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PERFORMANCE EVALUATION ON FOAMED CELLULAR LIGHT WEIGHT CONCRETE AS A REPLACEMENT OF BURNT CLAY BRICKS

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Abstract - *The project was aimed to replacement of Cellular light weight blocks can used as an alternative to the red bricks to reduce Environmental pollution. The material was mainly used as a replacement to reduce the carbon monoxide emission and consequence of greenhouse effect. The Compressive strength and Water absorption test was determined for the blocks and aimed to increase the strength and durability of concrete. The compressive strength and other physical properties of lightweight foamed mortar are influenced by the amount of air content introduced by foaming agents.*

***Key Words*: Cellular light Weight Mortar blocks, Conventional bricks, Compressive strength, Water absorption test,**

1. INTRODUCTION

At a local level, environmental pollution from brick-making operations is injurious to human health, animals and plant life. At a global level, environmental pollution from brick-making operations contributes to the phenomena of global warming and climate change. Also, extreme weather may cause degradation of the brick surface due to frost damage. Cellular light weight technology blocks can be used as an alternative to the red bricks, to reduce Environmental pollution and Global Warming. CLM blocks are environment friendly.

1.1 MIX DESIGN

Cellular light weight mortar or foamed mortar is produced by the mixing of sand, fly-ash cement, foam and water in requisite proportion in ready mix plant or ordinary mortar mixer.

The quality of CLM production can be controlled accurately at the project and implementation site, just like mortar. According to BS: 8110: Part 2: 1985 classifies the lightweight foamed mortar is one with a density of 1200 kg/m^3 or less. Lightweight foamed mortar can be gaseous or foamed mortar it is used to specially prepared chemicals; it can be a no-fines mortar 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 mortar is a class of aerated concrete. Aerated concrete can be classified as 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. Mortar which is aerated using foaming agent is known as lightweight foamed mortar. Foaming agents can be synthetic based or protein based.

The use of lightweight foamed mortar offer many benefits and advantageous particularly cost saving, fast completion and easy application compared to other materials such as steel and timber. Lightweight foamed mortar is characterized by its low compressive strength and also high insulation against heat and sound. The compressive strength and other functional properties of lightweight foamed mortar are greatly influenced by the amount of air content introduced by foaming agents.

1.2 MATERIAL STUDY

The mortar mixture consists of following ingredients.

1. Cement
2. Fly ash
3. Foaming agent
4. Fine aggregate
5. Water

Cement: Portland cement of 53 grade confirming to IS 12269:1987 is used in this study. The specific gravity of cement is 3.15.

Fly-Ash: Fly ash, the by-product in thermal power plants is used. Fly ash conforming to IS 3812 (part-1) is used. Uniform blending of fly ash with cement is ensured.

Foaming Agent: The containments holding foaming agents must be kept airtight and under temperature not exceeding 25 degree C. Once diluted in 20 parts of potable water. The emulsion must to be used soonest. The weight of foam Mortar should be minimum 50g/l under no circumstances must the foaming agent be brought in contact with any oil, fat, chemical. Or other material that might harm its function (oil has an influence on the surface tension of water)

The nominal dimensions of the CLM blocks are as follows:-

Length: 190mm.

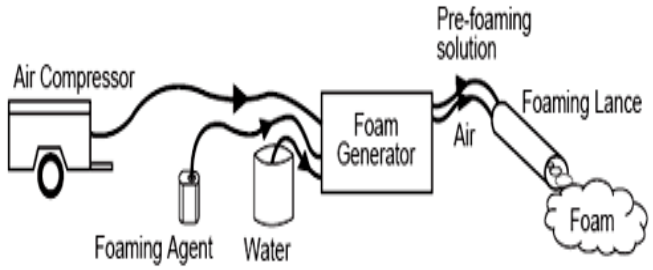
Height: 90mm.

Width: 90mm.

Water: The water used in the manufacture of CLM Blocks is potable water.

Synthetic Based Agent: The light weight mixed foaming, the surface active agent was mixed along with base mix ingredients and during the process of mixing; foam is produced resulting in cellular structure in mortar.

2. FOAMING PROCESS



PREPERATION OF FOAMED MORTAR BRICK

Table -1: SPECIFIC GRAVITY OF CEMENT

Specification	Trial gms
Weight of empty pycnometer	133
Weight of pycnometer + cement	256
Weight of pycnometer + cement +kerosene	424
Weight of empty pycnometer +kerosene	360
Weight of empty pycnometer + water	423

Specific gravity of cement = 3.15

Table -2: SPECIFIC GRAVITY OF SAND

Specification	Trial Kg
Weight of empty pycnometer	0.660
Weight of pycnometer + sand	1.330
Weight of pycnometer + sand+ water	1.911
Weight of empty pycnometer + water	1.479

Specific gravity of Sand = 2.65

Table -3: SIEVE ANALYSIS OF FINE AGGREGATE

Sieve Size	Weight Retained (gm)	Cumulative Weight Retained (gm)	% Cumulative Wt. Retained	% Passing
4.75mm	0	0	0	100
2.36mm	93	93	9.3	90.7
1.18mm	124	217	21.7	78.3
0.600µ	145	362	36.2	63.8
0.300µ	469	831	83.1	16.9
0.150µ	169	1000	100	0
TOTAL	**1kg**		**250.3**	

Fineness modulus = 250.3 / 100

= 2.50

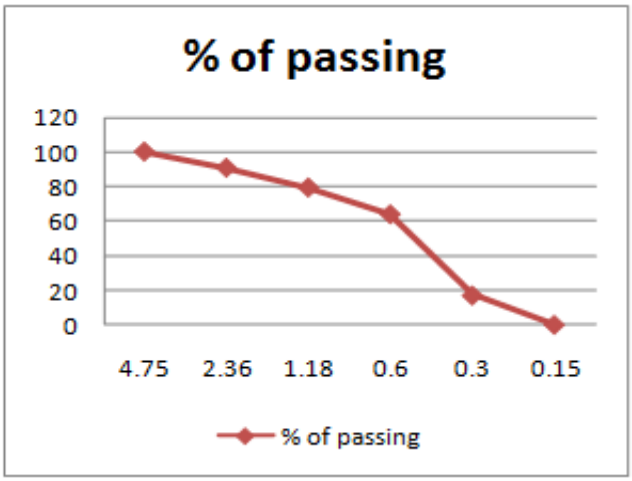


Chart -1: Sieve Analysis of Fine Aggregate

WATER ABSORPTION TEST

CONVENTIONAL BRICKS

Water absorption	$= M_2 - M_1/M_{1 X 100}$
Weight of brick (M_1)	= 3500g
Weight of saturated bricks (M_2)	= 38

Water absorption = 10.8%

FOAMED BLOCKS

Water absorption	$= M_2 - M_1/M_{1 X 100}$
Weight of brick (W_1)	= 2000g
Weight of saturated bricks (M_2)	= 2125g

Water absorption = 6.25%

COMPRESSIVE STRENGTH OF CONVENTIONAL BRICKS

Compressive strength = load /area

= 59850/17100

= 3.5 N/mm^2

Compressive strength on conventional bricks = 3.5 N/mm^2

COMPRESSIVE STRENGTH ON FOAMED BLOCKS

Compressive strength = load /area

= 64980/17100

= 3.8 N/mm^2

Compressive strength on foamed blocks = 3.8 N/mm^2

RESULTS AND DISCUSSIONS

COMPERSSIVE STRENGTH:

The compressive strength of CLM Blocks for 800kg/m^3 is 3.8 N/mm^2 and for Clay Bricks compressive strength is 3.5 N/mm^2.

WATER ABSORPTION

The water absorption of CLM Blocks is 6.25% for 800 kg/m3and 10.5% for burnt clay bricks. Due to the cellular structure of foam concrete water

SL. NO	PARAMETERS	CLM BRICKS	BURNT CLAY BRICK
1	Brick density	800	1900
2	Compressive strength (N/mm2)	3.8	3.5
3	Water absorption (%)	6.25	10.5
4	Drying density	No shrinkage	No shrinkage

3. CONCLUSIONS

- This study has shown that the use of fly ash in foamed concrete, either can greatly improve its properties. Most of the cleaner production effort is required in India.
- The clay brick production industry is a major source of air pollution in developing countries.
- The major issues in environmental improvement involve improving the combustion efficiency of existing kilns, and upgrading kilns to newer and more efficient process designs.
- The process of manufacturing clay bricks also requires high energy to burn due to the emission of CO2gas in the process.

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