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To Study the Effect of Cementitious Materials from Recycled CLC and ACC Block Dust

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Abstract - *In the current situation where the developments are expanding, the need to locate a valuable Cementing material for the improvement of solidarity and which has less natural impacts is of incredible importance. The fundamental target of the exploration work is to examine the chance of using cell lightweight cement and autoclave circulated air through solid square residue as incomplete substitution of concrete. The fundamental properties like consistency, explicit gravity was resolved and contrast and common Portland concrete. SEM, EDX and XRD investigation is additionally performed for synthetic arrangement and crystallography of using cell lightweight cement and autoclave circulated air through solid square residue. The consequence of the examination shows that up to 20% substitution of cell lightweight solid square residue invigorates more that ordinary mortar block. Nonetheless, enormous degrees of substitution lead to deferred hydration of the blend and permeable microstructure and thus lower compressive quality of 3D shape. From the XRD examination of 3D shape test shows that 20% substitution of cell lightweight solid square residue has more calcite part than 0% substitution of mortar block.*

Key Words: **Cement, Mortar, CLC Block Dust, AAC Block Dust, XRD.**

1. INTRODUCTION

Most designing developments are not eco-accommodating. Development industry utilizes Portland concrete, which is a weighty donor of the CO2 emanations and ecological harm. In India, measure of development has quickly expanded since most recent twenty years. It is verifiable truth that CO_2 discharges contribute about 65% of an Earth-wide temperature boost and it is unsurprising to increment by 100% by 2020. The concrete business contributes around 2.8 billion tons of the ozone depleting substance discharges every year, or about 7% of the complete man-made ozone depleting substance emanations to the world's air. The concrete business produces numerous other naturally unsafe items like sulfur dioxide (SO3) and nitrogen oxides (NOx) which add to the an unnatural weather change factors. The defilement raised from concrete creation pushed the solid network to discover numerous choices to diminish the CO2 outflow. One of those arrangements is substitution of concrete via Autoclave Aerated Concrete (AAC) and Cellular Lightweight Concrete (CLC) block dust.

Cell Light Weight Concrete (CLC) is otherwise called a Foam Concrete. Cell Light Weight Concrete (CLC) is a light in weight that is created like ordinary cement under encompassing conditions. CLC Blocks are a concrete reinforced material made by mixing slurry of concrete. Steady, pre-framed froth produced nearby is infused into this slurry to shape froth concrete. New froth solid appears as though a milk-shake and the volume of slurry in the froth directs the cast thickness of the froth concrete.

2. OBJECTIVE

The objective of this study was to improve the compressive strength of the cement mortar cube by replacing recycled cellular lightweight concrete block dust with cement. First CLC and AAC block are crushed and made into fine dust those pass through 90µ IS Sieve. A standard mix proportion of cement and sand is considered from ASTM: C 109/C 109M-07. Different mix proportions are then arrived by replacing cement with CLC and AAC block dust from 0-30% by weight of cement. The mortar cubes are prepared and cured in potable water. Compressive strength of the mortar cubes are measured after 7 days and 28 days of curing. Broken sample are collected for further tested for the microstructure analysis using XRD.

3. MATERIAL

3.1 Cement

Ordinary Portland cement (RAMCO) 43 grade was used for present study and it is conformed to IS: 8112 – 2013.

Sl. No.	Physical Properties	Experimental Results	IS: 8112 – 2013 Requirements
1	Consistency	31	-
2	Specific gravity	3.15	-
3	Initial setting time	60 minutes	< 30 minutes
4	Final setting time	500 minutes	> 600 minutes

Table -1

3.2 CLC and AAC Block Dust

Demolished CLC and AAC block are collected and crushed the block to make fine dust which was passing through IS 90µ I.S. sieve. XRD test was also done to know the all the minerals present in the CLC and AAC block dust based on crystalline structure of minerals.

Table -2

Physical properties	Experimental result	
	CLC dust	AAC dust
Specific gravity	2.10	2.18
consistency	45	53

3.3 Fine Aggregate

Fine aggregate which are used in present research work those specific gravity 2.68 and fineness modulus 2.2. The grading zone of sand is (IV) and it is find according IS: 383-1970

Table -3

sieve size (mm)	weight retained (gm)	Cumulative retained (gm)	Cumulative % weight retained	% passing	% passing for grading zone (IS:383-1970)
10	0	0	0	100	100
4.75	0	0	0	100	95-100
2.36	15	15	1.5	98.5	95-100
1.18	77	92	9.2	90.8	90-100
0.6	335	427	42.7	57.3	80-100
0.3	279	706	70.6	29.4	15-50
0.15	270	976	97.6	2.4	0-15

3.4 Water

The Potable fresh water is used for both mixing of mortar cube and curing of mortar cube specimens.

4. EXPREIMENTAL PLAN

A. Micro structural Studies
B. X-Ray Diffraction (XRD) Test
C. Compressive Strength Test On Cement Mortar
D. XRD Spectroscopy On Mortar Cube

5. RESULT & DISCUSSIONS

5.1 Compressive Strength Test on Cement Mortar

Then ordinary Portland cement was replaced with various % of CLC and AAC block dust (in weight) like 0%, 5%, 10%, 15%, 20%, 25%, and 30%.

Table -4: Cement replacement with CLC block dust

Specimen No.	Ordinary Portland Cement (gm)	CLC block dust (gm)
C-0	500	0
C-1	475	25
C-2	450	50
C-3	425	75
C-4	400	100
C-5	375	125
C-6	350	150

Table -5: Cement replacement with AAC block dust

Specimen No.	Ordinary Portland Cement (gm)	AAC block dust (gm)
A-0	500	0
A-1	475	25
A-2	450	50
A-3	425	75
A-4	400	100
A-5	375	125
A-6	350	150

Table -6: compressive strength of mortar cube with CLC

Specimen name	compressive strength (MPa)	
	7 days	28 days
C-0	22.3	27.8
C-1	17.8	30.0
C-2	20.1	33.8
C-3	18.6	31.5
C-4	18.5	30.6
C-5	16.5	25.3
C-6	14.5	24.9

block dust replacement

Table -7: Compressive strength of mortar cube wit AAC block dust replacement

Specimen Name	Compressive Strength (MPa)	
	7 days	28 days
A-0	23.3	29.6
A-1	20.2	28.3
A-2	20.5	27.1
A-3	15.5	26.8
A-4	14.8	25.1
A-5	14.5	24.3
A-6	13.5	22.2

Fig :1-7days Compressive strength mortar cube with CLC block dust replacement

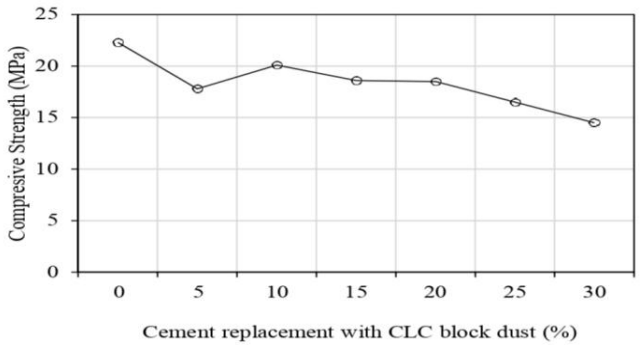


Fig: 2-28 days' Compressive strength mortar cube with CLC block dust replacement

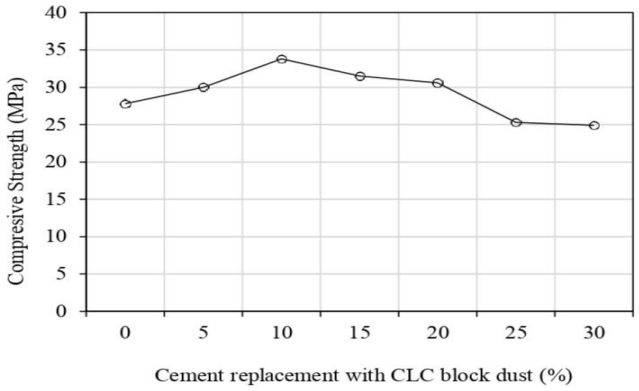


Fig: 3-7 days' Compressive strength mortar cube with AAC block dust replacement

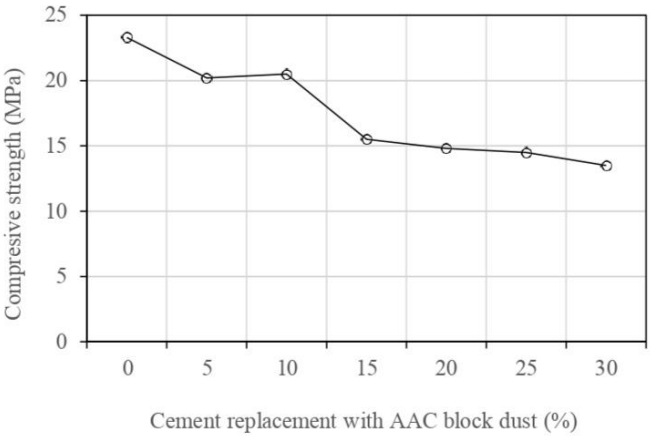
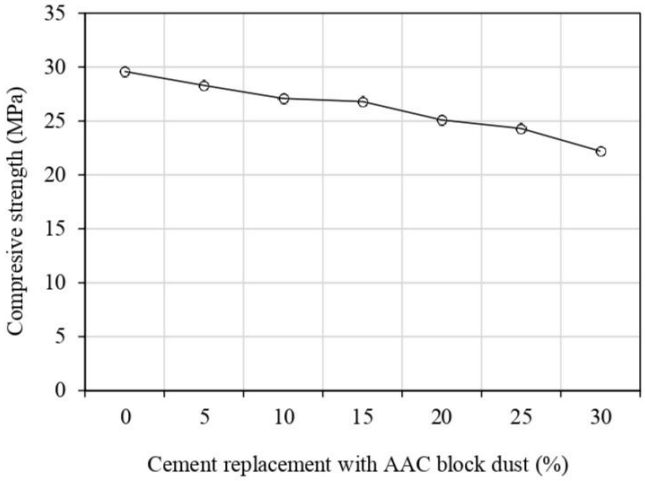


Fig: 4-28 days' Compressive strength mortar cube with AAC block dust replacement



5.2 XRD Spectroscopy on Mortar Cube

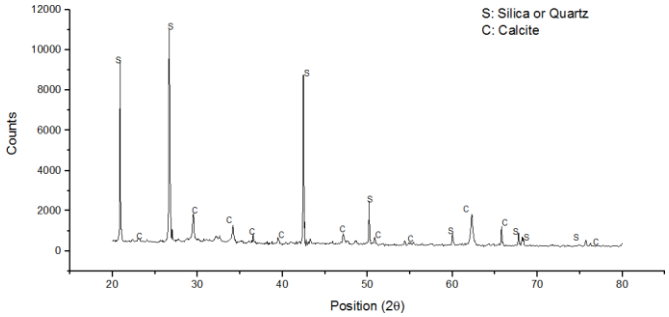
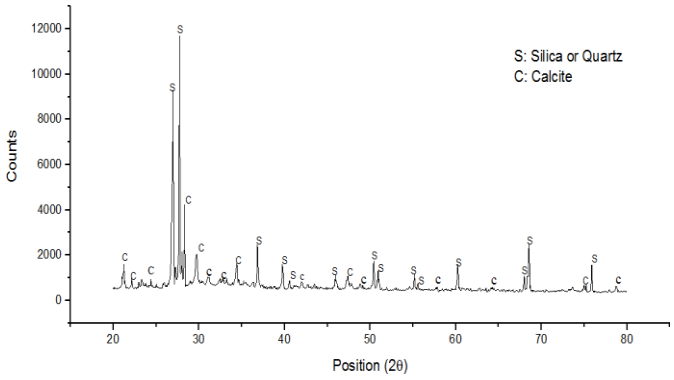


Fig :5-XRD analysis of Normal Mortar cube

Fig: 6- XRD analysis of Mortar cube with 20% replaced with CLC block dust



6. CONCLUSIONS

Based on the experimental investigation on utilization of CLC and AAC block dust in structural concrete for sustainable construction the following conclusion are drawn:

Specific gravity of CLC and AAC block dust are 2.18 and 2.10 respectively which was too low compared to the specific gravity of ordinary Portland cement (which is found to be 3.15).

The consistency of CLC and AAC block dust are found to be 45 and 53 respectively which was more than that of ordinary Portland cement. So it can be concluded that CLC and AAC dust need more water than cement for casting mortar cubes.

SEM, EDX and XRD analysis results show that CLC block dust contain more calcite component than AAC block dust and both has cementitious properties. Therefore these materials can be used to replace cement for concrete making.

Compressive strength of mortar cube at 7 day for 5% CLC block dust replacement found to be lower than normal cement mortar (with 0% replacement) but 10-20% CLC block dust replacement gives compressive strength more than normal cement mortar (with 0% replacement). However, the strength decreases for further increase of CLC dust replacement. On the other hand AAC block dust replacement does not show any improvement of compressive strength over the normal cement mortar (with 0% replacement)

Compressive strength of mortar cube at 28 day for 5-20% CLC block dust replacement found to be higher than normal cement mortar (with 0% replacement). Compressive strength of mortar cube at 28 day for AAC block dust replacement does not show any improvement of compressive strength over the normal cement mortar (with 0% replacement).

XRD analysis of mortar cube sample confirms that 20% CLC block dust replacement results more calcite component than normal cement mortar (with 0% replacement).

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