Strength and Durability Studies on Light Weight Self-Compacting Concrete with LECA as Partial Replacement of Coarse Aggregate

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Abstract: **This paper presents the results of strength and durability studies on light weight aggregate Self Compacting Concrete (SCC) made with expanded clay aggregate (LECA) partially replacing conventional coarse aggregate. The grades of the concrete investigated are M20, M30, M40 and M60 which consist of low, standard and high strength concretes. The durability studies include sorptivity, acid and sulphate resistance. The densities of LWSCC varied from 1870 kg/m^3 to 1950 kg/m^3. The sorptivity was found to be more. Acid and sulphate resistance were found to be less in LWSCC. The paper describes the details of investigations and results on LECA based LWSCC.**

Key words: Light Weight Expanded Clay (LECA), Light weight Self-Compacting Concrete, VMA, and Superplasticizer.

I. Introduction

Self-compacting concrete (SCC) is a special type concrete requiring no compaction and flow through congested reinforcement. The density of SCC is almost equivalent to that of normal concrete (NC). Light Weigh Concrete (LWC) has been developed to reduce the density of structures, which ranges from 300 to 2000 kg/m^3 [6]. Light Weight Aggregate (LWA) concretes are one type of LWC which are produced using natural or artificial LWA. The advantages of LWC includes reduction of dead loads of structures which reduces foundation costs. At present, number of investigations are in progress to develop Light Weight Self Compacting Concrete (LWSCC) to derive the benefits LWC [8]. Investigations carried out by different researchers using some Light Weight Aggregates in SCC have proved that Light Weight Aggregate Self Compacting Concrete (LWASCC) can be manufactured and used by judiciously choosing the LWA type [9]. Keeping the above in mind, the present investigations are taken up to study the strength and durability characteristics of LWASCC of M20, M30, M40 and M60 grades partly replacing conventional coarse aggregate with light weight expanded clay aggregate LECA.

II. Literature Review

Nan Su et.al (2001) proposed a mix design procedure for SCC. In this method, the amount of coarse aggregate content is determined, and the amount of finer material chemical admixtures and water are determined to satisfy the EFNARC guidelines for SCC. The SCC mixes produced, based on the above method are found to be satisfying the mechanical and durability properties of concrete [1].

M.V. Seshagiri Rao et al. (2013) developed a rational mix design method for SCC for designing SCC mixes of different grades. The rational mix design proposed, modified certain parameters of NaSu method and gives a direct mix design procedure for SCC to fix the CA, FA, fines admixture content and water/binder ratio. They developed W/b ratio various strength curves [5].

J. Alaxandare Bose et.al. (2012) investigated on Self compacting Light Weight Concrete (SWLC) with light weight aggregate available in Iberian Peninsula. The influences of different compositions of ingredients were studied and some limits were suggested. They concluded that SCLC of adequate stability and self compactibility can be produced for strength ranging from 3.7.4 to 60.8 MPa [3].

M.V. Seshagiri Rao et.al. (2013) studied the durability properties like Acid Strength Loss Factor (ASLF), Acid Attacking Factor (AAF), Acid Weight Loss Factor (AWLF) and Acid Durability Factor (ADLF) on different grades of SCC ranging from M20 to M70 and evaluated different factors and compared with normal concrete (NC). Sorptivity tests were also reported on SCC and NC [10].

P. Prakash et.al. (2015) reported the mechanical properties of M20 grade of LWC mud with CINDER and LECM as light weight aggregates mixed in different proportions. They have reported concrete

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with densities of range 1750 to 1850 kg/m^3 can be produced without compromising the strength [8].

Abdurrahman Nava Lotfy et.al (2015) investigated the durability properties of LWCC using three types of LWA i.e. furnace slag (FS), Expanded Clay (EC) AND Expanded Shale (ES). They observed that FSLWSCC has shown high resistance to salt scaling due to lower porosity and absorption properties of the aggregates compared to EWLSCC. All LWSCC specimens behaved reasonably well after 2 weeks of exposure to sulfuric acid. She observed that the fresh, hardened and durability of LWSCC mixes are affected by the CA to FA ratio and total aggregate proportion of LWA [7].

Gopi Rajamanickanna et.al. (2016) studied the fresh and hardened properties of SCC using LECA as fine aggregate replacement. They observed that a maximum of 25% LECA as fine aggregate can be replaced [15].

III. Experimental Programme

The experimental programme consisted of casting and testing of NWSCC and LWSCC specimens. The rational mix design was adopted. Several trails were made for producing NWSCC and LWSCC satisfying the EFNARC 2005 specifications. A total four grades of concrete were investigated consisting of M20, M30, M40 and M60 representing ordinary, standard and high- strength concrete, respectively. A total of 42 standard cubes of NWSCC and 96 cubes for LWSCC were cast to study the mechanical properties. 48 standard cubes for each NWSCC and LWSCC of size of 100mm*100mm*100mm were cast for acid attack. Three specimens each for NWSCC and LWSCC were cast and tested for sorptivity. The properties of the constituent materials used in the present study investigations are given in table I.

TABLE I.
Material Properties of Ingredients Used for NWSCC and LWSCC

Property/unit	Value
Cement – OPC 53 grade Specific gravity	3.10
Normal consistency	29.5%
Coarse aggregate (Gravel) Specific gravity	2.65
Bulk density: kg/m^3	1442
Fineness modulus	7.16
Coarse aggregate (LECA) Specific gravity	2.65
Bulk density: kg/m^3	1442
Fineness modulus	7.16
Super-plasticizer	Conplast SP 430
Fine aggregate Specific gravity	2.55
Bulk density: kg/m^3	1713
Fineness modulus	2.19

Mix proportioning and Mechanical properties

The details of mix proportion are shown in table II. Replacements of coarse aggregate fraction are shown in table III. The fresh properties of NWSCC and LWSCC are shown in table IV. The density and mechanical properties of NWSCC and LWSCC are shown in table V.

TABLE II.
Mix Proportions of NWSCC

Type of mix	Mix proportions	QUANTITIES kg/m^3					
		Cement	Flyash	Fine aggregate	Coarse aggregate	Water	SP
NWSCC-M20	1:1.2:3.4:2.6:0.9:0.021	258	310	900	685	240	5.67
NWSCC-M30	1:0.8:2.5:1.9:0.5:0.022	360	300	900	700	180	8.05
NWSCC-M40	1:0.7:1.8:1.4:0.51:0.026	468	350	885	700	240	12.2
NWSCC-M60	1:0.4:1.2:1.1:0.39:0.013	660	310	850	730	260	9.02

TABLE III.
Replacement of Coarse Aggregate in kg/m^3

Type of mix	Coarse Aggregate Replacement kg/m^3							
	Gravel 90%	LECA 10%	Gravel 80%	LECA 20%	Gravel 70%	LECA 30%	Gravel 60%	LECA 40%
LWSCC-M20	614.5	22.7	546.2	45.5	477.9	68.2	409.6	91.0
LWSCC-M30	629.8	23.3	559.8	46.6	489.8	69.9	419.8	93.3
LWSCC-M40	629.8	23.3	559.8	46.6	489.8	69.9	419.8	93.3
LWSCC-M60	656.1	24.3	583.2	48.6	510.3	72.9	437.4	97.2

TABLE IV.
FRESH AND HARDENED PROPERTIES OF NWSCC AND LWSCC

Type of mixes	Grade Of Concrete	Coarse Aggregate %		Fresh properties			Hardened properties	
		Gravel %	LECA %	T_{50} cm (2-5) sec	V-Funnel (6-12) sec	L-box (H_2/H_1) mm	7 days (MPa)	28 days (MPa)
NWSCC	M20	100	-	4	7	0.85	21.85	27.0
	M30	100	-	5	8	1	24.7	38.8
	M40	100	-	4	11	9.2	33.5	51.5
	M60	100	-	3.9	10	8.9	46.9	68.8
LWSCC	M20	90	10	4.2	9	1	13.3	21.3
	M20	80	20	4.2	11	0.92	13.4	20.5
	M20	70	30	4.4	8	0.92	12.6	20.4
	M20	60	40	4.1	12	0.89	11.46	20.2
	M30	90	10	4.2	11	0.95	24.6	37.3
	M30	80	20	4.1	11.5	0.93	22.9	35.5
	M30	70	30	4	12	0.92	18.9	33.0
	M30	60	40	4.3	9	0.91	13.0	24.3
	M40	90	10	3.4	9	1	31.9	49.1
	M40	80	20	3.9	10.2	0.89	25.2	40.1
	M40	70	30	4.3	9	0.89	25.1	37.8
	M40	60	40	4.7	11.2	1	23.4	34.8
	M60	90	10	4.3	10.3	1	46.2	60.6
	M60	80	20	4.7	10.9	0.9	43.7	59.8
	M60	70	30	4.6	12	0.96	40.6	57.1
	M60	60	40	4	11	1	35.3	52.3

Durability Tests On SCC

Durability is a very important engineering property of concrete. In the present investigations, some of the durability properties of the normal concrete SCC and light weight concrete SCC like chemical attack (acid attack and sulphate attack), capillary water absorption by sorptivity test were studied.

Tests for Acid Attack on SCC

After the curing period of 28 days the cubes were tested for the weights and compressive strength. The cured NWSCC and LWSCC specimens of different grades viz. M20, M30, M40 and M60 were kept exposed to 5% solutions of both sulfuric acid, hydrochloric acids and sodium sulphate. Cubes were continuously immersed in solution for 28 days and 56 days.

The change in appearance, weight, compressive strength and dimensions of solid diagonals were measured. For determining the resistance of concrete specimens to environments such as acid attack, durability factors such as acid strength loss factor (ASLF), acid attacking factor (AAF), acid weight loss factor (AWLF) and acid durability loss factor. (ADLF) were calculated.

1) Acid strength loss factor (ASLF) is an indication of relative performance of concrete in strength, before and after immersion in a particular concentration of acid. This also depends on the period of immersion of the specimen.

$$ASLF = S_r * N/M$$

Where,

S_r is the relative strength at N days (%), N is the number of days at which the durability factor is required.

M is the number of days at which the expose is determined.

A lower value of ASLF indicates greater stability towards acid attack.

2) Acid attacking factor (AAF) is an indication of diagonal loss of the specimen after immersion in acid for certain period of time. The extent of loss is determined as

AAF = (Loss of acid diagonal after immersion/ diagonal before immersion) * 100.

Higher value of it indicates that the dimensional stability is lower.

3) Acid weight loss factor (AWLF) is calculated as the % loss of weight of cubes by immersing the cubes in various types and concentration of acids for different immersion periods.

AWLF = (Loss of weight after immersion of cube / original weight of cube) * 100.

In order to determine the durability factor, these factors are combined, and it is termed as ADLF.

$$ADLF = ASLF*AAF*AWLF.$$

Table 9 shows AWLF for both the types of mixes. Table 10 shows AAF for both types of mixes. Table 11 shows the ASLF for both types of mixes and table 13 shows the ADLF for both types of mixes.

Sorptivity

Sorptivity is the rate of absorption and transmission of water by capillary action. The sorptivity test was conducted on 100 mm x 100 mm x100 mm cubes. The sorptivity measures the rate of penetration of water into the pores in the concrete by capillary suction.

Sorptivity coefficients are determined for normal concrete SCC and light weight concrete SCC.

Sorptivity test is done on the basis of Hall's method (Hall, 1989). After curing of specimens for 28 days in curing tank, the cubes are removed and dried. Paraffin wax is coated on four sides of the cube leaving the top and the bottom. The initial weights of the cubes are taken. Then, the cubes are immersed in water up to 6.6mm from the bottom.

The cube absorbs the water and transmits the water to upwards by capillary action. The weights of the specimens were measured at times of 1min, 5min, 10min, 15 min, 30 min, 1 h, 2 h, 4 h, 6 h, 24 h, 48 h and 72 h after the end of curing. The sorptivity studies were conducted continuously for 3 days.

Sorptivity test for normal concrete was carried out keeping one face of cube in water. For LECA concrete, the tests were done keeping both top and bottom faces of cubes in water separately. This is done as it is observed that LECA is floating due to low density is flowing and more LECA was observed on top surface.

The sorptivity coefficient (s) was obtained from the expression.

$S = I / T1/2, \quad I = \nabla W/Ad$

Where,

W is the amount of water absorbed (kg),

A is the cross section of specimen that was in contact with water (m^2)

d is the density of the medium in which the specimen was dipped (d = 1, as the medium used was water)

T = time (min).

The unit of S is kg/ (m^2 $min^{1/2}$).

The variation of i against $t^{1/2}$ was plotted.

Table VI shows the Sorptivity of NWSCC for different grades of concrete. Table VII shows the Sorptivity of LWSCC for different grades of concrete. Table 8 shows the LWSCC for Different Grades of Concrete with LECA portion immersed in water when compared to other parts of concrete.

TABLE V.
DENSITIES AND COMPRESSIVE STRENGTH OF NWSCC AND LWSCC

Type of mixes	Grade Of Concrete	Coarse Aggregate %		Average Densities kg/m³	Compressive strength MPa	
		Gravel %	LECA %		7-Days	28-Days
NWSCC	M20	100	-	2430	21.8	27.0
	M30	100	-	2450	24.7	38.8
	M40	100	-	2440	33.5	51.5
	M60	100	-	2460	46.9	68.8
LWSCC	M20	90	10	2303	13.3	21.3
	M20	80	20	2200	13.4	20.5
	M20	70	30	2076	12.6	20.4
	M20	60	40	1975	11.4	20.2
	M30	90	10	2313	24.6	37.3
	M30	80	20	2218	22.9	35.3
	M30	70	30	2086	18.9	33
	M30	60	40	1991	13	24.3
	M40	90	10	2286	31.9	49.1
	M40	80	20	2193	25.2	40.1
	M40	70	30	2083	25.1	37.8
	M40	60	40	1940	23.4	34.8
	M60	90	10	2301	46.2	60.6
	M60	80	20	2198	43.7	59.8
	M60	70	30	2113	40.6	57.1
	M60	60	40	1970	35.3	52.3

TABLE VI.
SORPTIVITY OF NWSCC FOR DIFFERENT GRADES OF CONCRETE

Sample no.	Time in Mins	Cumulative Water Absorption (Δw)Kg				S=I/M0.5 Sorptivity value in 10^{-3} mm/min$^{0.5}$			
		M20	M30	M40	M60	M20	M30	M40	M60
1	1	0	0	0	0	0	0	0	0
2	5	0.2	0.1	0.1	0	89.6	44.8	44.8	0
3	10	0.3	0.2	0.1	0.1	94.3	63.2	31.4	31.4
4	15	0.5	0.3	0.3	0.1	129.1	77.5	77.5	25.8
5	30	0.5	0.3	0.3	0.1	91.4	54.8	54.8	18.2
6	60	0.5	0.3	0.3	0.1	64.9	38.7	38.7	12.9
7	120	0.5	0.3	0.4	0.1	45.6	27.3	36.5	9.1
8	180	0.6	0.3	0.4	0.2	44.7	22.3	29.8	14.9
9	240	0.6	0.5	0.5	0.3	38.7	32.7	32.7	19.36
10	300	0.6	0.6	0.5	0.4	34.6	34.6	28.8	23.0
11	360	0.6	0.7	0.5	0.5	31.6	36.9	26.3	26.3
12	1440	0.7	0.7	0.5	0.5	18.4	18.4	13.1	13.1
13	2880	0.8	0.7	0.6	0.5	14.9	13.0	11.1	09.3
14	4320	0.8	0.7	0.6	0.5	12.1	10.6	09.1	07.6

TABLE VII.
SORPTIVITY OF LWSCC FOR DIFFERENT GRADES OF CONCRETE WHEN TOP PORTION (LECA) IMMERSED

Sample no.	Time in Mins	Cumulative Water Absorption (Δw)Kg				S=I/M0.5 Sorptivity value in 10^{-3} mm/min$^{0.5}$			
		M20	M30	M40	M60	M20	M30	M40	M60
1	1	0.3	0.3	0.4	0.4	300	300	400	400
2	5	0.4	0.4	0.4	0.4	179.3	179.3	179.3	179.3
3	10	0.4	0.4	0.4	0.4	126.5	126.5	126.5	126.5
4	15	0.5	0.6	0.5	0.6	129.1	155	129.1	155
5	30	0.7	0.6	0.7	0.7	127.9	109.6	127.9	127.9
6	60	0.7	0.7	0.7	0.7	90.4	90.4	90.4	90.4
7	120	0.9	0.8	0.7	0.9	82.1	73.0	63.9	82.1
8	180	0.9	0.9	0.9	0.9	67.1	67.1	67.1	67.1
9	240	0.9	0.9	0.9	0.9	58.1	58.1	58.1	58.1
10	300	1.1	1.1	1.1	1.1	63.1	63.1	63.1	63.1
11	360	1.1	1.1	1.1	1.1	57.9	57.9	57.9	57.9
12	1440	1.1	1.2	1.1	1.2	28.9	31.6	28.9	31.6
13	2880	1.2	1.3	1.3	1.3	22.3	24.2	24.2	24.2
14	4320	1.3	1.3	1.3	1.4	19.7	19.7	19.7	21.3

TABLE VIII.
SORPTIVITY OF LWSCC FOR DIFFERENT GRADES OF CONCRETE WHEN BOTTOM PORTION IMMERSED

Sample no.	Time in Mins	Cumulative Water Absorption (Δw) Kg				S=I/M0.5 Sorptivity value in 10^{-3} mm/min$^{0.5}$			
		M20	M30	M40	M60	M20	M30	M40	M60
1	1	0.2	0.2	0.2	0.2	200	200	200	200
2	5	0.3	0.3	0.3	0.3	134.5	134.5	134.5	134.5
3	10	0.4	0.4	0.3	0.4	126.5	126.5	94.9	126.5
4	15	0.4	0.4	0.3	0.4	103.3	103.3	77.5	103.3
5	30	0.4	0.4	0.4	0.4	73.1	73.1	73.1	73.1
6	60	0.4	0.4	0.4	0.4	51.6	51.6	51.6	51.6
7	120	0.5	0.4	0.4	0.5	45.6	36.5	36.5	45.6
8	180	0.6	0.5	0.4	0.5	44.7	37.2	29.8	37.2
9	240	0.7	0.5	0.5	0.6	45.1	32.2	32.2	38.7
10	300	0.7	0.6	0.5	0.6	40.4	36.6	28.8	34.6
11	360	0.7	0.6	0.6	0.6	36.9	31.6	31.6	31.6
12	1440	0.8	0.8	0.7	0.9	21.0	21.0	18.4	23.7
13	2880	1.0	0.9	0.8	0.9	18.6	16.7	14.9	16.7
14	4320	1.0	1.0	0.9	1.0	15.2	15.2	13.6	15.2

TABLE IX.
SORPTIVITY OF LWSCC FOR DIFFERENT GRADES OF CONCRETE

Solution	ACID WEIGHT LOSS FACTOR (AWLF) -56 DAYS							
	NWSCC				LWSCC			
	M20	M30	M40	M60	M20	L30	L40	L60
NA_2SO_4 - 5%	1.69	1.71	1.27	1.28	1.53	1.61	1.54	1.52
HCL - 5%	10.72	9.91	9.74	9.4	17.25	14.07	10.71	9.84
H_2S0_4 - 5%	22.2	32.7	23.1	23.6	27.46	37.06	4105	43.29

TABLE X.
AAF OF NWSCC AND LWSCC FOR DIFFERENT GRADES OF CONCRETE

Solution	ACID ATTACKING FACTOR (AAF) -56 DAYS							
	NWSCC				LWSCC			
	M20	M30	M40	M60	M20	L30	L40	L60
NA_2SO_4 - 5%	1.78	1.22	1.72	1.21	1.78	2.87	1.35	1.42
HCL - 5%	7.87	4.73	7.69	7.19	8.08	3.63	18.03	7.19
H_2S0_4 – 5%	18.56	19.09	18.03	15.78	20.54	17.67	12.49	13.47

TABLE XI.
ASLF OF NWSCC AND LWSCC FOR DIFFERENT GRADES OF CONCRETE

Solution	ACID STRENGTH LOSS FACTORS (ASLF)-56 DAYS							
	NWSCC				LWSCC			
	M20	M30	M40	M60	M20	L30	L40	L60
NA_2SO_4 - 5%	8.8	6.95	4.3	5.3	2.4	6.17	4.8	1.3
HCL - 5%	16.29	19.84	18.1	25.2	23.29	19.85	21.5	32.5
H_2S0_4 - 5%	60.37	78.71	83.1	84.01	74.25	81.06	83.5	85.5

TABLE XII.
ADLF OF NWSCC AND LWSCC FOR DIFFERENT GRADES OF CONCRETE

Solution	ACID DURABILITY LOSS FACTORS (ADLF)-56 DAYS							
	NWSCC				LWSCC			
	M20	M30	M40	M60	M20	L30	L40	L60
NA_2SO_4 - 5%	26.4	14.49	40.68	8.21	6.53	28.5	9.9	2.80
HCL - 5%	1376.3	929.9	1346.8	1709.24	3311.6	1008.7	999.35	1458.2
H_2S0_4 - 5%	24874.3	49134.1	34504.7	31285.9	41879.1	53855.6	37453	47348.3

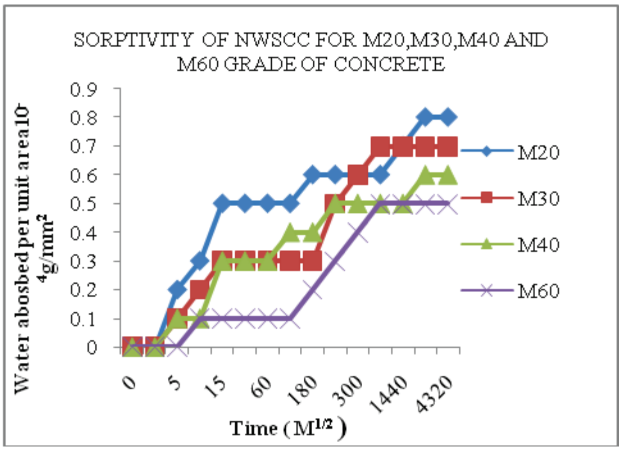

Figure 1. Sorptivity of NWSCC

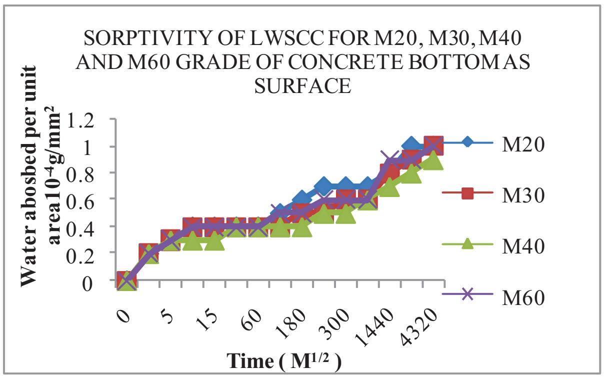

Figure 2. Sorptivity of LWSCC

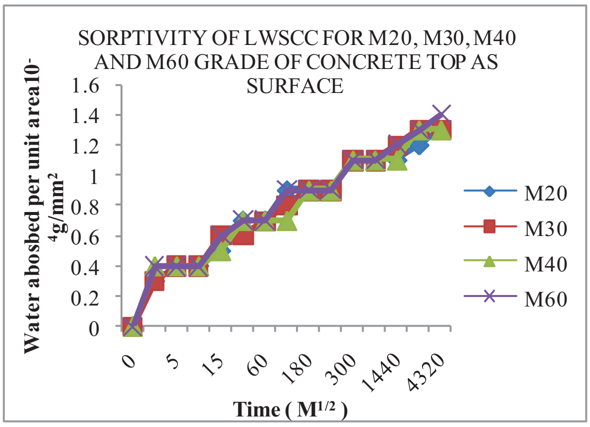

Figure 3. Sorptivity of LWSCC SCC with LECA portion is immersed in water when compared to other parts of concrete.

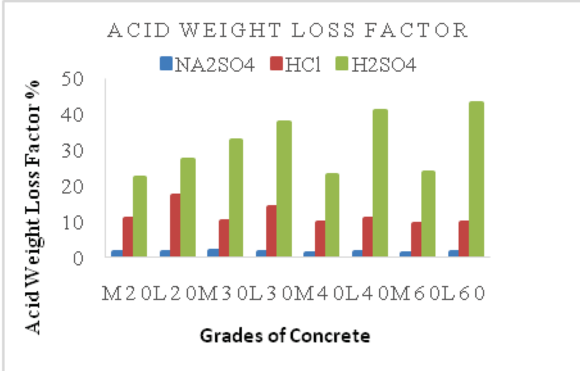

Figure 4. AWLF- 56 days

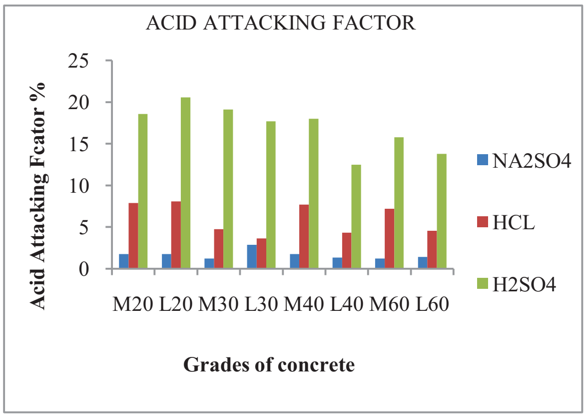

Figure 5. AAF- 56 days

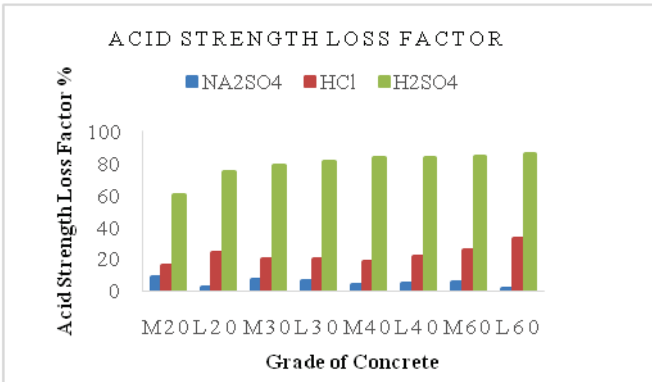

Figure 6. ASLF- 56 days

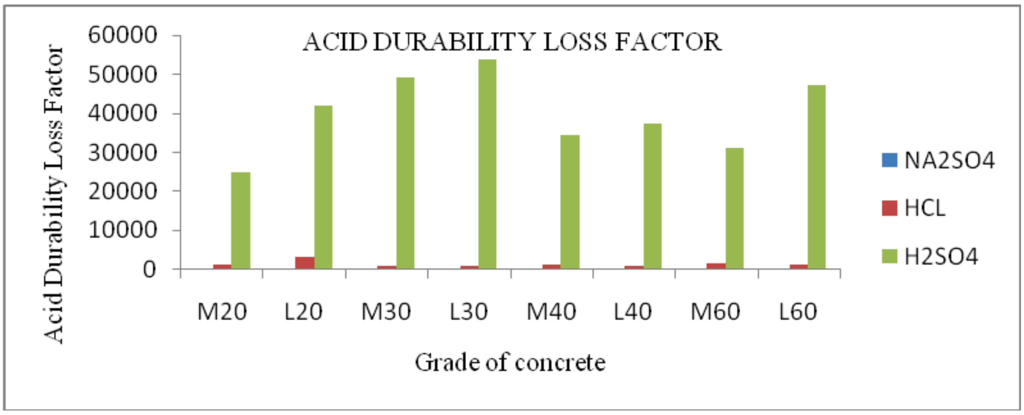

Figure 7. ADLF- 56 days

IV. Results

For M20, M30, M40 and M60 grade of concretes the fresh properties were satisfied. For M20, M30, M40 and M60 Grade of concrete the compressive strength for 7 days were 21.8, 24.7, 33.5, 46.9 and for 28 days were 27, 38.8, 51.5 and 68.8 N/mm^2. The densities of concrete are decreasing with the increase in the percentage replacement of coarse aggregate with LECA. The mechanical properties, it was observed that for M20 grade of concrete the replacement of coarse aggregate with 10%, 20%, 30% and 40% with LECA, the average compressive strength for 7 and 28 days in MPa were 13.3, 13.4, 12.6, 11.46 and 21.3, 20.5, 20.4, 20.2. It was observed that for M30 grade of concrete the replacement of coarse aggregate with 10%, 20%, 30% and 40% with LECA, the average compressive strength for 7 and 28 days in MPa were 24.6, 22.9, 18.9, 13 and 37.3, 35.5, 33, 24.3. It was observed that for M40 grade of concrete the replacement of coarse aggregate with 10%, 20%, 30% and 40% with LECA, the average compressive strength for 7 and 28 days in MPa were 31.9, 25.2, 25.1, 23.4 and 49.1, 40.1, 37.8, 34.8. For M60 grade of concrete the replacement of coarse aggregate with 10%, 20%, 30% and 40% with LECA the average compressive strength for 7 and 28 days in MPa were 46.2, 43.7, 40.6, 35.3 and 60.6, 59.8, 57.1, 52.3. It is observed that as the grade of the concrete increases, the rate of water absorption decreases. Also, the values of water absorption in SCC are much lower when compared to the LWSCC. The dimension loss is less in NWSCC when compared to LWSCC, both in acids and sulphate. For Na_2SO_4 1.48 and 2.47, HCL 17.87 and 18.79 and, in H_2SO_4 17.85 and 18.79. These are the average percentage loss for all grades of concrete for NWSCC and LWSCC. The weight loss is less in NWSCC when compare to LWSCC, both in acids and sulphate. For Na_2SO_4 9.94 and 13.02, HCL 9.94 and 13.02 and H_2SO_4 19.70 and 37.21. These are the percentage loss for all grades of concrete for NWSCC and LWSCC. The strength loss was less in NWSCC when compared to LWSCC, both in acids and sulphate. For Na_2SO_4 6.33 and 7.51, HCL 19.88 and 24.37 and H_2SO_4 76.56 and 81.09. These are the average percentage loss for all grades of concrete for NWSCC and LWSCC.

V. Conclusions

1. Density of concrete is found to decrease with the increase in the percentage replacement of normal aggregate with LECA.
2. The density of light weight aggregate varied from 1870 Kg/m3 to 1950 Kg/m^3, which is less than the weight of conventional concrete having a density of 2450 Kg/m^3 as measured in lab.
3. Due to light weight, LECA was found to be floating on the surface of the concrete causing problems for the flow of SCC.
4. The passing ability of SCC with LECA was found to decrease with increase in the percentage of LECA due to its water absorption. However, this can be compensated by higher dosage of super plasticizer.
5. Compressive strength of light weight SCC with LECA was found to increase when LECA is immersed in water for 24 hours before making concrete.
6. The sorptivity of light weight SCC was found to be more when SCC with LECA portion is immersed in water when compared to other part of concrete.
7. Higher grade SCC has lower water absorption values than lower grades with conventional aggregate. However, in Light weight SCC they found to be same in all grades.
8. With the increase in duration of exposure to the acidic environment, the AAF was found to be increasing in both LWSCC and NWSCC, in both acids and sulphates. However, the dimension Loss is less in LWSCC when compared to NWSCC.
9. With the increase in duration of exposure to the acidic environment, the AWLF and ASLF are found to be increasing in both LWSCC and NWSCC, in both acids and sulphate. However, the loss of weight and loss of strength is more in LWSCC when compared to NWSCC.
10. When compare to the NWSCC the LWSCC was found to be less durable in both Acids and Sulphate.

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