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CHEMICAL TREATED BAMBOO TO REPLACE STEEL AS A REINFORCEMENT IN A BEAM

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ABSTRACT: *Balco bamboo this is the most common bamboo species in India, has been chosen as the basis for the newly developed bamboo reinforced composite materials. Each every sample of bamboo we treated the bamboo in chemical composition. Bamboo is economical, fast developing, and broad distribution of growth is normal to contribute knowingly to earthquake-resistant construction and seismic retrofit technology in the developing countries. We also have been studied about the mechanical behavior of bamboo-reinforced concrete member and illuminating the differences of structural properties from steel reinforced concrete and bamboo reinforced concrete. There is various paper we studied the mechanical properties of bamboo reinforced.*

KEYWORDS: *Balco, Economical, Bamboo reinforced beam, earthquake resistance.*

1. INTRODUCTION

Bamboo has shown great future for making multiple materials and modules which are cost- effective and can be successfully utilized for structural and non-structural applications in construction. Bamboo can be developed in large quantity with low cost and this will be economical for construction purpose. Bamboo is a flexible material with its high strength, workability, and durability. Bamboo has high tensile strength property as well as compression property. We have mainly focused on the comparison of steel reinforcement and shear reinforcement by taking into consideration the bamboo as a structural material for stirrups as well as reinforcement in beam and column. The objective of shear reinforcement by using as a structural member was to get a good as well as effective shear strength and flexural strength of bamboo in a beam. We used bamboo stirrups for reinforcing bamboo beam. Bamboo has a high tensile strength as compared to steel bars. According to this paper, bamboo has a high compression property as compared to steel and the compression strength of bamboo is 168 KN. Bamboo is generally used as structural material but it is also used in the construction of bridges, scaffolding, and housing. In this paper, we compare the result of flexural strength between steel reinforced concrete and bamboo reinforced concrete beam.

2. METHODOLOGY

In order to study the comparison of flexural and deflection test of bamboo reinforcement in reinforced cement concrete specimen following tests are carried out on bamboo specimen and bamboo and steel reinforced concrete beam:

1. Mechanical Properties
a. Tensile test on bamboo
b. Flexure test on bamboo
c. Density of bamboo

1. Mechanical properties

a. Tensile test on bamboo :

During the performance of the tensile test on the bamboo specimen; first of all, we wrapped on the bamboo specimen for the purpose of grip. The specimen placed during the test was such that the general direction of the fibers was parallel to the longitudinal axis of the test specimen. The load shall be applied continuously and movable head of the testing machine shall travel at a constant rate of 0.01m/s. The maximum load recorded was 350 N/mm^2.

b. Flexural test on bamboo:

We performed flexural strength on Balco species of bamboo of 3' diameter and 950mm. We performed the flexural strength test of bamboo species on UTM (Universal Testing Machine) because of the size of bamboo is small. The load is applied at the center edge of the bamboo species until the breaking point. The maximum load recorded was 168 Kg/Div.

Fig. (a): Loading applied to Bamboo Fig. (b): Flexural strength on Bamboo

c. Density Test on bamboo:

The mass of a unit volume of the element is called its density.

DENSITY= MASS/VOLUME

In S.I unit density is expressed in kg/m3.

Take a graduated cylinder of proper capacity. Fill it with water up to known volume level make and immerse the specimen fully in water taken in the graduated cylinder. The specimen displaces water and the water level is rise. Note the position of the water level. keeping the eye in a horizontal position with the level. Find the difference between two positions of the water level to find the volume of specimen immersed. The average density of Balco bamboo species is 728.67kg/m^3.

2. DESIGN OF BEAM

The total design of beam for the steel reinforced concrete structure is prepared with the help of Indian standard code for RCC is 456-2000 and a similar procedure is applied for the bamboo reinforced concrete. The is designed for singly reinforced section.

For Steel Reinforced Concrete Beam:
A grade of concrete used- m25
A grade of steel - Fe 500N/mm^2
The size of beam- 1000mm x 300mm x 300mm
No. Of main reinforcement- 2φ12mm @100mmc/c
Shear reinforcement - 5 no of stirrups of 230mmc/c.

For Bamboo Reinforced Concrete Beam:
The size of beam - 1000mm x 300mm x 300mm
No. Of main Reinforcement - 2φ 3’ @100mm c/c
Shear Reinforcement - 5 no. of stirrups 230mm c/c.

Fig. (c): Bamboo Reinforcement Beam

Shear Reinforcement of Bamboo Reinforced Concrete Beam:
We used stirrups for bamboo reinforcement which is made by bamboo strips. The stirrups for the bamboo reinforced concrete beam are made by the heating process of bamboo strips. We used heating gas for bending of stirrups.

Fig. (d): Bamboo Stirrups Fig. (e): Gas used for made up of stirrups

3. BONDING OF BAMBOO WITH CONCRETE

We used Epoxy Resin for bonding between bamboo and concrete. CICO BOND EPO is two component 100% solids epoxy resin system comprising of Pack-A (Resin) and Pack-B (Hardener). It is mainly used to bond old to old concrete or new concrete or mortar to old concrete. Very high mechanical strength. Excellent bond strength on dry as well as damp concrete surfaces. Supply in two different colors (Pack A and Pack B) for easy identification and ensure proper mixing. No solvent is used therefore no harm to the environment. Epoxy Resin is used for improving the bonding strength between concrete and bamboo.

Fig. (f): Epoxy Resin

4. CONCLUSION

After the study of literature review available, broad research through the use of bamboo as a reinforcement in concrete is being agreed. It is recognized that the bamboo can suitably replace the steel for the modest housing for the urban poor areas who live close to bamboo regions. It is a good idea for low-cost cheap structures, as it is a naturally or easily available material. The bamboo can be used as eco-friendly. It is economical or cheap for poor peoples who cannot afford the high-cost houses. The results obtained can accomplish that replacement of steel with bamboo stirrups as a shear reinforcement as well as by comparison of steel with bamboo stirrups can give shear and flexural strength of bamboo than the strength of steel.

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