

Casting Of Bricks Using Waste Paper Pulp & Cement

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ABSTRACT:

As the demand for construction materials is increasing on a rapid rate so we are required to make such materials which are sustainable. So are the paper pulp bricks which are made using waste paper pulp and cement. Casting of waste paper bricks are simple and can be fabricated easily by the unskilled labors also with having information about how to make it, as it does not involve a lot of technology in it. So it can be made easily available to the public for its use.

Keywords: waste paper bricks, waste paper pulp bricks, waste paper sludge and cement bricks, light weight paper bricks.

INTRODUCTION:

Waste paper pulp bricks are such bricks which are manufactured with raw materials as waste newspaper sludge and cement in right proportion with required water content and with utmost care thoroughly mixed and casted. It is of very recent trend and not much has been discovered about it. A lot of research work is being carried out about it in India and abroad for making it more reliable and its pros and cons.

The main aim of this project is to compare the compressive strength of the bricks. So for this purpose, different percentage of 10%, 15%, and 20% cement was added with paper waste and then the compressive strength of the bricks was established. Then with the help of graph comparison between compressive strength and water absorption of ordinary bricks and paper bricks was determined. Before manufacturing the bricks, different properties of materials [cement and waste paper pulp] were verified.

After that bricks were made then with the help of a compression testing machine [CTM], their compressive strength was calculated. The purpose of this study was to use waste paper pulp for producing masonry bricks having additional qualities.



Figure 1: brick made up of waste paper pulp and cement.

METHODOLOGY:

The raw materials require for making the paper cement bricks are waste paper and cement. Take the paper waste and cement in required ratio. Waste Paper quantity should be higher because waste paper cost is low in comparison to the cement. Cement is required for only binding the waste paper. Cut the waste paper into small pieces. Then put the waste paper into the water. The waste paper was soaked in water for 30-40 hours. The water and the waste paper mixes were kept constant and the proportion of cement were varied. Then mix all the material in the mixer for large quantity. It can be done by hand mixing for small quantity. Sample for for each ratio, six samples were prepared. Size of brick is 228mm x 107mm x 69mm. In the mixing process of samples, paper sludge, cement and water contents were placed in a pan mixer and mixed for 5 minutes. Then pul mixed material into the mould. Then pressure was applied for 10 minutes to compact the mixed material in the mold.

The formed brick sample was removed from the mold as early as 1 minute. Then dried the brick for 24 hours at the room temperature.

Mainly two types of experiments have been done on paper cement bricks which are given below-

1. ABSORPTION TEST
2. COMPRESSIVE STRENGTH TEST

The other type of experiment which occurred on the bricks are hardness test and dimensional test.

DIMENSION TEST:

In this test, twenty full size units of bricks are taken then their length, width and thickness are measured. A steel scale graduated to 1mm is used for measuring dimensions. A steel scale is used for measuring the length, width and thickness. According to IS nominal size of bricks should be in 190mm x 90mm x 90mm (Length x Width x thickness) but in India size of the nominal brick should be 228mm x 108mm x 69mm. Variation in dimensions are allowed only within narrow limit ± 5 mm in length and ± 3 mm in width and thickness. The dimension of brick took the mean value of the result.

Mix Design A: Mean length = 230mm, Mean width = 110mm, Mean thickness = 70mm.

Mix Design B: Mean length = 230mm, Mean width = 110mm, Mean thickness = 68mm.

Mix design C: Mean length = 230mm, Mean width = 109mm, Mean thickness = 68mm.

COMPRESSION TEST:

Compression Test of the bricks is most widely used test to measure its compressive strength. This test was carried out by compression testing machine. Determination of Compressive strength of burnt clay bricks is described under IS 3495-1992 Part 1. The dimension of the bricks is measured. Unevenness observed in the bed faces of bricks is removed to provide two smooth and parallel faces by grinding. It immersed in water at room temperature for 24 hours for burnt clay bricks. The specimen is then removed and any surplus moisture is drained out at the room temperature. Fill the frog (where provided) and all voids in the bed face flush with cement mortar (1 cement, clean coarse sand of grade 3 mm and down). Store under the damp jute bags for 24 hours followed by immersion in clean water for 3 days. Remove and wipe out any traces of moisture. Place the specimen with flat faces horizontal, and mortar filled face facing upwards between two plywood sheets each of 3 mm thickness and carefully centered between plates of the testing machine. Apply load axially at a uniform rate of 14 N/mm² (140 kgf/cm²) per minute till failure occurs and note the maximum load at failure. The load at failure shall be the maximum load at which the specimen fails to produce any further increase in the indicator reading on the testing machine.

Sample no.	Characteristic load(in N)	Compressive strength(in N/mm ²)
1	79800	3.27
2	80700	3.31
3	81000	3.32
	Mean	3.31

Table 1: Compressive strength of clay bricks

Sample no.	% of cement added	Compressive strength at 7 days(in N/mm ²)
1	10	2.57
2	15	2.89
3	20	2.95

Table 2: Compressive strength of test samples at 7 days of curing

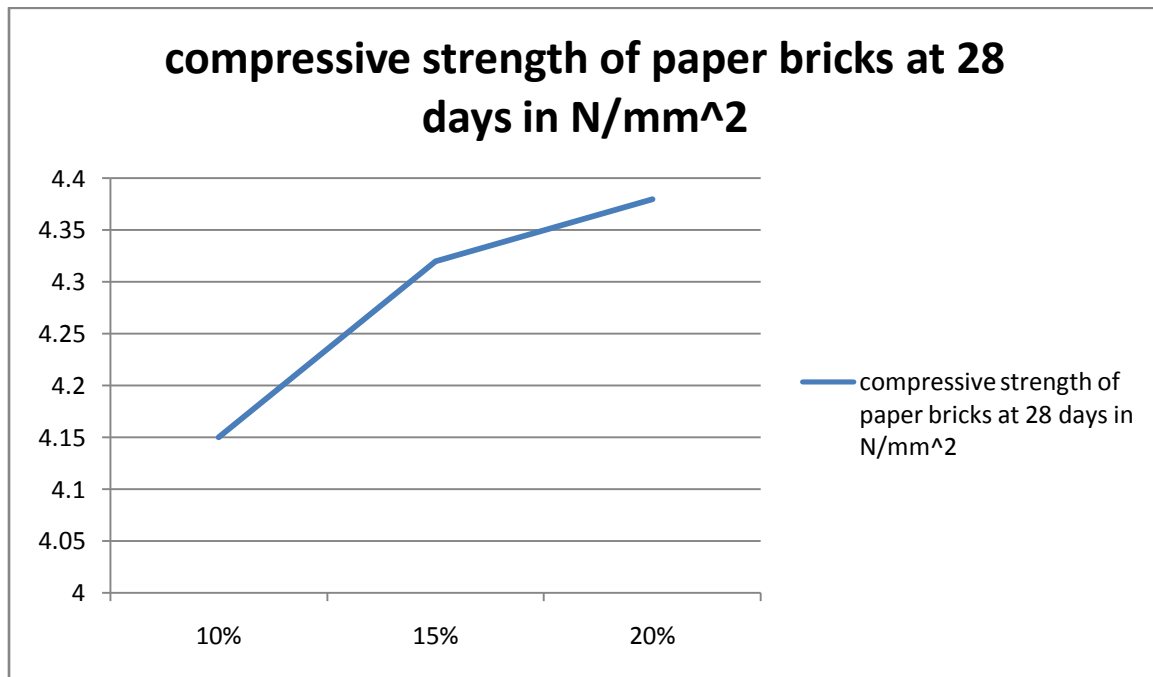
Sample no.	% of cement added	Compressive strength at 7 days(in N/mm ²)
1	10	4.15
2	15	4.22
3	20	4.38

Table 3: Compressive strength of test samples at 28 days**WATER ABSORPTION TEST:**

This test was done for measuring the absorption of water by the bricks. In this test bricks are weighed in dry condition and let them 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. The percentage of water absorption is then calculated. The less water absorbed by brick the greater its quality. Good quality brick doesn't absorb more than 20% water of its own weight.

Sample no.	% of cement added	Water absorption (in %)
1	10	44.1
2	15	40.9
3	20	38.7

Table 4: mean water absorption of the different samples.



Graph 1: graph showing compressive strength of waste paper pulp bricks after 28 days of curing.

CONCLUSION:

Compared with compressive strength of ordinary bricks the waste paper brick shows more compressive strength. Paper bricks are more economical. The times required to prepare paper bricks are less compared to ordinary bricks. Waste paper uses as building material is a better solution for environmental problems. It also shows that hardness increases as the cement increases. It has been noted that the strength achievement creases as percentage replacement of cement increases. It also shows that the percentage of water absorption decreases as the cement content increases.

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