Comparison of Engineering Properties of Foam Concrete Brick with other Material Brick

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Abstract— This paper present the comparison study on effect in strength of foam concrete brick compared to the other material brick like fly ash and quarry dust. Blocks are broadly utilized in building development as the most widely recognized building materials. The foaming agent has added with water and mixed thoroughly. Mixed cement and filler added slowly with this and after certain minutes of mixing this gel poured into the mould of size 19 x 9 x 9 cm to get the brick specimen. The specimen were water cured for 7 to 14 days. Then the compressive strength of these brick at the age of 7 and 14 days was obtained. Then we compare some engineering properties of bricks with each other.

Key words: Quarry Dust, Foam Concrete, Fly Ash, Compressive Strength

I. INTRODUCTION

A. General:

Foam concrete, is defined as a cement based slurry, with foam entrained into the mortar. As for the most part no coarse total is utilized for creation of froth concrete the right term would be called mortar rather than cement;it may be called "foamed cement" from which we had made bricks. And we use Pulverized fuel ash commonly known as fly ash is a useful by-product from thermal power stations using pulverized coal as fuel and has considerable pozzolonic activity. And we use Quarry dust which is a byproduct of the crushing process which is a concentrated material to use as aggregates for concreting purpose, especially as fine aggregates.

B. Objectives:

The main objective of the project is to compare the engineering properties of foam concrete brick with other material brick which satisfies the following points

1) cheap price
2) reducing weight
3) good compressive strength
4) less water absorbtion
5) ecofriendly

II. MATERIAL USED

The following material are used for produced building brick.

A. Foaming agent (FA):

A foaming agent is a material that facilitates formation of foam such as as a surfactant, or a blowing agent. A surfactant, when present in small amounts, reduces surface tension of a liquid (reduces the word needed to create the foam) or increases its colloidal stability by inhibiting coalescence of bubbles. A blowing agent is a gas that foams the gasesous part of the foam.

B. Cement:

A powdery substance made by calcaning lime and clay, mixed with water, sand and gravel to make concrete. Cement is a binder, a substance that sets and hardens independently and can bind other material together. The most important use of cement is the production of mortar and concrete, the bonding of natural and artificial aggregates to form a strong buildind material that is duriable in the face of normal environmental effects. OPC 53 Grade cement is required to conform to BIS specification IS:12269-1987 with a designed strength for 28 days being a minimum of 53 MPa or 530 kg/sqcm. 53 Grade OPC provides high strength and durability to structures because of its optimum particle size distribution and superior crystallized structure.

1) Grade:

OPC 53 Grade Birla Gold OPC 53 Grade, 50 Kgs. Birla Gold Regal Cement is a superior quality Ordinary Portland Cement which is made from high-quality Clinker added with calibrated amount of highly purified Gypsum.

C. Fly ash:

Fly ash or flue ash, also known as pulverised fuel ash. Fly ash is finely divided by-product resulting from the combustion of coal in power plants. It contains large amounts of silica, alumina and small amount of unburned carbon, which pollutes environment.

It is grey in colour and alkaline in nature. The practice size ranges between 1- 100 microns. The specific gravity of flyash lies between 1.9 to 2.8 (generally 3.15 for cement). Fly ash as a building material has many advantage, like cost effectiveness, environmental friendly, Increase in strength a nd conservation of other natural resources and materials. The surface area is typically 300-500 m2/kg although some FA can have a surface area as high as 700 m2/kg (around 330 m2/kg for cement) the mass per unit volume including air between particles(density) can vary from 540 to 860 kg/m3.the inclusion of high volume of the fly ash increase the workability as the content of FA is increased. The increase in the slump height is about 40% and 54% with the inclusion of 45% and 50% FA respectively. Generally higher substitution of port lab cement by fly ash reduces the water requirement for obtaining a given workability.

1) Points of interest of fly slag blocks:

- Lower water assimilation
- Dimensional exactness
- High solidarity to weight proportion
- High compressive quality
- Consumption of less mortar in development
- Conservation of regular assets like soil, sand and so forth.

2) Fly slag powder was gathered from, it is greyish shading

- Physical properties of fly ash:
- Specific Gravity -2.54 to 2.65gm/ cc
- Bulk Density- 1.11 gm/cc
- Fineness- 350 to 450 m2 /kg

3) Chemical Properties of Fly ash:

- Silica 35-70%
- Alumina 10-33%
- Calcium Oxide 0.2-2%
- Loss on ignition 0.1-2%
- Sulphur 0.5-1.5%
- Iron 2-7%

D. Quarry dust:

Quarry dust is a by-product of the crushing process which is a concentrated material to use as aggregates for concreting purpose, especially as fine aggregates. In quarrying activities , the rock has been crushed into various sizes: during the process the dust generated is called quarry dust and it is formed as waste. Quarry dust is a residue obtained during stone crushing process in crusher units. It is also used as an effective alternative material in normal concrete instead of fine aggregate sand. In this study Quarry dust passing through IS sieve of size 600 microns was used. Quarry Dust was collected from crusher plant district. The various properties of quarry dust are tabulated in Table 1

Sr no.	Description	Value
1	Density	2.67
2	Void ratio	0.64
3	Specific gravity	2.84
4	Fineness modulus	52.6%

Table 1: Properties of quarry dust

E. Water:

Water is an important ingredient for brick making. It helps in chemical reaction with cement. Water used in this project is free from organic material. Potable water with pH value 7 was used for mixing and curing throughout this experiment. It was tested permissible limit as per IS:456-2000. Properties obtained are-

Solid	Result(mg/l)	Permissible limit(mg/l)
Organic	50	200
inorganic	1250	3000
sulphate	80	400
Suspended matter	700	2000
pH	6.9	>6

III. EXPERIMENTAL PROCEDURE

A. Manufacturing Of Bricks:

As we as a whole are especially clear about the procedure of assembling of blocks, and there is no troublesome method of throwing the block. The block was produced by regular strategy.

B. Mould Preparation:

Form was set up of size (19x9x9) cm subsequent to gathering the required materials. This Mould was comprised of non-permeable material like wood of Standard size 190mm length, 90mm wide and 90mm height. Wooden shape was set up so that all pieces of the shape are masked for remoulding of block. For keep away from spillage issue joints were made with no gap or hole.

C. Mixing Ratio:

For the std, size of brick mould(19x9x9)cm required mixer of up to 2500 gm. In this study four different mix ratios of cement with filler were prepared.

D. Dry Mixing:

Ingredient were weighted in grams as per the proportions decided. Mixing was done within 4-5 minutes and stop watch was used. The wooden mould of size (19x9x9)cm was oiled properly before filling the mixer. The mix was prepared by dry mixing . Two dry materials Fly ash, and Cement were mixed thoroughly. And was added till the homogeneous mixer was obtained.

E. Casting of Bricks:

Inside 30 minutes , blend was put in the form. To make the procedure quick two molds were utilized at once. The additional blend was evacuated by spatula for giving appropriate wrapping up. After completing the block tests were demoulded and were taken for drying for the times of 12-13 hours.

F. Curing:

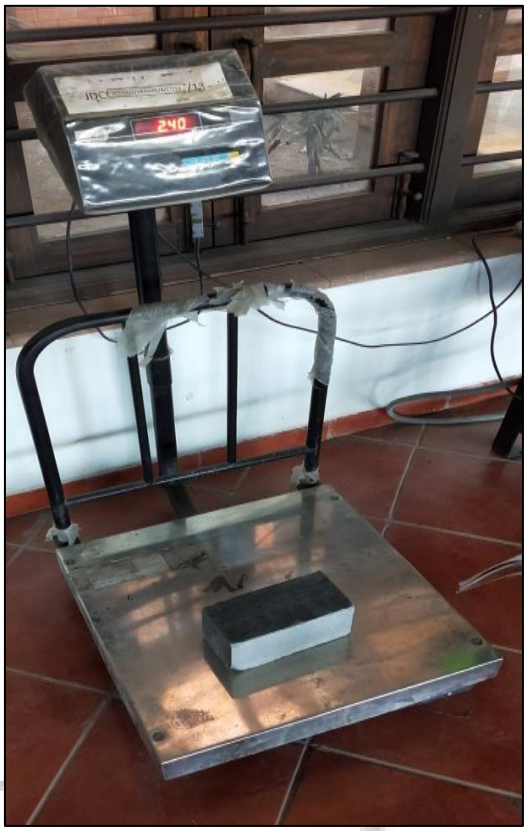
Curing was done by covering the bricks with a wet gunny bags for periods of 3days, 7 days and 14 days.

IV. RESULTS

In the wake of relieving the brick they were examined for utilizing as a brick. Weight, Compressive quality, and Water assimilation test were performed to look at properties of bricks. The test results were contrasted and the current and standard outcomes.

A. Weight

Sr no.	Sample	Fly ash in %	cement	Quarry dust	FA in litre	Weight in Kg
1	S1	70	30	-	-	2.40
2	S2	70	30	-	0.2	1.56
3	S3	-	30	70	0.2	2.50
4	S4	-	30	70	-	3.05



B. Water Absorption Test

The bricks were tested in accordance with the procedure laid down in IS 3495 (Part 2) after immersion in cold water for 24hr shall have average water absorption not more than 20% by mass up to class 12.5 and 15% by pass for higher classes.The brick is weaker when the water absorption capacity is more and vice versa.water absorption value of bricks grately affected by the bond between brick and mortar.

Sr.no	Sample	Water absorption %
1	S1	12.04
2	S2	25.72
3	S3	15.37
4	S4	11.48

C. Compressive strength:

The minimum average compressive strength of brick shall not be less than 3.5 N/mm^2 when tested as described in IS3495 (Part 1):1976.

The following steps were followed for Compression testing

– In the widespread testing machine the block was put midway on the base plate.
– Then with no development the upper plate of the widespread testing machine was dropped down up to the block was hold firmly.
– Then at a uniform rate the heap was connected pivotally.
– Till the half of the block this heap was connected.

1) For estimation of normal compressive quality three blocks from same extent were tried inevitably.
2) Compressive quality was determined by this equation
3) Compressive quality = (load/surface Area)N/mm ^{2}

Compressive strength of bricks at 7days and 14 days are shown in following table-

Sr.no	Bricks	Compressive strength (N/mm2)7 days	Compressive strength (N/mm^2)
1	1st brick	8.12	10.22
2	2nd brick	6.37	8.56
3	3rd brick	7.25	9.38

Average for 7 days- 7.25N/mm^2
Average for 14 days-9.38N/mm^2
Sample 1: cement +fly ash+ water

Sr.no	bricks	Compressive strength(N/mm2)7 days	Compressive strength (N/mm2)14days
1	1st brick	5.61	7.85
2	2nd brick	5.68	8.10
3	3rd brick	5.86	8.30

Average for 7days-5.71N/mm^2
Average for 14 days- 8.08N/mm^2
Sample 2-cement+fly ash+foaming agent+water

Sr.no	bricks	Compressive strength (N/mm2)7 days	Compressive strength(N/mm2)14 days
1	1st brick	5.60	6.24
2	2nd brick	4.98	6.87
3	3rd brick brick	5.09	7.20

Average for 7days-5.22N/mm2
Average for 14 days-6.77N/mm2
Sample 3- cement +quarry dust +foaming agent

Sr.no	bricks	Compressive strength (N/mm^2) 7days	Compressive strength (N/mm2) 14 days
1	1st brick	5.35	7.04
2	2nd brick	5.98	7.83
3	3rd brick	6.25	7.96

Average for 7 days-5.83N/mm^2
Average for 14 days-7.61 N/mm^2
Sample 4-cement+quarry dust +water

D. Soundness Test:

The blocks of having same extent were taken and they were hit with one another. The blocks were not broken and clear metallic or ringing sound was created. So the blocks are great.

E. Hardness Test:

In this test, the scratch was made on the outside of block. For all the three extents of block this test was completed. Light finger nail impression was left on the light weight block while the scratch was made with the assistance of figure nail on the

block. Thus, this test outcomes that light weight block are adequately hard.

V. CONCLUSION

- Fly ash and bond block are light weight block when contrasted with regular block and this lightweight blocks are light weight than concrete and fly ash block.
- The water absorption of other material brick is less than foam concrete brick.
- The compressive strength of fly ash brick is more than the other brick.
- The weight of foam concrete brick is lighter than the other material brick.
- The result in the increment of voids throughout the sample is caused by foam.

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