

Experimental Investigation on Compressive Strength of Bricks Made by Introducing of Various Materials in clay

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Abstract : The requirement for locally available building materials has been highlighted in numerous nations of the world due to their easy availability & low cost. Bricks traditionally have been viewed as one of the longest enduring and the strongest building materials used all through history. Normal building Bricks are made of a blend of clay, which is subjected to different procedures, conflicting as indicated by the nature of the material, the strategy to make, and the character of the completed item. In the wake of being appropriately arranged, the clay is framed in moulds to the coveted shape, at that point dried and burned. On observing the present-day curiosity for Bricks, an endeavor was made to examine the conduct of Bricks made utilizing miscellaneous waste materials like Rice Husk Ash, Wood Ash, Fly Ash even cement was utilized to produce Bricks. The fundamental point of this venture was to analyze the compressive strength of the Bricks. So for this reason, a diverse level of materials was independently included 5%, 10%, 15%, and 20% by weight and after that, the compressive strength of the Bricks was tested. And afterward, with the assistance of a diagram, an examination between the compressive strength of Bricks, made out of Rice Husk, Wood Ash, earth, Fly Ash, and Cement was resolved.

IndexTerms - Compressive Strength, Bricks, Introducing of Various Materials in clay.

I. INTRODUCTION

The requirement for privately conceived building materials has been stressed in numerous nations of the world. There is an irregularity between the expenses of ordinary building materials combined with the consumption of usual building materials. To address this circumstance, consideration has been centered on nominal effort elective building materials. Bricks are masonry units made out of inorganic non-metallic material and are broadly utilized as building segments everywhere throughout the world. The Bricks could be sun-dried or consumed. Consumed Bricks are typically more grounded than sundried Bricks, particularly if they are made of earth or clayey material. There are diverse classes of the Bricks, contingent on the admixtures and crude material utilized for making Bricks. It is likewise regular that specific admixtures are added to consume block crude blends to deliver distinctive impacts in the finished item. An instant class of admixtures incorporates the natural issue, for example, rice husks, sawdust, coal, and so on. Which wear out when the Bricks experience terminating. This class of admixtures fills three needs:

1. As they wear out they leave pores in the item. This allows the control of the mass thickness of block items and helps in creating lighter and more permeable Bricks.
2. The second reason for existing is that they result in more consistently consumed Bricks, particularly when the terminating is being done outside of production line conditions, in which case powerlessness to achieve the base wanted temperature of 1000 °C brings about un-consumed centers, particularly in strong Bricks.
3. The pores created as the admixtures are worn out allow the warmth to venture into the deepest piece of the center, in this way staying away from un-consumed centers, while the admixtures all alone part fill in as additional fuel which gives more warmth to the terminating.

Overall, there is rejoicing in fuel and power consumption. The temperature to which the bricks are fired amid burning is of vital significance. The higher the terminating temperature, the higher is the nature of the completed item. The third classification of admixtures is consolidating substances or melding agents. These admixtures are added to expand the bond between the particles and hence the quality of the block. Such admixtures are either cementitious or pozzolanic materials. Pozzolanic materials incorporate conventional lime. The current non-conventional pozzolanic admixtures utilized for block creation incorporate rice husk fiery debris, sawdust powder, and wood slag. The materials which were utilized as a part of Bricks, their properties, and diverse test and their compressive quality after the entire procedure, are portrayed beneath.

II. MATERIALS USED FOR MAKING BRICKS

2.1 Wood Ash:

Wood fiery remains is a side-effect made amid the burning of wood items for vitality creation at mash and paper plants, sawmills, and wood-item producing offices. Wood fiery remains are made out of both natural and inorganic mixes. The physical and concoction properties of wood fiery remains, which decides its useful uses, are impacted by the types of wood and the burning technique.

Focal points of Wood Ash Bricks:-

1. Due to high quality, no breakage amid transport and utilization.
 2. Due to the uniform size of Brick mortar required for the joints and mortar lessens nearly by half.
 3. Due to bring down the water entrance drainage of water through Bricks is significantly decreased.
 4. These Bricks don't require absorbing water for 24 hours.
- Just a sprinkling of water before utilize is sufficient.

2.2 Rice Husk:

India has a noteworthy agribusiness segment, which has accomplished exceptional triumphs in the course of the last three and a half decades. Rice husk a noteworthy result of the rice processing industry, is a standout amongst the most usually accessible materials. Rice husk is a farming buildup inexhaustibly accessible in rice creating nations. The husk encompasses the paddy grain. Amid processing of paddy around 78 % of the weight is gotten as rice, broken rice, and wheat. Rest 22 % of the heaviness of paddy is gotten as a husk. India is a bowl of noteworthy rice creating nation, and that is the reason the husk produced amid processing can be effortlessly accessible and can be utilized for Bricks.

2.3 Cement

In the broadest feeling of the word, concrete is a cover, a substance that sets and solidifies autonomously, and can tie different materials together. The synthetic response that outcomes, when the anhydrous concrete powder is blended with water, produce hydrates that are not water-dissolvable.

2.4 Fly Ash

Fly fiery debris is one of the deposits produced in burning and includes the fine particles that ascent with the vent gases. Fiery remains, which does not rise, is named base powder. In a mechanical setting, fly fiery debris more often than not alludes to powder delivered amid ignition of coal. Fly fiery debris is a waste material in the wake of the consumption of coal. Fly fiery debris Bricks are, the more grounded than different Bricks. Fly fiery debris Bricks contain just concrete, water, and fly slag, yet we are including diverse rates of fly cinders in the dirt block.

2.5 Clay

Because of the expanding expense of bond, the Forest Products and Industries Development Commission (FORPRIDECOM) led an examination that will create hinders from soil and water. Dirt particles in light of their fineness of division must uncover a lot of the outside surface. There are inner surfaces too, the total of which normally significantly surpasses that of a shallow character.

These are the materials that we are utilizing for various kinds of Bricks.

III. THE MANUFACTURING PROCESS OF BRICKS

There are four different operations are involved in the process of manufacturing of bricks:

1. Preparation of clay
2. Moulding
3. Drying
4. Burning

3.1 Preparation of Clay for Brick Manufacturing:

Preparation of clay for bricks manufacturing is done in these steps:

3.1.1 Unsoiling of clay We need unadulterated clay for the manufacturing of bricks. The top layer of soil may contain polluting influences, so the dirt in the top layer of soil about 200mm profundity is discarded. This is called unsoiling.

3.1.2 Digging After the elimination of the upper layer, the clay is excavated out from the ground and spread on the plain surface.

3.1.3 Cleaning In this step, the clay is cleaned of stones, vegetable issues, and so on the off chance that an enormous amount of particulate matter is available, at that point the soil is washed and screened. The chunks of clay are changed over into powder with earth squashing rollers.

3.1.4 Weathering The prepared clay is exposed to the atmosphere for softening. The period of weathering maybe 3 to 4 weeks or a full rainy season. Normally, the clay is excavated out just earlier the rainy period for bigger projects.

3.1.5 Blending If we need to improve any ingredient to the clay, it is to be added in this step by making the clay loose and spread the ingredient over it. Then take a small percentage of clay into the hands and tuning it up and down in a vertical direction. This process is called the blending of clay.

In this investigational work, the bricks are made in four different categories. These processes are as follows:

- i. In the first category, the bricks made with Clay + Wood Ash
- ii. In the second category, the bricks made with Clay + Rice Husk ash
- iii. In the third category, the bricks made with Clay + Fly ash
- iv. In the fourth category, the bricks made with Clay + Cement

In these categories, the admixture with clay added 5%, 10%, 15%, & 20% by weight.

3.1.6 Tempering In this Step, water is added to clay and squeezed or blended. The squeezing will be finished by steers or with feet of men for small projects, the pug factory is utilized as a processor for large projects. Along these lines, the mud gets the plastic nature and now it is appropriate for moulding.

3.2 Moulding of clay

In the moulding process, the brick of rectangular shape is caste by the prepared clay. For the manufacturing of bricks on a small scale, hand moulding is done due to manpower is cheap on a small scale. The moulds are rectangular made of wood or steel which are opened at the top and bottom.

We had taken a frame of size 23 x 11 x 7 cm and cast bricks.

3.3 Drying of raw bricks

After moulding process, the bricks contain some amount of moisture in it. So, drying is to be done otherwise they may be cracked while burning. The drying of raw bricks is done by the natural process. Bricks are laid in stacks. A stack consists of 8 to 10 stairs. The bricks in these stacks should be arranged in such a way that the circulation of air in between the bricks is free. The period of drying may be 3 to 10 days. It also depends upon the weather conditions.

3.4 Burning of bricks

In the process of burning, the dried bricks are burned either in clamps (small scale) or kilns (large scale) up to 1100°C temperatures. In this step, the bricks will gain hardness and strength so it is an important step in the manufacturing of bricks.

IV. COMPRESSIVE STRENGTH TEST

This test is done to determine the compressive strength of brick. It is also called the crushing strength of brick. Generally, 5 specimens of bricks are taken to the laboratory for testing and tested one by one. In this test, a brick specimen is put on a crushing machine and applied pressure until it breaks. The ultimate pressure at which brick is crushed is taken into account. All five brick specimens are tested one by one and the average result is taken as brick's compressive/crushing strength.

V. COMPRESSIVE STRENGTH TEST RESULTS

The test result of compressive strength of bricks made by introducing of Various Materials in clay are shown below-

Table 5.1: Compressive Strength Test Results

Percentage of materials	Compressive Strength of Bricks made by introducing of Various Materials (N/mm ²)			
	Wood Ash	Rice Husk Ash	Fly Ash	Cement
5%	5.91	3.52	4.13	5.92
10%	6.85	3.12	4.43	8.15
15%	9.24	3.65	5.02	12.21
20%	11.71	4.11	3.87	13.52

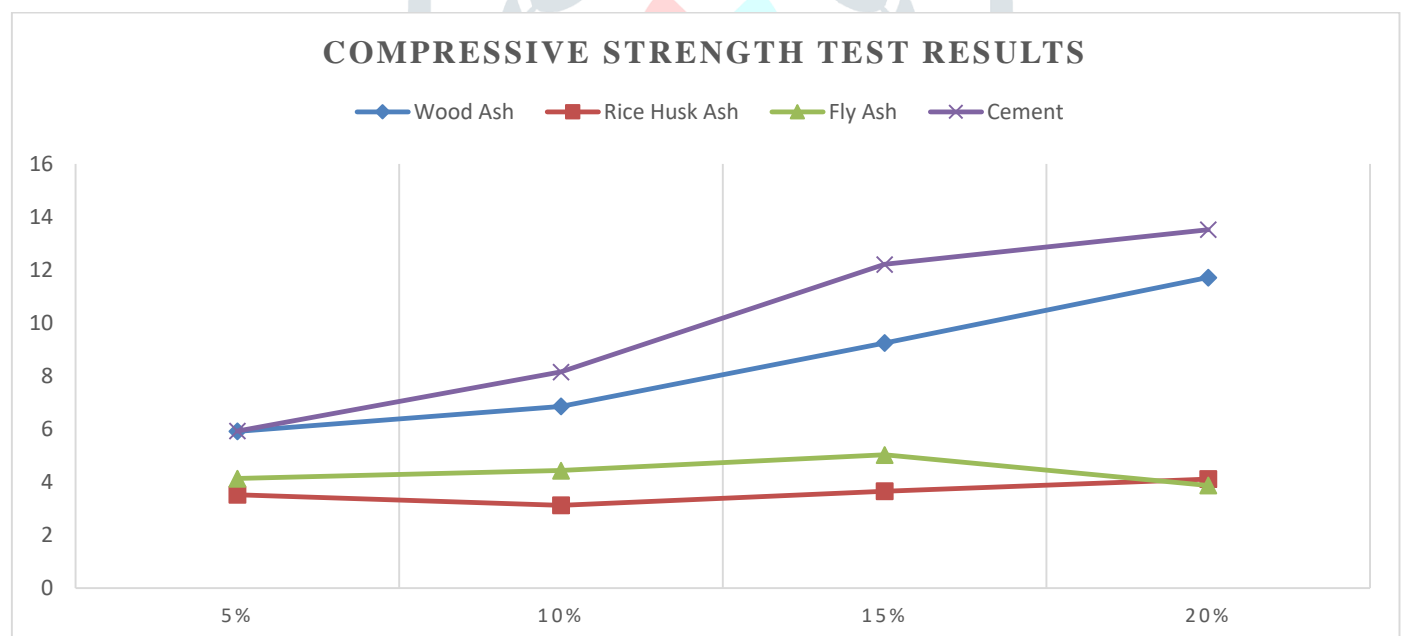


Figure 5.1 Graphical representation of Compressive Strength Test Results

VI. CONCLUSION

From the test results, we can say that Rise husk ash and wood ash doesn't show any significant change in strength, but the introduction of fly ash and cement in brick increase the compressive strength of bricks, and the maximum gain in strength is achieved by the addition of cement.

REFERENCES

- [1]. IS 1077 (1992): Common Burnt Clay Building Bricks- Specification
- [2]. Building Materials, By S.K. Duggal
- [3]. <https://www.slideshare.net/awanishshukla98/mass-housing>
- [4]. <https://www.sciencedirect.com/science/article/pii/S2214785318326683>
- [5]. https://www.standupmitra.in/Default/ViewFile/?id=1520957281716_Clay%20Bricks%20Manufacturing.docx&path=ProjectProfile