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MANUFACTURING OF LIGHT WEIGHT BRICKS

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Abstract - Brick is the most used and one of the main construction material used in assembling of various infrastructures. This study reviews to produce an all time alternative to normal fly ash and red brick by using foam agent and local materials which is substitute to the red clay bricks. This foam brick considered as new construction Buildings materials used in construction sector. This light weight foam Bricks are used in the construction and building material due to its properties. The development of fly ash-based lightweight foam bricks is relatively new idea in the field of construction materials. This study finds that the use of fly ash, cement and rice husk ash as a raw materials and addition of foaming agent produces a mixture which have porosity and good binding properties to form a brick. The effects of the various raw materials have been discussed and most manufactured bricks with adding of foaming agent have shown positive effects on lightweight foam bricks as it increases the pores in the brick and improved the thermal conductivity of fly ash-based foam brick.

Key Words: foam, porosity

1.INTRODUCTION

Bricks are the man – made construction materials and considered one of the oldest manufactured construction materials in the world. Bricks is one of the most important building materials in the construction industry. Brick making is a traditional method, generally occur in the rural areas. In recent years, with increasing urbanization and demand for construction materials, brick kilns should be capable of to meet the demand. But this kilns directly or indirectly caused a series of environmental and health problems hence environment friendly materials are important. Now walls in most buildings nowadays are made plywood and wood, common Bricks are mostly used but they have very heavy weight. Light weight bricks have two to three times less weight than then red or fly ash bricks. These fly ash based foam bricks are made up of eco-friendly material such as Fly ash and rice husk ash and other industrial wastes used manufacturing bricks and thus protecting the environment. The manufacturing process or its use does not release any harmful chemical to the environment. This also option to plywood partitions and thus control deforestation. Light weight foam bricks is a greater choice as a building material for where heat conductivity reduction, sound reduction, lighter loading, longer building lifespan or defence against seismic events are chosen. When light weight bricks is used in structural (load bearing) They reduce the dead load of the masonry structure from the building conditions, the weight gets lighter and decrease in the floor loads comes by the divider walls eventually reduces the overall dead load of the building. This is a outstanding and highly necessary outcome as it reduces risk and cost.

2. LITERATURE REVIEW

2.1 A.K. Marunmale, A.C.Attar, is concluded that Foamed concrete can achieve much lower densities (400 to 1400 kg/m^3) in comparison to conventional concrete. A series of tests was carried out to examine the mechanical parameters of foamed concrete: compressive strength, flexural strength, and modulus of elasticity. Furthermore, the influence of 25 cycles of freezing and thawing on the compressive strength was examined. The main conclusions that can be drawn from this study are the following: (i) the dosage of foaming agent influence the density of mix and hardened foamed concrete. The density of foamed concrete is strongly correlated with the foam content in the mix.(ii)The compressive strength, modulus of elasticity, and flexural strength decreased with the decrease of the density of the foamed concrete; the polynomial functions were suggested to describe these relationships.(iii)The compressive strength and modulus of elasticity of foamed concrete were slightly decreased by the addition of 5% of fly ash.(iv)The compressive strength of foamed concrete subjected to freeze-thaw tests shows the values only approximately 15% lower comparing to untreated specimens.

2.2 National Building Code of India 1983, The National Building Code of India (NBC), a comprehensive building Code, is a national instrument providing guidelines for regulating the building construction activities across the country. It is widely referred and used by state/local bodies regulating development and building construction activities, Government construction departments and agencies, private construction agencies/builders/developers, building professionals and consultants, academic and research institutions, and building material and technology suppliers throughout the country. The Code mainly contains administrative regulations, development control rules and general building requirements; fire safety requirements; stipulations regarding materials, structural design and construction (including safety); building and plumbing services; landscape development, signs and outdoor display structures; guidelines for sustainability, asset and facility management, etc. The Code was first published in 1970 at the instance of Planning Commission and then first revised in 1983. Thereafter three major amendments were issued to the 1983 version, two in 1987 and the third in 1997. The second revision of the Code was in 2005, to which two amendments were issued in 2015. Due to large scale changes in the building construction activities, such as change in nature of occupancies with prevalence of high rises and mixed occupancies, greater dependence and complicated nature of building services, development of new/innovative construction materials and technologies, greater need for preservation of environment and recognition of need for planned management of existing buildings and built environment, there has been a paradigm shift in building construction scenario. Considering these, a Project for comprehensive revision of the Code was taken up under the aegis of the National Building Code Sectional Committee, CED 46 of BIS and its 22 expert Panels; involving around 1 000 experts.

2.3 B. V. Venkatarama Reddy, (Feb 2007), **Richardson Lal**, and **K. S. Nanjunda Rao,** Soil-cement blocks are used for the load bearing masonry of 2–3-story buildings. Flexural and shear strength of such walls greatly depend upon the bond strength between the block and the mortar. This paper deals with the methods of improving the shear-bond strength of soil-cement block masonry (without altering the mortar characteristics) and the influence of shear-bond strength on masonry compressive strength. Altering the texture of bed faces of the block, size and area of the frog, and certain surface coatings have been attempted to enhance the shear-bond strength. The results indicate that: (1) rough textured bed face of the blocks yields higher shear-bond strength than the plain surface; (2) use of fresh cement-slurry coating on the bed faces improves the shear-bond strength considerably; (3) no significant changes are noticed in the compressive strength and stress-strain characteristics of soil-cement block masonry due to changes in shear-bond strength; and (4) masonry has a higher straining capacity than that of the block and the mortar.

2.4 Godwin A. Akeke, Maurice E. Ephraim, Akobo, I.Z.S and Joseph O. Ukpata. From the experiments and analysis of results of findings in this research work, the following facts are established about RHA Concrete. RHA is a super pozzolan and its use in Civil Construction, besides reducing environmental polluters factors, will bring several improvements to concrete Characteristics. The compressive strength and workability tests suggests that RHA could be substituted for OPC at up to 25% in the production of concrete with no loss in workability or strength. Based on the results of split Tensile Strength test, it is convenient to state that there is no Substantial increase in Tensile Strength due to the addition of RHA. The Flexural strength studies indicate that there is a marginal improvement with 10 to 25% RHA replacement levels. Rice Husk Ash concrete possess a number of good qualities that make a durable and good structural concrete for both short term and long term considerations. It is good for structural concrete at 10% replacement level.

3.MATERIALS USED

1. Cement

It is a binder. OPC cement is used. Provides increased brick strength and improves quality consistency. Portland cement is preferred to other cements such as pozzolan. A high quality cement (initial strength) is recommended for early shrinkage and optimal mechanical properties. Thick walls and the use of battery formwork generate excessive heat, potentially necessitating the use of poor quality concrete.

2. Fly Ash

This raw material is freely available in the combined heat and power plant. Particulate fuel ash, commonly called fly ash, is a useful by-product of thermal power plants using pulverized coal as fuel and has significant activity. This domestic raw material has been judiciously used to produce lime ash bricks in addition to ordinary mud bricks, resulting in conservation of natural resources and environmental quality improvement of less than 50 microns.

3. Rice Husk Ash

This type of ash comes from a rice mill. After harvest, the rice husks were burned under a wire mesh or fenced area to reduce the amount of ash that was thrown up. The ash was ground to the required fineness and passed through a 600µm sieve to remove impurities and larger particles. Rice hull ash contains silicic acid in amorphous and highly cellular form with a surface area of 50–1000 m2/g. Therefore, the use of rice hull ash cement and better stability reduce heat build-up, thermal cracking and plastic shrinkage.

4. Foam Agent

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It is a fully biodegradable protein based foam concentrate that forms stable bubbles. It is used to upsurge the volume of bricks. A foaming agent is a material that enables development of foam such as a surface-active agent or a blowing agent A surface-active agent, when present in small amounts, reduces surface tension of a liquid (reduces the work needed to create the foam) or increases its colloidal stability by constraining combination of bubbles. A blowing agent is a gas which forms the gaseous part of the foam in brick.

5. Water

The water which is used for mixing and curing should noted that to be clean and free from injurious quantities of alkalis, acid, oils, salt, sugar, organic materials, vegetable development and other substances that may be harmful to brick. Potable water is generally considered acceptable for mixing. The ph value of the water should be not less than 6. The potable water was used here for mixing the material.

4. METHDOLOGY

1. Preparation of mould:

1. For smooth surfaces, clean the moulds completely of remaining materials, then the steel/ wood surface must be oiled. Mostly vegetable oil is preferred.
2. The oil is applied overall to the all corners of the mould so that the brick can be easily dismantled from mould without directly breaking its edges.

2. Mixing of foam:

1. The foam is a vital part of cellular light weight bricks.
2. It is used to create air voids into the bricks.
3. The proportion of foam is 10% of the weight of one ratio.

3. Proportion and Mixing:

1. Proportion of light weight bricks is based on the grade and strength and also density of mixture.
2. Ingredients are placed in to the mixers. The mixer must be revolving at 250 – 300 RPM
3. Proportion of the ratios are 1:0.5:1, 1:1:1, 1:1.5:1,

4. Placing of Light weight brick in the mould:

1. The oiled which is applied on mould is placed on clean surface probably in shade avoiding sunlight directly.
2. The mould is then filled completely and the extra material which is on top surface is wiped out and made plain.
3. The mould is latter then kept for 24 hours for setting of material in mould.

5. Curing and Transport:

1.The sprinkler method will be helpful or gunny bag that is kept wet on the bricks**.**

2. Standards call for a 2 to 3 weeks curing period for cement-based bricks.

6. Assembly:

1. Assembly of brick in Light weight bricks happens usually the same way as with normal bricks.
2. Special care has to be taken to the newly made bricks not to apply any mechanical force to avoid damage.

5. EXPERIMENTAL RESULT

1.Compression Strength Test

The specimen should be carefully centered between the testing machine's plates with its flat faces horizontal and its face filled with mortar facing upward. In order to determine the maximum load at failure, apply load axially at a constant rate per minute until failure occurs. The specimen fails to produce a further increase in the value of the indicator on the testing instrument at the highest load, which is referred to as the load at failure.
Following are the ratios 1:0.5:1, 1:1:1, 1:1.5:1, 1:2:1

Compressive Strength {N/mm^2}
Compressive Strength = Ultimate load / Area

Sr. No.	Area{ mm^2 }	Sample	Ultimate Load {N}	Compressive Strength {N/mm^2}	Average Compressive Strength {N/mm^2}
1	27840	1	80000	2.87	2.90
2	27840	2	87000	3.12	
3	27840	3	75000	2.70	

Ratio 1:0.5:1

Sr. No.	Area{ mm^2 }	Sample	Ultimate Load {N}	Compressive Strength {N/mm^2}	Average Compressive Strength {N/mm^2}
1	27840	1	93000	3.34	3.48
2	27840	2	97000	3.48	
3	27840	3	101000	3.62	

Ratio 1:1:1

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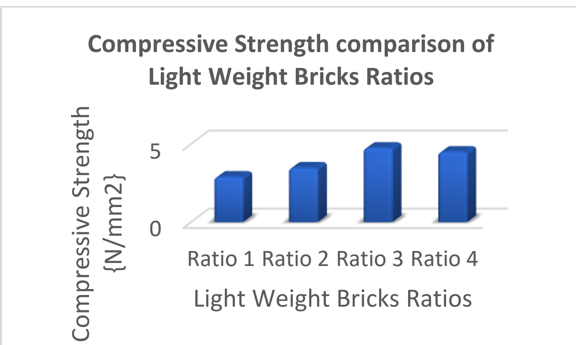
Sr. No.	Area{ mm^2 }	Sample	Ultimate Load {N}	Compressive Strength {N/mm^2}	Average Compressive Strength {N/mm^2}
1	27840	1	140000	5.02	4.75
2	27840	2	133000	4.77	
3	27840	3	125000	4.48	

Ratio 1:1.5:1

Sr. No.	Area{ mm^2 }	Sample	Ultimate Load {N}	Compressive Strength {N/mm^2}	Average Compressive Strength {N/mm^2}
1	27840	1	115000	4.13	4.06
2	27840	2	120000	4.31	
3	27840	3	105000	3.77	

Ratio 1:2:1



2. Water Absorption test

Totally dry the sample and dip it for 24 hours in clean water at a temperature of 27 2 °C. After removing the sample and using a wet towel to remove any remaining water, weigh the sample. Complete this weighing process 3 minutes after the sample have been removed from water (W2). Water absorption, percent by mass, after 24-hour Dipping of sample in cold water is given by the following formula:

W1-W2/W1*100

Sr. No.	Sample	Dry Weight [Kg] W1	Wet Weight [Kg] W2	Water Absorption= W2-W1/W1×100
1	1:0.5:1	1.875	2.405	22.04%
2	1:1:1	2.310	2.610	11.49 %
3	1:1.5:1	2.600	2.700	3.70%
4	1:2:1	2.400	2.515	4.57 %

3. Soundness Test

Bricks are tested for soundness to determine their resistance to rapid impact. In this experiment, two bricks are randomly selected and struck against one another.. Afterward, the sound made should be a crisp bell ringing sound, and the brick shouldn't crumble. It is then regarded as a nice brick.

Sr. No.	Light Weight Brick Ratios	Remark
1.	1:0.5:1	Good Ringing Sound
2.	1:1:1	Good Ringing Sound
3.	1:1.5:1	Good Ringing Sound
4.	1:2:1	Clear Sound

3. Hardness Test:

In this test, a cut is made on brick surface by the help of a finger nail. If no dint is left on the surface, brick is treated as to be satisfactorily hard. A decent brick should battle cuts against sharp things. So, for this test a sharp material tool or finger nail is use for making a cut on brick. If there is no cut imprint on brick then it is said to be solid brick.

Sr. No.	Light Weight Brick Ratios	Remark
1.	1:0.5:1	Scratches are Slightly visible
2.	1:1:1	Scratches are Slightly visible
3.	1:1.5:1	No scratches are formed
4.	1:2:1	No scratches are formed

6.SCOPE OF STUDY

The main aim of the study is to made workable lightweight foam brick made of local materials to substitute and alternative to the traditional red clay brick .After preparing the brick with cement, foam and eco-friendly waste, it can be concluded that this project will prove very useful for residents of rural and coastal areas and will have a significant impact on the environment due to its green character. This project itself is an innovative and new idea as it tackles a problem on a very macro level but solves it from a very micro perspective. After its success in India in, this project could also be implemented in other parts of the world.

7.CONCLUSION

1. The initial findings have shown that the light weight mortar bricks has a desirable strength to be alternative construction for the building system.
2. We include the rice hush ash on the light weight brick it help to increase the volume of the brick and also reduce the cost of the brick and also we maintain the existing physical properties of the normal CLC brick. When compare the other brick it was very cheap and durable. Light weight mortar brick are fully made by the wasted

material from the industries so, it was the ECO FRIENDLY PRODUCT.
3. Hardness of light weight brick is slightly very less hence wastage and damage of brick is very less as compare to fly ash bricks and clay bricks.

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