Rice Husk Concrete Slab Using Bamboo as Rein for cement

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ABSTRACT

Rice husk concrete slab- With bamboo as a reinforcement this idea basically deals with the use of the rice husk in the concrete and the bamboo sticks as a reinforcement. In the last decades, the use of rice husk in civil construction field has led to an advancement of using husk in concrete. Specially rice husk in the addition to concrete, has been subject of many researches besides to reduce the environmental polluters factors. It may lead to several improvements of the concrete properties. In this paper according to the author's study, the slab of rice husk concrete with bamboo as a reinforcement is prepared and various properties, factors regarding the bamboo and test of concrete has been done. The production of the rice husk has been estimated. The world wide rice harvest is 500 million tons per year, and Brazil is the 8th producer. Considering that 20% of the grain is husk, and 20% of the husk after combustion is converted into ash, a total of 20 million tons of ash can be obtained and can be used for the preparation of concrete. This paper tells the enhancement of the various properties of the concrete and proper placement of the bamboo in the slab for futuristic scope .

Keywords:

RHA; husk; culm; pozzolana; ball mill; sizing; bending; seasoning; design principles.

1.INTRODUCTION

Rice husk is an agro-waste material which is produced in about 100 million of tons. Approximately, 20 Kg of rice husk are obtained for 100 Kg of rice. Rice husks contain organic substances and 20% of inorganic material. Rice husk ash (RHA) is obtained by the combustion of rice husk. RHA is a highly reactive pozzolanic material suitable for use in lime-pozzolana mixes and for Portland cement replacement. [1]RHA contains a high amount of silicon dioxide. Research is based on producing rice husk ash (RHA) that can be incorporated to concrete and mortars. The use of rice husk in the concrete leads to improve the mechanical and durability properties of concrete. In this paper, RHA obtained by uncontrolled combustion of rice husk is added to concrete. Mechanical properties (compressive strength, splitting tensile strength, water absorption and elasticity modulus) were verified. The sample were tested at 7 and 28 days of making the samples. The cubes test has also being performed. Bamboo has been used as a construction material in certain area for centuries. It has been found that use of the high grade bamboo is effective for various construction purposes.

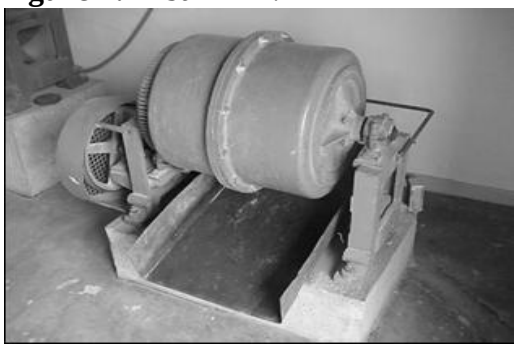
1.1 Introductory nature of bamboo sticks

Bamboo is giant grass not a tree. The density of fibres in cross-section of a bamboo shell varies with thickness as well as height. The strength of bamboo is greater than most of the timber products. Bamboo is more prone to insect attack than other trees and grasses. Bamboo can prevent pollution. Bamboo longitudinal reinforcement should be between 3 and 4 percent of the concrete cross section. It have the same bending moment resistance coefficient as a balanced steel reinforced beam, singly reinforced.[2]

1.2Rice husk ash (RHA)

Rice husk is burnt approximately 48 hours under uncontrolled combustion process. The burning temperature was within the range 600 to 8500C. The ash obtained is ground in a
ball mill for 30 minutes and its appearance color is grey.[3]

Figure 1: A ball mill.



2. NATURE OF BAMBOO

2.1 Selection

The following factors should be considered in the selection of bamboo culms (whole plants) for use as reinforcement in concrete structures:

1. Use only bamboo showing a pronounced brown color. This will insure that the plant is at least three years old.

2. Select the longest large diameter culms available.

3. Do not use whole culms of green, unseasoned bamboo.

4. Avoid bamboo cut in spring or early summer. These culms are generally weaker due to increased fiber moisture content.[4]

2.2 Preparation

Sizing. Splints (split culms) are generally more desirable than whole culms as reinforcement. Larger culms should be split into splints approximately 3/4 inch wide. Whole culms less than 3/4 inch in diameter can be used without splitting. [5]

Splitting the bamboo can he done by separating the base with a sharp knife and then pulling a dulled blade through the culm. The dull blade will force the stem to split open; this is more desirable than cutting the bamboo since splitting will result in continuous fibers and a nearly straight section. Table II shows the approximate net area provided by whole culms and by 3/4-inch-wide splints, as well as the cross-sectional properties of standard deformed steel bars and wire mesh.

Seasoning. When possible, the bamboo should be cut and allowed to dry and season for three to four weeks before using. The culms must be supported at regular spacings to reduce warping.

Bending. Bamboo can be permanently bent if heat, either dry or wet, is applied while applying pressure. This procedure can be used for forming splints into C-shaped stirrups and for putting hooks on reinforcement for additional anchorage.

Waterproof Coatings. When seasoned bamboo, either split or whole, is used as reinforcement, it should receive a waterproof coating to reduce swelling when in contact with concrete. Without some type of coating, bamboo will swell before the

concrete has developed sufficient strength to prevent cracking and the member may be damaged, especially if more than 4 percent bamboo is used. The type of coating will depend on the materials available. A brush coat or dip coat of asphalt emulsion is preferable. Native latex, coal tar, paint, dilute varnish, and water-glass (sodium silicate) are other suitable coatings. In any case, only a thin coating should be applied; a thick coating will lubricate the surface and weaken the bond with the concrete.

Figure3:- placement of the bamboo

2.3 PLACEMENT OF BAMBOO

Bamboo reinforcement should not be placed less than 1-1/2 inches from the face of the concrete surface. When using whole culms, the top and bottom of the stems should be alternated in every row and the nodes or collars, should be staggered.[6] This will insure a fairly uniform cross section of the bamboo throughout the length of the member, and the wedging effect obtained at the nodes will materially increase the bond between concrete and bamboo.

The clear spacing between bamboo rods or splints should not be less than the maximum size aggregate plus 1/4 inch. Reinforcement should be evenly spaced and lashed together on short sticks placed at right angles to the main reinforcement. When more than one layer is required, the layers should also be tied together. Ties should preferably be made with wire in important members. For secondary members, ties can be made with vegetation strips.

Bamboo must be securely tied down before placing the concrete. It should be fixed at regular intervals of 3 to 4 feet to prevent it from floating up in the concrete during placement and vibration. In flexural members continuous, one-half to two-thirds of the bottom longitudinal reinforcement should be bent up near the supports. This is especially recommended in members continuous over several supports. Additional diagonal tension reinforcement in the form of stirrups must be used near the supports. The vertical stirrups can be made from wire or packing case straps when available; they can also be improvised from split sections of bamboo bent into U-shape, and tied securely to both bottom longitudinal reinforcement and bent-up reinforcement. Spacing of the stirrups should not exceed 6 inches.

2.4 COMPARISON OF BAMBOO AND STEEL

Construction drawings call for a 6-inch-thick slab reinforced with No. 10 gage steel reinforcing wire on 6-inch centers. Replace it with a bamboo reinforced slab.[7]

1. The thickness of the slab does not change.

2. From Table II, the cross-sectional area of a No. 10 gauge wire is 0.0143 sq in. Since these wires are spaced at 6 in., the area per foot is 0.0286 sq in. Bamboo reinforcement should be 4 times that of the steel reinforcement or 0.114 sq in. per foot of slab width. From Figure 4, 1/8-inch-thick splints on 8-inch centers is adequate; however, the spacing should not exceed the slab thickness so a 6- inch spacing should be used.

Table I,II . Properties of bamboo and steel reinforcing bars STEEL REINFORCING

Whole Culms	
Diameter (in.)	Area (sq. in.)
3/8	0.008
1/2	0.136
5/8	0.239
3/4	0.322
1	0.548

BAMBOO

Nominal Dimensions - Round Sections		
Bar Designation No.	Nominal Diameter (in.)	Cross Sectional. Area (sq. in.)
2	0.250	0.05
3	0.375	0.11
4	0.500	0.20
5	0.625	0.31

3. RICE HUSK CONCRETE MIXTURE

The same mix designs can be used as would normally be used with steel reinforced concrete. Concrete slump should be as low as workability will allow. Excess water causes swelling of the bamboo. High early-strength cement is preferred to minimize cracks caused by swelling of bamboo when seasoned bamboo cannot be waterproofed. Superplasticizer and aggregates used are mentioned as follows.

3.1 Superplasticizer

A superplasticizer of third generation for concrete was used. This superplasticizer is suitable for the production of high performance concrete. It facilitates extremely high water reduction, high flowability as well as internal cohesiveness[8].

3.2 Aggregates

The fine aggregate used is a natural sand with fineness modulus of 2.25 and specific gravity 2.58g/cm3. The coarse aggregate (basalt rock) has maximum size of 19mm and specific gravity 2.96g/cm^3

4. SLAB PREPRATION

From the above samples and by using various basic design principles for our study. We have prepare a slab of 3*3 meter and of 6 inches thickness. Firstly the concrete is prepared and bamboo is placed as reinforcement. The framework is greased with the shuttering oil and concrete is placed. This concrete is allowed to setup and obtain its solid state. This slab requires very less curing of water as more curing can lead to swelling of bamboo. And cubes are also filled for testing.

5. CONCLUSION

The environmental and financial comparison demonstrates that bamboo can compete with building material. Bamboo is a natural product and will therefore always have some extent of irregularity. It is therefore suggested that the bamboo Culm should be used in functions were the measurement requirements are not entirely precise or fixed, as in temporary buildings (e.g., pavilions and tents) or small civil projects. Furthermore, bamboo can play a role as a non-supporting or finishing material. The use of RHA in civil construction, besides reducing the environmental polluter's factors, may bring several improvements for the concrete characteristics. Adding RHA to concrete, a

decreasing in water absorption was verified. A reducing of 38.7% was observed when compared to control sample. An increment of 25% was obtained when added 5% of RHA. Moreover, a reducing on waste Portland cement was verified, obtaining the same resistance of control sample. According to the results of splitting tensile test, all the replacement degrees of RHA researched, achieve similar results. Then, may be realized that there is no interference of adding RHA in the splitting tensile strength. All the samples studied have similar results in elasticity module. A decreasing in the module is realized when the levels of RHA are increasing

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