International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 08 | Aug 2019 www.irjet.net p-ISSN: 2395-0072

HIGH PERFORMANCE CONCRETE BY USING M SAND WITH ADMIXTURE 300

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ABSTRACT - *World's most used construction material considered is concrete. Typical concrete mixtures are comprised of water, sand, cement and an aggregate of rock. This project focuses on the high performance concrete by using M sand with admixture 300.The other material for this project are silica flume, fly ash, admixture 300. In this project the cement replaced with 10% of silica flume & 10% of fly ash and addition of admixture by varying percentage 0.5%, 0.7%, & 0.9%. In this project self compacting test are conducted by using L Box, U Box, & v funnel apparatus.*

Keywords: High performance concrete, M sand, workability, compressive, tensile, Flexural strength, self compacting tests

1. INTRODUCTION

Concrete is widely used construction material for various types of structures due to its structural stability and strength. All the materials required for producing such high quantities of concrete come from the earth's crust .Thus it deletes its resources every year creating ecological strain. On the other hand human activities on the earth produce solid waste in considerable quantities including material waste. Among the solid waste the major ones are fly ash, GGBS, silica flume and demolished construction material. This solid waste can be used as a mineral admixture which is used in the production of high performance and high strength concrete. The performance of high concrete is concrete which meets special concert and homogeny requirements that cannot be always achieved by using only the predictable materials and normal mixing, placing, and curing practices. The performance requirements may involve enrichment of placement and compaction without segregation and long term mechanical property, early age strength, toughness, service life. Rapid infrastructural growth on a world –wide basis has increased the demand for constructional material, River beds are being rubbed off than natural sand banks, resulting in lower underground water table disturbed aquatic life and loss of natural vegetation on the river beds. Hence manufactured sand is used as an admixture to make High performance concrete. Different combinations of experimental admixtures of tested to replace natural sand with EAF slag, in various combinations of cement dosages and the cement –water proportions. The durability, setting time, workability and compressive strength of the concrete mixes are evaluated and a comparative analysis is made to test the effect of M – sand on setting time of high performance concrete M sand which are also known as factory sand or artificial sand is type of sand used as replacement for natural sand in every construction industry today. Since it has become very difficult to get natural sand cheaply, because the type of resources are washed away very quickly. Now days good quality sand is not very easily available, since it should be transported from very long distances making it very uneconomical .The artificial sands are manufactured using proper machines which have become a better substitute to river sand. Sand which are to be used in construction should be enough sharp, clean and course. The sand which is prepared V.S.I crusher was found to be angular and cubical in shape. The sand manufactured in other type of crushers was found to be flaky, which is usually troublesome M-sand which is manufactured in other crushers usually contains large percentage of dusty matter and contains flaky particles. Because of the presence of flaky and angular particles the concrete may become harsh and could result in spongy concrete. In this silica flume is result of the refining procedure in the silicon and Ferro silicon industry and it will improve both the mechanical quantities and sturdiness of concrete .The partial replacement of cement with silica flume lessens the substance of concrete utilized as a part of the development business, which ensures the biological system with a literate in the diminishment of nursery gasses.

2. MATERIAL PROPERTIES

1. Cement

Table 1: Physical property of cement

SR NO	PROPERTIES	RESULT
1	Normal consistency	28.25%
2	Specific gravity	3.12
3	Initial setting time	170 min
4	Final setting time	250 min

2. Fine aggregate (M sand)

Table 2: Physical properties of fine aggregate

SR NO	PROPERTY	RESULT
1	Specific Gravity	2.72
2	Fineness modulus	2.68
3	Gravity zone	II

3. Coarse aggregate

Table 3: Physical properties of coarse aggregate

SR NO	PROPERTIES	RESULT
1	Size	12 mm
2	Specific gravity	2.68
3	Total water absorption	0.70%
4	Fineness modulus	7.20

4. Silica fume

Table 4: Physical properties of silica fume

SR NO	PROPERTIES	RESULT
1	Normal consistency	0.15
2	Specific gravity	2.22
3	Specific area	13000-30000(m^2/kg)
4	shape	spherical

5. Fly ash

Table 5: Physical Properties of fly ash

SR NO	PROPERTY	RESULT
1	Size	10-100 micro
2	Specific gravity	1.90-2.60

3. METHODOLOGY

3.1 Workability of Concrete:

Workability of concrete is the property of freshly mixed concrete which determines the ease and homogeneity with which it can be mixed, placed, consolidated and finished.

3.2 Compressive Strength Test:

Compressive strength test is the most common test conduct on concrete because it is easy to perform and most of the desirable characteristics properties of concrete quantitatively related to its compressive strength. Compressive strength is determined by using compression testing machine (CTM) of capacity 2000KN. The load apply ay uniform rate.

The cube specimen of the size 150 x 150 x 150 mm was tested after curing for period of 7 and 28 days for different combination. The results of three specimen taken as an average, should the compressive strength of the HPC.

3.3 Tensile Strength Test:

Knowledge of tensile strength of concrete is of great importance. Tensile strength is the basic and important properties of concrete. Tensile strength is determine by using filling ability. It can be used at site. The test also indicates the resistance to segregation .compression testing machine. The tensile strength of concrete is tested by using test specimens 150 x 150 x 150 mm. They are allowed for curing tank for 7 and 28 days. The test is carry out by placing a specimen between the loading surface of a CTM and the load is applied at uniform rate until the failure of the specimen. The tensile strength measure for each test condition and average value is considered.

3.4 Flexural Strength Test:

Flexural test on beams were carried out in universal testing machine of capacity 1000KN.Deflectometers were

$$Fr = \frac{PL}{bd^2}$$

fixed to measure the deflection at salient points. The load acting at two points also set up is as shown in Fig.4.6. The load was applied without shock and increased until failure occurs. The load-deformation pattern was plotted and maximum load applied to the specimens were recorded. The flexural strength test was determined according to B.S. 1881: part 118, 150 x 150 x 700 mm specimens were tested. The strength of the specimens were calculated by the following equation:-

3.5 Slump Test: The slump test is done to assess the horizontal flow of concrete in the

3.5.1 L Box Test:
The test assesses the flow of concrete also the extent to which concrete is subjected to blocking by reinforcement.

3.5.2 U Box Test: The test is used to measure the filling ability concrete. The apparatus consist of a vessel that is divided by a middle wall into two compartments.

3.5.3 V-Funnel Test: The test was developed in Japan. The equipment consists of v shaped funnel. The V funnel test is used to determine the filling ability of the concrete with a maximum size of aggregate 20 mm size. The funnel which is used for test filled with about 12 liter of concrete.

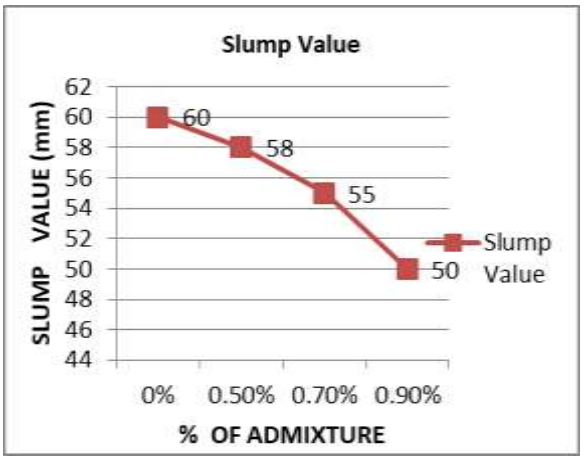
4. RESULT

4.1WORKAB ILITY OF CONCRETE

Table 4.1: WORKABILITY OF CONCRETE

% OF SILICA FUME & FLY ASH	%OF ADMIXTURE	SLUMP VALUE IN mm
0%	0%	60
10%	0.5%	58

10%	0.7%	55
10%	0.9%	50

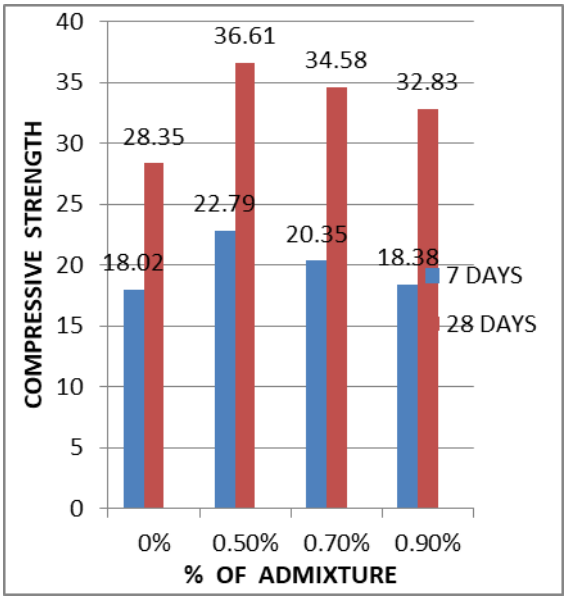


Graph 4.1: Workability of concrete test result

4.2 Compressive Strength:

Table 4.2: Test result of Compressive Strength

% of silica fume & fly ash	%of admixture	Compressive strength	
		7 day	28 day
0%	0%	18.02	28.35
10%	0.5%	22.79	36.61
10%	0.7%	20.35	34.58
10%	0.9%	18.38	32.83

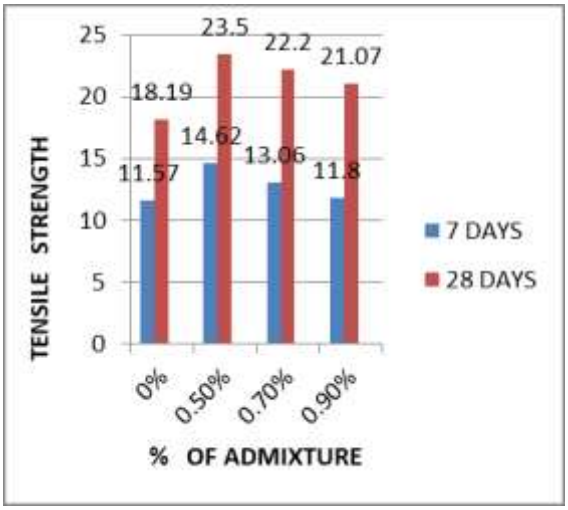


Graph 4.2: Test result of Compressive Strength

4.3 Tensile strength

Table 4.2: Test result of Tensile Strength

% of silica fume & fly ash	%of admixture	Tensile strength	
		7 day	28 day
0%	0%	11.57	18.19
10%	0.5%	14.62	23.50
10%	0.7%	13.06	22.00
10%	0.9%	11.80	21.07

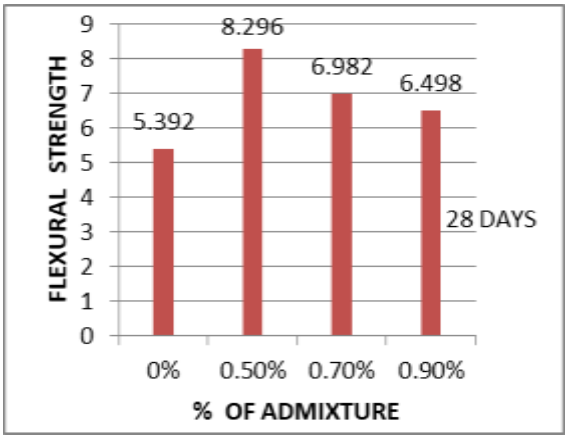


Graph 4.2: Test result of Tensile Strength

4.4Flexural strength

Table 4.2: Test result of Flexural Strength

%of silica fume & fly ash	%of admixture	Flexural strength
		28 days
0%	0%	5.392
10%	0.5%	8.296
10%	0.7%	6.982
10%	0.9%	6.498



Graph 4.2: Test result of Flexural Strength

4.5 L BOX TEST

Table 4.5: Test result of L box

% of silica fume & FLY ASH	% OF ADMIXTURE	Time (sec)	Height	
			20 cm	40cm
10%	0.5%	12	9.5	12.5
10%	0.7%	11	8	12
10%	0.9%	10	8	11

4.6 V FUNNEL TEST

Table 4.6: Test result of V FUNNEL

% of silica fume & FLY ASH	% OF ADMIXTURE	Time (cm)
10%	0.5%	11.3
10%	0.7%	10
10%	0.9%	9.5

4.7 U BOX TEST

Table 4.7: Test result of U box

% of silica fume & FLY ASH	% OF ADMIXTURE	Height Of material reached
10%	0.5%	6 cm
10%	0.7%	6 cm
10%	0.9%	5.5 cm

5. CONCLUSIONS

1. It is observe that with increase in percentage of admixture workability decreases.

2. 30% increment in the compressive strength of concrete by addition of 10% silica fume and 10% fly ash and addition of 0.5% admixture with respect to volume in concrete as compare to conventional concrete by using aggregate cement ratio (A/C) is 5.57 and water cement ratio (W/C) is 0.4.

3. 30% increment in the flexural strength is found by addition of 0.55% admixture and.10% silica fume & 10% of fly ash in concrete as compare to conventional concrete by using aggregate cement ratio (A/C) is 5.57 and water cement ratio (W/C) is 0.4.

4. 31% increment in the Tensile strength of concrete by addition of 0.5% admixture and 10% silica fume & 10% fly ash with respect to volume in concrete as compare to conventional concrete by using aggregate cement ratio (A/C) is 5.57 and water cement ratio (W/C) is 0.4.

5. By increasing % of admixture the flexural strength, compressive strength, tensile strength goes on decreasing.

6. Optimal use of 0.5% admixture we get maximum strength.

7. The usage of M sand (manufacturing sand) for high strength high performance concrete provides stronger and durable concrete structures which will be economical as well as environment friendly by preserving natural resources such as river sand.

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