ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

IJARMATE International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE) Vol. 3, Special Issue 11, March 2017

STRUCTURAL BEHAVIOUR OF SELFCOMPACTING CONCRETE BEAMS USING WASTE GLASS POWDER

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ABSTRACT- Selfcompacting concrete is an innovative concrete that does not require vibration for placing and compaction. It is capable of flowing under its own weight, completely by filling the formwork and achieving full compaction, even in the presence of conjested reinforcement. The vibrators cause much noise and this scc reduces the noise created by vibrator.In this project I have planned to reduce the percentage of coarse aggregate and increase the percentage of fine aggregate with an addition of glass powder by varying percentage to achieve the properties of SCC, Polycarboxylate ethers(super plasticizers) with varying percentages.The aim of this project is to determine the structural behaviour of SCC beams. The specimens to be casted are cube, cylinder,prism and RC beams using selfcompacting concrete and compared with conventional concrete.The different tests to be conducted are slump cone test, L- box test, V-funnel test. Here ultimate load carrying capacity of beams , deflection and crack pattern of the samples has to be found.

KEYWORDS-SelfCompacting Concrete,Glass Powder,VMA,Super Plasticizer,Compressive Strength,Deflection.

1.INTRODUCTION- Self-Compacting Concrete was developed in the year 1980 in Japan. SCC is a concrete which flows to every nook and corner of the formwork under the influence of gravity without segregation. SCC is obtained not only by increasing the water cement ratio, but also increasing

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ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

IJARMATE
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the viscosity of the concrete by using an admixture.World-wide SSC is becoming popular because of the characteristics is possess – faster rate of placing concrete without vibration, uniform surface finish, concrete can be pumped, automatic filling and consolidation around reinforcement, labour efficient and cost saving, reduced construction time, quality construction and human errors are prevented.SCC is obtained by controlling the water cement ratio, adding effective plasticizer, increasing fine – coarse aggregate ratio, and adding viscosity enhancing admixture.In the recent years, many attempts were made to study the structural behaviour of reinforced concrete beams using SCC. Preparing SCC especially to achieve high strength is really complex because workability plays a vital role (i) higher workability to maintain the flow characteristics for SCC and (ii) lesser workability to attain higher strength.It is very common in RCC construction that even after providing sufficient shear reinforcement, the structure cannot withstand the sudden shear load due to natural calamities. So this project focuses to prepare an SCC with cement, with varying percentages of powdered glass powder as a binder and additives so as to improve the strength of the concrete.

2.EXPERIMENTAL PROGRAM- In this work various tests have been taken toknow the fresh and hardened properties of concrete. The fresh concrete tests are slump cone test,L-Box , V-funnel,J-ring and U-box tests. The hardened concrete tests are compressive strength,split tensile strength,flexural test have been taken. The experimental work was carried out in Advanced Structural Engineering Laboratory.

The following steps are included in the project,

I. Preparing mix design for SCC
II. Preparation of SCC specimen
III. Casting of specimen
IV. Testing of specimen
V. Observation & result

1.preparing mix design for concrete.

The development of scc have been started now-a-days, there is no standard code books for scc preparation. 11to 12 trials have been taken to find the optimum value . m30 mix design is used in this method. The size of the coarse aggregates used are 12mm, river sand is used as fine aggregate. Ultratek cement is used as the binder.glass powder is used as the replacement material in concrete. Fly–ash is used with glass powder to reduce the alkali silicate reaction. The paste volume to be used is 440litre \m^3. Super plasticizer conplast SP430 and Visco crete H_{20} is used. The dosage used is 1.5% of binder content. The percentage of material (glass powder+fly ash) replaced are 5%,10%,15%, 20%,25% &30% .

Mix designation used are,

Mix 1-cement 95%+(fly ash+GP)5%

Mix 2-cement 90%+(fly ash+GP)10%

Mix 3-cement 85%+(fly ash+GP)15%

Mix 4-cement 80%+(fly ash+GP)20%

Mix 5-cement 75%+(fly ash+GP)25%

Mix 6-cement 70%+(fly ash+GP)30%

Mix to replace fine aggregate

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IJARMATE
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Mix 1-FA 95%+(GP)5%

Mix 2-FA 90%+(GP)10%

Mix 3-FA 85%+(GP)15%

Mix 4-FA 80%+(GP)20%

Mix 5-FA 75%+(GP)25%

Mix 6-FA 70%+(GP)30%

2.Preparation of SCC specimens.

The SCC specimens were prepared according to mix design. The specimems to be prepared are cube, cylinder, prism and beams.

3.Casting and curing of specimens.

The concrete is filled in the moulds. The casted specimens are cured for 28 days. The cured specimens are tested for 7,14 and 28 days.

4. Testing of specimens.

Specimens are tested at 7,14 and 28 days. The compressive strength,split tensile test,flexural strength are found.

Table.1.FRESH TEST ON CONCRETE-Cement Replacement

S.NO.	Mix	Slump(mm)	V-Funnel sec	T_{50} Sec	V-Funnel (T_5) sec	L-Box(h_2/h_1)
1	Mix-1	675	9	3.8	12.1	0.81
2	Mix-2	680	10.8	4	12.8	0.84
3	Mix-3	685	11	4.2	13.1	0.87
4	Mix-4	692	11.5	4.7	13.2	0.87
5	Mix-5	710	11.2	4.5	13.5	0.9
6	Mix-6	735	11.9	5	14	0.92

Table 2.FRESH TEST ON CONCRETE-FineAggregate Replacement

S.NO.	Mix	Slump(mm)	V-Funnel Sec	T_{50} Sec	V-Funnel (T_5) Sec	L-Box(h_2/h_1)
1	Mix-1	682	9.2	3.9	12.4	0.83
2	Mix-2	691	10.2	3.7	12	0.71
3	Mix-3	703	10.7	3.9	12.4	0.85
4	Mix-4	710	11.1	4.5	13.4	0.89
5	Mix-5	715	11.5	4.7	13.7	0.91
6	Mix-6	740	11.7	4.9	14	0.95

HARDENED TEST ON CONCRETE-

Table.3.COMPRESSIVE STRENGTH TEST ON CONCRETE

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
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(IJARMATE) Vol. 3, Special Issue 11, March 2017

S.NO.	Mix	7-days N/mm^2	14-days N/mm^2	28-days N/mm^2
1	ORDINARY	17	25	29
2	G.P+FA-5%	**16.6**	**18.9**	**24.6**
3	G.P+FA-10%	**18.4**	**22.1**	**25.4**
4	G.P+FA-15%	**18.8**	**23**	**30.2**
5	G.P+FA-20%	**18**	**21**	**27.5**
6	G.P+FA-25%	**18.1**	**19.8**	**26**
7	G.P+FA-30%	**17.5**	**18**	**25.1**
8	GP5%	**15.8**	**18**	**21.1**
9	GP10%	**17.9**	**20**	**20.5**
10	GP15%	**17**	**28**	**29**
11	GP20%	**19**	**23**	**25.4**
12	GP25%	**15.9**	**17**	**21**
13	GP30%	**14**	**16**	**20.8**

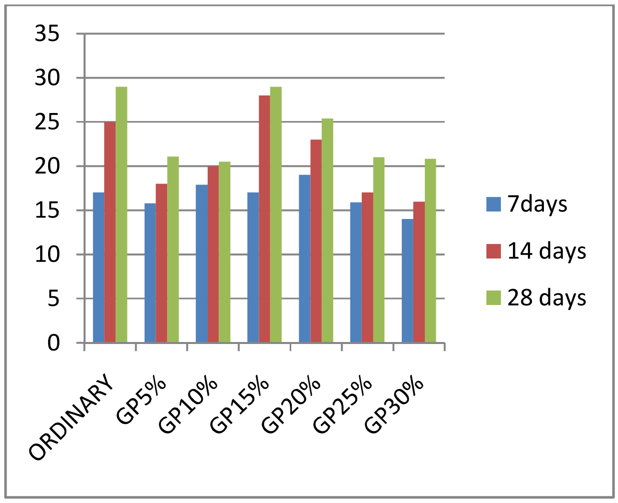
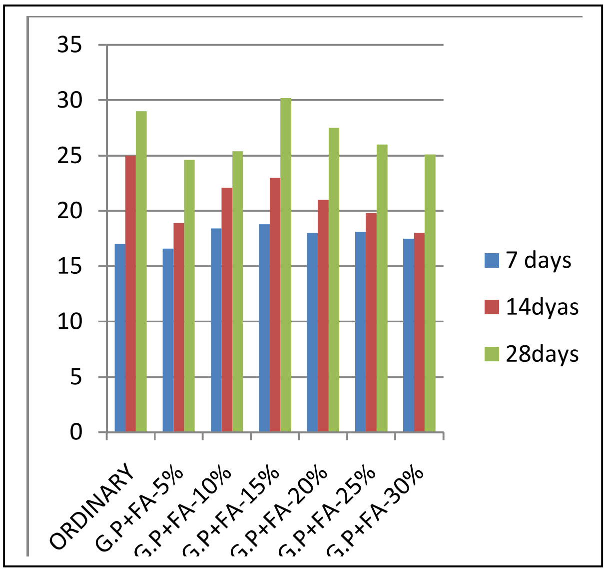


Fig.2.compressive strength of scc & ordinary



		days N/mm^2	days N/mm^2	days N/mm^2
1	ORDINARY	1.7	2.5	3.1
2	G.P+FA-5%	1.6	2.0	2.5
3	G.P+FA-10%	1.8	1.8	1.7
4	G.P+FA-15%	2.0	2.4	2.8
5	G.P+FA-20%	1.8	2.2	2.4
6	G.P+FA-25%	1.91	1.9	1.8
7	G.P+FA-30%	1.8	1.6	1.72
8	GP5%	**0.8**	**1.6**	**1.9**
9	GP10%	**1.4**	**1.8**	**2.1**
10	GP15%	**1.6**	**2.0**	**2.5**

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ISSN (PRINT): 2454-9762
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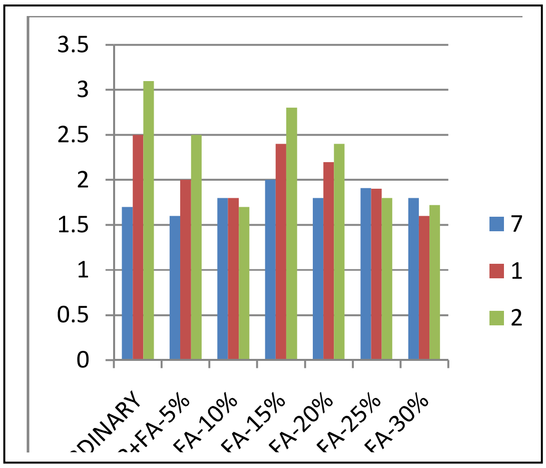
IJARMATE International Journal of Advanced Research in Management, Architecture, Technology and Engineering
(IJARMATE) Vol. 3, Special Issue 11, March 2017

11	GP20%	**2.1**	**2.4**	**2.9**
12	GP25%	**1.8**	**2.0**	**2.4**
13	GP30%	**1.5**	**1.7**	**1.8**



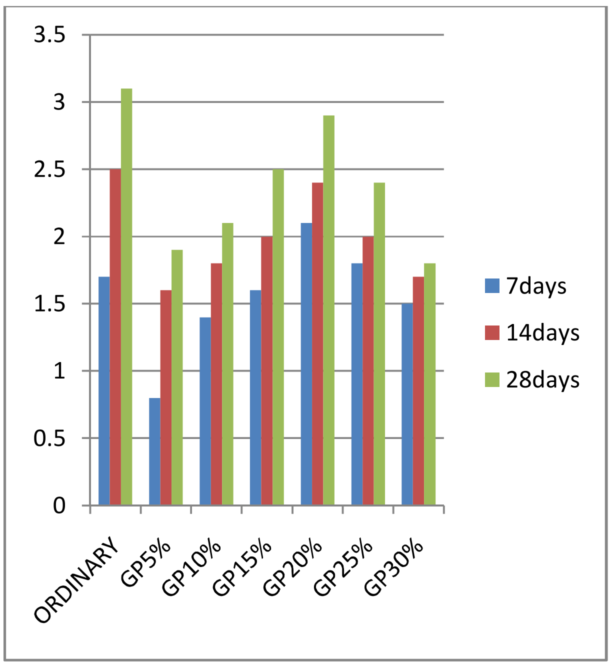
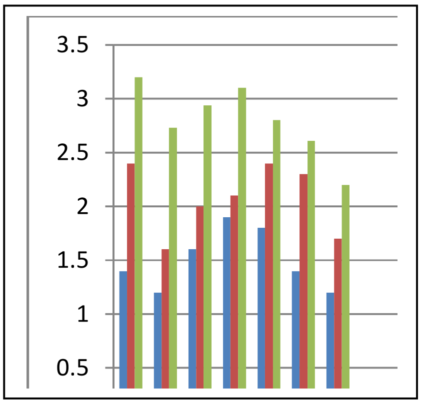


FIG 4.Slit tensile strength of scc &ordinary

TABLE.4.FLEXURAL STREGTH ON CONCRETE

S.NO.	Mix	7-days N/mm^2	14-days N/mm^2	28-days N/mm^2
1	ORDINARY	1.4	2.4	3.2
2	G.P+FA-5%	1.2	1.6	2.73
3	G.P+FA-10%	1.6	2.0	2.94
4	G.P+FA-15%	1.9	2.1	3.1
5	G.P+FA-20%	1.8	2.4	2.8
6	G.P+FA-25%	1.4	2.3	2.61
7	G.P+FA-30%	1.2	1.7	2.2
8	GP5%	**0.9**	**1.5**	**2.4**
9	GP10%	**1.2**	**1.8**	**2.6**
10	GP15%	**1.6**	**1.7**	**2.9**
11	GP20%	**1.8**	**2.4**	**3.1**
12	GP25%	**1.4**	**1.6**	**2.5**
13	GP30%	**1.0**	**1.4**	**2.1**



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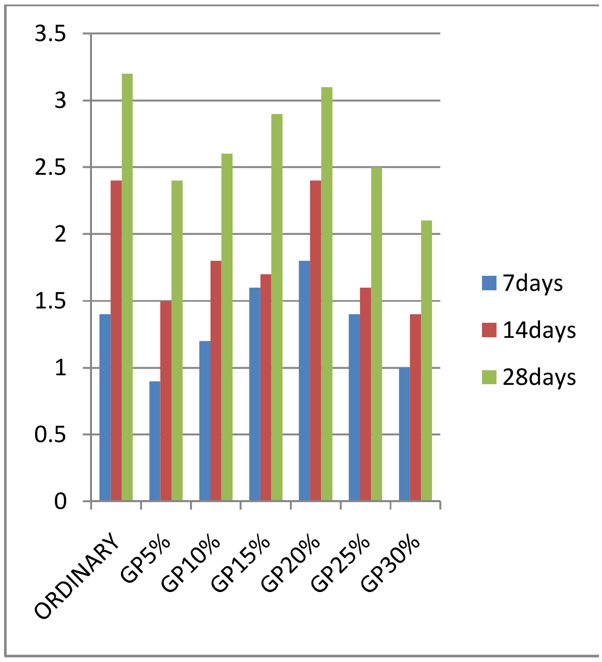

FIG.6.FLEXURAL TEST ON SCC &ORDINARY

research was to evaluate the fresh and hardened properties of a self compacting concrete produced by replacing part of the natural fine aggregate and cement with an aggregate and powder produced from locally available recycled waste glass and subjected to local conditions. From the test results of the samples, as compared to the respective conventional concrete properties, the following conclusions are drawn out.

1. SCC gives good finishing in specimen compared to the conventional concrete.
2. There is no need of compaction during the casting of the specimens in SCC .
3. The compressive strength,split tensile strength & flexural test on beams of concrete increases with the increase in % of glass powder and flyash in cement upto 25%.
4. The compressive strength,split tensile strength & flexural test on beams of concrete increases with the increase in % of glass powder replaced with fine aggregate upto 20%.
5. The deflection of scc beams are low when compared with ordinary concrete for 7,14 and 28 days.
6. The replacement of cement with glass powder and fly ash gives good strength on comparing to replacement of FA with glass powder.

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ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
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International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE) Vol. 3, Special Issue 11, March 2017

