An Experimental Investigation on Self-Compacting Concrete by Victimization M-Sand

R.Sanju[1], S.Frank Stephen[2]
[1]M.E Structural Engineering;
[2]Ast.prof Department of Civil Engineering
St.Xavier's Catholic college of Engineering
Chunkankadai, Nagercoil – 629 003

Abstract:- During this thesis, AN experimental investigation on self-compacting concrete by victimization M-sand is to be done. The materials to be used for the experiment area unit collected and therefore the physical properties tests area unit done. Self-Compacting Concrete (SCC) is AN innovative concrete that doesn't need vibration for putting and compaction. it's able to flow beneath its own weight, fully filling formwork and achieving full compaction, even within the presence of full reinforcement. within the work, a trial has been created to form a comparative study on the recent and hardened state properties of M40 grades of plain concrete mixes to self compacting concrete with the replacement of watercourse sand by factory-made sand. This paper presents Associate in Nursing Experimental Investigation on jf Strength aspects like Compressive, Flexural and Split strength of Self-Compacting Concrete and Workability tests (slump, L-box, and V-Funnel) square measure allotted. The methodology adopted is that factory-made sand more with five-hitter, 10%, 15%, and 2 hundredth of hydrocarbon based mostly super plasticiser is measured and compared. This analysis outcome is extremely useful and economical to the Community.

Keywords:- *Self compacting concrete, silicon oxide fume, factory-made sand, Conplast SP430, Ceraplast 300, Cera Hyperplast XR-W40.*

I. INTRODUCTION

Concrete could be a wide used construction material round the world, and its properties are undergoing changes through technological advancement. varied styles of concrete are developed to reinforce the various properties of concrete. So far, this development is divided into four stages. The earliest is that the ancient traditional strength concrete that consists of solely four constituent materials, that area unit cement, water, fine and coarse aggregates.

At the thanks to reach the high compressive starting, reducing the water cement quantitative relation was the best thanks to succeed the high compressive strength. thenceforth the fifth ingredient a water reducer or super plasticiser was indispensable. The chemical admixture is claimed to be any material that's more in a very tiny amount (i.e., but 5%) to the concrete mixture which reinforces the properties of concrete in each the recent and hardened state. But currently on a daily basis price|the value|the price} of sand has been increasing on the far side imagination that is leading to the rise in concrete cost. this is often as a result of demand for sand is over its offer to beat this drawback the experiment on concrete by partial replacement of stream sand by factory-made sand in self compacting concrete. will|we will|we are able to} cut back the value of concrete and enhance the strength of concrete additionally M-sand can cut back ecological imbalance in nature.

To study the mechanical properties of each SCC and made sand as a replacement material in varied percentages to the combo. A study has been done on the compressive, flexural and split strength with these varied combine Self-compacting mixes are designed to own recent properties that have the next degree of workability than typical concrete. Workability could be a approach of describing the performance of concrete within the plastic state and for SCC, workability is usually characterised by the subsequent properties.

- Filling ability: ability to fill formwork beneath its own weight.
- Passing ability: ability to beat obstacles like reinforcement.
- Stability : homogenous composition of concrete throughout and once inserting concrete

II. OBJECTIVES AND SCOPE OF THIS PROJECT

The objective of this study is to research the Self-Compacting concrete ready by factory-made sand (Msand). As adding completely different share of super plasticiser to be compared with strength of concrete.

- For style mixes for self compacting concrete mixed with factory-made sand in varied Percentages.
- To study it's recent and hardened state concrete properties.
- To compare the Compressive Strength at the ages of 7 and 28 days, Split strength and Flexural behavior of Self Compacting Concrete at 28 days for M40 Grades of Concrete Mixes.

III. MATERIALS AND BLEND STYLE

Following materials were employed in the preparation of self compacting concrete

- Normal Portland cement and silicon oxide Fume
- Msand
- Coarse mixture
- Superplasticizer
- Tap water

Ordinary cement consists of atomic number 20 salt sand, chemical compound sand, and aluminium oxide ferrite. it's obtained by mixing planned proportions lime stone clay and different materials in tiny quantities that is pulverised and heated at warm temperature – around 1500˚C to provide clinker. The clinker is then ground with tiny quantities of mineral to provide a fine powder referred to as normal cement [OPC]. once mixed with water, sand and stone. It combines slowly with the water to create a tough mass referred to as concrete. Cement is absorbent material that means it absorbs wetness, in presence of wetness it undergoes chemical action termed association. so cement remains in fitness as long because it doesn't are available contact with wetness. If cement is quite 3 month previous then it ought to be tested for its strength before being taken into use. normal cement confirming to IS 8112-1989 [43grade] is employed for experimental work. Laboratory take a look at were conducted on cement to work out relative density, consistency, initial and final setting time and fineness.

Manufactured sand confirming to IS: 383-1970 is employed. that is confirms to Zone II The physical properties of fine mixture like relative density, bulk density, gradation and fineness modulus is tested in accordance with IS: 2386- 1975.

Property	Coarse mixture
Specific gravity	2.65
Water absorption (%)	0.3

Table 1. Properties of coarse mixture

Crushed natural rock stone mixture of nominal take stock to 12.5 millimeter and mixture passing 10 millimeter were used. The aggregates area unit proportioned by trial within the mixes. The physical properties of those coarse aggregates area unit listed in table 1. The sieve analysis details of 12.5 millimeter coarse mixture area unit shown in table 3.

Property	Results
Physical state	Micronized powder
Appearance	White color powder
Colour	White
Specificgravity	2.3

Table 2. Properties of silicon oxide fume

Silica fume is additionally referred to as small silicon oxide. it's AN radical fine material with spherical particles but one µm. during this project 100% of cement is replaced by silicon oxide fume. The property of silicon oxide fume to cement concrete is to boost its properties like compressive strength, bond strength absorption resistance. silicon oxide fume reduces harm as a result of the free water is consumed in wetting of the big area of the silicon oxide fume and thus the free water left within the combine for harm additionally decreases.

Properties of CONPLAST SP 430	
Appearance	Brown liquid
Specific gravity	1.20 at 20˚C
Chloride content	zero to BS 5075

Table 3. Properties of superplasticizer

Conplast SP 430 is AN admixture of a replacement generation made up of the Forsoc Company. the merchandise has been primarily developed for applications in high performance concrete wherever the best sturdiness and performance is needed. Conplast SP 430 is freed from chloride & low alkali. it's compatible with all kinds of cements.

The chemical admixture other within the concrete deflocculates the cement particles and so created use of the entrapped water to boost the fluidness of the combination. By adding super plasticizers to the concrete combine, it's attainable to get practicable mixes even at water binder quantitative relation of 0.3 and less. within the gift investigation, a high vary water reducing admixture of sulphonated hydrocarbon methanal super plasticizers named CONPLAST SP 430 was used as a chemical admixture and therefore the properties area unit given in Table 4.

Properties of CERAPLAST 300	
Appearance	Brown liquid
Specific gravity	1.2 + .03

Table 4.

Ceraplast 300 may be a finest superplasticizer supported hydrocarbon, extremely suggested for enhanced workability and high early and supreme strengths of concrete. It disperses cement particles additional speedily

in the concrete combine by reducing the physical phenomenon of water and transmission offensive charges to the ions in resolution. This makes the concrete extremely practicable and flowable even at lower water-cement ratios, leading to inflated strength**.**

Cerahyperplast XR-W40 is predicated on Polycarboxylic Ether with specifications ASTM C 494-03, BS 5075 and IS 9103 capable of reduction of water up to

25th is employed because the chemical admixture.

Water is a very important ingredient of concrete because it actively participates within the chemical action with cement. the number and quality of water is needed to be watched into fastidiously in order that it will type the strength giving cement gel. moveable water is employed for creating mortar. The hydrogen ion concentration worth of water lies between six and eight that indicate the water is free from organic matters. The transportable water from the school was used for admixture and set throughout the project.

IV. MIX PROPORTIONS FOR SCC

As per IS 10262: 2009-Concrete mix proportioning-Guidelines the minimum cement content is 320kg/m^{3}and maximum cement content is 450kg/m^{3}has been taken. From this several mix ratios has required to presence of SCC.

S.N	MIXTURE	SCC1 (1:1.59:2.25)	SCC 2 (1:1.65:2.24)	SCC 3 (1:2.59:2.46)	SCC 4 (1:2.84:2.6)	SCC 5 (1:2.84:2.6)
1.	Cement(kg)	393	393	342	324	324
2.	M-Sand(kg)	722	722	986	1025	1025
3.	Coarse mixture (kg)	979	1020	937	936	936
4.	10%Silica fume(gram)	-	43.7	38	36	36
5.	Superplasticizer %	0.5	1	1.5	3	3.5
6.	Water(lit)	197	197	152	144	144
7.	W/C Ratio	0.45	0.45	0.4	0.4	0.4

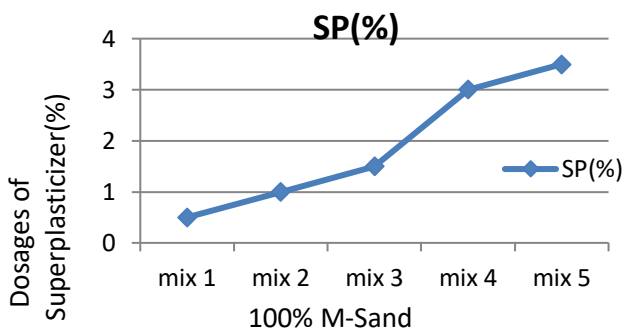
Table 5. Mix proportion for M40 grade

V. EXPERIMENTAL RESULTS

Fresh state properties

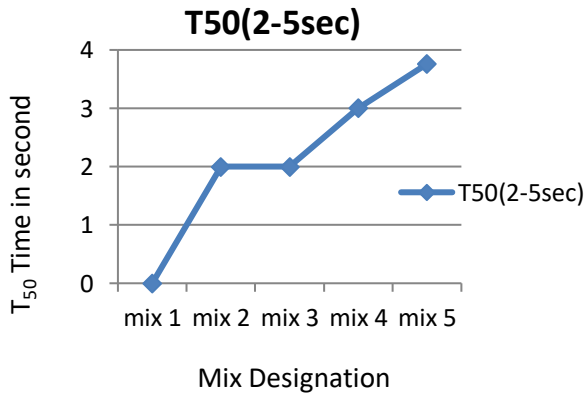
The recent state properties like slump flow, T50, V-funnel check, and L-box check has been applied to see the flowability and pass ability. and therefore the check result has been tabulated within the table below.

Variation of dose of superplasticizer with 100% replacement of Msand is shown in graph 1.



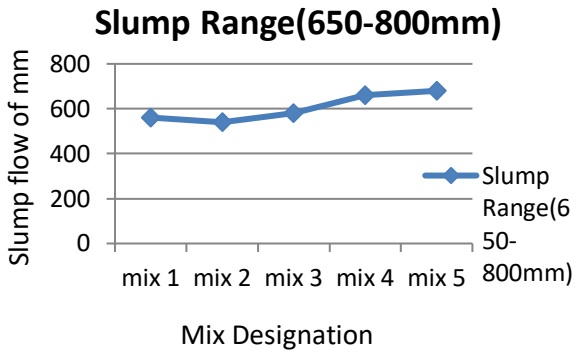
Graph a pair of variation in dosages of superplasticizer with 100% of Msand.

The variation of slump flow T50 time with 100% replacement of Msand in Self Compacting Concrete is shown in graph a pair of.It will be noted that the flowability has reduced with associate various factors by adding superplasticizer and resistance to segregation of Msand SCC.



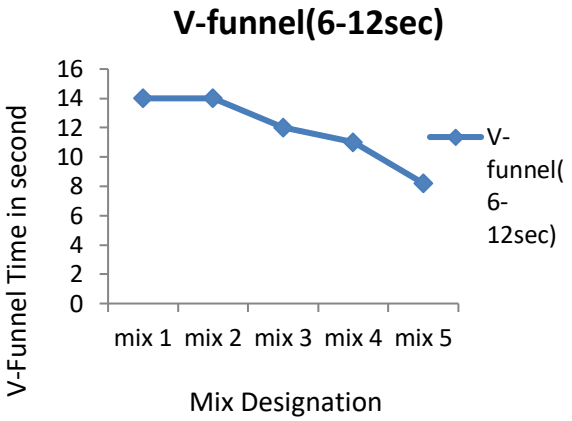
Graph a pair of Variation of T50 flow time of SCC with 100% replacement of Msand

The Variation of Slump flow were earned the vary of on top of 650mm.It has been achieved M-sand SCC as shown in graph 3.

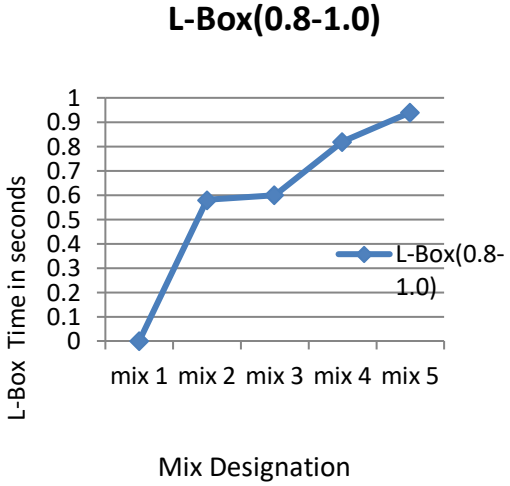


Graph a pair of Variation of slump flow time of SCC with 100% replacement of Msand

Variation of V-funnel time and L-box result has showed in graph 4 and graph 5 at100% replacement of Msand has achieved self compacting concrete with success.



Graph a pair of Variation of V-funnel flow time with 100% replacement of Msand



Graph a pair of Variation of L-box filling with 100% replacement of Msand

Table 6. Workability Test Result

S. N	Mix Designation	Slump flow 650-800mm	T_{50} (2-4sec)	L-box (h_2/h_1)	V-Funnel (8-12sec)	Results
1.	100%Msand+ 0.5%SP	560	-	-	14	Failed
2.	100%Msand+10% SF+ 1%SP	540	2	0.58	14	Failed
3.	100%Msand+10% SF+ 1.5% SP	580	2	0.6	12	Failed
4.	100%Msand+10% SF+ 3%SP	660	3	0.82	11	Passed
5.	100%Msand +10%SF+ 3.5%SP	680	3.76	0.94	8.2	Passed

➢ *Specimen details*

The specimens casted area unit

- Cubes of 100mmx100mmx100mm size
- Cylinders of 100mm diax200mm height
- Prism of 100mmx100mmx500mm size

➢ *Hardened state properties*

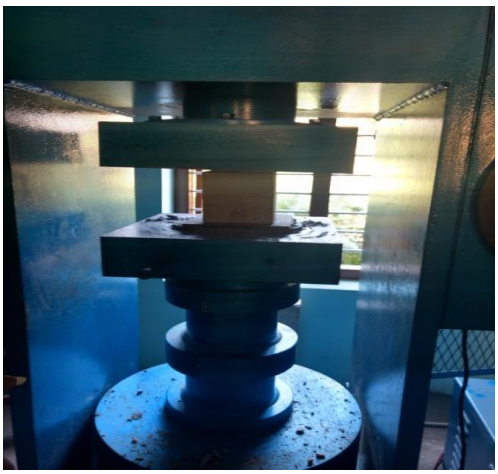


Fig 1:- Compressive strength check

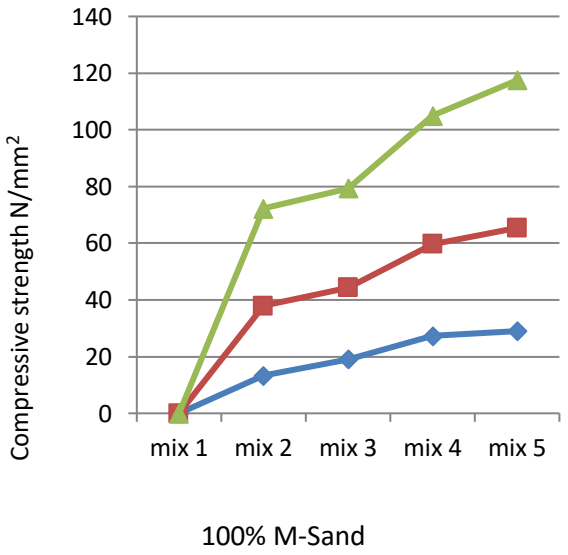
Fig 2:- Split strength check

VI. TEST RESULTS

The compressive strength of cubes and split strength of cylinders were tested and also the values area unit tabulated below.

Compressive Strength N/mm^2			
100% of factory-made sand	7 days	14 days	28 days
SCC 1	-	-	-
SCC 2	13.3	24.6	34.3
SCC 3	19	25.3	35
SCC 4	27.3	32.4	45.3
SCC 5	29	36.4	52.1

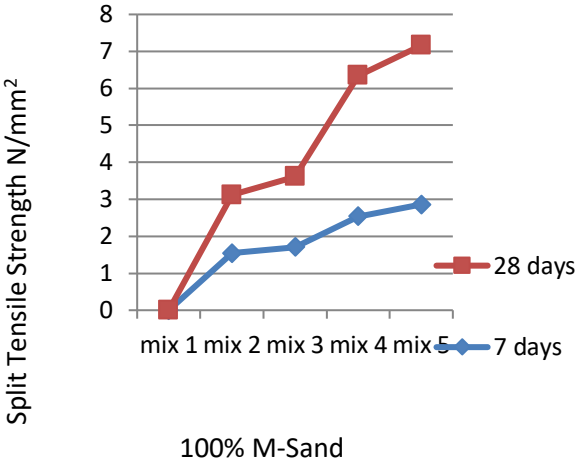
Table 7. Compressive strength of M40 grade Compressive Strength N/mm2



Graph half-dozen Compressive strength for M40 grade when 7, 14 and 28 days

Split strength N/mm2		
100% of factory-made sand	7 days	28 days
SCC 1	-	-
SCC 2	1.54	1.58
SCC 3	1.71	1.90
SCC 4	2.54	3.81
SCC 5	2.86	4.30

Table 8. Split strength of M40 grade



Graph a pair of Split strength for M40 grade when 7, 14, and 28 days

VII. CONCLUSION

M-sand may be a well hierarchical material and falls inside the grading limits given by BIS tips IS: 383-1970 code for obtaining zone II Sand classification. M40 grade combine once regenerate to SCC mix as per tips given in EFNARC satisfies the required demand criteria in slump, Compressive strength, Split tensile, Flexural strength check. M40 grade combine once regenerate to SCC mix as per tips given in EFNARC satisfies tests worth of slump, L-box, and V-Funnel satisfies the flowing ability of SCC by victimization Msand.

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