An Experimental Work in Concrete By Using GGBS and Silica Fume

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Abstract

This Sustainable development shall meet the need of the present without compromising the ability of the future generation to meet their requirements. It also shows development that is going to be made to sustain the resources by using them effectively without unnecessary wastage. The use of GGBS and Silica fume to the preparation of green concrete is because the production of cement emits carbon di oxide to the atmosphere. As the resources in the planet are getting day by day there is seriously a need of alternative of cement which is more eco-friendly and also possess the same properties and strength as that of the ordinary Portland cement. My study is based on the use of GGBS and silica fume in place of cement and to investigate the properties at different proportions.

Keywords— *GGBS, Silica Flume, Concrete.*

I. INTRODUCTION

Today the word green is not just limited to colour, it represents the environment, which is surrounding us. Concrete which is made from concrete wastes that are eco-friendly are called as **"Green Concrete".** The other name for green concrete is resource saving structures with reduced environmental impact for e.g. Energy saving, co_2 emissions, waste water. "Green Concrete" is revolutionary topic in the history of concrete industry. This was first invented in Denmark in year 1998 by Dr. WG. Concrete waste like slag, power plant wastes, recycled concrete, mining and quarrying wastes, waste glass, incinerator residue, red mud, burnt clay, sawdust, combustor ash and foundry sand.

Green Concrete is a term given to a concrete that has extra steps taken in the mix design and placement to insure a sustainable structure and a long life cycle with a low maintenance surface e.g. Energy saving, CO_2 emissions, waste water. The goal of the centre for green concrete is to reduce the environmental impact of concrete. To enable this, new technology is developed. The technology considers all phases of a concrete construction's life cycle, i.e. Structural design, specification, manufacturing and maintenance, and it includes all aspects of performance, i.e.

1) Mechanical properties (strength, shrinkage, creep, static behaviour etc.)
2) Fire resistance (spalling, heat transfer etc.)
3) Workmanship (workability, strength development, curing etc.)
4) Durability (corrosion protection, frost, new deterioration mechanisms etc.)
5) Thermodynamic properties (input to the others properties)
6) Environmental aspects (CO_2-emission, energy, recycling etc.)

There are a number of alternative environmental requirements with which green concrete structures must comply:

- CO_2 emissions shall be reduced by at least 30%.
- At least 20% of the concrete shall be residual products used as aggregate.
- Use of concrete industries own residual products.
- Use of new types of residual products, previously land filled or disposed of in others ways.
- CO_2- neutral, waste-derived fuels shall substitute fossil fuels in the cement production by at least 10%.

II. RESULT

Today The selection of material and mix proportion of Green Concrete was done to achieve of objective, namely development of Green Concrete, its workability and compressive strength for various ratios of mix properties of fresh state of Green Concrete are calculated by using slump cone test and are The selection of material and mix proportion of Green Concrete was done to

achieve of objective, namely development of Green Concrete, its workability and compressive strength for various ratios of mix properties of fresh state of Green Concrete are calculated by using slump cone test and are given in this chapter also properties of harden state of green concrete are calculated by compressive strength.

2.1 ANALYSIS OF TEST RESULT OF FRESH GREEN CONCRETE

2.1.1 SLUMP CONE TEST RESULT

The slump cone test were carried out in laboratory on green concrete as per IS 1199-1959. The results of slump cone test are given in table 2.1. column 2 of table represent initial slump after 15 min and column 3 represent final slump after 60 min. The green concrete was sticky in nature,

Table 2.1.1 Result Of Slump Cone Test

Sr No	Mix (SILICA FUME:GGBS:CEMENT)	Workability	
		Initial slump(mm)	Final slump(mm)
1	48.5:48.5:3	170	55
2	47.5:47.5:5	200	110
3	46.5:46.5:7	140	50
4	0:0:100	150	45

2.2 COMPRESSIVE STRENGTH OF GREEN CONCRETE

The result of compression test on green concrete are presented in table No.2.1 column 1 represents various types of mixes (Silica Fume: GGBS: Cement). Column 2,6 and 10 represents the respective weights of cubes. column 3,7 and 11 represent the maximum load that the cubes can bear. column 4,8 and 12 represents the respective compressive strength of cubes for 7,14 and 28 days at ambient temperature. Column 5,9 and 13 represents the average compressive strength of each mixes.

Table No. 2.1- Compressive Strength of Green Concrete

Mix	7 Days				14 Days				28 Days			
	Weight (kg)	Load (KN)	Compressive Strength(N/mm^2)	Avg (N/mm^2)	Weight (kg)	Load (KN)	Compressive Strength(N/mm^2)	Avg (N/mm^2)	Weight (kg)	Load (KN)	Compressive Strength(N/mm^2)	Avg (N/mm^2)
Mix-1 48.5:48.5:3	8.634	403.0	17.91	20.63	8.470	615.3	27.34	27.78	8.936	720.6	32.02	32.70
	8.668	467.7	20.78		8.496	628.5	27.93		8.506	698.1	31.02	
	8.499	522.4	23.21		8.476	632.2	28.09		8.576	789.0	35.06	
Mix-2 47.5:47.5:5	8.670	472.3	20.99	18.27	8.528	647.8	28.79	26.35	8.616	661.7	29.40	30.82
	8.390	371.4	16.50		8.622	570.9	25.37		8.504	695.8	30.92	
	8.400	390.0	17.33		8.336	560.4	24.90		8.640	723.4	32.15	

Mix-3 46.5: 46.5: 7	8.820	540.2	24.00	22.54	8.754	674.8	29.99	29.09	8.736	790.8	35.14	34.22
	8.576	512.1	22.76		8.712	652.2	28.98		8.704	774.0	34.40	
	8.794	469.5	20.86		8.808	636.9	28.30		8.972	745.5	33.13	
Conventional 0:0:100	7.988	414.4	18.41	18.13	7.384	487.8	21.68	20.30	7.422	369.9	16.44	20.14
	8.118	394.9	17.55		7.648	460.2	20.45		7.812	538.9	23.95	
	8.109	414.9	18.44		7.412	422.6	18.78		7.490	450.0	20.04	

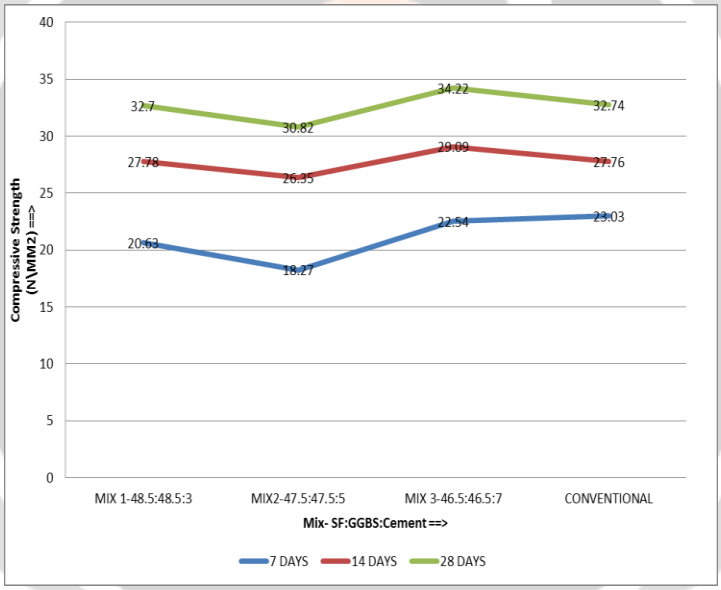

Fig No. 2.1 Compressive Strength Of Green Concrete at 7 Days, 14 Days and 28 Days

III CONCLUSION

Following are the conclusion made from overall work.

1. Higher strength achieved with GGBS, Silica Fume and Cement (Mix No.3).
2. At Mix No. 2 workability is more and strength achieved is less.
3. So as workability increases strength decreases.
4. By using GGBS and Silica Fume, Rheology is improved.
5. Heat of Hydration is less as GGBS contains less calcium oxide.
6. The most important parameter is all cubes were cured at room temperature (30^0c to 35^0c)

As maximum % of silica fume was used in the Mix No. 3, and got the desired compressive strength. Therefore Mix No.3 is economical Green Concrete.

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