A STUDY ON CELLULAR LIGHTWEIGHT CONCRETE BLOCKS

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Abstract

The use of Fly Ash Light-weight Concrete gives a planned answer for building development. In this paper, an endeavor is made to think about on cellular lightweight solid squares, and suggest as it can be utilized as a part of building development.

Keywords*: Fly Ash Foam Concrete, Foaming Agent CLC Blocks, CLC Bricks, Cellular Light Weight Bricks, etc.*

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I. INTRODUCTION

Since the properties of foamed cement can change generally, and it can be utilized as a part of a wide assortment of utilizations, it is vital to characterize execution prerequisites for every case.Conventional concrete made with natural aggregates originating from hard rock as a high density lies within the range of 2200 to 2260 kg/m^3 and speaks to a huge extent of the dead load on a structure. As indicated by BS: 8110: Part 2: 1985 arranges the lightweight foamed cement is unified with a density of 2000 kg/M3 or less.

Lightweight foamed concrete can be gaseous or foamed concrete that uses specially prepared chemicals; it can be a no-fines concrete that uses ordinary gravel or crushed stone, a normal-weight aggregate concrete with an excessive amount of entrained air, or a concrete that is made from lightweight aggregates. Lightweight foamed concrete is a class of aerated concrete. Aerated concrete can be classified according to the methods and agents used to introduce air in the concrete. Aerated concrete can be produced by introducing air entraining agent, gas forming chemicals and foaming agents. Concrete which is aerated using foaming agent is known as lightweight foamed concrete. Foaming agents can be synthetic based or protein based.

The use of lightweight foamed concrete offer many benefits and advantageous particularly cost saving, fast completion and easy application compared to other materials such as steel and timber. Lightweight foamed concrete is characterized by its low compressive strength and high insulation against heat and sound. The compressive strength and other functional properties of lightweight foamed concrete are greatly influenced by the amount of air content introduced by foaming agents. The application of lightweight foamed concrete in civil engineering works is very broad as it can be used in almost every parts of building from the superstructure right down to the substructure, including wall panels and roofing. Any conventional panels or masonry units used for load and non-load bearing walls using normal concrete can be replaced directly by foamed concrete panels and units. Very low density lightweight foamed concrete can be used as thermal and sound insulation panels, filtering media and floating blocks for fishery purposes. Lightweight foamed concrete can also be used to cast elements for architectural purposes, pottery, void filling, trench reinstatement, foundation raising and swimming pool. In highway construction, lightweight foamed concrete can be applied as soil filling for sub-base, bridge abutments and bridge embankment. It is worth noting that the use of lightweight foamed concrete is popular in other countries such Europe, Japan and United Kingdom.

II. MATERIALS AND BLOCK DIMENSIONS

A. Cement
B. Water
C. Fly-Ash
D. Foaming

Size of blocks is as following:-
Length: 600 mm.
Height: 250 mm.
Width: 200 mm.

III. EXPERIMENTAL PROGRAM

At first begin with the water and fly ash. Blend for a couple of minutes and include concrete in stages and ensure the blending is careful (Mortar slurry planning).

- With the help of electric panel the desired quantity of water that is 165kgs of water is filled in the foam concrete mixer.
- The fly ash used for producing CLC blocks should not contain any aggregates & should be very fine as it can burst the bubbles formed in the slurry & hence it is passed through a sieve of 0.4 mm size.
- Then with the help of a conveyor belt the fly ash is passed to the foamed concrete mixer. The quantity of fly ash added is about 360kgs.
- The grade of cement preferred is M53 (OPC).
- The cement is added in the foam concrete mixer through the screw conveyor. The quantity of cement added is about 125kgs.
- Mould releasing oil like reebol (fosroc) need to be applied. By adding hardening chemical, we can reduce the de-mould time marginally. Also, it depends on the climatic conditions.

- Pumping of the CLC discharged from the plant to the mould can be done separately by foam concrete pump (screw pump). However density may affect up to 10% to 15%.
- In water curing procedure 12 to 14 days are required while in steam curing procedure 12 hours are required.
- The proportions of the various constituents vary depending up on the density to be achieved.

Fig 3.1 Mould

IV. CLASSIFICATION OF CLC BLOCKS

Density of Fly Ash lightweight concrete range is 400kg/m3 to 1800kg/m^3. Data gave in this paper is to thickness of 800kg/m3 to 1000kg/m^3.

Fig 4.1 CLC Blocks

V. COMPARISION OF TECHNICAL PARAMETERS

Following is the procedure for water absorption test of foamed concrete.

- The dry weight of the samples is noted down. Let this weight be W1.
- The samples are immersed in water for 24 hours.
- Now the samples are taken out from water and weighed. Let this weight be W2.
- The difference in the weight gives the moisture content.

Calculation:-
Calculate the water absorption as follows:-
Water absorption kg/rn^3=$\big((B-A)(B-C)\big)\times 1000$
Water absorption percent=$((\mathrm{B}-\mathrm{A})\ \div\ \mathrm{A}))\ \times 1000$
Where;
A → wet unit mass in kg.
B → dry unit mass in kg.
C →suspended immersed unit mass inkg.

Table 1: Test Results – General Properties for water curing

SL.	PARAMETERS	CLC BLOCKS		
1	DRY DENSITY (Kg/m3)	800	900	1000
2	COMPRESSIVE STRENGTH (N/mm2)	2.6	3.2	3.8
3	DRYING SHRINKAGE (mm/meter)	NO SHRINKAGE	NO SHRINKAGE	NO SHRINKAGE
4	THERMAL CONDUCTIVITY (W/m.k)	0.32	0.34	0.36
5	WATER ABSORPTION (%)	11.87	11.51	11.37

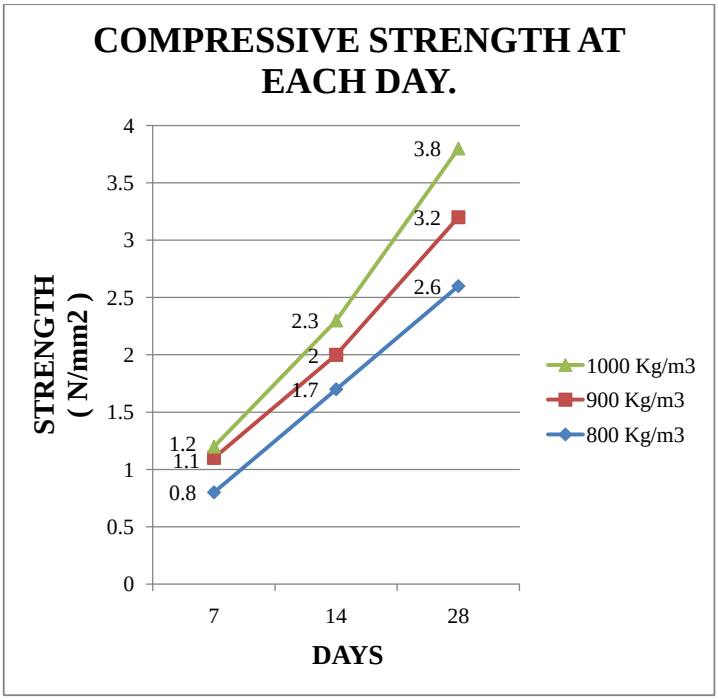

Fig 5.1 Compressive strength at each day

Table 2: Test Results – General Properties for steam curing

SL.	PARAMETERS	CLC BLOCKS		
1	DRY DENSITY (Kg/m3)	800	900	1000
2	COMPRESSIVE STRENGTH (N/mm2)	2.7	3.3	4.1
3	DRYING SHRINKAGE (mm/meter)	NO SHRINKAGE	NO SHRINKAGE	NO SHRINKAGE
4	THERMAL CONDUCTIVITY (W/m.k)	0.32	0.34	0.36
5	WATER ABSORPTION (%)	11.68	11.47	11.26

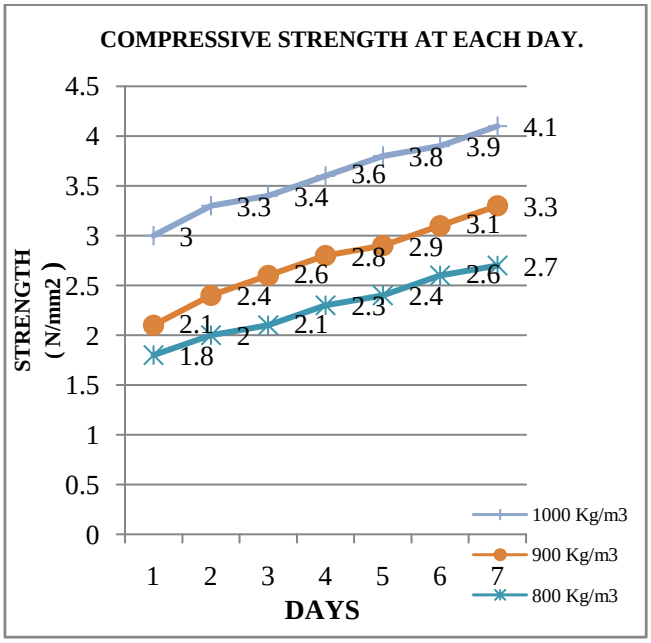

Fig 5.2 compressive strength at each day

VI. RESULTS AND DISCUSSIONS

Properties of fly ash lightweight concrete are good enough to be used in non-load bearing building construction where load is transferred from beam to column and then to foundation therefore structure load will not be falling on to wall in that case much needed strength in wall is not required.

VII. ADVANTAGES

Fly ash foamed concrete add to the diminishment of building dead weight along these lines bringing about more monetary basic configuration. Generation of more financial basic outline will diminish the measure of material utilized and in the long run chopping down the expense of development venture itself bringing about benefit increment to the contractual worker. Other than that, different scientists included that the gentility of structure makes it less demanding to be transported and took care of. Furthermore, it's additionally has a low warm conductivity that makes it a fantastic flame assurance property.

VIII. CONCLUSIONS

The compressive strength of foamed concrete is found to be within the prescribed limits as mentioned in IS code. The percentage of water absorption was also found to be within the prescribed limits. The density of foamed concrete blocks is less than that of burnt clay bricks & that of conventional concrete. Thus it reduces the dead load on the columns; this indirectly reduces the amount of reinforcement to be provided. Hence makes the construction economical. The cost of construction of foamed concrete blocks is less as it uses a waste product i.e. fly ash obtained from thermal power plant. Some of the features of foamed concrete blocks are as follows:-

- It requires low investment.
- It is a future product as burnt clay bricks are getting banned in India.
- The plant is easy to install.
- It can earn more profit as initial investment is less.
- Minimum 6000 sq. ft. area is required for setting the plant.

It is a green product.

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