

# A Critical Review on Studies of Properties of Brick with addition of Rice Husk Ash and Cow Dung Ash

Pankaj Narwal <sup>1</sup>, Asst. Prof. Himmi Gupta <sup>2</sup>, Dr. Sanjay K. Sharma <sup>3</sup>.

P.G. Student, Department of Civil Engineering, NITTTR, Sector 26, Chandigarh, India <sup>1</sup>

Assistant Professor, Department of Civil Engineering, NITTTR, Sector 26, Chandigarh, India <sup>2</sup>

Head of Dept., Department of Civil Engineering, NITTTR, Sector 26, Chandigarh, India <sup>3</sup>

**Abstract:** This paper reports the results of study conducted to know the properties of bricks with the addition of Rice Husk Ash and Cow Dung Ash. The size of bricks used is 19\*9\*9 cm, which is the traditional brick size used in India. The brick specimens are made with varying percentages of additives that are 5%, 10%, 15%, 20% and 25%. Bricks are air dried initially for a period of 3 days, and then burnt in muffle furnace for 8 hours at 900 degree Celsius. Properties such as Compressive Strength, Water Absorption, Efflorescence, Warpage are studied, and the results are plotted in graphical representation.

**Key words:** Brick, Rice Husk Ash (RHA), Cow Dung Ash (CDA).

## 1. INTRODUCTION

Brick is one of the oldest building materials and continues to be most popular and leading construction material. Brick is made from the clay earth, after removing the impurities, adding optimum quantity of water and then air drying. Further bricks can also be burnt in kilns, for durability and toughness.

A good-quality brick predominates all other construction materials since it possesses good strength, durability, requires low construction and maintenance cost.

Bricks are generally classified as First, Second, Third and Fourth class, on the basis of their quality. First class bricks are well burnt, regular texture, strongest and most durable. Fourth class bricks are not used in buildings works, as they are not of uniform size, and don't achieve the required Indian strength parameters.

With the ever increasing demand of bricks, there is lot of load on the natural resource, soil. Also, increase in population leads to more waste production, which pollutes the environment, due to insufficient treatment plants. One possible solution to the problem is production of bricks using waste materials in optimum percentage. So, it becomes important for us to manufacture bricks with addition of such waste materials that best results are obtained. With the ever increasing population there is a need for the fulfilment of construction industry for the people around the world. In the process of filling the requirements of the individuals, there is a lot of waste that is being produced. This waste being generated in abundance needs to be taken care of, if environment is to be taken care of. Hence many wastes are being added with the construction materials, in optimum percentages, so that waste consumption can be done. Various kinds of admixtures that can be added to the construction materials are Silica fumes, Rice Husk Ash, Metakaolin, Fly Ash, etc

It is observed that with higher percentage of admixtures used in making of bricks, the properties of bricks advances. But with increase in percentage of admixtures in brick more than 20%, there is decrease in favourable characteristics of bricks.

## 2. LITERATURE REVIEW

Literature review has its own significance in any research work. It briefly summarized the scope of the work and the work done before the relevant topic. The review of literature in the field of research serves the same purpose. The following section aims to show the effect of adding RHA and CDA in bricks to its properties.

### 2.1 Review of Literature

#### 1). Strength and Durability Properties of Cow Dung Stabilized Earth Brick; Dorothy Manu, Ghana. [1]

The researcher studied the properties of brick earth when stabilized with cow dung. Better compressive strength and durability was seen when cow dung was mixed with brick earth. Best results were seen at addition of 20% of cow dung. There was increase in compressive strength and also abrasive resistance and decrease in water absorption capacity of the brick up-to this 20% of cow dung to the weight of brick earth.

#### 2). Development of Eco Brick and Concrete with the partially replacement of cow dung; A.S.Hilal, Coimbatore, India.[2]

The author studied compressive, tensile and flexural strength properties of brick and concrete with the partially replacement of cow dung. Bricks and concrete showed best results of compressive strength when 10% of cow dung was added to them. Though the other

properties which are tensile strength and flexural strength showed below-par results with the addition of cow dung. The porosity level and the water absorption capacity also increased which is due to the burning of cow dung in the bricks.

### **3). Characterization and Utilization of Rice Husk Ash (RHA) from Rice Mill; Md. Sagirul Islam, Bangladesh Council of Scientific & Industrial Research. [3]**

He studied the properties of Rice Husk Ash. According to the studies RHA has maximum percentage of silica present in it, followed by quartz and cristobalite. The size of irregular particles of RHA is 0.05 mm. These particles are porous, which can be good insulator producing material. The author also produced bricks, with addition of RHA. The results showed that with addition of 10% of RHA in bricks, conform to Grade C bricks of Bangladesh Standard.

### **4). Utilization of fly ash and cow dung ash as partial replacement of cement in concrete; Jitender Kumar Dhaka, Haryana, India [4]**

The studies were performed on concrete when cement was partially replaced with Fly Ash and Cow Dung Ash. The results showed that maximum compressive strength was obtained on 28 days of concrete curing. Also, no difference in the compressive strength of the concrete was found, when 20% of replacement was done (10% Fly Ash and 10% Cow Dung Ash) on 21 days and 28 days of curing. The researcher also compared the results by replacing coarse aggregate, rock aggregate to brick aggregate in concrete, and the results showed that rock aggregate produced higher strength cubes than brick as coarse aggregate used after 28 days of curing. Though 7 days and 14 days strength was more in case of brick aggregate concrete. Hence it could be concluded from the study that, rock aggregate can be used in concrete, with partial replacement of Fly Ash and Cow Dung Ash to cement, with 20% as optimum quantity.

### **5). Comparison of Mechanical Properties of Al-5%Si Alloy Reinforced with Cow dung ash and Rice husk ash; B. S. Bharath Kumar, Bangalore, India [5]**

The researcher compared addition of RHA and CDA in Al-5%Si alloy, to determine and differentiate its properties. Specimen produced by addition of CDA in alloy, has greater Hardness value, than that of specimen prepared by addition of RHA to Al-5%Si alloy. Also, Hardness is maximum when 2% of CDA is added. Though the porosity of the specimen increases with this percentage of CDA, compared to standard alloy with no additives. So, it can be concluded that CDA can be used in Al-5%Si alloy, for better hardness and to reduce the density of the material.

### **6). Project on innovation and implementation of composite brick in construction; V.M.Sathianarayanan, Chennai, India. [6]**

He studied the properties of composite bricks, which were made by Fly Ash, Granite dust, Ironite and Cement in different proportions. Maximum compressive strength was attained with mix no. 5 when Fly Ash in the brick was 45% with 25% each of Granite dust and Ironite, and 5% of cement, at 7 and 28 days of testing. Though when water absorption test was conducted it was seen that, mix no. 4 which had, 45% of Fly Ash, 10% of granite dust, 40% of Ironite and 5% of cement, followed by mix no. 5. Hence it can be concluded that for better strength, composite bricks with mix no. 5 proportions could be used, which also gives better than IS standards water absorption values.

### **7). Utilization of waste material in Burnt clay bricks; Vilas M. Patil and Rahul Bhoge, Jalgaon, Maharashtra. [7]**

He studied the use of various waste materials in burnt clay bricks. The materials added were bassage of sugarcane, rice husk, hair fiber, plastic fiber of plastic bags and soy sludge. The maximum compressive strength of bricks was found out by addition of hair fiber of 15 grams. Minimum water content was found in bricks which had bassage of sugarcane of 10grams. With the increase in quantity of waste materials, dry density of majority of bricks increased, as the weight of the waste materials used is much less than that of burnt clay earth.

### **8). Performance Analysis of Fly Ash Bricks and Comparison with Common Red Burnt Clay Bricks; M. Jotsna, D. Santhi, B. Venkata Chalapathy, B. Charan Kumar, Kadapa, A.P, India. [8]**

The researcher studied the properties of Fly Ash bricks and compared them with normal bricks. Fly Ash bricks had almost 45% more crushing strength than normal bricks. The water absorption of Fly Ash bricks decreased by 18%, when compared to that of traditional bricks. Less than 10% of Efflorescence was seen on the surface of bricks made from Fly Ash, which is almost same as that of traditional bricks. From all the above observations it can be concluded that Fly Ash bricks are superior to traditional burnt clay bricks, and hence should be use in construction works.

### **9) Performance Of Rice Husk Ash Bricks; N.Vamsi Mohan, ijera.[9].**

Studies were conducted to know performance of bricks made with the addition of Rice Husk Ash. Results stated that addition of Rice Husk Ash decreased the strength of bricks gradually up to 40% RHA, and at much higher rate when percentage of RHA was more than 40%. Optimum percentage of RHA is found to be 30%. The water absorption capacity also increased with increase in RHA content, making the brick more porous. When the clay content is replaced with gypsum and lime, the best results are seen when the

percentage of RHA, Lime and Gypsum are 40%, 40% and 20% respectively. Also, water absorption reduces with increase in lime and gypsum.

#### **10) Utilization of barley husk ash in clay bricks; Dhruv Vyasi, Gujarat, India. [10]**

He studied the amount of various proportions in which bricks constituents should be mixed, to find out brick of optimum cost. Barley Husk Ash was added in proportions varying from 0% to 50%. It was found out from the study that, with 50% addition of Barley Husk Ash, the cost of brick is minimum, which is 2.71 Rs/ brick. It does not have clay content, hence it cannot have required strength, for using in construction works.

#### **11) Manufacturing of Eco-Friendly Brick; S.V. Giri Babu, Vijayawada, AP, India. [11]**

In the study, various types of waste materials from the different industries have been used in different proportions and different methods are adopted to produce bricks. He has positively influenced and enhanced the performance in terms of making them environment friendly and manufacturing economical bricks leading to the design of green building. Certain bricks are made without firing which is an advantage over other method of manufacturing of bricks in terms of low embodied energy material. It also offers a solution to the problem of waste disposal as well as eco friendly environment in construction industry. The use of eco-friendly bricks made-up of waste materials is still very limited and there is a scope of further research in manufacturing reinforced bricks using waste materials. Further research and development is needed to promote wide range of production of eco-friendly low cost bricks from waste materials in the absence of relevant standards, which have semi acceptance by the industry and the public.

#### **12) A Review Study on Alternate Low Cost Construction Materials & Techniques for Building Design ; Vivek Kumar, Vidit Gupta, Shivam Sagar, Sushant Singh, Uttar Pradesh, India. [12]**

Fly ash is an industrial waste from the power stations, there rise a big problem of utilization of fly ash. It can be used for different purposes as it shows the cementing properties when mixed with water and can be manufactured easily and show sufficient strength. Cost of the fly ash brick is very low as compared to conventional clay brick. It can be concluded that conventional clay bricks can be replaced with the Fly ash brick.

### **3. CONCLUSION**

It can be concluded from above that various waste materials from the different industries have been used in different proportions to produce bricks. Based on the literature review, the researchers have revealed that many successful attempts are made to produce by adding wastes. Adding of these wastes not only reduces pollution, but also enhances the properties of bricks. They have positively influenced and enhanced the performance in terms of making them environment friendly and manufacturing economical bricks leading to the design of green building. It also offers a solution to the problem of waste disposal as well as eco-friendly environment in construction industry. The use of eco-friendly bricks made-up of waste materials is still very limited and there is a scope of further research in manufacturing reinforced bricks using waste materials. Further research and development is needed to promote wide range of production of eco-friendly low cost bricks from waste materials in the absence of relevant standards, which have semi acceptance by the industry and the public.

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