An Experimental Investigation on Partial Replacement of Cement By GGBS And Fine Aggregate By Fly Ash With Lime Stone

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Abstract- *In the present state of affairs the scarcity of natural sand has end up a trouble for the development industry, after a good deal research the developed technological know- how gave rise to new generation sand named as m-sand or manufacture sand. It will be easily flow in a position on placing on excessive reinforcement bar. It is a modern concrete that does now not require vibration for placing and compaction. The methodology adopted is that manufactured sand are changed by means of 0 %, 25%, 50%, 75%, 100%, for river sand and overall performance is measured and compared. The water cement ratio is taken as 0.5, while the rest of the aspects stored same barring the chemical admixture which has been adjusted for acquiring the self-compatibility of the concrete. Cubes, cylinders, and prism will be casted and tested compressive strength, Split tensile strength, and flexural electricity as well as for durability properties.*

I. INTRODUCTION

The improvement of new technology in the material science is progressing rapidly. In last three decades, a lot of research was carried out for the duration of globe to enhance the overall performance of concrete in terms of strength and durability qualities. Consequently concrete has no longer remained a construction material consisting of cement, aggregate, and water only, how ever has will become an engineered customized tailor-made material with various new ingredients to meet the particular needs of development industry.

The developing use of concrete is different architectural configurations and carefully spaced reinforcing bars have made it very important to produce concrete that ensures acceptable filling ability, suitable structural overall performance and sufficient durability. In current years, a lot of lookup was carried out during the world to improve the performance of concrete in terms of its most important properties, i.e. strength and durability.

Concrete technology has below long gone from macro to micro level find out about in the enhancement of strength and durability residences from 1980onwards. Till 1980 the look up learn about used to be targeted only flow capability of concrete, so as to beautify the power then again durability did now not draw lot of attention of concrete technologies.

Originally developed in Japan to offset a growing scarcity of knowledgeable labor, it has proved to be really useful from the following points.

Development of Concrete Mix

- However, at the hardened state, there is not much difference in terms of mechanical properties and durability between other type of concrete mixes viz. high performance concrete (HPC), normal strength concrete (NSC), etc. (Subrato Chowdhuryet al. 2008).
- Concrete mix for this study was designed using EFNARC [4,5] norms as well as BIS 10262. mix can be designed to provide the required hardened concrete properties for an application, similar to conventional concrete.
- Partial mix is designed to have higher paste content or fines compared to conventional concrete.

1.1 OBJECTIVE

- Study the applicability of experimental project process of M-25 grade of concrete.
- Evaluate the power of fine aggregate replaced with the aid of 0%, 25%, 50%, 75%, 100% M-Sand in self compacting concrete mix.
- For the specific percentage replacement of M-Sand for fine aggregate.
- Major goal of the study was to observe the suitability of M-Sand as fine aggregate in motors and concrete.

- concrete produced by replacing natural sand by using M-Sand, it two is excellent bonding with other materials.
- The Objective of the present study is to determine the properties of prepared by river sand (NS) as fine aggregates and at various replacement levels ofM-sand.
- The properties of with river sand and M-sand fine aggregate are compared to evaluate the effect of replacement of river sand by M-sand.

1.2 SCOPE

- The scope of the learn about is constrained to the following aspects. The workability, compressive strength, split tensile strength of silica fume in of different combine proportions with constant w/c ratio have been investigated.
- Moisture is trapped in between the particles which is correct for concrete purposes.
- Though M-Sand makes use of natural coarse aggregates to form, it causes much less harm to surroundings as in contrast to rivers and.

1.3 **METHODOLOGY**

- Literature Collection And Study
- Material Collection And Study
- Test On Material Study & Properties
- Mix Design M-25 Grade Of Concrete
- Testing Of Fresh Concrete
- Casting Of Specimens
- Curing Of Specimens
- Testing The Mechanical Properties Of The Concrete
- Result And Discussions
- Conclusion

II. MATERIALPROPERTIES

2.1 MATERIAL UESD

a) Cement (OPC53)
b) Coarse Aggregate
c) Fine Aggregate
d) M-sand
e) Mixing of water

2.1.1 Cement

OPC53 Grade conforming IS12269:1987, Minimum cement content:320 kg/m3 (IS456:2000), Specific gravity of Cement:3.02

S. No	Test for Cement	Apparatus	Value Obtained
1.	Standard consistence test	Vicat apparatus	26.5%
2.	Initial setting time	Vicat apparatus	30 minutes
3.	Final setting time	Vicat apparatus	230 minutes
4.	Specific gravity test	Conical flask	3.02

FIG 1 CEMENT

20mm used. The shape of coarse aggregate is angular, water absorption is 1.0%. Specific gravity of nominal size of aggregate is 2.56

FIG.2.COARSE AGGREGATE

2.1.5 M-Sand

As per IS 383:1970 fine aggregate properties were tested. Water absorption is 2.5%, Specific gravity of fine aggregate is 2.43

FIG.3.M-SAND

2.1.6 Water

According to IS 3025, water to be used for mixing and curing should be free from injurious or deleterious materials. Portable Water is generally considered satisfactory. In the present investigation, available water within the campus is used for both mixing and curing purposes.

III. MIX DESIGN

3.1 Materials and mix design

Following materials were used in the preparation concrete (i) Ordinary portland cement(ii)River sand and M-sand (iii)Coarse aggregates (iv)Superplasticizer (v)Tap water Ordinary portland cement of 53 Grade satisfying the requirements of IS 12269:1987.

The specific gravity of cement is 3.12 . Natural sand and M-sand are used as fine aggregates(F.A). Properties of fine aggregates were 2.43 Both the fine aggregates belong to zone II of IS 383:1970

3.2 Concrete mix proportion

The mixes were designated in accordance with IS 10262-2009 mix design method. Based on the results, the mix proportions M25 was designed. Concrete mix with w/c ratio of 0.45 was prepared. The details of mix proportions for 1m^3 of concrete are given in Table below.

Mix proportions for M25 Grade of Concrete (Kg/m^3)

Grade	Cement	FA	CA	Water
Mix 25	425.72	838.44	828.34	191.61
	1	1.96	1.95	0.45

4.1CompressiveStrength

Compressive strength can be defined as the measure maximum resistance of a concrete to axial loading. The specimens used in the compressive test are: 150 mm x 150 mm x 150 mm. There are three specimen were used in the compression testing for each mixes. The compression testing machine used for testing the cube specimens is of standard make. The capacity of testing machine is 2000 KN. The machine has a facility to control the rate of loading with a control valve. The plates are cleaned before the testing of cubes. After the required period of curing, the cube specimens are removed from curing tank and cleaned to wipe off the surface water. It is placed on machines such that the load is placed centrally. The smooth surface of specimen is placed on the bearing surfaces.

4.2 Split Tensile Strength

The split tensile strength of concrete is determined by casting cylinders of size 150 bmm x 150 mmx 150 mm. The cylinders were tested by placing them uniformly. Specimens were taken out from curing tank at the age of 7, 14, and 28 days of moist curing and tested after surface water dipped down from specimens. This test was performed on Universal Testing Machine (UTM) as shown in fig. Split Tensile strength of concrete is tested on cylinders at different percentage of cement replacements content in concrete.

The strength of concrete has been tested on cylinder at 7, 14, and 28 days. 7 days test has been conducted to check the gain in initial strength of concrete. 28 days test gives the data of final strength of concrete at 28 days curing. Compression testing machine is used for testing the Split Tensile strength test on concrete along with two wooden boards. At the time of testing the cylinder taken out of water and dried and then tested.

4.3 Flexural Strength

Flexure specimens shall be beams whose cross section is a square with a side length not less than three times the maximum coarse aggregate size and not less than 100 mm. The beam length shall be at least 80 cm longer than three times the side length of the cross-section. The standard cross-sectional size of flexure specimens is 100 by 100 mm or 150 mm by 150 mm. Self compacting concrete shall not be shifted with a sieve to reduce the size of specimens as practiced for normal concrete.

1. CASTING OFSPECIMENS

a) Cubes(150x150x150mm)
b) Cylinders (150mm diameter, 300mm height)
c) Prism (500,100 and100mm)

2. TESTING OFSPECIMENS

a) Compressive strength test
b) Split tensile strength test
c) Flexural strength test

3. RESULTS

COMPRESSION STRENTHTEST

% OF M-SAND	COMPRESSION STRENTH TEST N/mm^2	
	7 DAYS	28 DAYS
0%	20	30.07
50%	20.74	30.16
75%	20.45	29.33

SPILT TENSILE STRENTH TEST

% OF M-SAND	SPILT TENSILE STRENTH TEST N/MM2	
	7 DAYS	28 DAYS
0%	2.03	3.1
50%	2.26	3.11
75%	2.02	2.45

FLEXURAL STRENTH TEST

% OF M- SAND	FLEXURAL STRENTH TEST N/mm^2	
	7 DAYS	28 DAYS
0%	2.47	3.06
50%	3.32	4.34
75%	3.13	3.23

IV. CONCLUSION

- From the above experimental investigation of the following conclusions are,
- Fine aggregate replacement 0%, 25%, 50%, 75%, 100% with M-Sand leads to increase in mechanical properties for M30 grade of concrete.
- From 50% there is decrease in mechanical strength for 7 and 28 days of curing period.
- The completely replacement of fine aggregate by M-Sand is given a maximum results.
- Optimum content of M-Sand for achieving higher strength is50%.
- The strength is increased by 50% and decreased by 75% and 100% ,when compared to 50% of replaced. to achieve the high strength of self compacting concrete.
- M-Sand qualifies 50% economic than the naturals and.
- The results showed good flow ability and passing ability properties with replacement of natural sand by M-Sand for self compacting concrete.

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