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EXPERIMENTAL INVESTIGATION ON PAPERCRETE BRICKS MANUFACTURED USING FLY-ASH & RICEHUSK

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Abstract - *Reuse of Waste generated from agricultural and industrial activities as building materials appears to be viable solution to problem of pollution and waste disposal. nearly 30% of the daily production turns on waste during the manufacturing transportation and usage has been estimated in India. In the building construction burnt clay bricks have been used from decades and it helps to reduce the energy consumption of buildings due to its excellent thermal insulation property. As a result of this, huge quantity of soil is being exploited for its production and there is still an existing demand for clay bricks. Production of huge quantity of ceramic powder by ceramic tiles, marbles, marble dust which are found to be difficult for disposal. Also rice husk ash has been generated by rice milling industries which is also considered as a waste product. The construction industry consumers a large amount of non-renewable resources. Our challenge aimed to make use of the waste paper and fly ash to apply as a production fabric constitutes a step toward sustainable development.*

Key Words: Clay bricks, Rice husk ash, Fly ash, Ceramic powder.

1. INTRODUCTION

Construction places an important role in economic development of a country. Papercrete is a currently evolved production fabric which includes re-pulped paper fibre with Portland cement. Papercrete is a construction material which consists of cement and fine aggregate Papercrete is a new composite material. Waste paper is used waste as a partial replacement of Portland cement. This increase in the popularity of using environmentally friendly, low-cost and light weight construction materials in building industry. About 45% of discarded papers is recycled annually, 55% thrown away or goes in to the land fill. The majority of deserted paper waste is accumulated

Therefore, inventions have been carried to use this waste paper into blocks and form a Papercrete bricks. It is a construction material which consists of paper slurry and Portland cement and can be used in many applications including Papercrete blocks. This kind of fabric is taken into consideration environmentally pleasant fabric. Papercrete is a production fabric which includes cement and great aggregate. It is perceived as an environmentally friendly material due to the significant recycled content, by the presence of cement. This experimental examine investigates the capability use of waste paper for generating a low-value and mild weight composite brick as a constructing material. These opportunity bricks have been made with papercrete. In the prevailing scenario, the complete international is going through a primary hassle of environmental pollutants through the waste business substances like as they're dumped as landfills. Fly-ash, micro silica, metal slag etc., are some examples of the waste substances. Hence those substances may be used as options withinside the production enterprise a good way to assist assembly the sustainable improvement requirements.

2. MATERIALS

2.1 CEMENT

Fig-1: Cement

Cement is defined as the well-proportioned mixture of calcareous and argillaceous material.

Cement could be a grey, finely ground combination of minerals. Ordinary Portland cement is generally used for preparation of concrete but for special purposes other types of cement low heat cement, rapid hardening cement, high alumina cement, white cement, blast furnace slag cement.

The raw materials used for the manufacture of ordinary Portland cement contains mainly lime (60-67%), silica (17-25%), alumina (3-8%), iron oxide (0.5-6%), magnesia (0.5-4%), Sulphur trioxide (1.3-3%), calcium sulphate (3-5%). In

our work, **ULTRATECH CEMENT 53 Grade OPC** conforming to IS: 12269-1987 has been used.

2.2 MANUFACTURED-SAND (M-SAND)

Fig-2: M Sand

Manufactured sand (M-Sand) is an alternative of river sand for concrete construction. By crushing of hard granite manufactured sand (M Sand) is produced. The size of mixture 4.75mm and smaller are known as quality mixture. Locally available M sand is used in this investigation. Production involves crushing, screening and possibly washing. By feeding hard stones of varying sizes to primary and secondary crushers manufactured sand (M Sand) is produced. The fine aggregate along with hydrated cement paste fill the space between coarse aggregate. As per IS:383-1970 four zones are there in fine aggregate. The grading zone becomes progressively finer from grading zone 1 to grading zone 4.

2.3 FLY-ASH

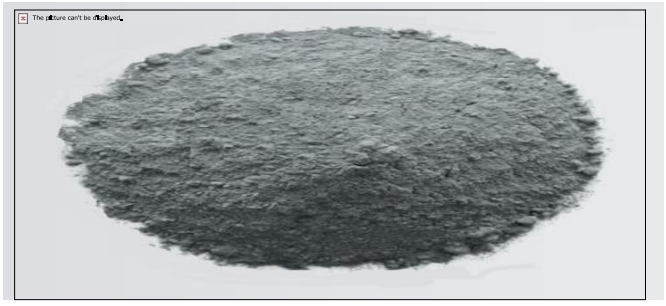


Fig-3: Fly-Ash

The ash produced during combustion of coal is called fly ash. It is usually captured by static precipitators or alternative particle filtration instrumentation before the flue gases reach the chimneys of coal-fired power plants, and at the side of bottom ash removed from the bottom of the furnace in this condition it is known as coal ash. Fly-ash, is also known as fuel-ash, is one in every of the residues generated in combustion, and includes the fine particles that rise with the flue gases. The employment of ashes a replacement of sand contains a nice potential to profit our society in terms of reducing. Ashes employed as a partial replacement material for cement, so as to decrease the density of the brick. Fly ash usually replaces up to 30% by mass of Portland cement. **Class 'C' Fly-ash of1.18mm sieve passing is taken.**

2.4 RICE-HUSK ASH

Fig-4: Rice-husk ash

RHA generally referred to an agricultural by-product of burning husk below 800 °C under controlled temperature. Rice husk ash is found to be superior to other supplementary materials like fly ash. Due to its high pozzolanic activity, both strength and durability of concrete are increased.

2.5 WASTE PAPER

Fig-5: Tearing of waste paper

Paper is known as a natural polymer which consists of wood cellulose. Different type of papers like newspaper, magazines, old invitation cards, paper tickets can be used for making papercrete. The waste papers which were collected cannot be used directly It should be made into paper pulp before mixing with other ingredients.

3. RESULTS AND DISCUSSIONS

3.1 Compressive Strength Test

The determination of Compressive Strength of the brick's samples were carried out as per standard practice. The following Table 1 shows the Compressive Strength of various

mix proportion of samples after testing. The brick was tested after standard days of curing.

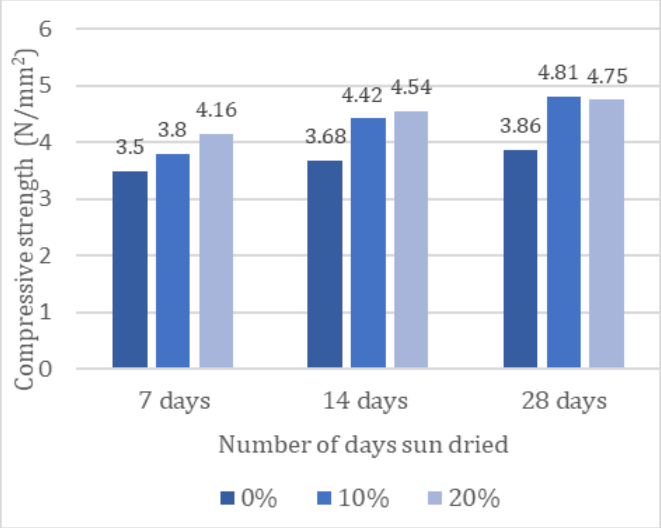
For conventional brick standard compressive strength is 3.5 N/mm2 as per IS 3495:1992. Compression test is the main and vital test for bricks. This test will be conducted in a Compression Testing Machine (CTM).

This test was carried out on the 7th, 14th and 28th day from the date of casting. It had been discovered while testing the specimens that the bricks didn't crush or fully collapse, it simply compressed like compressing a rubber, the structure didn't collapse only the outer faces cracked and raw out.

Table-1 Compressive Strength Test Result of Brick

No of days	IDENTIFICATION MARK	BRICK NO	LOAD (KN)	COMPRSSIVE STRENGTH (N/mm²)
7	B1(0%)	1	60	3.50
	B2(10%)	2	65	3.80
	B3(20%)	3	71	4.16
14	B1(0%)	1	62	3.68
	B2(10%)	2	76	4.42
	B3(20%)	3	78	4.54
28	B1(0%)	1	65	3.86
	B2(10%)	2	83	4.81
	B3(20%)	3	82	4.75

Chart-1: Compressive Strength



The compressive strength has been increased with increase in percentage replacement of cement with increase in curing days.

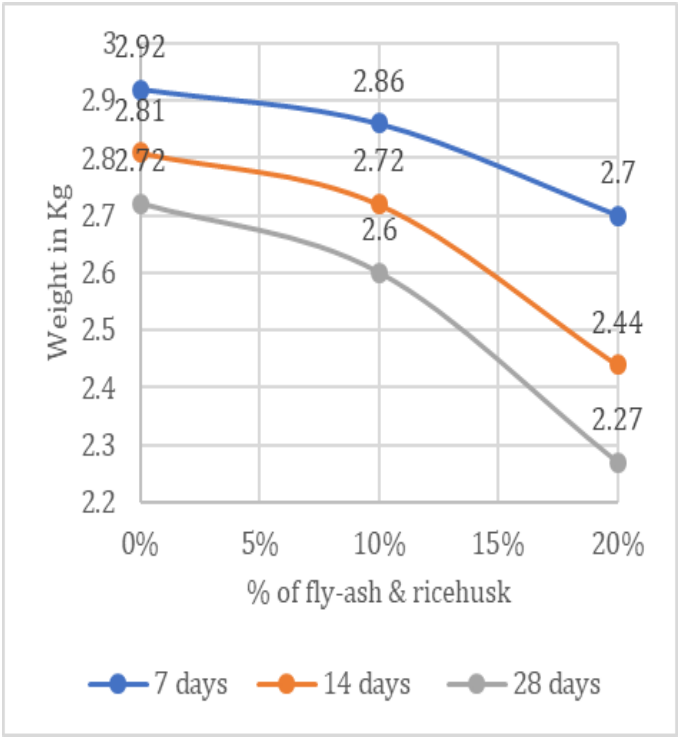
3.2 Weight Test

The important objective of this project is to produce light weight bricks. So, all the bricks were weighed in an electronic weighing machine. The weight of conventional brick is 3 - 3.5 kg as per **IS 1077:1992**. The following are the weight of the papercrete bricks:

Table-2 Weight Test Result of Brick

No of days	IDENTIFICATION MARK	BRICK NO	Weight in Kg
7	B1(0%)	1	2.92
	B2(10%)	2	2.86
	B3(20%)	3	2.71
14	B1(0%)	1	2.81
	B2(10%)	2	2.69
	B3(20%)	3	2.44
28	B1(0%)	1	2.72
	B2(10%)	2	2.6
	B3(20%)	3	2.3

Chart-2: Weight Test



The weight has been reduced with increase in percentage replacement of cement with increase in curing days. This may be due to less self-weight of the materials used viz fly-ash and rice-husk.

4. CONCLUSIONS

The compressive strength of the papercrete brick is more than 3.5 N/mm2. The compressive strength has been increased when the % of fly-ash and rice husk is increased by 10 % to 20% and also increase in time of drying.

These bricks are suitable for non-load bearing walls, partition walls and compound walls Because compressive strength of papercrete bricks is less compared to regular bricks.

Papercrete bricks are lightweight as compared with conventional bricks. The weight has been reduced about 2/3rd lesser, with increase in number of curing days.

Papercrete bricks consists of waste materials and hence cost is very low compared to conventional bricks. Good choice to use waste paper as it is economical. Papercrete bricks can be used for cost effective and energy efficient buildings at earth quake prone areas.

These bricks are termite proof; in papercrete bricks the paper was mixed with cement. it will reduce the landfills and pollution because of waste material used.

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