1999. "Workability, Testing, andPerformance of Self-Consolidating Concrete", ACIMaterials Journal, 96(3): 346-353.
[12]. Hwang, C.L. and M.F. Hung, 2002. "DurabilityConsideration of Self-Consolidating Concrete",Proceedings of the First North AmericanConference on the Design and Use of Self-Consolidating Concrete, Hanley-Wood,