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Bamboo Reinforced Concrete

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***Abstract*—Recently, in the attention in response to global warming issues and sustainable society, the manufacturing using natural materials has become actively. Bamboo, low cost, fast growing, and broad distribution of growth, is expected to contribute significantly to earthquake-resistant construction and seismic retrofit technology in the developing countries. The authors also have been studied for understanding the mechanical behavior of bamboo reinforced concrete member and clarifying the differences of structural properties from steel reinforced concrete and bamboo reinforced concrete. It compares these experimental results of bamboo reinforced concrete members with the experimental ones of reinforced concrete members, and the mechanical property of the bamboo reinforced concrete members is studied. From these experimental works, the possibility of effective using of 'Bamboo' is discussed.**

***Keywords*—Bamboo Reinforced Concrete, Bamboo, Corrosion, Pull-out test, Flexural strength**

I. INTRODUCTION

In recent years, steel prices have soared. For developing countries, steel is difficult to obtain because of expensive prices, and for the construction industry, usage of steel is currently limited heavily. The production of steel has high consumption of fossil fuels, so, the steel discharge in the construction of structures has been presented, showing the possibility of drastic reduction by research institutes. Meanwhile, for developing countries, it is important to make the development of buildings construction; low cost, no requirement of sophisticated technologies and reliable construction methods.

Environmental destruction such as pollution of air and water has been occurring in some regions by rapid development and production of materials like iron, steel, glass, cement and aluminium that use limited mineral resources. On the other hand, plants and fibers are annually reproducible clean resources. Bamboo is a unique group of gigantic grasses the culm of which originates in underground rhizomes. It grows naturally in many parts around the world country but some species are artificially planted. Bamboo forests are found across tropic and sub-tropic zones between latitudes of about 40° south, i.e. areas with mean annual temperatures of from 20° C to 30° C. Bamboo suitable for water pipes grows at altitudes from 20 to 3,000meters. The plant is fully mature at an age of three to four years.

II. CORROSION OF BAMBOO

The volume of bamboo is expanded to absorb the water in the concrete. In addition, the volume of bamboo shrinks to lose the water according to the drying of concrete. Because the shrinkage of bamboo is so larger than that of concrete and its speed is also faster, the bamboo embedded in concrete will be exposed to expansion and contraction repeatedly. It is believed that this is one of the reasons why the bond stress has been lost. The change in tensile strength of bamboo soaking in the alkali water

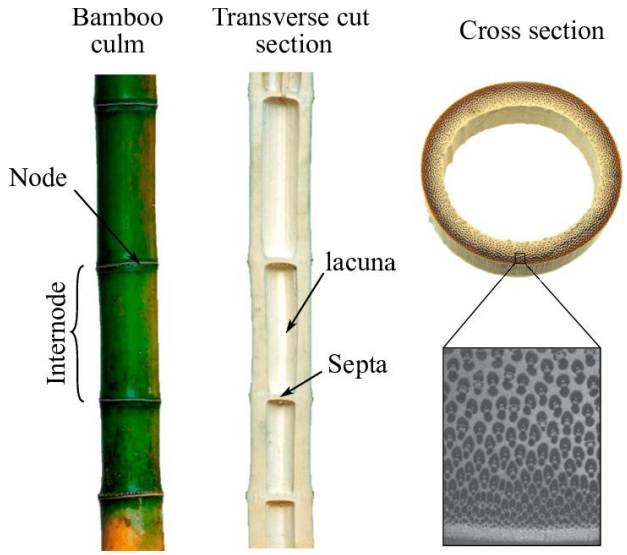

Fig. 1. Cross sections of bamboo.

III. CONCRETE MIX PROPORTIONS

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.

IV. PLACEMENT OF BAMBOO

- Bamboo reinforcement should not be placed less than 1½ inches from the face of the concrete surface.
- The clear spacing between bamboo rods or splints should not be less than the maximum size aggregate plus ¼ inch.
- Reinforcement should be evenly spaced and lashed together on short sticks placed at right angles to the main reinforcement.
- The ties can be made with vegetation strips.
- This embedded depth is approximately 10 times the diameter of whole culms or 25 times the thickness of ¾ inch wide splints.
- Spacing of the stirrups should not exceed 6 inches.

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V. DESIGN PRICIPLES

Bamboo reinforced concrete design is similar to steel reinforcing design. Bamboo reinforcement can be assumed to have the following mechanical properties**.**Bonding between concrete and bamboo as reinforcement ismust for design. Split bamboo provides better bonding with concrete than whole culms when used as reinforcement. Bamboo should be split and provided in more compact reinforcement layers for better bonding with concrete.Bamboo is stronger than steel in regards to the tensile strength. Steel has a tensile strength of 23,000 pounds per square inch. But bamboo surpasses steel with a noticeable lead at 28,000 pounds. And yes, bamboo is stronger than steel in this case, as it has a tightly packed molecular structure than steel.Bamboo is easily accessible. Bamboo lowers the cost of construction. Increases the strength of the buildings. Bamboo can crack and deflect more than steel reinforcement.

VI. CONCLUSIONS

The authors conclude that, although bamboo is a material with extraordinary mechanical properties, its use in bamboo-reinforced concrete is an ill-considered concept, having significant durability, strength and stiffness issues, and does not meet the environmentally friendly credentials often attributed to it.This review addressessuch 'bamboo-reinforced concrete' andassesses its structural and environmental performance as an alternative to steel reinforced concrete.

REFERENCES

[1]. Kawamura, K.(1941). Bamboo reinforced Concrete, SankaidoSyuppan, Japan

[2]. H. E. Glenn. "Bamboo reinforcement in portland cement concrete," Engineering Experiment Station, Clemson Agricultural College, Clemson, South Carolina, Bulletin No. 4, May 1950.

[3]. U. S. Army Engineer Waterways Experiment Station. Technical Report No. 6- 646: "Precast concrete elements with bamboo reinforcement," by E. F. Smith and K. L. Saucier. Vicksburg, Mississippi, May 1964.

[4]. S. R. Mehra and R. G. Ghosh. "Bamboo-reinforced soil-cement," Civil Engineering and Public Works Review, Vol. 60, no. 711, October 1965; vol. 60, no. 712. November 1965.

[5]. "Concrete floors on ground," Portland Cement Association Concrete Information, ST-51.

[6]. American Concrete Institute. "Building code requirements for reinforced concrete," (ACI 318-56). May 1956.

[7]. Department of the Navy, Bureau of Yards and Docks. Design Manual NAVDOCKS DM-2, Structural Engineering. October 1964.

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