EXPERIMENTAL STUDY ON SELF COMPACTING CONCRETE MADE WITH M-SAND

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ABSTRACT

The use of Self Compacting Concrete (SCC) which is capable of flowing in from work and congested reinforcement without any mechanical vibrator fills the concrete voids with its high paste content is highly durable and economical. It is believed that this kind of property is attained by achieving high packing density among the constituents of concrete with satisfactory workable properties. Comparative experimental studies on the arrived M40 grade SCC is carried out with replacement of ordinary port land cement replaced with some percentage of GGBS and 100% replacement of sand with manufactured sand (M-sand). Self-compacting concrete offers a rapid rate of concrete placement, with faster construction times and ease of flow around congested reinforcement. The fluidity and segregation resistance of SCC ensures a high level of homogeneity, minimal concrete voids and uniform concrete strength, providing the potential for a superior level of finish and durability to the structure. SCC is often produced with low water-cement ratio providing the potential for high early strength, earlier remolding and faster use of elements and structures. The elimination of vibrating equipment improves the environment on and near construction and precast sites where concrete is being placed, reducing the exposure of workers to noise and vibration. The improved construction practice and performance, combined with the health and safety benefits, make SCC a very attractive solution for both precast concrete and civil engineering construction.

Key words: **SCC, M-Sand, GGBS**

INTRODUCTION:

Self Compacting Concrete (SCC) is able to flow under its own weight, completely filling formwork and achieving full compaction, even in the presence of congested reinforcement. The hardened concrete is dense, homogeneous and has the same engineering properties and durability as traditional vibrated concrete. Concrete that requires little vibration or compaction has been used in Europe since the early 1970s but self-compacting concrete was not developed until the late 1980‟s in Japan. In Europe it was probably first used in civil works for transportation networks in Sweden in the mid1990‟s. The EC funded a multi-national, industry lead project “SCC” 1997-2000 and since then SCC has found increasing use in all European countries. As on date there is no IS code for SCC, therefore the guidelines given by EFNARC (European Federation of Natural Association Representing For Concrete) are followed. Self-compacting concrete offers a rapid rate of concrete placement, with faster construction times and ease of flow

around congested reinforcement. The fluidity and segregation resistance of SCC ensures a high level of homogeneity, minimal concrete voids and uniform concrete strength, providing the potential for a superior level of finish and durability to the structure. SCC is often produced with low water-cement ratio providing the potential for high early strength, earlier demoulding and faster use of elements and structures. The elimination of vibrating equipment improves the environment on and near construction and precast sites where concrete is being placed, reducing the exposure of workers to noise and vibration. The improved construction practice and performance, combined with the health and safety benefits, make SCC a very attractive solution for both precast concrete and civil engineering construction. Self-compacting concrete (SCC) is a flowing concrete mixture that is able to consolidate under its own weight. The highly fluid nature of SCC makes it suitable for placing in difficult conditions and in sections with congested reinforcement. Use of SCC can also help minimize hearing-related damages on the worksite that are induced by vibration of 2 concrete. Another advantage of SCC is that the time required to place large sections is considerably reduced.

MATERIALS USED FOR THE MAKING SELF COMPACTING CONCRETE

CEMENT: It Is a Binding Material Used In the Making of Concrete

M-SAND: Manufactured sand (M-Sand) is a substitute of river sand for concrete construction. Manufactured sand is produced from hard granite stone by crushing. The crushed sand is of cubical shape with grounded edges, washed and graded to as a construction material. The size of manufactured sand (M-Sand) is less than 4.75mm.

GGBS: Ground-granulated blast-furnace slag (GGBS or GGBFS) is obtained by quenching molten iron slag (a by-product of iron and steel-making) from a blast furnace in water or steam, to produce a glassy, granular product that is then dried and ground into a fine powder

COARSE AGGREGATE: It is used in the concrete as a filler material in this 20mm and 10mm aggregates used for making concrete.

FINE AGGREGATE: it is used in the concrete as filler material in this M-Sand used instead of instead of river sand

ADMIXTURE:

Chloride free liquid chemical admixture especially designed in the manufacture of light precast concrete. It is also recommended as a plasticizer for concrete made with harsh or poorly grade aggregates.

M-sand

super plasticizer

PROPERTIES OF M-SAND AND RIVER SAND

S. No	Property	M-sand	River sand
1	Specific gravity	2.63	2.67
2	Bulk density	15.31	14.4
3	Fineness modulus	2.0	2.33
4	ph	10.13	8.44

PROPERTIES OF CEMENT AND GGBS

S. No	Property	GGBS	Cement
1	Specific gravity	2.85	3.1
2	Initial setting time	48min	50
3	Final setting time	530min(after replacing)	550min(after replacing)

Test on cement

Test on aggregate

CHEMICAL COMPOSITION OF CEMENT

S. NO.	CHEMICAL COMPONENT	% OF CHEMICAL COMPONENT
1	SiO_2	97
2	Fe_2O_3	0.5
3	Al_2O_3	0.2
4	CaO	0.2
5	MgO	0.5
6	K_2O	0.5
7	N_2O	0.2
8	SO_3	0.15

Chemical composition of GGBS

S. NO.	CHEMICAL COMPONENT	% OF CHEMICAL COMPONENT
1	SiO_2	33.4
2	Fe_2O_3	0.32
3	Al_2O_3	13.46
4	CaO	41.7
5	MgO	5.99
6	K_2O	0.29
7	N_2O	0.16
8	SO_3	2.74

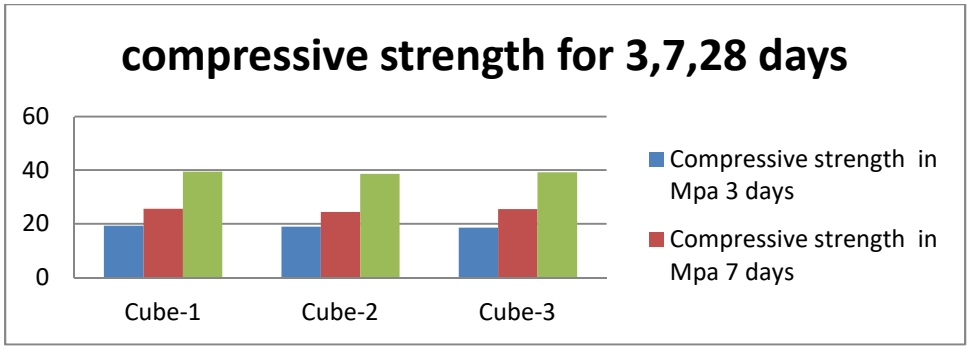
Trail mix-I

Design mix:

Cement : 380kg
GGBS: 190kg
Coarse aggregate: 800kg
M-sand: 180kg
Water: 166kg
Admixture(chryso hyper plast) : 0.3

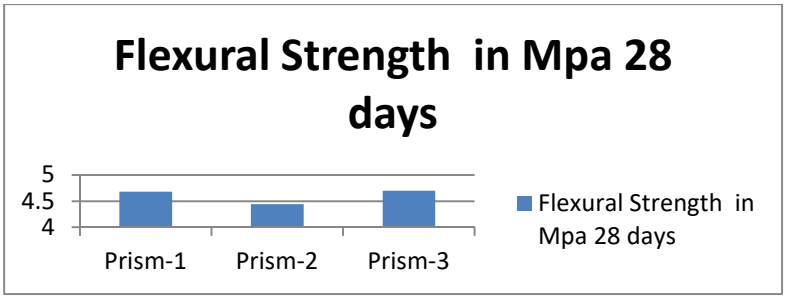
Compressive strength results for 3,7,28 days

Trail-I	Compressive strength in Mpa		
days	3 days	7 days	28 days
Cube-1	19.33	25.66	39.44
Cube-2	18.99	24.44	38.66
Cube-3	18.55	25.44	39.22



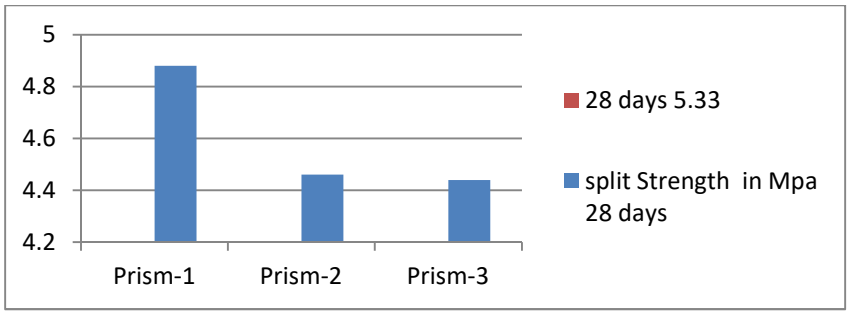
Flexural strength results for 28 days

Trail-I	Flexural Strength in Mpa
days	28 days
Prism-1	4.68
Prism-2	4.44
Prism-3	4.7



Split tensile strength for 28 days

Trail-I	split Strength in Mpa
days	28 days
Prism-1	4.88
Prism-2	4.46
Prism-3	4.44

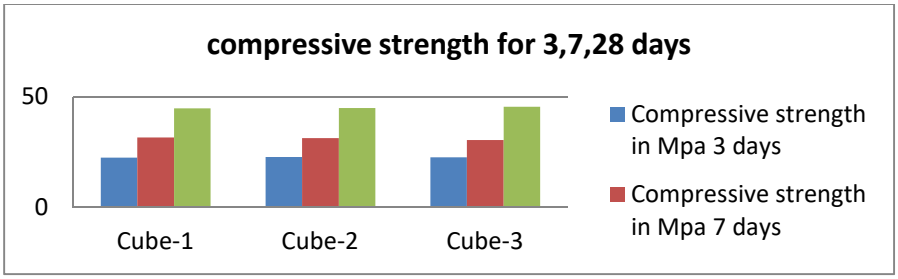


Trail mix-II

Cement : 400kg
GGBS: 130kg
Coarse aggregate: 763kg
M-sand: 191kg
Water: 175kg
Admixture (chryso hyper plast): 0.64

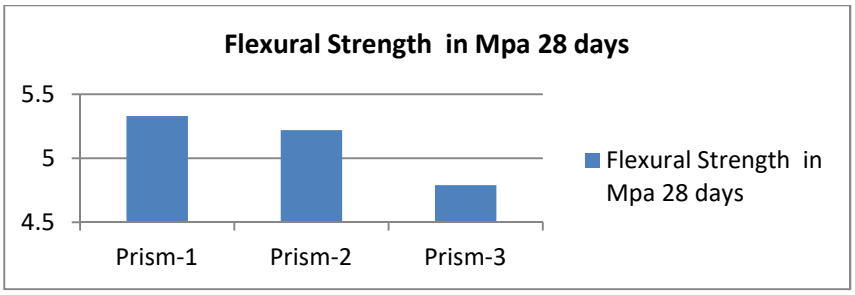
Compressive strength results for 3,7,28 days

Trail-II	Compressive strength in Mpa		
days	3 days	7 days	28 days
Cube-1	22.40	31.5	44.78
Cube-2	22.78	31.22	44.89
Cube-3	22.6	30.44	45.44



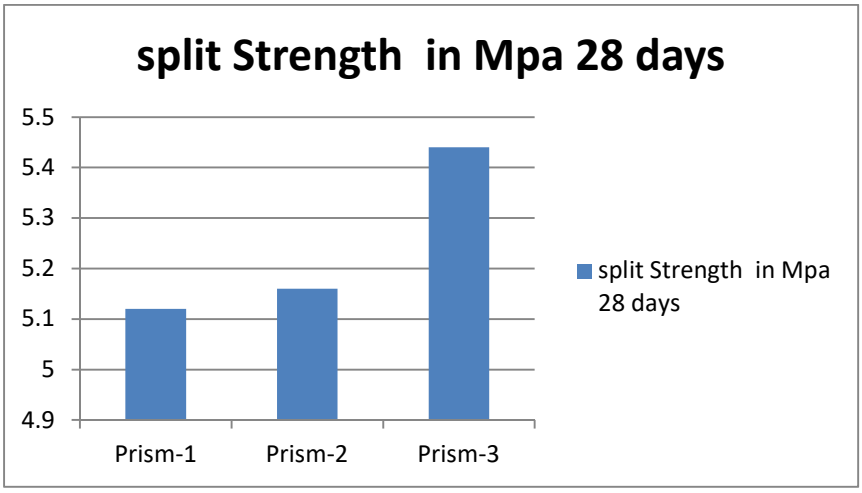
Flexural strength results for 28 days

Trail-II	Flexural Strength in Mpa
days	28 days
Prism-1	5.33
Prism-2	5.22
Prism-3	4.79



Split tensile strength for 3,7,28 days

Trail-II	split Strength in Mpa
days	28 days
Prism-1	5.12
Prism-2	5.16
Prism-3	5.44



Conclusion

1. It is the evident that the trail mix-I, and mix-II gives the exact strength characteristic strength by using M-Sand instead of sand.
2. Trail mix-II when the fines are reduced in the mix the strength may vary. Above mixes are attained by trial and error method by using different percentages of hyper plast admixture at trail mix-II gives the better results as same as river sand gives the strength to concrete
3. Here I concluded that M-sand is also used for making self compacted concrete it gives same strength like river sand
4. There above concrete can use where the congested reinforcement is used
5. The concrete gives better workability and fulfill all the requirements like filling passing segregation resistance.

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