

Usage of Paper pulp residue for fabrication of bricks

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ABSTRACT: Bricks are reckoned to be the most important building materials which are employed for constructional use. Utilization of concrete in the construction industry is altering day-after-day. The increasing demand for concrete in the future is of major emerge, for which an alternate option is to discover at a reduced or no additional price and to cut down the environmental impingement due to increase of cement industries that are significant constituent to economic ontogeny. Papercrete bricks were groomed out of waste paper, and quarry dust with partial replenishment of cement by another industrially acquired by-product Fly Ash in variable proportions of approximately 25%, 40% and 55% respectively. Paper pulp residue along with fly ash, lime, quarry dust & gypsum is used to manufacture the bricks. The variety of properties like mechanical strength, standard quality equivalences with the conventional bricks through standard trials like hardness, soundness, fire resistance and Cost-Benefit Analysis were performed and contemplated.

KEYWORDS: Bricks, Fly ash, Hardness, Papercrete, Quarry dust, Residue, Soundness.

I. INTRODUCTION

According to a research, it was observed that, more than 450 million tons of papers are being raised worldwide annually. According to findings incurred by Environment Protection Agency, the United States recycles nearly about 45% of discarded paper every year. That entails that, about 55% or in other words, about 48 million tons of paper ends up in landfill sites while some are burned. Waste paper reprocessing has not been able to match waste paper generation yet.

Since there exists large demand on construction industry, especially in the last decade due to enormous increase in pollution which causes a inveterate deficit of building resources, the civil engineers have been gainsaid to change over the industrial waste to useful building and construction

materials. One exclusive recycle chance is by using waste paper as a construction substantial. Since the construction industry consumes a great amount of non-renewable resourcefulness's, thus the potential purpose of waste paper for producing a low cost and light weight composite brick for construction not only delivers the potentiality usage of waste paper recycling but it will also let down the demand insistency on planetary natural resources.

[1]. Papercrete is a complex material composed of Portland cement, waste paper, water and/or with sand. Papercrete have been described to be as a relatively low alternative building material and it basically have a good sound absorption and thermal insulation property which is considered as a light weighted and fire-resistant material respectively.

[2]. The authors in these research findings have developed a path way to create paper bricks from recycling waste product. It is mainly made up of with 90% recycled paper mill waste and 10% of cement compositions. Also, the authors have studied about the physical and mechanical properties of brick samples with paper pulp and binder.

[3]. They carried out an experimental investigation on Paper Crete concrete cubes with normal mixing and aggregate-based mix made up of with cement, sand, paper pulp and aggregate indifferent mix proportions for determining few properties. They have also accounted that, Paper Crete can easily be molded into any desired shape and size, also light in weight when compared with conventional clay bricks and very good surface finishing could be achieved.

[4]. In this paper, the author has claimed that, due to urbanization of the areas, it has become very serious issue to dump the waste sludge material. Furthermore, the author also claimed that, there can be drastic reduction of the dumping problem of sludge by using it in to the manufacturing of bricks by partially replacing it with the clay soil respectively.

It has been considered that, fibrous concrete is a kind of mixture comprising of paper, Portland

cement and water. There exist no harmful byproducts used in the production process.

II. METHODOLOGY



Preparing of Paper Sludge:

In this method, a paper which is used were from a variety of sources like newspapers, record sheets, magazines, etc., These papers were torn into small pieces and soaked in water for 3 – 4 days until

they started debasing to paste like form. Then the papers were got rid from water and ground in a mixer to obtain the paper sludge. But for mass production, mechanically controlled tow mixers can be urged to reduce the cost considerably.



Casting of bricks

III. EXPERIMENTATION

Mixing of ingredients: The other main constituents of papercrete were – cement, river sand and M-sand, were dry mixed until a uniform colour was shaped. In this study, mixing was manually

accomplished and the paper sludge thus were obtained was then further mixed with it to obtain the craved papercrete mix. No additional water has been appended further, unless it was essential.



Fire Resistance Test

Mould Specifications:

Brick mould which is made up of ply wood sheets was employed. The sheet is extended to outside for adjudging the mould while preparation of brick. The dimensions of the mould were that of the modular bricks i.e., 190 mm x 90 mm x 90mm.

Casting of bricks:

The mix should be poured in the mould within 30 minutes of mixing on a table and the material was compacted using a tamping rod manually. The additional content was used at a time to cast the bricks at a faster rate. A few bricks were then sun-dried for 21 days and a few others were sun-dried for 7 days and later cured in water for the next 14 days respectively.

Compression test:

This test will decide about the strength of the brick. This test was implemented with the aid of universal testing machine. This test was carried out for 3 days, 7 days and 28 days of sun drying from the date of casting. While testing the paper pulp brick, utmost care must be put forth, because these bricks never failed tragically, it just compressed like squeezing rubber. Hence, load was applied up to full compression. When these brick failed at the higher load, the structure was not fully collapsed. Only the outer faces were cracked and peeled out. A brick that is used for construction should have compressive strength more than 3.5 N/mm².

Water absorption test:

The procedure for water absorption test for bricks was conducted by following the standards pertaining to IS: 3495 – Part 2. A brick is chosen and weighed dry respectively. It was then further particularly immersed in water for duration of 24 hours. It was weighed again and the

difference in weight indicates the amount of water absorbed by the brick. It should not, in any case, exceed 20% of weight of dry brick. Water absorption value of bricks largely influences the bond between brick and mortar. If water absorption in bricks is more and bricks are not soaked before the masonry work, the water from freshly laid mortar is probably to be absorbed by bricks

Efflorescence test:

This test was channelled to know the compartment of any alkaline matter in papercrete bricks. The brick samples were taken and placed along their ends in a dish. The depth of immersion in water was around 2.5. When the water is completely absorbed and the brick appears to be dry, the same procedure is repeated. The bricks are later probed for efflorescence after Second evaporation.

Fire resistance test:

A brick which is used for construction should not be flammable in open flame, so this test was performed out for these bricks. The following are the various steps involved in this test, at first, the brick was wiped with cloths and all the foreign matters were removed. Then, furthermore the flammable sticks were fired. After that, the bricks were held on the flame for 30 minutes. The bricks were then detected. From the aforementioned test, it was remarked that, the papercrete bricks just smouldered like charcoal. But if these bricks are exposed to fire for several hours, they will become ashes.

IV. OBSERVATIONS

The following are the various values and observations obtained regarding the bricks and the amount to water absorbed respectively by the bricks as depicted in the table mentioned below:

Bricks	Weight after ovens (Kg)	Weight of Brick after drying water absorption (Kg)	Water absorbed (%)
Pure Brick	4.63	5.23	12.66
10% P.P. Brick	4.53	5.34	16.99
20% P.P. Brick	4.42	5.39	20.88
30% P.P. Brick	4.38	5.41	23.89

V. CONCLUSION

From the above observations, the following are the conclusions were made and concluded namely:

- The possibility to use the Paper Wastes as an alternative raw material in the production of Bricks leading to much more relief on waste disposal worries.
- Paper Pulp Bricks neither devours energy nor emits pollutants and hence gives an economical viable option for designing GREEN AND ENERGY EFFICIENT Buildings.
- Paper-pulp Bricks have the ability to provide the sufficient strength to walls.

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