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POROSITY AND MECHANICAL BEHAVIOUR OF SELF COMPACTING CONCRETE

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ABSTRACT; Self-Compacting Concrete (SCC) is one of the most important developments in the building industry. It provides solution to the problems occurring in normal concrete such as inadequate compaction which affects the strength and durability of structures. This project is taken up with the objective to evaluate the performance of self compacting concrete for M40 grade by conducting the bond behaviour strength analysis using hypo sludge and by adding suitable super plasticizer. The optimum combination of normal conventional concrete. The hypo sludge particles can fill the voids and make better resistance to permeability and also because of better bonding.

***Key Words*: Cement, fine aggregate, coarse aggregate, water, hypo sludge**

1. INTRODUCTION

Self compacting concrete produces resistance to segregation by using mineral fillers or fines and using special admixtures. Self compacting concrete is required to flow and fill special forms under its own weight, it shall be flowable enough to pass through highly reinforced areas, and must be able to avoid aggregate segregation. This type of concrete must meet special project requirements in term of placement and flow.

Current studies in scc, which are being conducted in many countries, can be divided into the following categories:

i) use of rheometers to obtain data about flow behavior of cement paste and concrete,

ii) mixture proportioning methods of SCC,

iii) characterization of SCC using laboratory test methods

iv) durability and hardened properties of scc and comparision with normal concrete and construction issues related to SCC. These will be relevant to the immediate needs.

2. OBJECTIVE

- This paper investigate the study of workability and durability characteristics of self compacting concrete.
- The mix design of ssc was arrived as per the guidelines of european federation of national association representing for concrete.
- The experiments are carried out by adopting a water powder ratio of 0.45 workability of fresh concrete is determined using tests such as slump flow, T 50,v-funnel, l-box and u-box tests.

3. EXPERIMENTAL INVESTIGATION

Material testing is essential for the mix design of concrete. It gives the optimum amount of material required for a given strength and workability of concrete. Hence the properties of the following materials were found.

CEMENT:

The ordinary Portland cement confirming to IS 4031 was used for the preparation of specimens. OPC 53 grade was used. Physical and chemical characteristics of cement play a vital role in developing strength and controlling theology of fresh concrete. Fineness affects water requirements for consistency.

When looking for cement to be used in high performance concrete one should choose cement containing as little C3A as possible because the lower amount of C3A, then easier to control the theology and lesser the problems of cement super plasticizer compatibility. Finally from strength point of view, this cement should be finaly ground and contain a fair amount of C3S.

4. FINE AGGREGATE

In the present work the concrete mixes were prepared using locally available river sand free from silt, organic matter and passing through 4.75mm sieve. The sand used confining to Zone 2 of IS383-1970. In those present, we use crushed Aggregate. In crushed gravel, the amount of clay, fine silt, and fine dust should not be more than 4% by weight and in crushed stone it should not be greater than 10%.

5. TEST FOR FINE AGGREGATE

SI.NO	PROPERTIES	M-SAND
1	Specific Gravity	2.69
2	Fineness modulus	4.4
3	Water Absorption	5.4 %

6. COURSE AGGREGATE :

Crushed granite aggregate particles passing through 12.5mm and retained on 10mm I.S sieve used as the natural aggreagate which met the grading requirement of IS 383-1970. The coarse aggregate is the strongest and least porous component of concrete.

7. TEST FOR COARSE AGGREGATE

SI.NO	PROPERTIES	COARSE AGGREGATE
1	Specific Gravity	2.147
2	Impact Value	10.87%
3	Water Absorption	0.5 %

HYPO SLUDGE:

Paper mill sludge is a major environmental problem for the paper and board industry. The material is by-product of the de-inking and re-pulping of paper .The million tons quantity of paper mill sludge produced in the world. Paper sludge behaves like cement because of silica and magnesium properties which improve the setting of the concrete .0.5%added mix added to concrete

Water

Water is an important ingredient of concrete as it actively participates in the chemical reaction with cement. Since it helps to form the strength giving gel, the quantity and quality of water is required to be looked very carefully. In practice, very often great control on properties of cement and aggregate is exercised, but the control on the quality of water is often neglected. Since quality of water affects the strength, it is necessary for us to go into the purity and quality of water with pH value of 7.0±1 and confirming to the requirement of IS 456-2000.

MasterGlenium SKY 8233

MasterGlenium SKY 8233 helps to produce high performance concrete with longer workability retention, and high early strength. Mostly compatible with all OPC, PPC, PSC and can be used with high pozzolonic material.

Permeability - increased durability

4. Reduced shrinkage and creep.

8. MIX PROPORTION (M40)

Cement	**Fine aggregate (kg)**	**Coarse aggregate (kg)**	**Water(l)**	**Hypo sludge**
503.97	898.29	809.36	178.4	0.5%
1	1.78	1.61	0.4	

Slump flow test

The slump flow is used to assess the horizontal free flow of HSSCC in the absence of obstructions. It was first developed in Japan (1) for use in assessment of underwater concrete. The test method is based on the test method for determining the slump. The diameter of the concrete circle is a measure for the filling ability of the concrete.

BENEFITS:

1. Elimination of vibration and reduced labour
2. cost in placing Marked increase in early & ultimate strengths Higher E modulus
3. Improved adhesion to reinforcing and stressing

L-BOX TEST

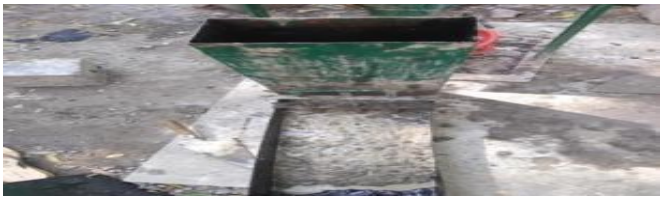
The L – Box test is used to measure the filling and passing ability of self – compacting concrete. This test was originally developed in Japan for underwater concrete the test is also applicable for highly flowable concrete.

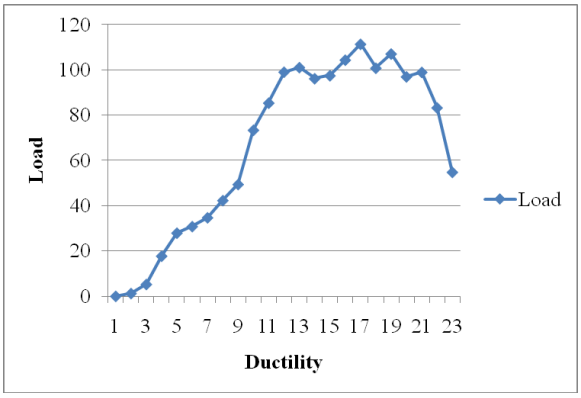
V-Funnel Test

The described V-funnel test is used to determine the filling ability (flowability) of the concrete with a maximum aggregate size of 20mm. The funnel is filled with about 12 litre of concrete and the time taken for it to flow through the apparatus measured. After this the funnel can be refilled concrete and left for 5 minutes to settle. If the concrete shows segregation then the flow time will increase significantly.

J-RING TEST

The test is used to determine the passing ability of the concrete. The equipment consists of a rectangular section (30mm x 25mm) open steel ring, drilled vertically with holes to accept threaded sections of reinforcement bar. These sections of bar can be of different diameters and spaced at different intervals: in accordance with normal reinforcement considerations, 3x the maximum aggregate size might be appropriate. The diameter of the ring of vertical bars is 300mm, and the height 100 mm





Slump Flow Table Value

S.no	Slump flow value	EFNARC Limitation		Slump diameter	EFNARC Limitation	
		Min	Max		Min	Max
1	2.5	2	5	790	650	800
2	2.6			733		
3	3.1			742		

L Box Table Value

Mix	H2 / H1 ratio	Limitation as per EFNARC guidelines	
		Min.	Max
1	0.84	0.8	1.0
2	0.92		
3	0.818		

V Funnel Table Value

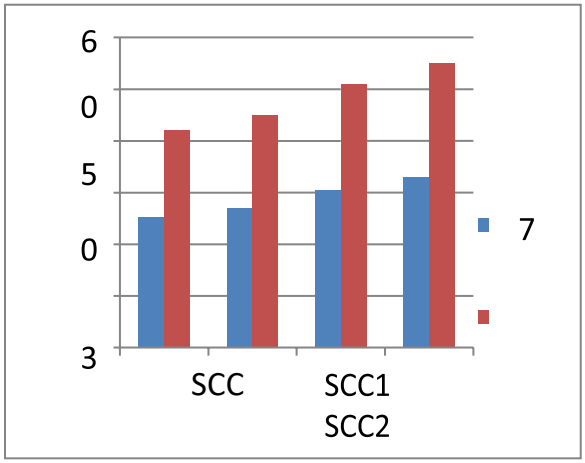
Mix	Flow in 'sec'	EFNARC guidelines	
		Min	Max
1	8.25	8	12
2	9.5		
3	9.35		

Table 3.17 J ring value

Mix	Average length in 'mm'	as per EFNARC guidelines	
		n	Max
1	9.25	0	10
2	8.9		
3	8.2		

COMPRESSIVE STRENGTH

S.no	Specimen	Hypo sludge	7 days	28 days
1	SCC	0%	26.2	43
2	SCC 1	10%	28	48
3	SCC 2	20%	30.8	52
4	SCC 3	30%	22	38



POROSITY

The composition of the SCC/m3

AGE (DAYS)	POROSITY	PORESIZE	INTERPOLATION
1	24.3	119.8-666.6	6.4-18.6
7	13.6	90.2-332.4	5.2-19.5
28	10.62	79.5-233.1	3.9-15.1

CONCLUSION

This Experimental study brief details of self compacting concrete with the effect of filler material such as condensed silica and recron fibre .The work represents the summary of literatures, parametric study of materials and collection of materials, mix design of self compacting concrete as per EFNARC guidelines. Thus the material properties are well studied for producing self compacting concrete.

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