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A Review of Behavior of Bamboo Reinforcement in RCC Beam

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Abstract:

In India balco bamboo is the most usable species every sample is treated with the solution bamboo is economical and fast-growing and widely available and it slightly earthquake resistance we also have studied about properties and behavior of bamboo we also compare the steel and bamboo in a different way the use of bamboo reinforcement as replacement of Steel it is very important today mainly this is important for economic aspect and ecological as well target is to provide low-cost facilities by using bamboo reinforcement.

Introduction:

The demand of bamboo is rapidly growing and the supply depends on many things for low-cost housing many countries are facing many problems so that bamboo who is a very good option for this problems bamboo is one of the oldest building material used for the construction in bridges scaffoldings and housing but this type of construction is not what a permanent structure and these are the temporary structure in this modern world with the innovation of Science and Technology e new and durable methods are needed for construction as we studied various papers many of them are for the treatment of bamboo with different Chemicals to improve a property and Bond strength with concrete in the construction of building the main difficulty is that the diaphragm of the nodes chemically treated bamboo is used in construction so that the bonding and other properties are increased.

Basic characteristics of bamboo:

Bamboos are not trees as commonly believed by people these are giant grass-like plants. The strength of bamboo is greater than most of the timber. The strength of bamboo is vary is with the height and age of the bamboo Culm. It is proven in many researches that the strength of bamboo increases with age. Optimum strength of bamboo is obtained in 2.5 to 4 years. And the node of bamboo is useful to prevent axial cracks.

Bamboo as the construction material:

Among all materials glass fibers, Steel has proven itself as a good composite material for the RCC construction. Unfortunately in some parts shortage of steel is occur and in most of the countries which are developed or developing the cost of steel is high. And asbestos fibers can be used as reinforcement in concrete sheets pipes and boards but the health problem associated with it is now well known so that in such scenario bamboo is used for construction material whenever it possible and suitable. The tensile strength of bamboo is more than the other Timber material so it is suitable for reinforced concrete. Due to its low modulus of elasticity bamboo can be tracked under some condition. We know that still has a corrosion problem that's why it needs protection. As compared to steel bamboo is very lightweight and bamboo can available in every tropical and subtropical region bamboo can increase the strength of building which is under reinforced.

Bonding between bamboo and concrete:

In general the perfect bond is between the steel and concrete this is the basic composition of reinforced concrete. This is also called as an addition between the steel and concrete which is prevented from slipping. Many parameters can affect the bond of bamboo and concrete-like surface texture of bamboo maximum size shape grade of concrete etc. [5 6]

The behavior of bamboo is different than the Steel in reinforced cement concrete in bamboo major problem is the absorption of water and get expand due to expansion of bamboo the concrete results into cracks and when curing is stop the bamboo get shrink and produce voids in the inner side it affects condition the bonding of bamboo and strength of concrete.

Behavior of reinforced cement concrete:

Mixing of more than one or two materials reinforced concrete is a composite material by Bernoulli beam theory design simple concrete cross-section and also satisfies equilibrium.

Strength:

The strength of section depends on the reinforcement because it gives tensile strength to that section behavior of bamboo is different than steel and also its capacity to resist load is poor results to be inter zonal stress occur more. We use bamboo and glass fibers reinforcement polymer (GFRP) for brittle reinforcement material but reinforcement Failure is not acceptable does over reinforced section are prescribed [7].

To satisfied equilibrium and strain compatibility requires providing force to its element the average tensile strength of Guadua Angustifolia bamboo is 20 GPA. [8]

Bamboo reinforced concrete:

In many papers we studied that the use of bamboo and reinforcement concrete is more in Asian countries. In early experimental studies of bamboo reinforcement are performed in the MIT of Germany [9] Italy [10].

Bamboo can be used as a bar whole culm as a small diameter are its splits. In the earliest time bamboo reinforcement used by us they are interested in bamboo because due to bamboo possibility of rapid construction in world war. U.S. war production board financed research [11]. They produce some conclusion from the test results as well as the design some construction principle on the reinforced concrete main points in that research are deflection ductility and brittle failure reduced ultimate loading capacity as compared to Steel. Bonding of bamboo with concrete is affected due to cracking and swelling of bamboo and it also needs between as coating material. After the studies report gives design methodologies that are brink and rush [12]. Allowable stress is considered for the construction of bamboo reinforces concrete ACI 318[13].

Maximum research papers describe about structural strength of bamboo and basic design methodologies. Which is given by geymayer and Cox [14]? It is recommended design capacity for the unreinforced section should be the factor of safety for cracking is 2 and` for failure is 7 [15].

Investigation of bonding properties is not included in this paper and if we recommended the plants of bamboo we need a double layer of coating [15]. This method near about similar to that of bamboo splints by Ghavami [16]. In this paper the recommended that the bamboo splints should be rough before using first coating and before the second coating we wrap the bamboo with 1.5 mm thick wire. After study ghavami found that the beam with a 3% ratio of bamboo splints gives 4 times more strength as compared to reinforced concrete.

Advantage:

1. Bamboo is flexible material.
2. Bamboo gives good strength as per the cost.
3. Lighting in weight.
4. Bamboo is easily available and economical.
5. Slightly having vibration resistance.

Disadvantage:

1. Bamboo strength depends on the edge so that when the age of bamboo goes increase the strength will decrease.
2. Moisture content is harmful to bamboo.
3. Not a fire-resistant material.
4. Having less bonding property and it is less durable.

Conclusion:

In bamboo water absorption property is occurs so that proper coating is given as compared to steel the tensile strength of bamboo is low but it can be used in RCC structure as low-cost material bamboo has low so strength so that it cannot be using your reinforcement in reinforced structure bamboo has a weakness and the node major failure occurs at the mode. As for the different people it has low elastic property so that when it subjected to call rolling condition bamboo gets cracked. To stop this cracking behavior we have to give sufficient bond between bamboo and concrete. Bamboo is organic material so if we used bamboo without treatment it will not able to get that much strength and durability main thing is that before using bamboo we have to Treat bamboo some researchers like VO and Navard [18] gives of very important knowledge about this concept number of methods used for the reducing biomass is helpful for all structure and also for preparation of concrete. For the treatment of bamboo chemicals are used which is not in the environment friendly and the cost is high. For long life structure bamboo is not suitable but for the small structure bamboo is very useful material.

References:

1. JA. Jansen, (1981) “bamboo in building structures, Ph.D. thesis, Eindhoven University of Technology, Holland”.
2. K. Ghavami, (1995) “ulimate load behavior of bamboo-reinforced lightweight concrete beams, cement concrete composition”.

3. S.C. Lakkad, J.M. Patel, (1981) "material of bamboo, a natural composite, fiber scitechol"
4. K. Ghavami, (2005) "bamboo as reinforcement in structural concrete element cement concrete composite"
5. K. Ghavami, (2000) "Bureau of Indian standard, IS-456, plain and reinforcement concrete, code of practices, fourth revision.
6. "Bureau of Indian standard IS-2770-I methods of testing bond in reinforced concrete-part-I pull out test"
7. American countries institute (ACI)(2015) ACI-440 IR-15 guide for the design and construction of structural concrete reinforced with fiber-reinforced polymer (FRP) bars American countries institute (ACI) Farmington hills.
8. Correal JF, (2016) "bamboo design and construction in non-conventional and vernacular construction material characterization properties & application".
9. Datta K.(1936) "Versuche uber die verwending von bamboo in bottom (experiment on the use of bamboo in concrete construction) der beuingenieur (berlin Wilmer Dorf)17".
10. De Simone D.,(1939) "norme ; materials structure per limitazione dellimpiego del Ferro Nelle construction".
11. Glenn HE, (1950) "bamboo reinforcement in Portland cement concrete, engineering experiment station, Clemson agriculture college, Clemson south Carolina, bulletin no.4".
12. Brink FE, rush PJ, (1966) "bamboo reinforced concrete construction US naval civil engineering laboratory report part Hueneme".
13. American concrete institute (ACI) (1956) ACI 318-56 building code requirements for reinforced concrete. American concrete institute (ACI) Detroit.
14. Geymayer HG, cox FB (1970) "bamboo reinforced concrete J Am concrete inst 67(51):841-846".
15. Kankan JA, ben-George m-perry SH (1988) "bamboo reinforced concrete beam subjected to third point loading".
16. Ghavami K., (1995) "ultimate load behavior of bamboo reinforcement lightweight concrete beam".
17. Ghavami K., (2005) "bamboo as a reinforcement in structural concrete elements concrete composition .27:637-649".
18. VO.LTT, Navard p, (2016) "treatment of plant biomass for cementations building materials a review".