

Experimental Work on Innovation and Implementation of Composite Brick in Construction

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Abstract— This project is an attempt to minimizing the extraction of raw materials with respect to the demand for building materials especially bricks. So this is an attempt to invent the composite brick by using the various raw materials like granite dust, ironite, M-sand with cement as binder. The composite bricks of size (190x90x90) mm are produced by applying pressure such that no need to burn in the kilns in turn environmental pollution can be avoided, this can be known as a green movement in making the building materials. After 28 days of curing the bricks will be tested for various characteristics like compressive strength and water absorption capacity, so this study will demonstrate the production of composite bricks and their comparison with the conventional clay bricks.

Key words: Cement, M-Sand, Granite Dust, Ironite, Compressive Strength, Save Environment

I. INTRODUCTION

The clay bricks are the well-known building materials for the construction of masonry walls which composed of clay, sand and water. The clay bricks are baked in the sunlight and burned in the kilns to get the required strength, however the increase in the demand of the building material for the high infrastructure has made the people to go for the alternate building materials for construction, it leads to invention of many kind of bricks likely as fly ash bricks, concrete blocks etc...

However the material mining for the production of clay bricks and other variant while leads to the environment destruction, also the production of common clay bricks emits a lot of greenhouse gases in atmosphere specially burning in the brick kilns, should be consider as the worse action against the environment.

But the composite bricks are the kind of bricks produced using waste materials from the various industries. The composite bricks produced in this project was done with cement, m-sand, granite dust from the various granite industry and ironite which is commonly known as the floor hardener obtained from various iron related industries.

In this study the composite bricks are produced in four different combination by varying the proportion of raw material. The size of the brick is common for all four combination likely (190x90x90) mm as per IS code 13757:1993. The composite bricks are produced by applying the pressure such that no need to burn in the kilns. The main theme is to produce the composite brick and compared with conventional clay bricks to know its merits and demerits.

II. OBJECTIVE

- To avoid the environmental pollution.
- Compared to normal brick the composite brick has higher compressive strength.

- It is easy to handle and also it's easy to work.

III. MATERIALS FOR COMPOSITE BRICKS

The various raw materials for manufacturing of composite bricks are M-sand, Granite dust, Ironite which is commonly known as the floor hardener and cement as a binder.

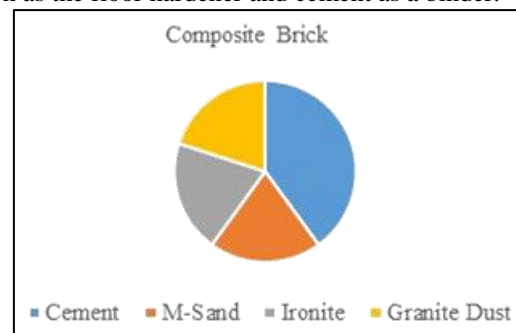


Fig. 1: Composition of Composite Brick

A. Cement

Cement is the binding material or building material which can be acts as binder because of the present of lime content hence its need as the binder in the production of composite brick.



Fig. 2: Cement

B. M-Sand

M-Sand stands for manufactured sand. M-sand is crushed aggregate produced from hard granite stone which is cubically shaped with grounded edges, washed and graded with consistency to be used as a substitute of rives sand.



Fig. 3: M-Sand

C. Granite Dust

The Granite dust is a by-product produced in granite factories while cutting into desired shapes. Granite belongs to igneous rock family which is having compressive strength more than 200 Mpa. Granite industry produces around 18 million tons waste per annum. It's also the fine material but contain some amounts of lumps. Those lumps should be taken away before using it.



Fig. 4: Granite Dust

D. Ironite

The Ironite or iron power obtained from the iron ores or grinding the waste iron. It is commonly known as the floor hardener used to strengthen the floor. It is a high rich ferrous material hence it can be added as the admixture in the production of bricks.



Fig. 5: Ironite

IV. MIXING PROPORTIONS AND MAKING OF COMPOSITE BRICK

The composite bricks shall be made with the raw materials like M-sand, Granite dust, Ironite and cement and water. The four combinations of raw materials as follows,

Mix No.	Cement in (%)	M-Sand in (%)	Granite Dust in (%)	Ironite in (%)
1	30	20	40	10
2	35	20	30	15
3	40	20	20	20
4	45	20	10	25

Table 1: Mixing Proportions for Composite Brick

A. Mould

The mould for making the composite bricks are made up of plywood. The size of the mould is (190*90*90) mm which is the standard size given in the IS code 13757:1993



Fig. 6: Mould for Composite Brick

B. Making of Composite Brick

The raw material like M-Sand, Granite dust, Ironite and Cement for each and every proportion are properly weighed in the weigh machine.

The raw materials are added one by one in the tray and mixed thoroughly by hand using trowel until the homogenous mix is obtained without adding the water such called as a dry mix.

Then the water is added in the required quantity as the mix must be capable of moulded into the brick, but it is to be ensured that the water content ratio should not exceed 0.55% with respect to the cement quantity.

Then the wet mix is filled in the mould with proper compacted.

Once the bricks are casted it should be undisturbed for a day hence it should be kept in a safe place. After 24 hours of time all the bricks should be removed from the mould and taken it to curing process. Minimum of 3 bricks to be casted in each and every mixes to know the characteristics properly.



Fig. 7: Dry Mix of Composite Brick



Fig. 8: Composite Bricks after Demoulded

C. Curing Process for Composite Bricks

The curing of the bricks is done by spraying water over it twice a day and kept under the sunlight to dry. Since the bricks have the tendency to dissolve in the water.

V. TESTING OF COMPOSITE BRICKS

The composite bricks should be tested for compression strength and water absorption capacity in the regular intervals like 3rd day, 7th day and 14th day to know its characteristics.

A. Compression Strength Test

The compression test shall be carried out in the compression testing machine the corresponding load at which the brick failure to the surface area gives the compression strength of the bricks. The average compressive strength for all the mixes at the 3th, 7th, 14th days are tabulated as follows

$$\text{Compressive Strength} = \frac{\text{Load in N}}{\text{Surface Area in mm}^2}$$

Mix No.	3 days (N/mm ²)	7 days (N/mm ²)
1	1.17	1.75
2	1.75	3.50
3	4.09	14.03
4	3.50	2.34

Table 2: Mean Values of Compressive Strength (N/mm²)

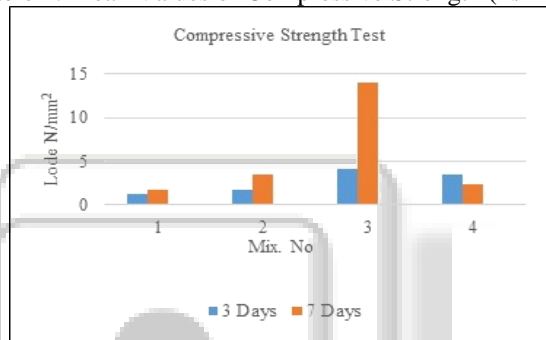


Fig. 9: Comparison of Compressive Strength of Various Mixes

B. Water Absorption

The water absorption of Composite bricks should not be greater than 20% of its weight. Similarly all mixes of the composite bricks are tested by keeping a bricks in the water for 24 hours and weighted as W2 and weighted before kept in water as W1 then the following formula gives the water absorption.

$$\text{Water absorption in \% by weight} = \frac{W2 - W1}{W1}$$

Mix No	Water Absorption Capacity in %
1	14.67
2	18.52
3	10.60
4	12.50

Table 3: Mean Values of Water Absorption Capacity in (%)

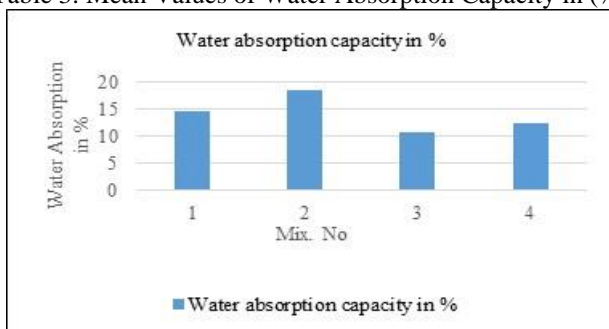


Fig. 10: Water absorption capacity in %

VI. CONCLUSIONS

Based on the experimental study, the following conclusions can be drawn on innovation and implementation of composite brick

By comparing the compressive strength of all the mixes of composite bricks with the compressive strength of burnt clay brick is 3.5 N/mm² as given in the IS Code 13757: 1993 table 1, the following mix 3 is just passing the minimum compressive strength required to use as the bricks as building material. Also the water absorption capacity of those mixes 3 are less than 12%. Hence the composite brick can be casted in four different proportions of its raw materials including Cement, Granite dust, Ironite, M-Sand, which will yield the strength of burnt clay bricks given. However an improvement is needed in the mixing, casting and curing to bring out the more effective and efficient composite bricks with the raw material used in the project.

REFERENCE

- [1] Dinesh W Gawatre (2014), Strength Characteristics of Different Types of Bricks. *International Journal of Science and Research*. Vol: 3, pp: 22472252.
- [2] M. Narmatha (2014), Strengthening of Fly Ash Brick by Ironite. *IOSR Journal of Mechanical and Civil Engineering*. Vol: 11, pp: 21-26.
- [3] P Devika Sabarirajan (2017), Study on Financial Performance of cement IJCRT Vol: 5, Issue 4 November 2017/ ISSN: 2320-2882.
- [4] Brick Industry Association. Technical Note 9A, Specifications for and Classification of Brick. Retrieved 28 December 2016.