

Strength Characteristics of Self Compacting Self Curing by using Light Weight Aggregate

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Abstract— Self-compacting is a new-fangled concrete that flows under its own weight devoid of any vibration and doesn't segregate and spreads effortlessly even in overcrowded reinforcements. Self-curing is a practice, which supplies water for more effective hydration of cement. Water soon is going to turn out to be a scarce material day-by-day; there is a vital necessity to research in cut of water for production of concrete and curing. Curing of concrete is upholding appropriate dampness in concrete throughout its primary segment in order to get better strength and durability attributes. Conception of SCSCC is to eradicate compaction for concrete also upholding sufficient dampness for curing purpose. Efforts are made to acquire SCSCC by using LWA as internal curing agents. Strength stricture like Compressive', Splitting tensile' strength and durability attributes deliberated for diverse percentages of self-curing agent (0%, 5%, 10%, 15% weight of cement) and from the outcomes, conclusion may perhaps draw that 15% LWA SCSCC blend offered more strength properties.

Key words: SCC, SCSCC, LWA, Light Weight Aggregate

I. INTRODUCTION

Self-Compacting Concrete (SCC) was invented in Japan; Hajime Okamura during 1980's when there was a non-uniformity and an partial compaction which was recognized and considered as a primary aspect which is in charge for the deprived performance of the concrete structure which was constructed using habitually mixed conventional concrete. SCC as a facility to fill the jam-packed located reinforcement and its formwork which doesn't requisite a mechanical pulsation due to its extremely flowable property and it also doesn't segregate. Fresh state properties of SCC such as workability, bleeding, finish capability propel capability, isolation and hardened state properties such as compression strength, split tensile strength are influenced by distinctiveness of aggregates. It is customary to implement a few fine powders as the space filler materials; the most capable among them is Fly ash.

A self-curing concrete is a solitary in which by retaining its dampness content it can cure by itself. Thus toting up curing admixture or else toting up the curing compounds the concrete can be prepared as self-curing agent. In a few places there is a paucity of water at times edifice works to be conceded in such places throughout that epoch there is necessitate for self-curing. To avoid trouncing of moisture from top horizontal face of the concrete such as highways and airports which have been considered as a difficult task for construction industries. External self-curing concrete it is the course of action in which know how to cure itself through retain its dampness within the concrete by the treatment of curing compound on the surface of the

concrete. Internal self-curing concrete: it is the course of action in which hydration of cement persist the accessibility of inner water which is not ingredient of the mixing water.

- Saturated porous Light Weight aggregate (LWA).
- Poly-Ethylene Glycol (PEG).

II. OBJECTIVE OF PRESENT STUDY

The main objective of present study about fresh properties of Self-compacting concrete for instance: Slump Flow, J-Ring, U-Box, V-funnel and L-box. To study strength characteristics like compressive and split tensile strength of the Self Curing and Self Compacting Concrete (SCSCC).

III. EXPERIMENTAL PROGRAM

A. Materials used in this experiments

1) Cement (C):

In the present study 53 grade OPC manufactured. A basic test on cement was conducted as per IS-12269-2013

Properties	Outcome
Specific Gravity	3.09
Standard Consistency (%)	34
Fineness of Cement (%)	1.3
Initial-Setting time in min	75 min
Final-Setting time in min	N

Table 1: Properties of Cement

2) Light weight aggregate (LWA):

It is highly porous light weight aggregate of pumice is used in present study.

Physical Properties	Results
Particle size	1/2" (12 mm) minus
Dry Density	< 650 kg/m ³
PH	near neutral

Table 2: Properties of Coarse Aggregate

3) Silica Fume (SF):

Silica fume (micro silica) which has a specific gravity of 2.14 was used.

4) Fly Ash:

(FA) Fly ash used for this project is Class F type, specific gravity of Fly ash tend to be 2.04.

5) River Sand:

River sand according to IS: 2386-1975, used for this testing.

Physical Properties	Outcome
Specific Gravity	2.67
Packing factor	1.091
Fineness modulus	4.594

Table 3: Properties of River Sand

6) Coarse Aggregate (CA):

In this experiment coarse aggregate used is of Granite stone which as actual size of 12.5mm according with IS 2386-1963.

Physical Properties ¹	Results
Specific Gravity	2.58
Bulk density of compacted aggregate	1417.69
Bulk density of loose aggregate	1287.72
Packing factor	1.041

Table 4: Properties of Coarse Aggregate

7) Quarry Dust (QD):

Close by reachable quarry dust are used

Mix	Cement	Fly ash	Sand	QD	CA	LWA	Water	SP
FSCSCC0	394.28	126.03	836.64	0	670.35	0	234.28	0.9
FSCSCC1	394.28	126.03	669.31	167.32	636.83	33.57	234.28	0.9
FSCSCC2	394.28	126.03	669.31	167.32	603.3	67.03	234.28	0.9
FSCSCC3	394.28	126.03	669.31	167.32	569.79	100.55	234.28	0.9

Mix	Cement	Silica Fume	Sand	QD	CA	LWA	Water	SP
SSCSCC0	394.28	124.57	836.64	0	670.35	0	233.48	0.9
SSCSCC1	394.28	124.57	669.31	167.32	636.83	33.57	233.48	0.9
SSCSCC2	394.28	124.57	669.31	167.32	603.3	67.03	233.48	0.9
SSCSCC3	394.28	124.57	669.31	167.32	569.79	100.55	233.48	0.9

Table 5: Properties of Coarse Aggregate

IV. RESULTS & DISCUSSION

A. Compressive strength

In the present study a minimum strength as be achieved by the particular mixes which is conducted for each

8) Water:

Here portable water has been used which is free from minerals and all soluble salts, quality is confined by IS: 456:2000.

9) Super Plasticizers (SP):

Super plasticizer Glenium B233 as per EN 934-2 T 3.1-3.2 was used.

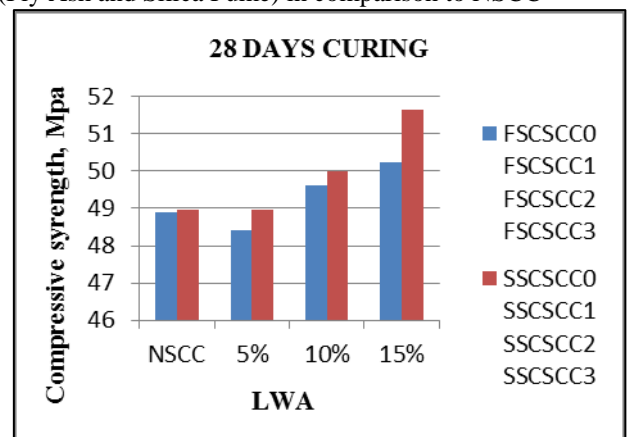
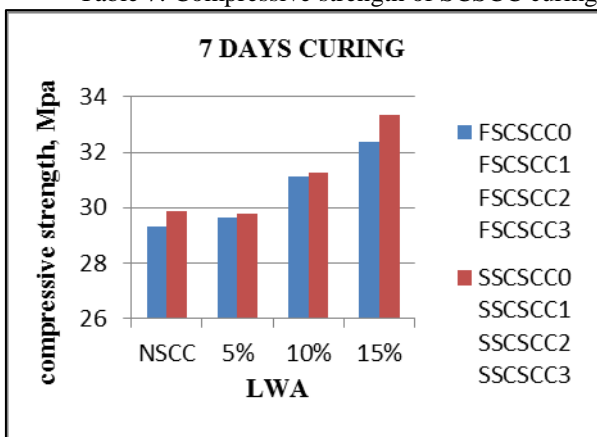
experimental level. To find the compression strength a concrete cubes of size 150mm × 150mm × 150mm are used then it is cured at ambient temperature for 1,4 and 8 weeks.

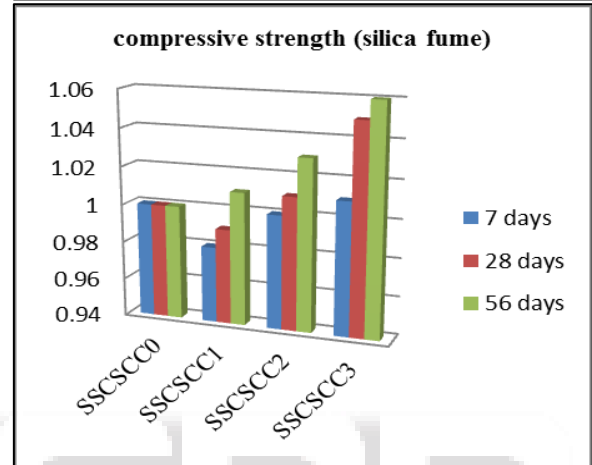
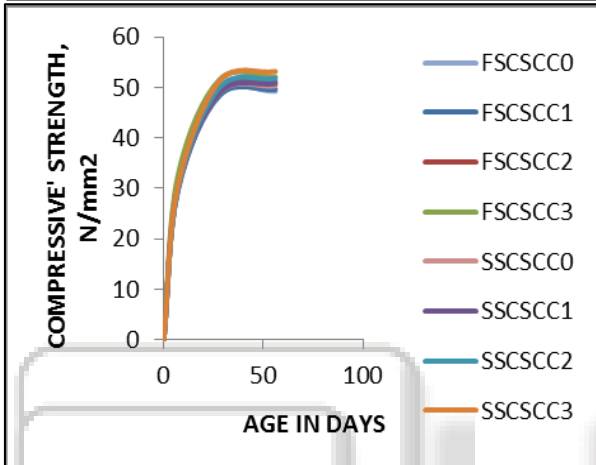
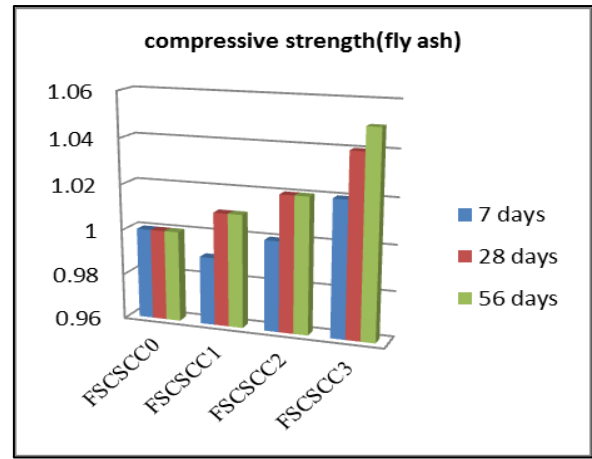
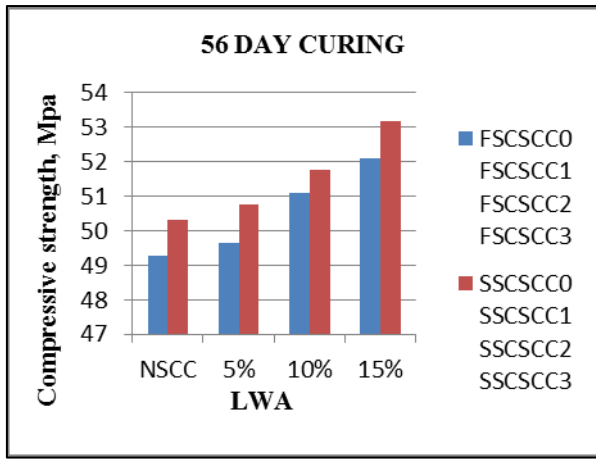
Mixes	Average compression load in MPa (using Fly Ash)			Mixes	Average compression load in MPa (Using Silica fume)		
	7 days	28 days	56 days		7 days	28 days	56 days
FSCSCC0	29.33	48.88	49.26	SSCSCC0	29.88	48.96	50.32
FSCSCC1	29.62	48.42	49.66	SSCSCC1	29.76	48.98	50.78
FSCSCC2	31.10	49.62	51.10	SSCSCC2	31.25	50.01	52.18
FSCSCC3	32.36	50.25	52.11	SSCSCC3	33.35	51.66	53.16

Table 6: Compressive strength of SCSCC curing period (Fly Ash and Silica Fume)

MIX	7 days	28 days	56 days	MIX	7 days	28 days	56 days
FSCSCC0	1	1	1	SSCSCC0	1	1	1
FSCSCC1	0.98	0.99	1.01	SSCSCC1	0.99	1.01	1.01
FSCSCC2	1.00	1.01	1.03	SSCSCC2	1.00	1.02	1.02
FSCSCC3	1.01	1.05	1.06	SSCSCC3	1.02	1.04	1.05

Table 7: Compressive strength of SCSCC curing period (Fly Ash and Silica Fume) in comparison to NSCC





B. Split Tensile Strength Results

This is an indirect test for tensile potency of concrete. To find Split tensile strength a cylinder specimen 150 mm × 300mm height are casted and it is cured for 7,28 and 56 days These tests are carried out as per IS: 5816-1970.

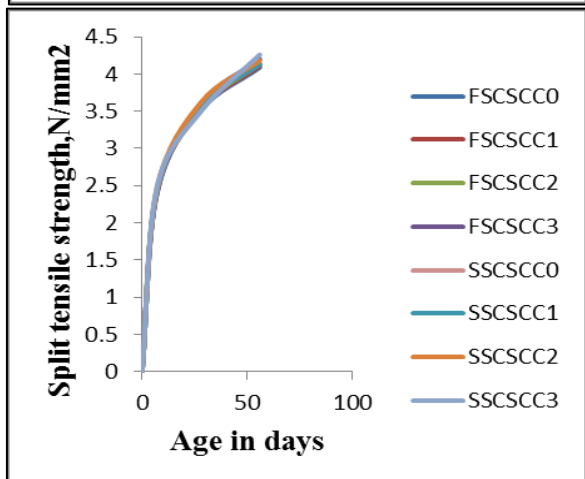
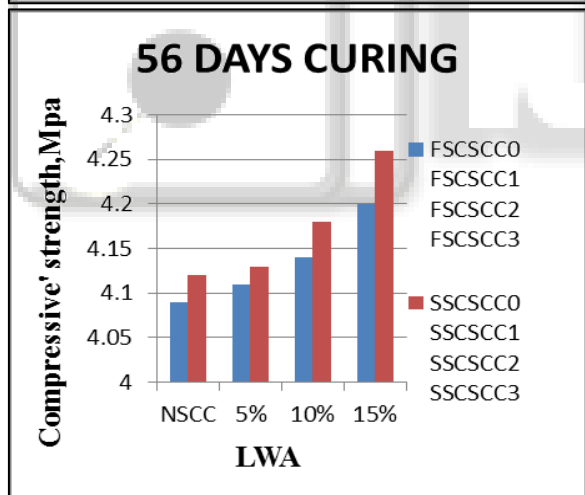
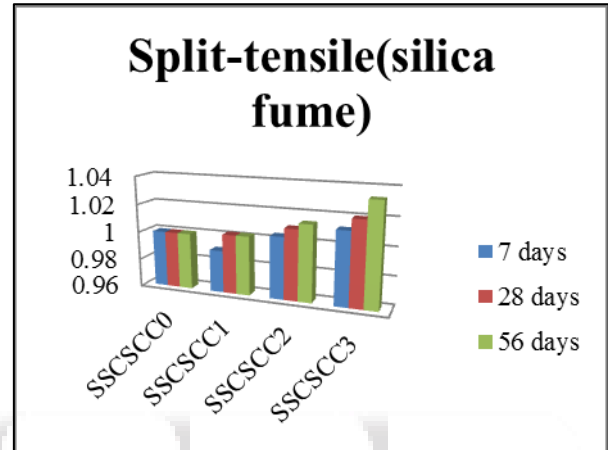
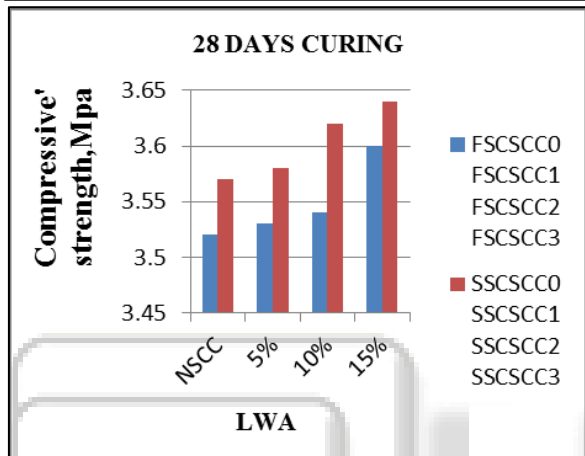
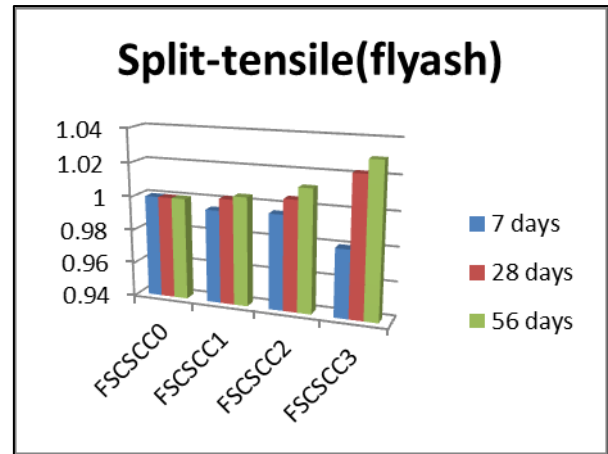
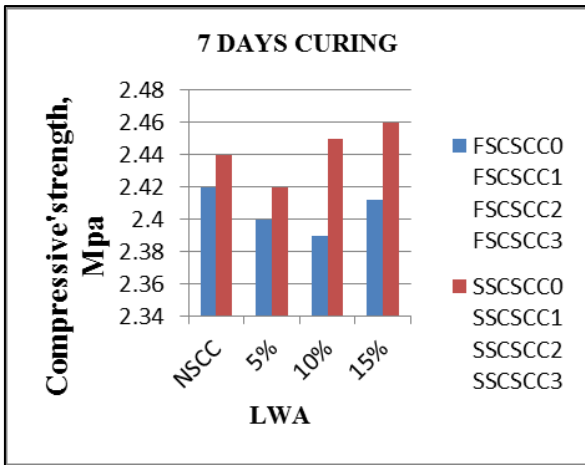
Then the results of 7, 28 and 56 days are given below

Mixes	Average compression load in MPa (Fly Ash)			Mixes	Average compression load in MPa (Silica Fume)		
	7 days	28 days	56 days		7 days	28 days	56 days
FSCSCC0	2.42	3.52	4.09	SSCSCC0	2.44	3.57	4.12
FSCSCC1	2.4	3.53	4.11	SSCSCC1	2.42	3.58	4.13
FSCSCC2	2.39	3.54	4.14	SSCSCC2	2.45	3.62	4.18
FSCSCC3	2.412	3.60	4.20	SSCSCC3	2.47	3.64	4.26

Table 8: Split Tensile' strength of SCSCC curing period (Fly Ash and Silica Fume)

MIX	7 days	28 days	56 days	MIX	7 days	28 days	56 days
FSCSCC0	1	1	1	SSCSCC0	1	1	1
FSCSCC1	0.995	1.002	1.004	SSCSCC1	0.99	1.002	1.002
FSCSCC2	0.996	1.005	1.012	SSCSCC2	1.004	1.01	1.014
FSCSCC3	0.98	1.022	1.03	SSCSCC3	1.012	1.02	1.033

Table 9: Split tensile' strength of SCSCC curing period (Fly Ash and Silica fume) in comparison to NSCC



Split-tensile(flyash)

Split-tensile(silica fume)

V. CONCLUSION

- 1) Mix blend of SCSCC with LWA and cement mortar content the fresh workability concrete properties are well within the prescribed limits as per recommended guide lines in EFNARC.
- 2) Compression strength, split tensile strength values are improved upto 15% of LWA for air cured Mix Samples in comparison to control mixes for both Fly ash and Silica Fume.
- 3) The optimum proportion of LWA in SCC for air cured mixes is found to be 15% thus extended the hydration by internal curing and amplifies the growth in strength of concrete.
- 4) Thus SCSCC with LWA as an internal curing agent may be adopted for filed application anywhere curing is complex and water insufficiency places

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