

Bamboo-Crete Walls

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Abstract— Steel and concrete are the most used materials in the world, with approximately more than three tones concrete used per annum individually. Concrete is consumed around the world twice than the entirety of all other construction materials, including aluminum, steel, wood and plastic. However, the material is used so widely that world cement production contributes 5 % of annual global CO₂ production. In the attention in response to sustainable society and global warming issues, manufacturing using natural materials has become actively. Low cost, fast growing, and broad distribution of growth of Bamboo, is expected to contribute significantly to earthquake-resistant structures and seismic retrofit technology in the developing countries. This paper presents the construction of bamboo-crete slab with the help of wire mesh and plane cement concrete. These studies led to establishment of bamboo's composite behaviour through the rule of mix.

Key words: Bamboo, Concrete, Bamboo-Crete

I. INTRODUCTION

Now a day, Increasing price and common reduction of steel reinforcement in maximum divisions of the world has led to increase in the probabilistic use of conventional locally possible materials for the reinforcement. In the recent period, rate of steel have raised. For the developing countries steel is upstanding to get because of high rates and for construction industry, application of steel presently limited hardly.

The reduction of natural resources has posed a serious problem of existence before the next generations. Engineers are working on replacement of conventional materials of building construction with eco-friendly material for sustainable development. Bamboo has been in use of mankind for various purposes since a long time. There are more than 1000 species of bamboos and are used for more than 1500 uses all over in the world. Bamboo regenerates and can be used within four years, Bamboo has, therefore, acquired a place in the list of material of green technology and renewable source. Bamboo has less CO₂ emission and because of this bamboo has been used in building construction in all over the world. Various techniques have been developed for housing. Walls, Roofs, Trusses, Doors, composite laminates made up of bamboo have been used.

II. LABORATORY EXPERIMENTS ON BAMBOO

A. Tensile Test

One of the properties that would make bamboo a good substitute to steel in reinforced concrete is its strength. The strength of bamboo is greater than many timber products which are advantageous, but it is quite less than the tensile strength of steel. Bamboo is easily accessible as it is available in almost every tropical and subtropical regions, this lowers the cost of construction and increases the strength of the buildings that would otherwise be unreinforced. Tension test is the most basic type of mechanical test. It is easy to perform

and relatively inexpensive compared to other tests. The stress- strain characteristics of bamboo have been derived from the results of this tension test.

B. Sample Preparation

First a bamboo was divided into two pieces lengthwise using carpenter's tool hammer and chisel. Each of the two halves was further divided into 3 pieces. 3 samples of finished bamboo were taken for tensile test each having the following criteria-

- 1) Each specimen contained at least 2 nodes.
- 2) Any form of imperfection (fracture, void, decay, etc.) was avoided.
- 3) Any undulation was trimmed off.
- 4) Diameter was measured at four different locations and then the average diameter was calculated.

1) Test Results

Specimen No.	1	2	3
Average area (mm ²)	200	181	155
Failure Load (KN)	17.6	19.4	24.2
Stress at Failure (mPa)	88	107.2	156.1

Table 1:

C. Compression Test

The compression test of Bamboo is taken to find out the crushing strength of Bamboo which is required for design of compression members.

1) Test Results

Specimen No.	Load (KN)	Compressive Strength (N/mm ²)	Average Compressive Strength (N/mm ²)
1	86.6	98.06	88.13
2	68.6	77.67	
3	78.3	88.13	

Table 2:

III. COMPOSITE STRUCTURE

A. Bamboo-Crete Wall

Wall panels were constructed using split bamboo faced one side. The round shape of split bamboo were faced outside while the other side was inside. Due to this it will give a natural texture from outside of the house.

The inside of the bamboo is plastered. As we know that, bond between the bamboo and concrete is not same as bond between steel and concrete, we have use steel wired mesh on the inner part of the panel and then plastering is done.



Fig. 1: Wire Mesh Layer on the Inner Part of Wall Panel before Plastering



Fig. 2: Plastering of Wall Panel From Inside

IV. CONCLUSION

On the basis of work conducted in this project we conclude that,

- 1) Cost of RCC Structure and Steel structures is 72% more than that of bamboo structures.
- 2) Tensile Strength of Steel is 37% more than that of bamboo.
- 3) Carbon emitted per kg of steel is 1.37 kg of concrete is 0.159 kg and that of timber is 0.46 kg and that of Bamboo is ZERO, making it eco-friendly and economical. There by we come to a conclusion that Bamboo reduces carbon footprint of the structure making it more stable and durable.
- 4) Life span of RCC and steel structures is more than that of bamboo structures. Bamboo being a naturally occurring substance degrades earlier but if properly treated and preserved, its life span increases.
- 5) The strength to cost ratio of bamboo is comparatively greater than that of the steel.

- 6) Bamboo wall reduce 53% of brick wall construction cost.
- 7) Due to lower self-weight of proposed building as compare than conventional building it is found that the earthquake load on propose building is lower than conventional building.
- 8) Use of bamboo as building material may reduce the demand of brick and cement production in a country.
- 9) The waste produced after dismantling bamboo house is very less when compared to steel and RCC house.
- 10) Bamboos reflect heat so the house gives more comfortable life.
- 11) A bamboo building is not only economically but also aesthetically better than RCC and steel building.

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