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Study on strength properties of SCC with partial replacement of granite sludge

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Abstract –

SCC is highly engineered concrete with much higher fluidity without segregation & is capable of filling every corner of the formwork under its self weight. Thus SCC eliminates the need of vibration either external or internal for the compaction of concrete eithout compromising its engineered properties.
The assurance of nature is a fundamental aspect, which is specifically associated with the survival of civilization. Parameter like ecological awareness, defence of natural resources, maintainable improvement assume a fundamental part in present day necessity for development. Remembering this in this review the fresh & harden properties of SCC utilizing granite waste as a partial replacement for cement were assessed. Cementatious material in the mix was replaced with granite waste at 10%, 14%, 18% & 20% by weight of cement. The result shows that the use of granite waste will build the quality of SCC when compared with the normal SCC but it should not exceed 10% of granite waste..

Key Words: SCC, Mineral admixture, Granite sludge

1.INTRODUCTION

Concrete is the most basic element of any kind of construction work. No matter what type of building structure it is, the concrete used study & well compacted.

The main reason for comoacting the concrete is to ensure maximum density & to ensure concrete used is full in contact with steel & formwork.

SCC is defined as " Concrete that is able to flow and consolidate under its own weight , completely fill the formwork even in the presence of dense reinforcement , while maintaining homogeneity without the need of additional compaction ".

SCC should contain :

- Lower coarse aggregate content
- Higher amount of sand & cementaious material
- Lower water cement ratio
- Higher super plasticizers ratio

1.1 Objective of persent investigtion:

- To know the improvements of SCC by utiizing granite sludge
- Designed by replacing the cement by granite sludge
- Study the fresh & hardened properties of SCC mic in laboratory by different methods.
- To study the comparitiveness

1.2 Scope of study:

In present investigation, to accomplishes the SCC by replacing the cement with granite sludge.
Trail 1: Utilize 100% cement & 0% granite sludge
Trail 2: Utilize 90% cement & 10% grante sludge
Trail 3: Utilize 80% cement & 20% granite sludge
Trail 4: Utilize 86% cement & 14% granite sludge
Trail 5 : Utilize 82% cement & 18% granite sludge

2. Materials used & tests conducted on it:

CEMENT:

Table -1: Tests & Results of cement

Tests conducted & its results		
Test conducted	**Result obtained**	**Requirement as per IS**
Specific gravity	3.12	3.15
Standard consistency	28	33-34
Intial setting time (mm)	60	Not less than 30
Final setting time (mm)	600	Not more than 600
Finess (%)	7.9	Not more than 10

FINE AGGREGATE:

Table 2- : Tests & Results of FA:

Tests conducted & its results		
Test conducted	**Result obtained**	**Requirement as per IS**
Specific gravity	2.67	2.6-2.8
Bulk density (Kg/m^3)	1448.57	Not more than 1713
Water absorption (%)	0	Should not be more than 1% for construction
Fineness modulus (%)	2.824%	2.6-2.9

COARSE AGGREGATE:

Table -3: Tests & Results of CA

Tests conducted & its results		
Test conducted	**Result obtained**	**Requirement as per IS**
Specific gravity	2.6	2.6-2.8
Bulk density (Kg/m^3)	1384.90	Not more than 1713
Water absorption (%)	0.11%	Should not be more than 1% for construction
Fineness modulus (%)	7.61%	6.5-8.5

CHEMICAL ADMIXTURE:

Table -4: Tests & Results of Chemical admixtures

Parameters & Specifications	
Specific gravity	1.08-1.13
Chlorine content	NIL
Air entrainment	Approx. 1% additional air is entrained
Compatibility	Can be used with all types of cements except high alumina cement.

GRANITE SLUDGE:

Table -5: Tests & Results of Granite Sludge

Tests conducted & its results		
Test conducted	**Result obtained**	**Requirement as per IS**
Specific gravity	2.61	Not more than 2.85
Colour	Light gray	White/ light gray
Odour	No odour	No odour
Particle size	2.5 micron	2.5 micron

2. MIX DESIGN:

In this investigation we use Nan –Su mix design method for achieving SCC.

- Characteristics strength: 50MPa
- Maximum size of aggregate: 12.5mm
- Specific gravity of CA:2.6
- Specific gravity of FA: 2.67
- Specific gravity of cement: 3.12
- Bulk density of loose CA: 1384.9 Kg/m3
- Bulk density of loose FA: 1448.57Kg/m3
- Volume of fine/coarse aggregate ratio (s/a): 0.55

Coarse aggregate determination :
Amount of CA(Wca) = PF*Wca *(1-s/a)
Assume PF = 1.15
Wca =1.15*1384.9*(1-0.55) =716.68Kg/m^3

Fine aggregate determination :
Wfa =PF*Wfa*(s/a)
Amount of fine aggregate(Wfa) =1.15*1448.57*0.55=916.22 Kg/m^3

Determination of cement :
C=F'c/0.11
Cement content= 58.25/0.11=529.540 Kg/m^3

Determination of water:
For W/C ratio for 58.25MPa is =0.34
W/C = (W/C)/C
=0.34*529.540
W=180.640Kg/m^3

Determination of SP dosage:
SP dosage= 1.2 % (529.54) = 6.35 kg/m^3.

SCC mix proportion for grade M50 =1:1.730:1.353 with W/C ratio = 0.34.
For 1m3 of volume quantise of materials:

Cement =529.540 Kg/m^3
Coarse aggregate=716.68Kg/m^3
Fine aggregate =916.22Kg/m^3
Water= 180.64 Litre/m^3
SP dosage = 6.35 Kg/m^3.

Table -6: Details of materials for trails

Materials	Trail 1	Trail 2	Trail 3	Trail 4	Trail 5
Cement	16.08Kg	14.475 Kg	12.864 Kg	13.82 Kg	13.185 Kg
FA	27.830 Kg	27.830 Kg	27.830 Kg	27.830 Kg	27.830 Kg
CA	21.76Kg	21.76Kg	21.76Kg	21.76Kg	21.76Kg
Water	5.48Li	5.48Li	5.48li	5.48li	5.48li
Super plasticizers	0.198li	0.198li	0.198li	0.198li	0.198li
Granite Sludge	-	1.605Kg	3.216Kg	2.26Kg	2.895Kg

2.1 TESTS & RESULTS :

Table -7: Fresh concrete Specifications & Results

Specifications & Results on fresh concrete		
Specifications	**Filling ability**	**Flowing ability**
NSCC	661	0.8
GS10%	693	0.8321
GS20%	699	0.868
GS14%	703	0.958
GS18%	707	0.988

Table -8: Hardened concrete Specifications & Results

Specifications & Results on hardened concrete			
Specifications	**Compressive strength @ 7 days**	**Compressive strength @ 14 days**	**Compressive strength @ 28 days**
NSCC	35.10	44.37	49.898
GS10%	42.227	49.24	53.96
GS20%	33.93	43.22	45.083
GS14%	39.41	47.65	49
GS18%	35.06	44.50	45.42

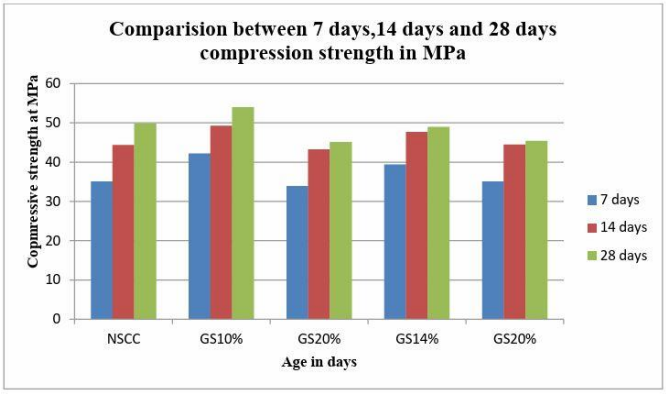

Chart -1: Compressive strength between 7, 14 & 28 days

3. CONCLUSIONS

- SCC could be created without using VMA as done in this investigation.
- The compressive strength increases upto 10% of granite sludge by replacement with cement.
- If we further increase above 10% strength will be decreased.
- By using granite waste material, the cement consumption will be reduced & help for ecological balance.
- In present study, the minimum slump flow is 661mm is for NSCC & all other mix proportions provide slump flow more than 650mm.

4. Scope for future work:

- To study the long term durability of blended SCC
- To develop the high strength SCC by using marble industrial by-products like granite sludge.
- To predict the hardened properties in SCC.

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