

# A Review on Fly Ash Cement Brick

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**Abstract:** This paper is a study about Fly ash Cement Bricks which are manufactured by composition of Fly ash, cement and sand with requisite quantity of water mixed in proper proportions. These bricks are comparatively lighter in weight and stronger than the ordinary clay bricks. The Fly ash is one of the major byproduct of thermal power plants, 1kg of coal on burning produces about 200 to 500gms of Fly ash. Thus, Fly ash is very easily available which can be used to manufacture Fly ash bricks as a substitute of ordinary clay bricks which could lead to reduce the environmental pollution and help in conserving natural resources.

**Keywords:** Cement, Compressive Strength, Fly ash, Gypsum, Lime, Quarry dust, Sand.

## I. INTRODUCTION

Fly-Ash Cement Bricks are manufactured by composition of Fly ash, cement and sand with requisite quantity of water mixed in proper proportions. Similar to the burnt clay bricks, the fly ash bricks can also be used in all Building constructional activities. In production of fly ash bricks the main raw material which is used is fly ash which is easily available near thermal power plants as a waste product causing several environmental pollution problems. The utilization of Fly ash not only reduces problem of environmental pollution but also creates an opportunity for proper waste utilization. These bricks are comparatively lighter in weight and stronger than the ordinary clay bricks. No firing is needed for manufacturing of fly ash brick however curing for a pre determined period is done to enable the bricks to gain desired strength. In India more than 100 million tons per annum of fly ash is generated by thermal power plants. One kilogram of fired coal yields about 200 to 500 grams of fly ash. At present about 10% fly ash is being utilized only. The fly ash is generated by thermal power stations in big quantity so the fly ash bricks manufacturing units can be set up nearby thermal power stations. The demand

for Fly Ash bricks has picked due to superior quality, eco-friendly nature and government support.

**Various special features of fly ash Cement bricks are as follows:**

- Uniform shape and size due to machine finished.
- Consumes 20-25% less cement mortar.
- More Stronger and durable than Class-I, burnt clay building bricks.
- Outside wall plastering is not required due to its cement gray colour, smooth surface and low water absorption capacity.
- Resistance to salinity.
- The dead load and transportation cost is less due to its lighter weight.
- Pollution due to firing is eliminated as firing of the bricks is not needed.
- Adopting this process leads to conserve the top soil of agricultural land.
- By consuming 80-82% fly ash, the cause of environmental pollution and hazards due to disposal is minimized.

## **II. LITERATURE REVIEW**

A brief review of the findings of earlier investigations on the important properties / parameters of fly ashes; the available literature on the mechanisms of lime-fly ash and cement-fly ash hydration processes; influence of fly ash addition on the properties of concrete, namely, workability and compressive strength, have been presented. The section comes to provide information issues in the effort of present research and to focus the significance of the current study, the work already done so far and also to show the relevance of the current research work.

**Sumathi A. [2015]<sup>[5]</sup>** The study was conducted to find the optimum mix percentage of fly ash brick. However the brick specimen of size 230mm x 110mm x 90mm were cast for different mix percentage of Fly ash (15 to 50%), Gypsum (2%), Lime (5 to 30%) and Quarry dust (45 to 55%). 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/mm<sup>2</sup>.

**Anubhav Rai [2014]<sup>[2]</sup>** In this paper I have found 'FALGCSD' Bricks with the varying combinations of fly ash and other ingredients and named 'FALGCSD' bricks, which's meaning is FLYASH, LIME, GYPSUM, CEMENT , STONE DUST Bricks. These bricks are better in cost and strength in comparison to conventional clay BRICKS. The strength and cost is affected by varying the quantity of fly ash and other ingredient of these bricks.

The different percentage of ingredients in the "FALGCSD" bricks affects the Strength and Cost of the bricks.

**Yogesh Gowda [2014]<sup>[15]</sup>** An effort for an alternate approach in the manufacturing of brick was accomplished by using industrial by products like class F fly ash, granite dust and sludge lime as key ingredients, results as follows

- Maximum Compressive Strength was attained when the percentage of Flyash and Granite dust were 55 and 25 respectively for both methods of curing i.e., partial curing and immersed curing.
- Completely immersed brick samples project a higher Compressive Strength trend when compared to partial cured brick sample.
- Water Absorption Capacity of these Bricks are relatively lower when compared to the Clay Bricks.

**Nitin S. Naik [2014]<sup>[10]</sup>** Manufacturing of bricks involved burning of bricks using coal. Various properties of these bricks were studied by different researchers and they found that these bricks can be used for construction of low cost houses in the area in the vicinity of thermal power plant.

- Cementitious binder with fly ash and phosphogypsum content equal to 90% gives better compressive strength and 28.22 % water absorption and thus suitable for use in construction industry.
- When subjected to higher Sulphate concentration, the cementitious binders which gave low water absorption exhibited a very low strength loss.

**Aakash Suresh Pawar [2014]<sup>[1]</sup>** Mixing various properties of fly ash in clay material (5-50% by weight, in ratio of dry fly ash to wet clay, at a step of 5% each) this will from 16 bricks of each proportion have been manufactured. The bricks manufactured from fly ash possessed

compressive strength more than 5 N/mm<sup>2</sup>. Other important characteristics of the fly ash bricks have been evaluated.

- The results are indicative of the satisfactory performance of Fly ash Bricks as load bearing elements. This type of bricks uses 15% fly ash mixing with 85% clay. It therefore provides a large venue for the disposal of fly ash in a very efficient, useful and profitable way. This result is better compared to lime bricks and clay bricks.
- The edges of Fly ash Bricks are good compared to lime bricks and clay bricks.

**Ravi Kumar, Vandana Patyal [2014]<sup>[13]</sup>** Efforts has been made to study the behaviour of fly ash bricks by taking different proportions of fly ash, cement, lime, gypsum and sand. Three types of fly ash bricks in the different percentage of cement such as 3%, 5% and without cement are designed and then various tests such as compressive strength test, water absorption test, efflorescence, weight test, structural test were performed in order to have comparison with conventional bricks. In the experimental study it is found that the compressive strength of fly ash brick containing 5% cement is 152.1 kg/cm<sup>2</sup> which is more than that of class I conventional bricks by 40% approximately.

**Er. Rinku Kumar [2014]<sup>[5]</sup>** This dissertation presents the results of testing and the advantages gained by this type of fly ash bricks over conventional clay bricks. In the present study, the effects of fly ash on the properties of bricks are studied and the behaviour of fly ash bricks is compared with conventional burnt clay bricks.

- Fly Ash Bricks were found to be sufficiently hard as scratching by the finger nail on the surface left no impression on it as compared to normal bricks.
- The Efflorescence of all bricks tested were found to be slight as white or grey deposits were less than 10% on surface of the bricks which is almost same as that in the normal bricks.

**Nutan C. Patel [2013]<sup>[11]</sup>** Experiments have been carried out by several materials like Fly ash, lime, sand, Kheda dust, Glass fibre for the manufacturing of the brick. The fly ash of 'F' category was used as a raw material for making fly ash bricks. With Changing (increasing) in the

percentage of the Glass fibre of compressive strength of the fibre fly ash brick is increase and water absorption is decrease.

- Cost of this brick is high but if we use this brick mix for the replace as PCC (Plain Cement Concrete, BBCC (Brick Bat Cement Concrete), RCC (Reinforced Cement Concrete) at plinth level and also it can be used in compressive element so the cost of the PCC, BBCC and RCC is decreases.

**M.N. Akhtar [2013]<sup>[9]</sup>** In the present study, the effect of fly ash with high replacement, and different properties of bricks combination were studied. It was found that the compressive strength of Plain Fly

Ash and Treated Fly Ash Bricks (FAB, FALB) increases linearly and maximum with 5% coarse sand and 15% sand combination at 10% cement. This increase of compressive strength continues with the addition of 0.25% Plastic fibre in FAB and FALB.

- The addition of lime to the fly ash increases the cementitious properties of Fly ash and it was found that at 1.5% of lime, the OMC is minimum and dry density is maximum.
- The compressive strength of Plain Fly Ash Brick and Treated Fly Ash Brick is increases linearly and maximum with 5% coarse sand and 15% sand combination at 10% cement.

**K.Vidhya, Dr.S.Kandasamy [2013]<sup>[7]</sup>** Many research studies were carried out for effective utilization of fly ash and pond ash in building industry as it possess suitable pozzolanic properties. In this study, various mix proportions were arrived by using materials fly ash, pond ash, lime, gypsum and sand.

- In future the requirement of this brick will be more because the quantity of pond ash is available enormously at thermal power stations at free of cost.
- The compressive strength of brick was increased with increase in lime content.
- Weight density of brick reduced with increase in pond ash percentage.

**Saurabh Samander [2013]<sup>[14]</sup>** This investigation is done to study of the effect of silica fume on fly ash cement bricks. In first phase the fly ash, stone dust percentage are kept constant and

cement is replaced with silica fume in different proportion, whereas in second phase, silica fume is added as a admixture in same proportion of weight of cement.

- The water absorption characteristics of bricks become poor, when the cement is replaced by the silica fumes; however it gets improved when the silica fume is added in mix.
- The compressive characteristics of bricks degrade with the replacement of cement by the silica fumes; however it gets improved when the silica fume is added in mix.

**Mamta Rajgor [2013]<sup>[8]</sup>** Stone waste is generally a highly polluting waste due to both of its highly alkaline nature, and its manufacturing and processing techniques ,which impose a health threat to the surroundings.

- As the percentage of stone waste increases, compressive strength increases up to a certain point and then after the decreases. The optimum point at which we get maximum strength is replaced 30% stone waste by class F fly ash.
- Environmental effects of wastes and disposal problems of waste can be reduced through this research.

**Jayesh Kumar Pitroda [2013]<sup>[6]</sup>** The resulting large quantities of agricultural wastes, unfortunately, are not always well managed or utilized. These wastes can be recycled, such as by retrieving fibres from disposed leaves and fruits bunches, and then incorporate in brick making.

- Class F Fly ash is utilized in the brick manufacturing work as judicious decision taken by Engineers.
- As the percentage of the Rice Husk in brick increases, the compressive strength of the brick increases. In this experimental work 1% fibre addition in the brick gives the maximum strength  $7.861 \text{ N/mm}^2$  after 21 days.

**Apurva Kulkarni [2013]<sup>[3]</sup>** Sugar-cane bagasse is a fibrous waste-product of the sugar refining industry, along with ethanol vapour. Huge quantity of ash which is a waste product, available at very negligible rate.

- Compressive strength decreases on increase in percentage of Bagasse ash as compare to fly ash.

- Use of bagasse ash in brick can solve the disposal problem; reduce cost and produce a 'greener' Ecofriendly bricks for construction.
- A better measure by an innovative Construction Material is formed through this research.

**Prashant G. Sonawane [2013]<sup>[12]</sup>** In this research work an attempt is made to find out the possibility of using pond ash in burnt clay bricks. The part of the clay is replaced by pond ash in different composition and the bricks are made in conventional method at a brick manufacturing plant.

- The dry density of the bricks decreases with increase in % of pond ash. The decrease in dry density for bricks with pond ash 5.00, 10.00, 15.00, 17.50, 20.00, 22.50, 25.00 and 30.00% are 1.35%, 2.99%, 3.68%, 4.40%, 5.64%, 6.54%, 7.48% and 8.89% respectively.

### **III. Conclusion**

**On the study of above mentioned Review paper, following conclusion are obtained regarding Fly ash cement bricks:**

- Fly ash cement bricks are comparatively lighter in weight and stronger than the ordinary clay bricks.
- The strength and cost is affected by varying the quantity of fly ash and other ingredient of these bricks.
- For different mix proportions, at different curing ages are required.
- The edges of Fly ash Bricks are good compared to lime bricks and clay bricks.
- Fly Ash Bricks were found to be sufficiently hard as scratching by the finger nail on the surface left no impression on it as compared to normal bricks.

### **ACKNOWLEDGMENT**

I would like to express my gratitude and remain indebted to all the scholars whose articles are cited and form that a valuable help received for completing this review paper. The authors are also grateful to authors, editors and publisher of those journals and articles from where the literature for this article has been reviewed and discussed.

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