

Use of Locally Available Material in Preparation of Self Compacting Concrete and Its Application

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Abstract—In India the construction sector is growing at very high rate with high demand of housing. For the sustainable development there is great requirement of self-compacted concrete (SCC). However, the compaction is difficult in precast structures, so there is high demand of SCC. Use of locally available material to form SCC can overcome the problem faced by construction industries as fine aggregates and coarse aggregate have different properties as per their source of formation. In these paper case study is done on the formation of SCC using locally available material in Aspire Building Project under ARG Group. The compressive strength of SCC is M30.

Keyword: Of self-compacted concrete, sustainable.

1. INTRODUCTION

In India Self -compacted concrete is used in less projects, because the main problem is of proper guidance and lack of papers. As the property of material in India varies from place to place so, a proper guideline is not provided for the construction field. The use of fly ash, Silica Gel can vary the property of SCC.[1]

2. MATERIAL USED

Mainly the materials used are locally available such as fly ash, ground granulated blast furnace slag (GGBS), fine aggregate, coarse aggregate and water as per the availability. Admixture is used as per the suitability and cement used is OPC of grade 53 for the preparation of SCC. [2]

The fly ash used is taken from the Thermal Power Plant (TPP), Kota. The fly ash used is of various properties as discussed below in table 1. The aggregate used are in size ranging from 12.5 mm to 10mm as per the suitability. The SCC is prepared using crushed sand at the place of river sand due to its better property. [3]

Table 1: Properties of Fly Ash

Parameter	Properties
Source	TPP, Kota
Specific Gravity	2.11
Fineness by Blaine	328m ² /kg

TABLE-2 PROPERTIES OF COURSE AGGREGATE

Parameters	Properties	
Particle Size Distribution	IS Sieve Size	% Passing
	12.5mm	91.8
	10mm	60.6
	4.75mm	1.98
	2.36mm	0.93
Specific Gravity	2.74	
Water Absorption	0.56%	
Impact Value	17 to 21	
Dry Loose Bulk Density	1402kg/m ³	

Table 3: Properties of Crushed Sand

Parameters	Properties	
Particle Size Distribution	IS Sieve	% Passing
	10mm	100
	4.75mm	93.7
	2.36mm	75.6
	1.18mm	53.9
	0.600mm	48.1
	0.300mm	33.3
	0.150mm	18.2
	0.075mm	7.1
Specific Gravity	2.73	
Water Absorption	2.45%	
Dry Loose Bulk Density	1400kg/m ³	
Fineness Modulus	2.6-3.0	

The preparation of concrete from above crushed sand requires high quality control at site. Water added in concrete was taken from bore at site and other sources. Water was also replaced by ice cubes to maintain the temperature of concrete at proper limit and temperature of water was also kept at minimum temperature. [4]

Admixture used was tested before to meet the satisfactory results with cement of different companies as the cement used on site can be of different companies. Sulphonated Naphthalene Formaldehyde (SNF) type admixture is used for

making SCC. Properties of admixture are discussed below in table 4.

Table 4: Properties of Admixture

Parameters	Properties (SNF)
Specific Gravity	1.21
Color	Dark brown
PH Value	8.25
Solid Content	44.56
Ash Content	14.37

3. MIX DESIGN AND FRESH/HARDENED PROPERTIES

Mix Design is done on the basis of requirement of early strength of concrete for the removal of formwork and grade of concrete. The mix design is calculated as per IS 10262: 2009 [5,6].

The various properties of concrete are discussed below in table 5, 6 and 7.

Table 5: Mix Design for M30 SCC

Material	Quantity (kg/m ³)
OPC 53 Grade	335
Fly Ash	155
10mm Coarse Aggregate	870
Crushed Sand	780
Total Water	525
Admixture	5.35

Table 6: Properties of Fresh Concrete

Study	Batching Plant
Flow at the time of placing	620-650
V ₀ and V ₅ Seconds	5&8 to 7&11
L Box	0.75 - 0.85
T ₅₀₀	3 seconds

Table 7: Compressive Strength of Concrete

Age in Days	Compressive Strength (N/mm ²)	Statistical Data at 28 days
1	10 to 15	Standard Deviation 2.5 MPa C ₀ V 1.5 (Average for the project)
2	18 to 25	
3	20 to 26	
7	30 to 38	
28	39 to 50	
56	50 to 60	

4. CONCLUSION

Formation and use of SCC requires understanding of properties of material and requirement of properties such as workability, method of placing and many other factors. Mainly particle size distribution should be focused and sufficient particle size passing from 0.150mm crushed sand which plays important role in SCC mix design. The material should be added in such quantity to make desired grade of SCC.

Control over crushed fines which are passing from 0.150mm and 0.075mm sieve is mandatory even though they helps in contribution to powder content. The addition of fine crushed should be modified suitably by the SNF admixtures as it can produce low strength grade of SCC.

It should be very careful while placing the SCC as it can help in better surface finishing and provides good quality of concrete.

As in India the properties of material vary from place to place so, it could not be possible to use single guideline for the particular project.

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