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Aggregate on Self Compacting Concrete Using M70 Grade

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Abstract: Advancement in concrete technology is reducing the consumption of natural resources and energy resources and lessening the burden of pollutant on environment. In this experimental study the aggregate on Self Compacting Concrete is made for M70 grade by using Super Plasticizer and investigating the optimum dosage of it. Self Compacting (SC) which flows under its own weight and homogeneity while completely filling any form work and passing around congested reinforcement. The Self Compacting Concrete produced by using M70 grade and Poly-carboxylate ether base Superplasticizer. Three trials of dosage are test as 0.8%, 1.0%, 1.2%. By investigating those trials the optimum dosage for SCC is taken which gives more Workability and High strength. Compressive Strength were made on Hardened Concrete Specimen.
Keywords: Self Compacting Concrete, M70 grade, Poly-carboxylate ether, Workability, High Strength, Compressive Strength.

I. INTRODUCTION

A. General

Making concrete structures without vibration, have been done in the past. For examples, placement of concrete under water is done by the use of tremie without vibration. Mass concrete, and shaft concrete can be successfully placed without vibration. But the above examples of concrete are generally of lower strength and difficult to obtain consistent quality. Modern application of self-compacting concrete (scc) is focused on high performance, better and more reliable and uniform quality. Recognising the lack of uniformity and complete compaction of concrete by vibration, researchers at the University of Tokyo, Japan, started in late 1980's to develop SCC. By the early 1990's Japan has developed and used SCC that does not require vibration to achieve full compaction. By the year 2000, the SCC has become popular in Japan for prefabricated products and ready mixed concrete.

Several European countries recognised the significance and potentials of SCC developed in Japan. During 1989, the founded European federation of natural trade associations representing producers and applicators of specialist building products (EFNARC)

The utilisation self-compacting concrete started growing rapidly. EFNARC, making use of broad practical experiences of all members of European federation with SCC, has drawn up specification and guidelines to provide a framework for design and use of high quality SCC, during 2001. Most of the information particularly test methods given in this chapter is based on specification and guidelines for self-compacting concrete given by EFNARC.

B. Self-Compacting Concrete (SCC)

Self-compacting concrete has been described as "the moist revolutionary development in concrete construction for several decades". Originally developed in Japan to offset a growing shortage of skilled labour, it has proved to be beneficial from the following points.

1) Faster construction
2) Reduction in site manpower
3) Better surface finish
4) Easier placing
5) Improved durability
6) Greater freedom in design
7) Thinner concrete sections
8) Reduced noise level
9) Safer working environment

II. MATERIALS

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A. Cement

Ordinary Portland cement 43 or 53 grade can be used. Whereas OPC 53 grade is taken here.

B. Aggregate

The maximum size of aggregate is generally limited to 20mm. aggregate of size 10mm to 12mm is desirable for structures having congested reinforcement. Wherever possible size of aggregate higher than 20mm could also be used. Well graded cubical or rounded aggregates are desirable. Aggregates should be uniform quality with respect to shape and grading.

For considerable size 12mm aggregate is choosen as coarse aggregate.

Fine aggregate can be natural or manufactured. The grading must be uniform throughout the work. The moisture content or absorption characteristics must be closely monitored as quality of SCC will be sensitive to such changes.

Particles smaller than 0.125mm i.e.125 microns size are considered as fines which contribute to the powder content.

C. Mixing water

Water quality must be established on the same line as that for using reinforced concrete or prestressed concrete.

D. Chemical admixtures

Super plasticizers are an essential component of SCC to provide necessary workability. The new generation super plasticizers termed poly-carboxylate ethers (PCE) is particulary useful for SCC.

Hence, poly-carboxilate ether (liquid form) is taken as Super plasticizer.

Other types may be incorporated as necessary, such as viscosity modifying agents (VMA) for stability, air entraining agents (AEA) to improve freeze-thaw resistance, and retarders for control of setting.

III. SCOPE AND OBJECTIVE

A. Requirement For Self-Compacting Concrete

The main characteristics of SCC are the properties in the fresh state. The mix design is focused on the ability to flow under its own weight without vibration, the ability to flow through heavily congested reinforcement under its own weight, and the ability to retain homogeneity without segregation. The workability of SCC is higher than “very high” degree of workability mentioned in IS 456:2000.

A concrete mix can only be classified as self-compacting if it has the following characteristics: Filling ability, passing ability, Segregation resistance

Several test methods have been developed in attempts to characterize the properties of SCC. So far no single method or combination of methods has achieved universal approval to include in national or international organisations. However the table 1 gives the list of test methods for workability properties of SCC based on EFNARC specification and guidelines.

For the intial mix design of SCC all the three workability parameters need to be assessed.

TABLE 1: LIST OF TEST METHODS FOR WORKABLITY PROPERTIES OF SCC

SL.NO	METHODS	PROPERTY
1.	Slump flow	Filling ability
2.	T_{50cm} slump flow	Filling ability
3.	J-ring	Passing ability
4.	V-funnel	Filling ability
5.	V-funnel at T_5 minutes	Segregation resistance
6.	L-box	Passing ability
7.	U-box	Passing ability
8.	Fill-box	Passing ability
9.	GTM screen stsability test	Segregation resistance
10.	Orimet	Filling ability

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TABLE 2: THE WORKABILITY PROPERTIES OF SCC AND ALTERNATIVE TEST METHODS.

PROPERTY	TEST METHODS LAB MIX DESING	FIELD QUALITY CONTROL	MODIFICATION OF TEST ACCORDING TO MAX. SIZE AGGREGATE
Filling ability	Slump flow T_{50cm} slump flow V-funnel Orimet	Slump flow T_{50cm} slump flow V-funnel Orimet	None None Max. 16mm
Passing ability	L-box U-box Fill-box	J-ring	Different opening in L-box and J-ring
Segregation resistance	V-funnelatT_5 minutes GTM	G.T.Test V-funnelatT_5minutes	None

For site quality control, two test methods are generally sufficient to monitor production quality. Typical combinations are slump-flow and V-funnel or slump-flow and J-ring. With consistent raw material, even a single test method carried out by trained and experienced technician may be sufficient.

B. Workability Requirement For The Fresh SCC

The following requirements are to be fulfilled at the time of placing. Any changes in workability during transport and other delay should be taken into account in production.

IV. METHODOLOGY

A. Complexities Involved In Making SCC

Normal strength concrete itself is a complex material. High strength and high performance concrete with low water\ binder ratio adds to the complexity. Making self-compacting concrete, particularly of high strength, adds further to the complexity.

Generally self-compacting concrete is used in situations for concrete requiring high strength say over 40Mpa or more. Production of such high strength concrete would require the use of relatively low binder\water ratio. Binder generally includes silica fume also. Use of silica fume while increasing the strength reduces the workability to an unacceptable level for self-compacting requirements.to store the workability or even to have much higher level of workability needed for scc, a higher dose of super platicizer is needed. Very high dosage of super plasticizer could lead to two major problems. Firstly, all the super plasticizers available in the market are not suitable for application at high dosage. Therefore it is important to choose the one that could be used without causing adverse side effect such as excessive retardation, at the same time the one that could retain the slump for sufficiently long time. The super plasticizers based on naphthalene or melamine are generally not suitable for self-compacting concrete requiring very high strengths

Initial trial for finding the compatibility between super plasticizer and cement, at very low water\binder ratio is also required to be ascertained.

Another point for consideration is that, there is tendency for using relatively large binder paste volume in order to achieve both high strength and self-compacting properties. From all round performance point of view, the use of large binder paste volume is undesirable as it would lead to higher heat of hydration, greater shrinkage and creep.

B. New Generation Plasticizers

From various studies for production of scc it was found to use poly-carboxylate based super plasticizer(pc).this next generation super plasticizer or what is sometimes called hyper plasticizer is more is more efficient than naphthalene or melamine based super plasticizer with respect to plasticizing property and slump retention property. They cause dispersion of fine particles more by steric hindrance of many side long chain of pc than only zeta potential of naphthalene based or melamine based plasticizers. Such

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polycarboxylatebased(PC), multi carboxylatehers(MCE) or carboxylic acrylic ester (CAE)etc,are available in India.

C. Viscosity Modifying Agent

Another important material required for production of scc.is viscosity modifying agent (VMA).one of the methods of improving the stability of flowing Scc is to increase the paste content by using large amount of filler active or inert of late, however, attempts are being made to reduce the fines content (the paste content)with a view to reduce shrinkage and creep by using VMA for stability VMAs have been in use for long time for under water concreting in the past. Now their use is extended to Scc. Most VMAs contain polysaccharides as active ingredient. Some starches could also be used for control of viscosity. diutan gum are often become part of certain viscosity modifying admixture.it is claimed that such VMA becomes compatible with all super plasticizers.

One must be careful about the sequence of addition of VMA and super plasticizer into Scc. VMA should be added after super plasticizer is added and mixed with cement particles. If VMA is added before super plasticizer, it swells in water and dispersion of super plasticizer in concrete becomes difficult. Usually VMA is added in a small dose 0.2 to 0.5 per cent by weight of the binder content.

Availability of new generation super plasticizer and VMA in India for Scc

The following table gives the brand names of new generation super plasticizer and VMA available in India.

S.NO	NAMES OF CHEMICAL ADMIXTURES MANUFACTURING COMPANIES	NEW GENERATION SUPERPLASTICIZERS FOR SCC	VMA FOR SCC
1	MC bauchemie (ind)pvt.ltd	Muraplast FK 63 FK 61	Centramentstabi 510 (non-organic base)
2	BASF	Glenium 51 Glanium B 233	Glanium Stream – 2
3	Fosroc	Structuro	-
4	Sika	VISCO crete-1	Sika stabilizer 229
5	Burgin and leonsagenturenpvt.ltd	-	Kelco-crete 200 (containing diutan gum)

D. BASF: The chemical company

1) *Masterglenium sky 8233(formerly glenium B233):* High –performance super plasticizer besed on PCE (polycarboxylic ether)for concrete
2) *Description:* Masterglenium sky 8233 is an admixture of a new generation based on modified polycarboxylic ether. The product has been primarily developed for applications in high performance concrete where the highest durability and performance is required.

Masterglenium sky 8233 is free of chioride& low alkali.it is compatible with all types of cements.

Recommended uses

Production of rheodynamic concrete

High performance concrete for durability

High early and ultimate strength concrete

Precast &pre stressed concrete

Concrete containing pozzlans such as microsllica,GGBFS,PFA, including high volume fly ash concrete.

3) *Performance test data*

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aspect	Light brown liquid
Relative density	1.08±0.01at x25ºc
pH	≥6
Chloride ion content	<0.2%

4) *Workability:* Masterglenium sky 8233 ensures that rheoplastic concrete workable in excess of 45 minutes at +25ºC. workability loss is dependent on temperature, and on the type of cement, the nature of aggregates, the method of transport and initial workability. To achieve longer workability period please use masterset RT55.

V. MIX DESIGN AND PROPORTION

A. Mix Design of M70 Grade

STEP 1: STIPULATIONS FOR PROPORTIONING

a) Grade designation : M70

b) Type of Cement : OPC53 grade conforming to IS12269 [IS456 pg:13, 5.1]

c) Maximum nominal size of aggregate : 10mm

d) Minimum Cement content: 320Kg/m³ [IS456 Table: 5]

e) Maximum Water Cement ratio: 0.40 [IS456 Table: 5]

f) Workablity: Collapsible

g) Exposure condition : Severe (for reinforcement concrete) [IS456 pg:18, 3]

h) Method of concrete : Pumping

j) Degree of supervision : Good

k) Type of aggregate : Angular aggregate

m) Maximum Cement content : -

n) Chemical Admixture type : Super plasticizer (Polycarboxilate ether) [Liquid form]

STEP 2: TEST DATA FOR MATERIALS

a) Cement used : OPC 53 Grade concforming to IS 12269

b) Specific gravity of Cement : 3.15

c) Chemical Admixture : Super plasticizer conforming to IS 9103

d) Specific gravity of

1) Coarse aggregate : 2.74

2) Fine aggregate : 2.74

e) Water absorption:

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1) Coarse aggregate : 1.06

2) Fine aggregate : 1.32

f) Setting time of Cement:

1) Initial time : 135 min

2) Final time : 310 min

STEP 3: TARGET STRENGTH FOR MIX PROPORTIONING

$f_{CK}' = f_{CK} + 1.65$ S

Where;

f_{CK}' = Target average compressive strength @ 28 days

f_{CK}= Characteristic compressive strength @ 28 days

S = Standard deviation

From table 8, Standard deviation S = 5N/mm² [IS456]

Therefore;

Target strength = 70+ (1.65 x 5)

= 78.25 N/ mm²

STEP 4: SELECTION OF WATER CEMENT RATIO

From Table 5 of IS456, Maximum Water Cement ratio = 0.40

Based on experience, adopt Water Cement ratio as 0.35

STEP 5: SELECTION OF WATER CONTENT

From table 2,

Maximum Water content for 10mm aggregate = 208 litre

As Super plasticizer is used, the water content can be reduced up to 20 % and above.

Based on trials with super plasticizer water content reduction of 20% has been achieved.

Hence arrived Water content = 208 x 0.8

STEP 6: CALCULATION OF CEMENT CONTENT

Therefore ,0.35 for Water Cement ratio for M70 grade

Water Cement ratio = 0.35

= 166

Cement content $=\frac{166}{0.35}$

= 475 Kg / m³

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From table 5 of IS 456,

Minimum Cement content for "Severe" exposure condition = 475Kg / m^3

STEP 7: PROPORTION OF VOLUME OF COARSE AGGREGATE AND FINE AGGREGATE CONTENT

From table 3, Volume of Coarse aggregate corresponding to 10mm size aggregate and Fine aggregate (Zone II) for water cement ratio of 0.50 = 0.46.

In the present case Water Cement ratio is 0.35.Therefore, Volume of Coarse aggregate is required to be increased to decrease the Fine aggregate content.As the Water Cement ratio is lower by 0.10 the proportion of Volume of Coarse aggregate is increased by 0.02(@ the rate of -/+ 0.01 for every ± 0.05 change in Water Cement ratio)

Therefore corrected proportion of Volume of Coarse aggregate for the Water Cement ratio of 0.35 = 0.49

For pumpable concrete these values should be reduced by 10%.

Therefore, Volume of Coarse aggregate = 0.49

Volume of Fine aggregate content =1 – 0.49

= 0.51

STEP 8: MIX CALCULATION

The mix calculations per unit Volume of Concrete shall be as follows:

a) Volume of Concrete = 1m^3
b) Volume of Cement $= \frac{mass\ of\ Cement}{specific\ gravity\ of\ Cement} x \frac{1}{1000}$

$$\frac{475}{3.15} x \frac{1}{1000}$$

= 0.150 m^3

c) Volume of Water $= \frac{mass\ of\ Water}{specific\ gravity\ of\ Water} x \frac{1}{1000}$

$= \frac{208}{1} x \frac{1}{1000}$

= 0.208 m^3

d) Volume of chemical admixture (Super plasticizer @ 2.0 % by mass of Cementitious material) = $\frac{mass\ of\ Chemical\ admixture}{specific\ gravity\ of admixture} x \frac{1}{1000}$

$=\frac{3.8}{1.08} x \frac{1}{1000}$

= 0.003 m^3

e) Volume of all in aggregate = [a - (b + c + d)]

= [1- (0.150 + 0.208 + 0.003)]

= 0.638 m^3

f) Mass of Coarse aggregate = e x Volume of Coarse aggregate x Specific gravity of Coarse aggregate x 1000

= 0.638 x 0.49 x 2.74 x 1000

= 856 kg

g) Mass of Fine aggregate = e x Volume of Fine aggregate x Specific gravity of Fine aggregate x 1000

= 0.638 x 0.51 x 2.74 x 1000

= 891 kg

STEP 9: MIX PROPORTION FOR TRIAL NUMBER 1.

Cement = 475 kg / m³

Water = 166 kg / m³

Fine aggregate = 891 kg (IS 650:1991)

Coarse aggregate = 856 kg

Chemical admixture = 3.8 kg / m³

Water Cement ratio = 0.35

Hence, the proportion is 1 : 1.8 : 1.8

VI. PRODUCTION & PLACING

A. *Initial Mix Composition*

In the design of mix, the relative proportions of the key components may be considered by volume rather than by mass. Indicative proportions of materials are shown below for self compactability.

1) Water/powder ratio by volume is to be 0.80 to 1.00
2) Total powder content to be 160 to 240 litres (400 – 600kg)per m³
3) The sand content may be more than 38% of the mortar volume
4) Coarse aggregate content should normally be 28 to 35% by the volume of the mix
5) Water/cement ratio is selected based on strength. In any case water content should not exceed 200litres/m³

TABLE 3: TYPICAL ACCEPTANCE

SL.NO	METHOD	UNIT	TYPICAL RANGES OF VALUES	
			MINIMUM	MAXIMUM
1.	Slump flow	mm	650	800
2.	T_{50}cm slump flow	sec mm	2	5
3.	J-ring	sec	0	10
4.	V-funnel	(h2/	8	12
5.	L-box	h1)	0.8	1.0

B. *Criteria For SCC*

The following method listed above in the table are done for the test of workability of aggregate. Their acceptance criteria are taken as reference. One must beat in mind that there is going to be some variation in raw material quality and variation in moisture content in aggregate. After laboratory trials, the mix should be tested at full scale at the concrete plant or site. In the event of not getting satisfactory performance, the mix should be readjusted in respect of type and quality of filler material proportions of F.A or C.A, dosage of super plasticizer and VMA. Try also alternative type of super plasticizer which may be more compatible.

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C. Production and Placing

1) Aggregate: Aggregate should come from same source. There should not be much variation in size, shape and moisture content.

2) Mixing: Any suitable mixer could be used – generally, mixing time need to be longer than for conventional concrete. Time of addition of admixture is important. A system should be established for optimum benefit during trial itself. In the beginning there may be fluctuations in the quality of freshly mixed concrete. It is recommended that every batch must be tested until consistent and compliant results are obtained. Subsequently, checking could be done "by the eye" and routine testing is sufficient.

3) Placing: Formwork must be in good conditions to prevent leakage. Though it is easier to place SCC than ordinary concrete, the following rules are to be followed to minimize the risk of segregation.

a) Limit of vertical free fall distance to 5 meter
b) Limit the height of pour lifts (layers) to 500mm
c) Limit of permissible distance of horizontal flow from point of discharge to 10 meters.

4) Curing: On account of no bleeding or very little bleeding, SCC tends to dry faster and may cause more plastic shrinkage cracking. Therefore, intial curing should be recommenced as soon as practicable. Alternatively the SCC must be effectively covered by polyethylene sheet. Due to the high content of powder, SCC can show more plastic shrinkage or creep than ordinary concrete mixes. There are disagreements on the above statement. Theses aspects should be considered during designing and specifying SCC. It should also be noted that early curing is necessary for SCC.

VII. EXPERIMENTAL TEST METHODS

A. Test Methods

It is important to mention that none of the test methods for SCC has yet been standardized and the tests mentioned below are not yet perfected. They are mainly adhoc method which have been devised for SCC.

B. Slump flow test

The slump flow test is done to assess the horizontal flow of concrete in the absence of obstructions. It is a most commonly used test and gives good assessment of filling ability. It can be used at site. The test also indicates the resistance to segregation.

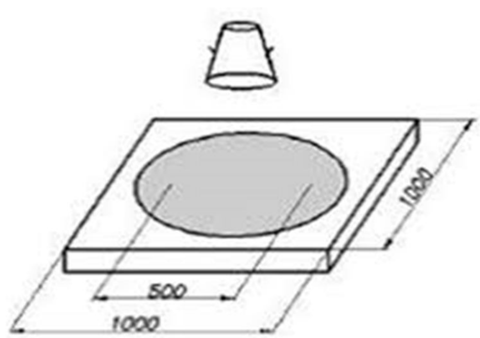

Fig.1. Slump flow test

FIG 1: SLUMP FLOW TEST

1) Equipment's:

The usual slump cone having base diameter of 200 mm, top diameter 100mm and height 300 mm is used.

a) A stiff base plate square in shape having at least 700mm side. Concentric circle are marked around the centre point where the slump cone is to placed. A firm circle is drawn at 500mm diameter
b) A towel
c) Scoop
d) Measuring tape

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e) Stop watch

2) *Procedure:* About 6 litre of concrete is taken for the test. Placed the base plate on level ground. Kept the slump cone centrally on the base plate. Filled the cone with the help of scoop. And made sure that not to tamp. Striked of the concrete level with the trowel simply. Removed the surplus concrete lying on the base plate. Raised the cone vertically so that the concrete are allowed to flow down freely. Measured the final diameter of the concrete in two perpendicular direction with the help of tape and calculated the average of the two diameters. And noted it in mm. where noted that there is no water or cement paste or mortar without coarse aggregate is seen at the edge of the spread concrete.

FIG 2: COLLAPSIBLE SLUMP

3) *Interpretation:* The higher the flow value, the greater its ability to fill formwork under its own weight. A value of at least 650 mm is required for SCC. In case of severe segregation, most coarse aggregate will remain in the centre of the pool of concrete and mortar and paste at the periphery of concrete.

C. *T_{50} CM Slump Flow Test:*

The procedure for this test is same as for slump flow test. When the slump cone is lifted, started the stop watch and found the time taken for the concrete to reach 500mm mark. This time is called as T_{50}time. This is an indication of rate of spread of concrete. A lower time indicates greater flowablity. It is suggested that T_{50} time may be 2 to 5 seconds.

D. J-Ring Test:

J-ring test denotes the passing ability of the concrete. The equipment consists of rectangular section of 30mm x 25mm open steel ring drilled verically with holes to accept threaded sections of reinforcing nars 10mm diameter 100mm in length. The bars and sections can be placed at different distance apart to simulate the conjestion of reinforcement at the the site. Generally these sections are placed 3x maximum size of aggregate. The diameter of the ring formed by vertical sections is 300mm and height 100mm.

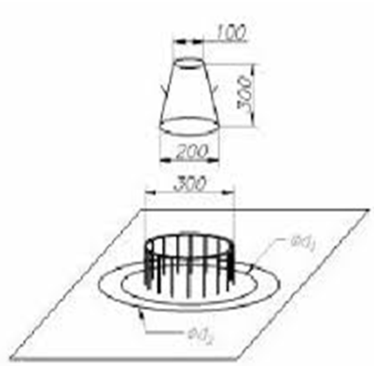

FIG 3: J-Ring Test

1) *Equipments:*

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a) Slump cone without foot pieces
b) Base plate atleast 700mm square
c) Trowel
d) Scoop
e) Tape
f) J-ring rectangular section 30mm x 25mm planted vertically to form a ring 300mm dia generally at a spacing of 48 ± 2mm.

2) *Procedure:* About 6 litres of concrete is taken for the test. Moisten the inside of the slump cone and base plate. Placed the J-ring centrally on the base plate and the slump cone centrally inside the J-ring. Filled the slump cone with the help of the scoop without any form of tamping. Simply striked off the concrete level with trowel. Removed all surplus concrete. Raised the cone vertically and so that it allows the concrete to flow out through the J-ring. Measured the final diameter in two perpendicular directions. And also calculated the average diameter. Measured the difference in height between the concrete just inside the J-ring bars and just outside the J-ring bars. Calculated the average of the difference in height at four locations in mms. Noted that in any border of mortar or cement paste without coarse aggregate at the edge of the concrete. The acceptable difference in height between inside and outside should be between 0 and 10mm.

FIG 4: Unsegregated And Cohesive Concrete Coming Out Of J-Ring

E. V-FUNNEL Test

This test was developed in Japan. The equipment consits of a V-shaped funnel shown in diagram below. The V-funnel test is used to determine the filling ability (flowability) of the concrete with a maximum size of aggregate 20mm size. The funnel is filled with about 12 litre of concrete. Find the time taken for it to flow down. After this the funnel can be filled with concrete and left for 5 minutes to settle. If the concrete shows segregation then the flow time will increase significantly.

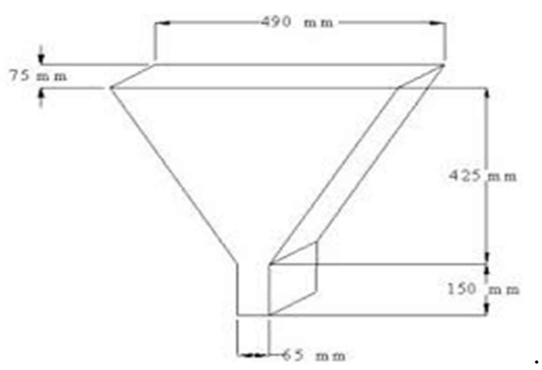

FIG 5: V-FUNNEL TEST

1) *Equipment:*
a) V-funnel
b) Bucket 12 litres
c) Trowel

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d) Scoop
e) Stopwatch
2) *Procedure:* About 12 litre of concrete is taken for the test. The setting of V-funnel is done on the firm ground. Moisten inside of the funnel. Kept the trap door open to remove any surplus water. Closed the trap door and placed the bucket underneath. Filled the apparatus completely with concrete – no compaction or tamping is done. Stiked off the concrete to a level. The trap door is opened within 10 seconds and recorded the time taken for the concrete to flow down. And also recorded the time taken for empltying. This can be judged when tha light is seen when viewd from top. The whole test is performed in 5 minutes.

FIG 6: V-FUNNEL TESTS EQUIPMENT

VIII. RESULT AND DISCUSSION

A. *Compression Test*

This test is done to determine the cube strength of concrete mix prepared. The test is conducted on the 3rd, 7th, 14th day and the 28th day and its observation are listed below.

Table4: 3days Compressive Strength Result

Replacement % of PSA	Cube Weight (kg)	Load (kN)	Compressive Strength (N/mm^2)	Average Compressive Strength (N/mm^2)
Control	8.320	1037.7	46.12	46.12
	8.485	989.3	43.96	
	8.680	1086.5	48.28	
0.8%	8.505	862.4	38.33	40.37
	8.515	1001.1	44.49	
	8.585	1064.3	47.30	
1.0%	8.415	933.5	41.48	40.86
	8.410	885.1	39.35	
	8.400	940.8	41.77	
1.2%	8.405	964.1	42.85	43.36
	8.315	899.5	39.97	
	8.350	1063.5	47.26	

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Table 5: 7days Compressive Strength Result

Replacement % of PSA	Cube Weight (kg)	Load (kN)	Compressive Strength (N/mm^2)	Average Compressive Strength (N/mm^2)
Control	8.320	1037.7	46.12	80.12
	8.485	989.3	43.96	
	8.680	1086.5	48.28	
0.8%	8.505	862.4	38.33	70.37
	8.515	1001.1	44.49	
	8.585	1064.3	47.30	
1.0%	8.415	933.5	41.48	73.86
	8.410	885.1	39.35	
	8.400	940.8	41.77	
1.2%	8.405	964.1	42.85	77.36
	8.315	899.5	39.97	
	8.350	1063.5	47.26	

Table 6: 14days Compressive Strength Result

Replacement % of PSA	Cube Weight (kg)	Load (kN)	Compressive Strength (N/mm^2)	Average Compressive Strength (N/mm^2)
Control	8.320	1037.7	46.12	59.12
	8.485	989.3	43.96	
	8.680	1086.5	48.28	
0.8%	8.505	862.4	38.33	50.37
	8.515	1001.1	44.49	
	8.585	1064.3	47.30	
1.0%	8.415	933.5	41.48	53.86
	8.410	885.1	39.35	
	8.400	940.8	41.77	
1.2%	8.405	964.1	42.85	56.36
	8.315	899.5	39.97	
	8.350	1063.5	47.26	

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Table 7: 28days Compressive Strength Result

Replacement % of PSA	Cube Weight (kg)	Load (kN)	Compressive Strength(N/mm^2)	AverageCompressive Strength (N/mm^2)
Control	8.320	1037.7	46.12	65.12
	8.485	989.3	43.96	
	8.680	1086.5	48.28	
0.8%	8.505	862.4	38.33	59.37
	8.515	1001.1	44.49	
	8.585	1064.3	47.30	
1.0%	8.415	933.5	41.48	61.86
	8.410	885.1	39.35	
	8.400	940.8	41.77	
1.2%	8.405	964.1	42.85	63.36
	8.315	899.5	39.97	
	8.350	1063.5	47.26	

Fig 7: Cube in compression testing before cracking

Fig 8: Concreting of cubes

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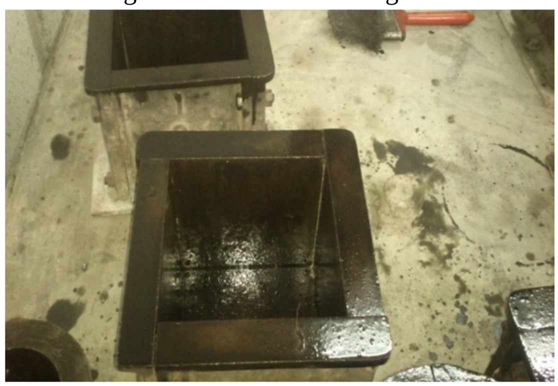
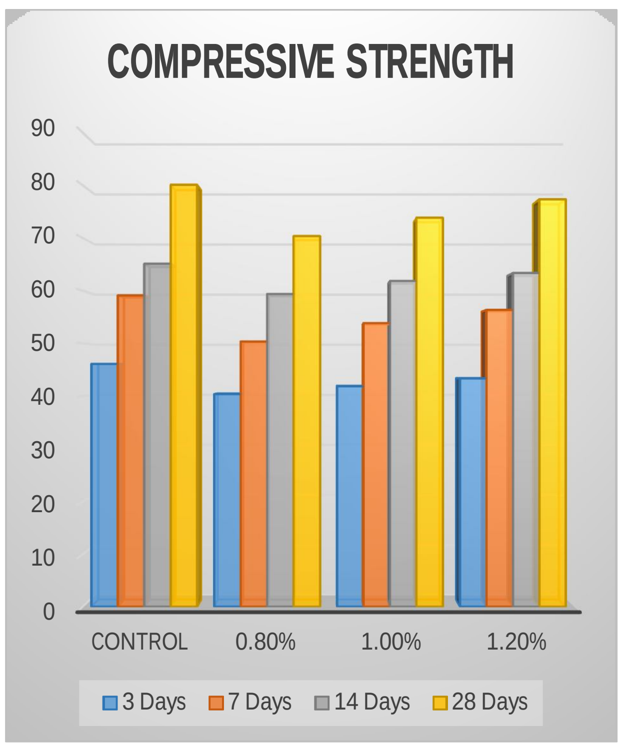
Fig 9: 15cm x 15cm x 15cm cube moulds

Fig 10: The cubes are being oiled





Contemporary architectural buildings set new, high technological requirements. Concrete which appears in all contemporary architectural buildings adapts to these new building conditions. Thus, today we can speak of self-compacting concrete which is transported by pumps to heights even up to 600 m, about concrete which can be continually placed into congested reinforcement and

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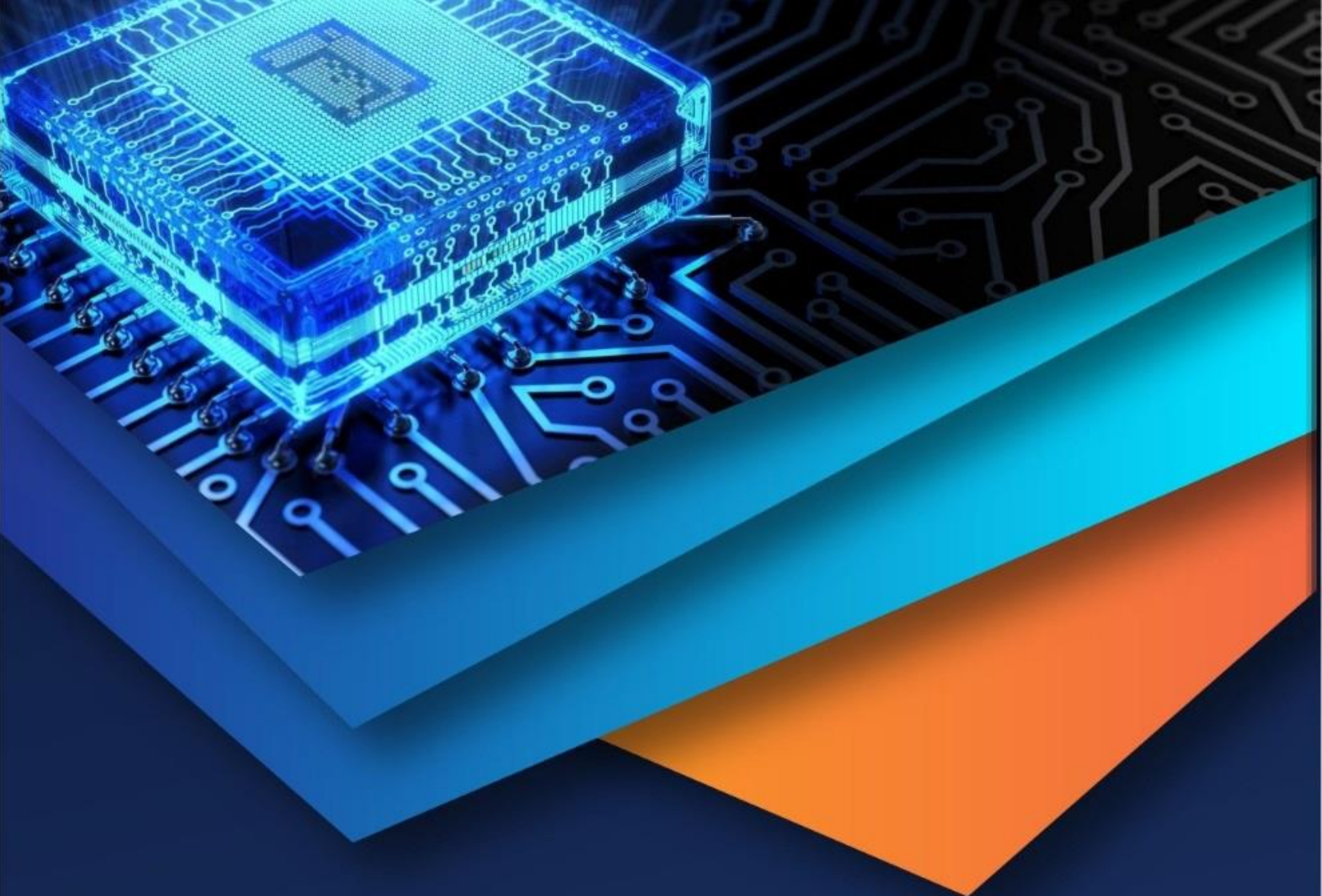
which can be allowed to flow and can be placed into forms under the action of self-weight only, without vibration. Self-compacting concrete appeared as a response to increased conditions of reinforced concrete buildings durability and high-quality smooth surface of architectural concrete

IX. CONCLUSION

Self Compacting Concrete using M70 grade and Poly-carboxylate ether based Superplasticizer with the dosage of 0.8%, 1.0% and 1.2%. Finally,SCC with the dosage of 1.2% Poly-carboxylate ether is gives the Higher Compression Strength when compared to other dosages. SCC gives more Workability and High Strength.

REFERENCES

[1] Champion, j. m. and Jost, p., 'self-compacting concrete: expanding the possibility of concrete design and placement', concrete international, vol.22, no.4, pp. 159-178, June 1998.
[2] Heine, Hans j. "saving dollars through sand reclamation - part 1," foundry management and technology. 111:5 (may, 1983), pp. 22-25
[3] Henderson, n. "Self-compacting concrete at millenium point", concrete, vol.34, no. 4, April 2000, pp.26-27.
[4] Kameswara Rao, c.v.s (1983) "analysis of some common workability tests". Indian concrete journal, 57 (3): 71-73 and 75.
[5] Kathy stanfield, "self-compacting concrete a growth area", the str.engg. vol. 76, no's 23and 24, pp. 462-463.
[6] Nagataki, s. and fujiwara, h. "self-compacting property of highly-flowable concrete" ici journal July-September 2002.
[7] Klaus holschemacher, "structural aspects of selfcompacting concrete", nbm&cw, July 2002, pp. 8-12.
[8] Mahindrakara.b. research work study on red mud by, klescet, Belgaum, 1999.
[9] Mehta, p.k., 'concrete structure: properties and materials', prentice hall, pp. 367-378, 1986. ici journal July-sep 2002.
[10] Michael j. Campion and Philippe Jost, "selfcompacting concrete", concrete int. 2000, pp. 31-34.
[11] Okamura, h (1997), "self-compacting high performance concrete", concrete international, vol. 19, no. 7, pp-5054.



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