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INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY TECHNOVATION (IRJMT)

http://www.mapletreejournals.com/index.php/IRJMT
Received 05 September 2019 ISSN 2582-1040
Accepted 28 October 2019 2019; 1(6); 258-265
Published online 02 November 2019

An Experimental Study on Bricks by Partial Replacement of Bagasse Ash

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Doi: https://doi.org/10.34256/irjmtcon35

ABSTRACT

The need for locally manufactured building materials has been emphasized in many countries of the world because of their easy availability & low cost. Bricks also have been regarded as one of the longest lasting and strongest building materials used throughout history. ordinary building bricks are made of a mixture of clay, which is subjected to various processes, differing according to the nature of the material, the method of manufacture and the character of the finished product. After being properly prepared the clay is formed in moulds to the desired shape, then dried and burnt. on seeing the present day demand for bricks, an attempt was made to study the behavior of bricks manufactured using, different waste materials like Bagasse ash with alumina sulphate, and lime was used to manufacture bricks. The main aim of this project was to compare the compressive strength of the bricks, so for this purpose different percentage of materials were separately added 6%, 8%, 16% & 20% by weight and then the compressive strength of the Bricks was established, and then with the help of graph a comparison between compressive strength of bricks, made out of Bagasse ash with alumina sulphate and normal brick was determined. Before manufacturing the bricks, different properties of the materials (Bagasse ash with alumina sulphate) was also verified. After that bricks were made & sun dried and some bricks were brunt & then with the help v of Compression Testing Machine (C.T.M.) finely their compressive strength was calculated. From this test in this project work it was concluded that the Bagasse ash was that waste material, which gave the acceptable compressive strength. The effects of the addition of Bagasse ash with alumina sulphate by percent-clay mix were also investigated. The admixtures were added in various combinations of proportions by weight (from 6 to 20%). The alumina sulphate, to contribute in attaining denser products with acceptable in compressive strengths, higher softening coefficients, lower water absorption rates, good compaction.

Keywords: Bricks, C.T.M., Building materials,

1. INTRODUCTION

The need for locally manufactured building materials has been emphasized in many countries of the world. There is imbalance between the expensive conventional building materials coupled with depletion of traditional building materials. To address this situation, attention has been focused on low-cost alternative building materials. Bricks are masonry units composed of inorganic non-metallic material and are widely used as building components all over the world. The bricks could be sun-dried or burnt. Burnt bricks are usually stronger than sundried bricks, especially if they are made of clay or clayey material. There are different categories of the bricks,

depending upon the admixtures and raw material used for making bricks. The recent studies shows that the Bagasse ash with alumina sulphate brick works attain its full strength. And also it is proved that the Bagasse ash with alumina sulphate added brick work has more capability to withstand more load, and has more crack resistance when compared with other materials added with cement mortar. This attempted to understand mechanisms of bond developed between clay and Bagasse ash and is essentially mechanical in nature. Improve the network of hydration products with the addition of lime, but there is inadequate evidence for bond strength improvement. In this research, different mix of ratio is made with sets of combinations of, lime. The study showed that the behavior of cement brick is superior to the brick. Compressive strength of brick was affected by adding of high percentage replacement of Bagasse ash, addition of, the presence of lime. This category of admixtures serves three purposes:

1. As they burn out they leave pores in the product. This permits the control of the bulk density of brick products and help in producing lighter and more porous bricks.
2. The second purpose is that they result in more uniformly burnt bricks, especially when the firing is being done outside of factory conditions, in which case inability to reach the minimum desired temperature of 1000 °C results in un-burnt cores especially in solid bricks.
3. The pores produced as the admixtures are burnt out permit the heat to reach into the innermost part of the core, thereby avoiding un-burnt.

MATERIALS AND METHODS

Clay

Due to the increasing cost of cement, the Forest Products and Industries Development Commission (FORPRIDECOM) conducted a research that will produce blocks from soil and water. Clay particles because of their fineness of division must expose a large amount of external surface. There are also internal surfaces as well, the sum of which usually greatly exceeds that of a superficial character

Bagasse ash

India has a major agribusiness sector which has achieved remarkable successes over the last three and a half decades. Sugarcane (Bagasse ash) a major by-product of the sugar milling industry is one of the most commonly available materials. Sugarcane waste is an agricultural residue abundantly available in sugarcane producing countries. The sugarcane surrounds the sugar. India is a major sugarcane producing country, and that's why the Sugarcane (Bagasse ash) generated during milling can be easily available and can be used for bricks.

Aluminum Sulphate:

Imparts plasticity to brick clay which is very important I molding also imparts density. Aluminum sulphate alternatively spelled either aluminium or sulphate is a chemical compound with the Al_2 $(so_4)_3$. It is soluble in water and is mainly used as a flocculating agent in the purification of drinking water and waste water treatment plants and also in paper manufacturing.

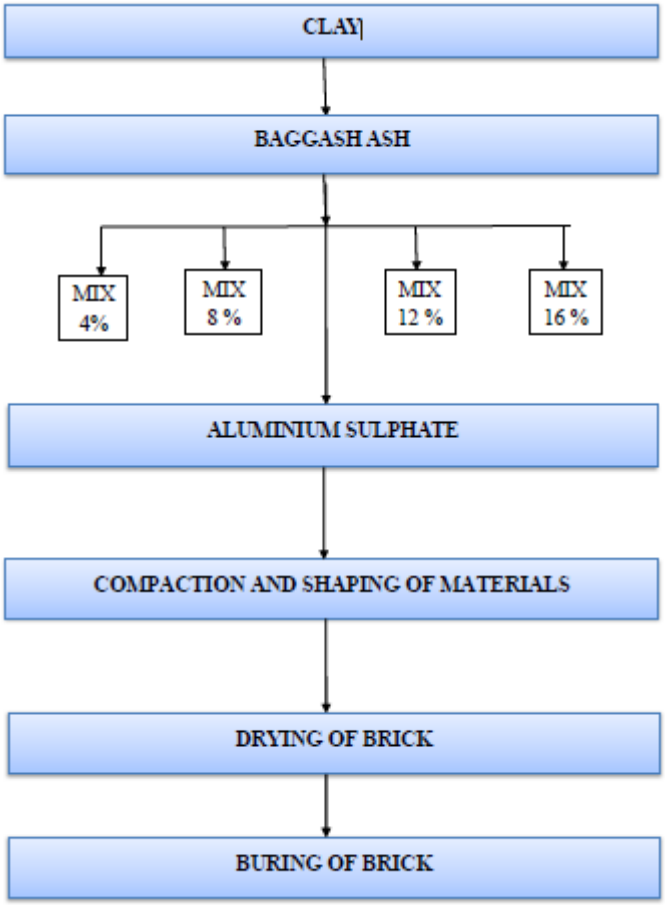
2 AL (OH) $_3$ + 3 H_2SO_4 + 8 H_2O AL_2 (SO_4). 14H_2O 14**.**

Lime

Lime is a generic term referring to the calcium oxide component of a material. When the term lime is used, it should always be followed by another term. For instance, lime in terms of a rock type is limestone and lime in the context of mortar is quicklime, lime putty and hydrated

lime. When a farmer wants to lime his fi led he will use crushed limestone, and when he wants to white wash or lime wash his dairy, he may use crushed limestone in the form of chalk or may use hydrated lime in wet slurry. To only say lime is not often enough information. Always think about which lime is being discussed.

Methodology



RESULTS AND DISCUSSION

General:

The investigation was carried out to determine the strength characteristics due to the influence of Sugarcane Bagasse ash in brick masonry are discussed. The preliminary investigation includes finding out of aspect ratio of Sugarcane Bagasse ash that can be mixed with cement mortar.

Compressive Strength:

Bricks to be used for different works should not have % of water adsorption less than as mentioned in Table 4.1. The % of water adsorption testing machine is used for testing the % of water adsorption of bricks. Any unevenness observed in the bed faces should be grounded first to have two smooth and parallel faces. The bricks are then immersed in water for 24 hours at normal temperature. After 24 hour immersion the bricks should be drained off of surplus water. The frog and other voids if any then should be filled with a mortar of ratio 1:1 with the maximum size of sand not exceeding 3 mm. and should be stored under damp jute bags for 24 hour followed by immersion in clean water for 3 days. The bricks then should be tested only when the mortar is close to an anticipated strength of brick. To test the specimens, bricks are then placed with flat

faces horizontal and mortar filled face facing upward between two 3-ply plywood sheets each of 3 mm thickness and carefully cantered between plates of the testing machine. The load at failure is the maximum load at which specimen fails to produce any further increase in the indicator reading on the testing machine as show in figure 4.1 and 4.2.

Figure 4.1 Before Failure of brick

Figure 4.2 After Failure of Brick

The addition of Sugarcane Bagasse ash was found to increase compressive strength to an acceptable limit. The alumina sulphate chemical were added to be higher workability and compaction than ordinary brick preparation, the compressive strength increases 14.2% higher than ordinary clay brick, strength lightly decreased by 5.5% for mixing proportion of 16% replacement of Sugarcane Bagasse ash and From Table 4.1, shows the varying in % of mixing of Sugarcane Bagasse ash and the optimum percentage of Sugarcane Bagasse ash has to be mixed to get maximum compressive was determined as. The variation of % of compressive strength with respect to percentage of Sugarcane Bagasse ash mixed is shown graphically in from Fig. 4.3

Table:4.1 Compressive Strength and % of Water Absorption Bricks for Various Percentage of Mix

Percentage of Materials replaced (Sugarcane Bagasse ash)	**% of water adsorption of clay bricks 5.4 N/mm2**	**Percentage of Material replaced**	**Water absorption (not exceed20%)**
	% of water adsorption of Bagasse ash Bricks(N/mm2)		
6%	4	6%	20.2
8%	4.2	8%	19.8
16%	5.1	16%	19
20%	6.3	20%	17.9

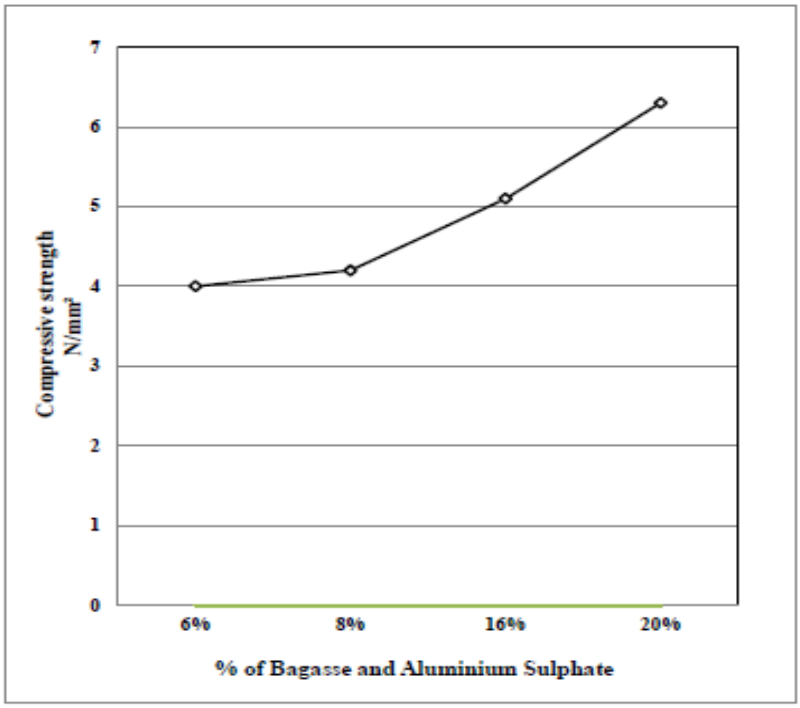


Figure 4.3: Compressive Strength of Bagasse ash Bricks.

Water Absorption:

First class Bricks should not absorb water more than 20%. The bricks to be tested should be dried in an oven at a temperature of 105 to 115o C till attains constant weight cool the bricks to room temperature and weight (W1). Immerse completely dried and weighed W1 brick in clean water for 24 hours at a temperature of 27±20 Degree Celsius. Remove the bricks and wipe out any traces of water and weigh immediately (W2).

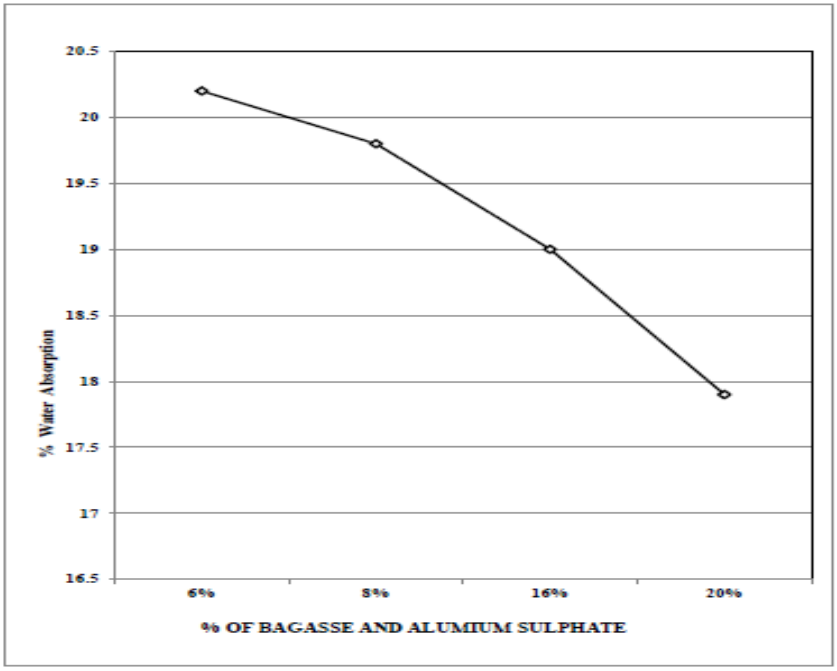


Figure 4.4: Percentage of Water absorption of Bagasse ash Bricks

The addition of Sugarcane Bagasse ash was found to increase the % of water adsorption to an good acceptable limit. The alumina sulphate chemical were added to be higher workability and compaction than ordinary brick preparation, the % of water adsorption decreases 20.71 % less than ordinary clay brick , water Absorption lightly decreased by 10.90% for mixing proportion of 12% replacement of Sugarcane Bagasse ash and From Table 4.1, shows the varing in % of mixing of Sugarcane Bagasse ash and the optimum percentage of Sugarcane Bagasse ash has to be mixed to get minimum and maximum water absorption were determined and the value various between 17.9% to 20.2% .The variation of % of water adsorption with respect to percentage of Sugarcane Bagasse ash mixed is shown graphically in from Fig. 4.4.

RESULTS COMPARISONS:

Results Comparisons of water absorption of brick:

First class Bricks should not absorb water more than 20% of the self-weight of the brick and hence the absorption capacity of various forms were compared with Bagasse ash brick hence it is moderately good durable in absorption of water while compare to other way of replacements materials and the water absorption capacity is low due to the reduction of the brick self-weight. And hence it is good in workability; compaction and due to this uniform shape of the brick can be formed.

Sl.No	Replacement Material	Compression strength (N/mm2)
1	Bagasse ashash	6.3
2	Water treatmentbottomash	25.6
3	Recycledmarbleandgranite	15
4	Ligniteflyash	8
5	Blastfurnaceslab	8-15
6	Copperminetallings	0.5-3
7	Fruitpineappleleaves	5.2
8	Glass waste	26-41
9	Textile waste	5.2

CONCLUSION

The present research replicate the effect of waste product Bagasse ash, on compressive strength of brick and following results were obtained: - The clay bricks gave the compressive strength of 6.3 N/mm2. While different percentage of Bagasse ash 6%, 8%, 16%, 20 % was added by weight in the clay, the compressive strength of bricks increased moderately. Thus from above study; this project concluded that, with the addition of waste material Bagasse ash, the compressive strength of bricks increases, and workability , absorption is preferably good while compare to any other replacements of materials. And conclude with the following salient points.

1. In this study replacement of Bagasse ash ash and aluminium sulphate were replaced and the basic test were carried out in order to identify the compressive strength and water absorption test
2. From this we have observed the water absorption capacity of Bagasse ash brick is averagely low when compared with normal bricks and various replacement materials in brick .

3. 3.Workability get increasing when the mix is added with sulphate with very minimum percentage.
4. The compression strength of Bagasse ash brick as satisfies the strength of a normal brick(190CM*90CM*90CM) as specified in the code IS2212(1991). We hope that this project will act as guidance in terms of compressive strength.

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Conflict of Interest

None of the authors have any conflicts of interest to declare.