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Manufacturing of Bricks using Eco Sand and Foundry Sand

[1] R. Gopinath
Assistant Professor,
Department of Civil Engineering,
KGISL Institute of Technology, Coimbatore

***Abstract*- Burnt clay bricks are an old age building material which is used for housing in urban and rural parts of India. These bricks are manufactured from clay, which are obtained from agricultural land. Excess use of clay result in loss of fertile soil and diversion of agricultural land for brick manufacturing. It also involves of burning of bricks by coal and wood which results in production of greenhouse gases leading to environmental pollution.**

An effort for alternative approach in the manufacturing of brick was accomplished by using industrial by-product like foundry sand and eco sand derived from dolomitic lime stone with cement as key ingredients. In India there are many industries which generate foundry sand which is been dumped into vacant ground as waste. Dumping industrial waste into ground may be hazardous in nature; their disposal is a major concern. Recycling such waste by utilizing them into building materials is a moderate solution to reduce the pollution issues. Eco sand is the secondary product of rock after the separation of lime component. Eco sand can be used as an alternative for river sand and M Sand. The properties of eco sand and foundry sand are found out by using standard test procedure. In this project different proportions of cement, eco sand, foundry sand are thoroughly mixed and moulded into bricks and the test were performed for the property of compressive strength for 7 days,14 days, 28 days of curing and 24 hours of sun drying.

Keywords- Cement, Eco sand , Foundry sand Compressive strength.

I.INTRODUCTION

India has to face the global challenges of advanced technology, energy conservations, rapid automation, high productivity, low prices and efficiency-oriented privatisation for economic survival and growth. The traditional construction materials such as concrete, bricks, hollow blocks, solid blocks, pavement blocks and tiles are being produced from the existing natural resources. In the present scenario in the construction industry, use of economic and environmental friendly material is of a great concern.

In our country we are using ordinary burnt clay bricks. These bricks are having numerous disadvantages such as environmental pollution i.e. air pollution and land pollution. Air pollution takes place due to burning of bricks using coal and wood as a fuel for burning. Burning of coal produces greenhouse gases leading to environmental pollution. For manufacturing of these bricks huge amount of clay is required. This clay is obtained from agricultural land. Thus it causes land pollution through loss of good fertile soil.

We have made an attempt of manufacturing of bricks was accomplished by using industrial by-product like foundry sand and eco sand derived from dolomitic lime stone with cement as key ingredients.

II.LITERATURE SURVEY

[1]DHARSHANADEVI, ARAVINDSAMY, GURU SARAVANAN, SOWNDHARYAN, TAMIL SELVI: Concluded that concrete with Eco sand can be used for all normal construction activities to that of the conventional one.Eco sand can be used as substitute for fine aggregate which will reduce the cost of fine aggregate in concrete and also reduce the consumption of sand. Therefore it is safe to replace the fine aggregate with 25% Eco sand considering strength. It also enhances the workability of fresh concrete. Eco sand can be used as substitute for sand (fine aggregate) which will reduce the cost of sand in concrete and also reduce the consumption of sand. Therefore it is safe to replace the sand with 25% eco sand considering strength.28 days compressive strength, split tensile strength, modulus of elasticity, strength of ultimate concrete is more than the conventional concrete.

[2]PREETINDER SINGH, DR. SANJAY K. SHARMA, MRS. HIMMI GUPTA, ER. JASVIR SINGH RATTAN: Concluded that the experimental study is done on the newly developed Geopolymer brick using foundry sand by totally replacing the normal sand. Compressive strength is higher as compare to fly ash-cement based and burnt clay bricks. Water absorption is also low as compare to clay burnt bricks. Utilization of waste from foundry industry in making bricks for construction. Compressive strength increases as Na OH concentration varies from 8M to 12M. Size and shape is uniform throughout the length, width and height as per specification given in IS: 1077 (2002). Use of 2% ultra fine mineral material is optimum percentage which imparts strength to the bricks. No any kiln burning & water curing is required, simply bricks are harden by air curing and giving first class brick strength at 28 days. Slight efflorescence was visible on brick surface after performing efflorescence test.

[3]A. Sumathi, K. Saravana Raja Mohan:

Based on the experimental study, following conclusions can be drawn regarding the strength behavior of

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flyash brick; The study was conducted to find the optimum mix percentage of flyash brick. However the brick specimen of size 230mm x 110mm x 90mm were cast for different mix percentage of Flyash (15 to 50%), Gypsum (2%), Lime (5 to 30%) and Quarry dust (45 to 55%). However the specimens have been tested for seven mix proportions. The mechanical properties such as compressive strength were studied for different mix proportions, at different curing ages. From the results it was inferred that, among the seven proportions the maximum optimized compressive strength is obtained for optimal mix percentage of Flyash-15% Lime-30% Gypsum-2% Quarry dust-53% as 7.91 N/mm².

III.PROPOSED METHODOLOGY AND DISCUSSION

The main objective of the project is to effectively use the industrial waste that is widely available in the industries such as foundry sand. And also we use eco sand which is the secondary product of rock after the separation of lime. The weighed quantity of eco sand, foundry sand & cement was thoroughly mixed in dry state in a pan with the help of a trowel. The mixture in dry state is mixed till it attains a uniform colour. When the mixture attains uniform colourweighed quantity of water is added in the mixture of eco sand, foundry sand and cement. After addition of the required quantity of water the mixture is thoroughly mixed with the help of trowel in a pan. After mixing the mix initially with the trowel the mixture is again mixed thoroughly by kneading until the mass attains a uniform consistency. To calculate the quantity of water to be added Standard normal consistency test was performed and the water content for the normal consistency was determined. The water content used in the mix for strength tests was 90% of that required to produce the standard normal consistency.

Standard cement mortar brick moulds of size 230mmx110mmx70mm were used for preparation of bricks. The mixed binder was placed in the brick mould and was compacted properly by rod. Excess paste was hand finished. The mould was filled in three layers and each layer was compacted properly.

The bricks were taken out from the moulds after 24 hours. After removal from the moulds the bricks were kept for air drying for 2 hours. Curing is done for a period of 7 days,14 days and 28 days. The various percentage of materials has been taken and tested for strength to obtain maximum strength. The following are the sets proposed:

Proportions	Eco Sand (%)	Foundry Sand (%)	Cement(%)
SET1	-	85	15
SET 2	85	-	15
SET 3	42.5	42.5	15
SET 4	5	80	15
SET 5	10	75	15
SET 6	15	70	15
SET 7	20	65	15
SET 8	25	60	15
SET 9	30	55	15

IV.EXPERIMENTAL RESULTS

A. *Preliminary tests*

1. Sieve analysis test

The test is conducted for cement, foundry sand and eco sand.

Materials	Fineness modulus
Foundry sand	306
Eco sand	259.8

2. Specific Gravity test

Materials	Specific gravity(g/cc)
Cement	3.15
Foundry Sand	2.47
Eco Sand	2.1

3.Test on cement

Tests Conducted	Results
Consistency	33%
Initial setting time	30 minutes
Final setting time	9 hours 30 minutes

B. Compressive strength test

The compressive strength conducted for different mix proportions to obtain the characteristic strength of the material.

SET	7 Days (N/mm^2)	14 Days (N/mm^2)	28 Days (N/mm^2)
S_1	7.87	10.25	13.12
S_2	3.59	6.8	9.88
S_3	7.82	11.23	14.62
S_4	4.82	6.34	8.55
S_5	6.16	7.4	9.16
S_6	6.72	8.14	10.79
S_7	7.94	9.6	11.38
S_8	9.6	9.88	11.22
S_9	10.43	11.01	12.25

(a) Foundry sand

(b) Eco sand

(c) Bricks before curing

(d)Compression test

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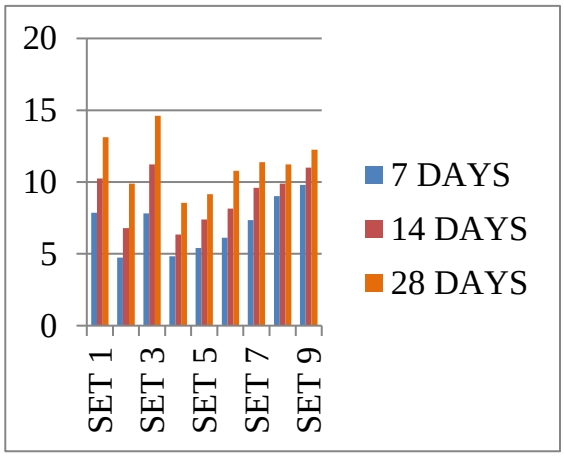

(e) Comparitive graph

- Maintenance cost of Solid block masonry is less than brick masonry because of efflorescence in brick masonry wall.
- Solid Block masonry is eco-friendly because in block units the sand can be substituted by waste products like Foundry sand and eco sand.
- Solid Block masonry presents better architectural view as compared to brick masonry.
- Block masonry consumes less mortar than brick masonry because volume of joints is less in brick masonry.
- From the manufacturing process to shipment, construction, and waste disposal is in ecological balance and Environmental friendly.
- It is easy to erect a solid masonry structure quickly and precisely. Only few tools for Implementation is necessary.

VI.REFERENCE

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For the effective result the maximum compressive strength is 14.62N/mm^2 obtained by adding 42.5% of foundry sand , 42.5% eco sand and then adding 15% of cement.

V.CONCLUSIONS

Based on the Experimental study the following conclusion has been drawn.

- First class Bricks are usually of 190X90X90 mm the Solid Block can be made of 230x110x70 mm.
- Compressive strength of Solid block masonry is 8.55 N/mm^2 to 14.62N/mm^2 which came out to be higher than nominal compressive strength of brick (3.5 to 5.5 N/mm^2).
- The cost of Solid block is estimated to be 20% more than that of a normal brick. So, block masonry is costlier than normal brick masonry.