A Review Study on Use of Bamboo Reinforced Concrete

Ms.Revati Kinekar[1] Ms.Aditi Barwade[2] Ms. Jyoti Bandagar[3] Ms. Chhaya Kitture[4]
[1,2,3,4]UG Student
[1,2,3,4]Department of Civil Engineering
[1,2,3,4]Sharad Institude of Technology, Polytechnic, Ichalkaranji, India (Maharashtra), India

Abstract— Bamboo is one of the oldest building materials used by mankind. Bamboo is used for various construction works. It has good strength and durability. Now a day's concrete is a widely used as construction material for its various advantages such as low cost, availability, fire resistance etc. Reinforced cement concrete plays vital role in construction. The cost of construction is increasing due to increase in the cost of steel and cement. To control the cost of construction and promote the use of natural products the study is required be carried out. The aim of present research work is to explore the use of bamboo as reinforcement in reinforced cement concrete work. This paper shows the investigation of use of bamboo reinforcement in beam. To study the effect of replacement of steel reinforcement by bamboo, tests have been conducted on 28 beams of size 750 mm length and 150 mm x150 mm. Beams were tested to failure under two point load tests. The highest and lowest failure loads were recorded for the case of steel reinforcement and bamboo reinforcement with steel stirrups. Flexural strength of beam model has been studied by replacing bamboo completely, in compression zone and in tension zone.

Keywords: Bamboo Reinforced Concrete

I. INTRODUCTION

Bamboo reinforced concrete construction follows same design, mix proportions and construction techniques as used for steel reinforced. Just steel reinforcement is replaced with bamboo reinforcement. Properties of bamboo reinforcement, mix proportion of concrete, design and construction technique with bamboo reinforced concrete is discussed in this article.

Nature's material, bamboo has been widely used for many purposes. Mainly as a strength bearing material. It is used for building shelters from an earlier time.

Bamboo has used for scaffolding works, formwork supporting stands and many in building construction works. These are limited to medium-large projects.

Even though existence of bamboo has been found from centuries, bamboo as reinforcement material is an innovation in the civil engineering construction field. This innovation was based on Clemson's study that has been conducted in the Clemson Agricultural College.

Bamboo is a biodegradable and renewable in nature. It is energy efficient as it is of natural origin and environmentally sustainable in nature. These properties have forced to use this in the construction field for centuries.

The details on how bamboo is efficient in replacement for steel reinforcement in concrete are discussed in the following sections.

II. LECTURE REVIEW

1) Edwin ZeaEscamillaEt.al.(19 July 2018)Such treatments, as described in the literature, are labour intensive, costly, and often utilise materials of known toxicity or which have handling restrictions associated with workplace health and safety. Vo and Navard draw a very prescient conclusion in this regard: "A large proportion of [the methods used to overcome issues of biomass durability when embedded in concrete] are effectively helpful in easing the concrete preparation and leading to better final materials. However, most of them, if not all, have little practical value since they are either impossible to be implemented because of the use of chemicals which are not environmentally-friendly or much too expensive."
2) Masakazu TERAI Et.al.(2012) Mr. Masakazu TERAIconclude that the availability of combination bamboo and concrete structure can be confirmed. Therefore, for construction of the actual structure, it is necessary to verify some realistic methods. It can be said that this study is the first step towards the development for the future. It is important to accumulate further experimental data and to consider the practical application. For practical application of the structure with bamboo, it seems to be important to consider the following conditions:
    1) Design of the structure with bamboo,
    2) Combinations of materials (the concrete strength and type of bamboo),
    3) Construction and Workability and
    4) Durability of bamboo within mortar and concrete.
3) Ishwar Kumar GuptEt.al.(November 2017) 1. Bamboo shows reasonable tensile strength, which suggests that it can be used as reinforcement in RCC structure for low cost housing projects. 2. As bamboo is weak in shear it cannot be used as shear reinforcement in RCC structures 3. If complete steel reinforcement is replaced with bamboo then it gives only 26 % strength. 4. It gives reasonable strength of 83% when bamboo is placed in compression side only with steel at tension side. 5. Bamboo is weak at node section, major failure in bamboo occurs at node. 6. The tensile strength of middle portion of bamboo is always larger than that of top and bottom
4) Jigar K. Sevalia (March -April 2013)Mr.Jigar K. Sevalia conclude that Doubly Reinforced Beam has performed more elastically than Singly Reinforced Beam while performing flexural tests. • Load carrying capacity in Doubly Reinforced Beam increased by 29.31 % as compared to Singly Reinforced Beam. • Vertical cracks are developed, on failure of the beam, within middle third region of the beam. This type of failure is a proof existence of pure moment without any shear.

5) Mritunjay Kumar Singh(June 2020)Bamboo has been used for several years since the ancient times as a building material but has gained much attention in the spotlight since the Clemson study. However, there is no such method that can be relied upon for the proper construction of any structure that is reinforced with bamboo. The property of bamboo is the reason for which it was selected as the material for reinforcing beams. It is a sure inevitability that the structural member that has been reinforced with bamboo will lose its strength up to a significant limit, so this project report has focused on providing a method by which steel and bamboo can be used as individual or together so that the strength of the member and thus the structure is not compromised with sighting a reduction in selfweight and making the structure economical.

III. CONCLUSION

Bamboo as a building material has high compressive strength and low weight has been one of the most used building materials as support for concrete, especially in those locations where it is found in abundance. Bamboo as a buildingmaterial is used for the construction of scaffolding, bridges and structures, houses.Because of its extraordinary physical characteristics, Guadua bamboo is suitable for all types of structures and constructions. Bamboo is non-polluting and does not have crusts or parts that can be considered waste.

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