

Utilization of Rice Husk and Cashew Nut Shells in Bricks

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ABSTRACT: Bricks are the most widely used material in construction. Clay bricks are used for construction purpose. But pure clay is not available in suitable amount. Population explosion leads us to use the nature to its dead line. Thus, there is an urge to the human kind, to move for an alternate source. Addition or replacing some alternates with bricks will do a lot for the above cause. In our project, we partially replaced the clay with Rice Husk (RH) & Cashew Nut Shell (CNS). Finally we analysed it and compared it with standard test for bricks. Ultimate result says that minimum RH in the clay mix of 20% has very good impact on strength aspect, while CNS in the very same mix has poor effect. However CNS played a very good binder in "Rice husk – Cashew nut shell Brick" (RCB).

KEYWORDS: Rice husk(RH), Cashew nut shell(CNS), Rice husk-Cashew nut shell brick(RCB).

I. INTRODUCTION

A brick is building material used to make walls, pavements and other elements in masonry construction. Traditionally, the term brick referred to a unit composed of clay, but it is now used to denote any rectangular units laid in mortar. A brick can be composed of clay-bearing soil, sand, and lime, or concrete materials. Bricks are produced in numerous classes, types, materials, and sizes which vary with region and time period, and are produced in bulk quantities. Two basic categories of bricks are fired and non-fired bricks. Fired bricks are one of the longest-lasting and strongest building materials, sometimes referred to as artificial stone, and have been used since circa 5000 BC. Air-dried bricks, also known as mud bricks, have a history older than fired bricks, and have an additional ingredient of a mechanical binder such as straw.

Production of bricks increased massively with the onset of the Industrial Revolution and the rise in factory building in England. For reasons of speed and economy, bricks were increasingly preferred as building material to stone, even in areas where the stone was readily available. It was at this time in London, that bright red brick was chosen for construction to make the buildings more visible in the heavy fog and to help prevent traffic accidents.

The demand for high office building construction at the turn of the 20th century led to a much greater use of cast and wrought iron, and later, steel and concrete. The use of brick for skyscraper construction severely limited the size of the building – the Monadnock Building, built in 1896 in Chicago, required exceptionally thick walls to maintain the structural integrity of its 17 storeys.

Following pioneering work in the 1950s at the Swiss Federal Institute of Technology and the Building Research Establishment in Watford, UK, the use of improved masonry for the construction of tall structures up to 18 storeys high was made viable. However, the use of brick has largely remained restricted to small to medium-sized buildings, as steel and concrete remain superior materials for high-rise construction.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 3, March 2017

From an extensive literature survey it is noticed that population explosion have created demand for vast resource which doesn't except construction field also. As said above, Brick, which mainly composed of clay, is the main component of construction. Thus an increased demand have been imposed on clay. In this study we have studied the performance of RH and CNS as alternate in clay.

II. METHODOLOGY

1. Rice husks(RH) are the hard protecting coverings of grains of rice. In addition to protecting rice during the growing season, rice husk can be put to use as buildingmaterial, fertilizer, insulation material, or fuel.
2. Cashew nut shells(CNS) are the protective covers which are hard in nature. They are usually not used and are disposed. Thus, production of solid waste is increased. They also have a heavy impact in land filling.
3. We bought the above two ingredients and powdered the CNS. Also their specific gravity was calculated. Specific gravity of RH and CNS are 0.67 and 0.58 respectively.
4. After the collection and gathering of the replacements, they are batched using the plates. The process was carried out manually. The exact proportion was not known and was taken as trail.
5. The batches were mixed thoroughly with no bulks. The process was carried out manually. Since the batching was volume, they are calculated in parts which were converted to parts later.
6. The bricks are casted with the help of the standard brick mould of 225mm*100mm*75mm. The clay mixture was placed into the assembled moulds. A plate is used to level the brick into the forms. They are allowed to set for half a minute. The above procedure is done for all the bricks. The casted brick are allowed to dry in the sun light for seven days. On the next week the bricks are stripped to forms. They are sent to chamber for burning.
7. In the burning process, they are burnt at all the water is removed at the temperature of 650 degrees but they are burnt at an temperature of about 1100 degrees



(a)



(b)



(c)



(d)



(e)

Figs.1 (a) Batching. (b) Mixing (c) Casting (d) Burning and (e) Final brick

International Journal of Innovative Research in Science, Engineering and Technology

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III. EXPERIMENTAL RESULTS

COMPRESSION, WATER ABSORPTION AND SOUNDNESS TEST:

The ultimate pressure at which brick is crushed is taken into account. All five brick specimens are tested one by one and average result is taken as brick's compressive/crushing strength.

In water absorption test bricks are weighed in dry condition and they are immersed in fresh water for 24 hours. After 24 hours of immersion those are taken out from water and wipe out with cloth. Then brick is weighed in wet condition. The difference between weights is the water absorbed by brick.

In soundness test two bricks are held by both hands and struck with one another. If the bricks give clear metallic ringing sound and don't break then those are good quality bricks.

S.no	Brick Type	Compressive Strength(N/mm ²)	water absorption(%)	Soundness Test
1	Normal brick	7	15	Clear ringing sound

Table: 1 Normal brick

S.no	Clay	RH	Compressive strength (N/mm ²)	water absorption(%)	Soundness Test
1	90	10	6.5	15	Clear ringing sound
2	80	20	7.2	16	Clear ringing sound
3	70	30	5.8	21	No Clear ringing sound
4	50	50	2.8	25	No ringing sound
5	40	60	Thrushold limit	30	No Clear ringing sound

Table: 2 RH brick

International Journal of Innovative Research in Science, Engineering and Technology

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S.no	Clay	CNS	Compressive strength (N/mm ²)	water absorption(%)	Soundness Test
1	90	10	3.5	18	Clear ringing sound
2	80	20	2.8	23	Clear ringing sound
3	70	30	1.5	27	No Clear ringing sound
4	50	50	1.2	34	No ringing sound
5	40	60	Threshold limit	43	No Clear ringing sound

Table: 3 CNS brick

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S.no	Clay	RH	CNS	Compressive strength (N/mm ²)	water absorption (%)	Soundness Test
1	80	10	10	6	16	Clear ringing sound
2	70	15	15	6.4	23	Clear ringing sound
3	60	20	20	4.3	30	No Clear ringing sound
4	50	25	25	Thrushold limit	34	No ringing sound
5	40	30	30	Thrushold limit	41	No Clear ringing sound

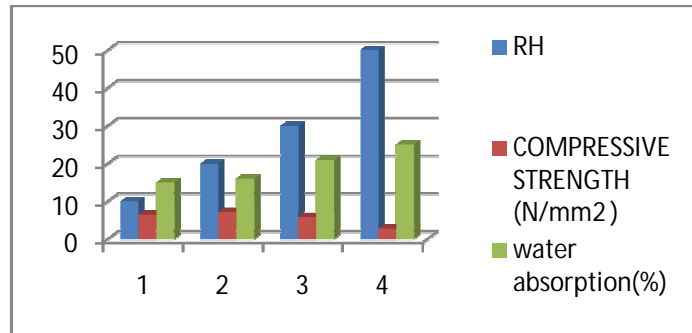
Table: 4 RC Bricks

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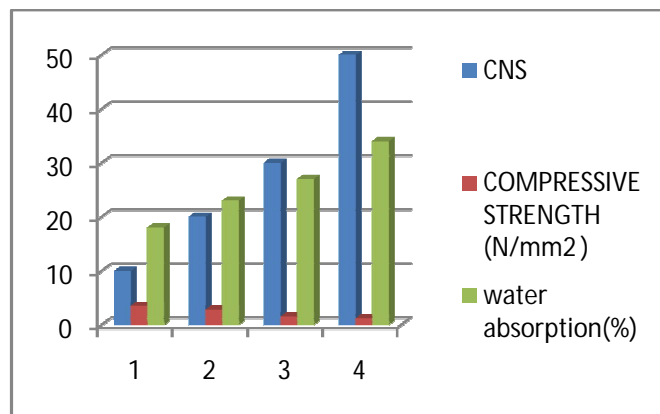
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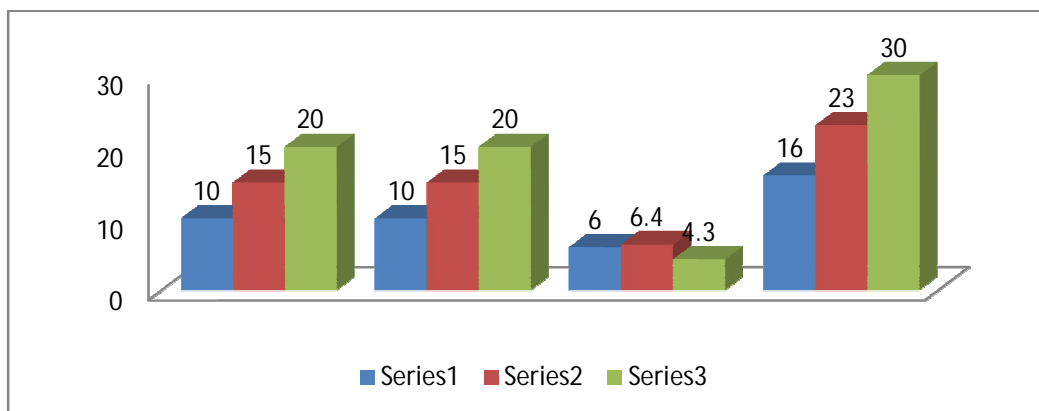
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(a)



(b)



(c)

Fig. 2 Compressive strength, water absorption and soundness test resultsof (a) RH brick (b) CNS brick (c) RC brick

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EFFLORESCENCE TEST

The Efflorescence test of the RCB is determined by the standard procedure. They are placed in the water for 24 hours. Efflorescence test reveals no presence of grey or white patches. Thus there are no alkali present in the bricks.

HARDNESS TEST

The hardness test of the bricks are determined by the standard procedure. Nail impression was impinged in the hardened brick. Hardness test reveals no presence of nail impressions. Thus, the bricks are sufficiently hard.

SIZE, SHAPE AND COLOUR TEST

The size, shape and colour test of the bricks are determined by the standard procedure. 20 bricks are randomly selected and their shape and size are compared. They are perfectly rectangle and size is of 22.5 cm* 10 cm* 7.5 cm respectively. Also their colours are evenly coloured red.

STRUCTURE TEST

The structure test of the bricks are determined by the standard procedure. The above 20 bricks are broken down at various section and thoroughly tested. Structure test reveals no presence of flaws, cracks or voids. Thus the casted bricks are good quality.

IV. CONCLUSION

The results from the project work shows that minimum RH in the clay mix has very good impact on strength aspect, while CNS in the very same mix has poor effect. However CNS played a very good binder in RCB. It is also noted that minimum RH in the mix has increased the strength without affecting the self weight of the brick, while CNS does. Anyhow, CNS may give rise to a new era, **LOW WEIGHT BRICK**, in the future.

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