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Comment on bamboo as a reinforcement material for modern buildings

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ABSTRACT

Concrete is the basic building material used throughout the world. Concrete has a high compressive strength and a weak tensile strength. To counter , this steel is used as a reinforcing material to increase stress. Steel is expensive and easily corroded, leading to deterioration of the structure. Bamboo can be outclassed due to its light weight, high strength, durability, and easy regeneration. Therefore, in construction industries, the traditional use of steel reinforcement was replaced by the use of bamboo as a reinforcement material. Bamboo is a natural, cheap and abundant material. Compression and tensile strength are required. The deflection in the middle of the span can be reduced by providing bamboo stiffeners. We will compare the properties of steel and bamboo to find the best results.

Keyword : - Bamboo strips, cypress, bending strength, laminate, treated bamboo, untreated bamboo

1. INTRODUCTION

Giant bamboo is the largest member of the grass family. In bamboo, the intermodal area of the stem is usually hollow, and the vascular bundles in the cross section are scattered throughout the stem instead of being arranged in a cylindrical shape. Bamboo includes species of the fastest growing plants in the world. Certain types of bamboo can grow 91 cm in 24 hours. They are of great economic and cultural significance, which can be used as building materials and as general-purpose raw materials. The compressive strength of bamboo is higher than brick, wood, and concrete, and the tensile strength is higher than concrete. The world's demand for wood is rapidly increasing, but the supply has been exhausted. Industrially processed bamboo has shown to have higher strength and can manufacture economical composite materials and parts, and may be suitable for structural and non-structural applications in buildings. Developing countries have the greatest demand for reinforced concrete, but there is usually no way to produce steel to meet this demand. The abundant, sustainable and extremely strong bamboo has future potential and can be an ideal substitute where steel cannot be easily produced. enhances its strength through its hollow tubular structure to resist the wind in its natural habitat. This lightweight frame also makes it easy to pick, place and transport. Due to its rapid growth cycle and the diversity of areas where it can grow, bamboo is very cheap. It needs grass to absorb carbon dioxide. These factors alone can encourage people to invest in the development of bamboo as a reinforcing material. With the advancement of science and technology, the processing of bamboo requires new methods to make it more durable and useful in building materials. The basic characteristics of bamboo and the methods for processing it into various composite products have been studied. Bamboo has several unique functions, such as the ability to grow quickly with high yields, and matures quickly. Furthermore, bamboo can also be grown in large quantities at a lower cost, which makes it more economical.

II. LITERATURE REVIEW

Prem kumar.V, vasuki.V (2014) conducted an in-depth study on the mechanical properties of bamboo reinforced concrete beams. The analysis of the experiment was performed on conventional steel bars on reinforced concrete beams with treated and untreated bamboo. The untreated bamboo tendon beam is made of mechanically heat-treated rods and bamboo hoops. The treated bamboo reinforcement beam is made of mechanically heat-treated rod stirrup material and epoxy resin coated bamboo (main index 1315), which is coated with fine sand spray to provide high bonding strength. The comparative experimental values of conventional steel, treated and untreated reinforced concrete beams are considered to explain their durability, flexural strength and sustainability.

James Kariuki et al. (2014) conducted an experimental analysis on the flexural strength of laminated bamboo beams. Yushaniya alphina is a kind of bamboo. The bamboo strips are laminated with the help of a high-strength polyethylene acetate adhesive. uses a splitting machine to split and split the bamboo. The silky smooth outer layer is peeled off, then the is boiled and dried. It is then boiled in a solution containing hydrogen peroxide for 3 hours and preserved with the preservatives boric acid and borax oxide, which are effective against termites and fungi. Finally, the water evaporates and the salt is deposited in bamboos, which are dried in the air for 3 months until the humidity reaches 12%. Compared with three bunches of cypress, six bunches of bamboo laminate is . Bamboo laminate beams have better bearing capacity than cypress beams.

Farhana Naznin and others. Al (2015) studied the study of bamboo fiber concrete beams. Ayurveda (Bambusa tulda) was made into slats of 16mm and 20mm, then treated with copper chromium boron, and finally surface dried. Two types of bamboo slats are prepared: simple board and pallet. Tor slats are only coated with asphalt and sandblasted to increase the bond strength. steel was used as abutment material to wrap the bamboo-reinforced concrete that was finally poured. A cement-cement water mixture in the required proportion of is used. Then test the bending, tension and moisture content of the bamboo board. According to the obtained results, we can obtain better bending performance by increasing the number of trusses, the steel bar diameter and the shear connection of to the reinforced bamboo beam. The deflection of the mid-span is reduced, and the bending strength is also increased.

Jigar K. Sevalia et al. (2013) conducted an investigation on cement concrete reinforced with bamboo. The bamboo shaking tensile test, the cement concrete cube compression test and the bamboo reinforced concrete beam bending test were carried out to evaluate the performance of the bamboo. traction, bamboo with a length of 520mm and a thickness of 10mm and both ends were roughened with to achieve grip For the compression test, a cement concrete sample with a size of 150mm x 150mm x 150mm was cast and cured prior to testing. For the bending test, three different types of bending beams were prepared, such as a simple cement concrete beam (without bamboo stir), a separately reinforced cement concrete beam (with two raw bamboo stirrups at the bottom of the component), Double reinforced concrete beam (without bamboo stir). Two unprocessed bamboo horse stirs are provided on the top and bottom of the beam respectively. The ordinary cement concrete beam suddenly failed without any warning, indicating a brittle failure. Compared with a single beam, the elastic modulus and load have a larger load capacity for double-strengthened beams.

Ogunbiyi and so on. Al (2015) compared the strength of bamboo and steel as the structural members in the building structure. Produce 10mm, 12mm, 16mm, 20mm and 25mm low carbon and high performance steel bars. 10mm, 12mm, 16mm, 20mm and 25mm bamboo stems were manufactured. The tensile test was performed on 3 samples of different diameters. Based on the obtained results, we concluded that the tensile strength of bamboo is very low, and when a load is applied due to the low breaking force, it will undergo brittle failures. Replaces partition walls, ceilings, and other light construction , but is not recommended for heavy construction.

H.M.A. Mahzuz et al. (2011) evaluated the behavior of bamboo made with mortar and concrete. The basic sample type is , such as a single bamboo sample, a composite bamboo sample with mortar poured into its hole, a composite bamboo sample with mixture of sand, cement, and gravel poured into its hole, and a column reinforced with bamboo. with bamboo sticks. The sample is used as a substitute for steel. To prepare the first type of samples, the bamboo was air dried and wormed free, 1 'long. The intermodal areas were hollowed out and the two ends of the bamboo were perpendicular to the surface. To prepare the second type of sample , each bamboo with a length of 1 'was selected for testing. The hollow part of the bamboo sample is filled with concrete. air dried the sample on day 16 of curing to avoid swelling and odor problems. Curing continued further and Sample was air dried again for 2 days prior to testing. To prepare the third sample, each bamboo sample with a length of 1 'was selected for testing. The hollow part of the bamboo sample is filled with sand, cement and pieces of stone. In order to prepare the fourth type of sample , bamboo slats were made to test its effectiveness on concrete columns. According to the results of the compression test on four samples, the average tension provided by the bamboo reinforced concrete column can withstand medium loads. This sample is suitable for low-cost buildings. Compared with the bamboo composite material part in which mortar is poured into the hollow part, the sample composed of the mixture of bamboo, cement, sand and stone chips poured into the hollow part has higher strength.

V. Ashwin et al. Al (2015) conducted an experimental study on the deformation of bamboo reinforced concrete columns. Conventional steel columns have been prepared according to specifications. The bamboo reinforcement column is made by cutting bamboo stalks into specific specifications. Apply a thin layer of epoxy (a waterproof chemical) to the ferrule to reach to achieve a good bond. Compression and axial load tests were

performed on conventional steel columns and bamboo reinforced columns, and the results were compared. According to the results obtained, the bamboo reinforced column will not increase the strength, but the can increase the ductility of the section. It is suitable for low rise buildings, not water retention structures, because your exhibits higher deflection and higher moisture content.

I.K. Khan (2014) conducted an experimental study on bamboo reinforced concrete beams. In this study, we will use to compare bamboo and steel rebar reinforced beams with square, triangular, and circular cross sections. The load capacity, deflection, bending and shear strength obtained according to the test results of are higher than that of triangular and rectangular section bamboo reinforced beams, section bamboo reinforced beams square cross section are taller. Therefore, the tensile strength and elastic modulus of bamboo are half and a third of steel, respectively.

Dr. Patel Pratima.A and others (2013) evaluated the performance of bamboo as a reinforcing material in the design of structural elements. Three -year-old palm bamboo plants were selected, each of which was 1 m sample, and the bottom of the plant was 3 plants with plants and 5 nodes. In the single-reinforced slab, bamboo strips are used in the tension zone, and in the double-reinforced concrete slab, the bamboo strips are used in the compression and tension zone. The elasticity and load-bearing capacity are the same as steel. Therefore, bamboo replaces steel as the connecting element.

Adom et.Al (2011) compared rural buildings with bamboo reinforced concrete beams using different abutment materials. As reinforcement, mature bamboo species Bambusa vulgarius and rattan species Ermospatha spp were used. uses different types of stirrups, such as steel stirrups, bamboo stirrups, and rattan stirrups. Compared with bamboo steel bars, rattan steel bars with steel stirrups are more expensive. Therefore, bamboo reinforcement reinforcement stirrups are recommended to improve the bearing capacity.

III. ADVANTAGES

1. Bamboo is easy to cut, repair, manipulate, reposition, and maintain without the need for complicated tools and equipment.

2. Guadua bamboo is suitable for all types of structures due to its physical properties.

3. Bamboo is non-polluting, has no scabs or parts, and can be considered waste. In addition to the problem of not increasing the pollution of the landfill like traditional construction waste, any part of the bamboo hat that is not used is processed back to the ground as fertilizer or as bamboo charcoal. round and hollow pieces of bamboo make bamboo a lightweight building material, easy to handle, transport and store. Therefore, building with bamboo can save time.

4. Bamboo can be used for permanent and temporary construction. bamboo has a dividing wall or transverse wall at each knot, which can maintain strength and allow bending to prevent from breaking when bent. Due to these characteristics, the bamboo structure has excellent seismic resistance.

5. Using simple hand tools (such as scimitars) to cut the fiber components in the longitudinal or transverse walls into pieces of any length.

6. The natural surface of bamboo is smooth, clean, and has an attractive color. It does not require

7. to be painted, scratched or polished. In addition to being used as structural elements.

8. bamboo can also perform other functions, such as flooring, wall panels, water pipes, drainage systems and furniture.

9. Another advantage of bamboo built with bamboo is that it can be combined with other types of materials, such as the reinforcement material used for foundations.

IV. DISADVANTAGES

1. Bamboo shrinks easily, so a special wash may be necessary.
2. Designing and building with bamboo requires special skills that general contractors may not possess.
3. The benefits of bamboo outweigh the disadvantages.

VI. CONCLUSION

By using proper harvesting and preservation techniques to absorb the water, the moisture content of the bamboo can be controlled. By using ordinary bamboo, we can get enough compressive strength. When bamboo is used as an anti-seismic reinforcement for concrete, it has ductility. The bamboo cement panel can also be used as the filler material for the frame structure, providing the structure with better ductility and flexibility. Based on previous research, you can assure that we can use bamboo rebar. Compared to traditional steel bars, bamboo rebar is the cheapest and cheapest. It is recommended for use in single-story buildings. Considering its credibility, the use of bamboo bracing to design multi-story buildings in the future is very wide.

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