

Bamboo Reinforced Concrete

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Abstract: Currently, all buildings and structural elements rely primarily on precast concrete. RCC's Steel is responsible for supporting and developing the structure. However, steel production can cause environmental pollution, so alternative methods must be in place. Therefore, we have chosen the cheapest and most readily available bamboo. Bamboo is a kind of giant grass and is an orthotropic material. Bamboo was initially used as a building material. Bamboo provides an excellent reinforcing material because of its very good tensile and compressive strength. The bending strength of bamboo-reinforced beams indicates greater strength. The purpose of this article is to present an environmentally sound construction method that meets the cost-effectiveness and local availability of building materials. The report was prepared using findings and combining results from various experiments conducted to determine the mechanical properties of bamboo and its use as a building material. This paper discusses the design principles involved in the design of bamboo-reinforced elements and structures, and shows that the use of bamboo instead of steel, as well as steel in general, provides weight savings and cost effectiveness. Advantages of strength compromised in a compact and safe level.

Keywords: RCC, steel, bamboo, compressive strength, flexural, economic.

1. Introduction

Bamboo has been used as a building material in some areas for centuries. The replacement of reinforcement with concrete is a necessity in the construction field. Conventional materials used for construction can be very costly, and their production has had a huge impact on environmental degradation in terms of pollution. To eliminate this problem, bamboo available in nature is considered as the best alternative material. Bamboo is a natural resource endowed with great strength and weight ratio and is easily workable with conventional concrete reinforcement tools. Before starting the project, the mechanical and physical properties of reinforced concrete were analyzed and documented so that they could be used for our future comparison with bamboo reinforced concrete. And the main interest of the study is to analyze the feasibility of using bamboo as a reinforcing material and analyze its mechanical properties. As the whole world is moving towards "green", the promotion of a green material such as bamboo with very low embodied energy compared to steel would be a remarkable step forward in green building engineering, and is considered a good field of study.

2. Methodology

Table 1
Materials required

S.No.	Materials	Property
1	Cement	Ordinary Portland cement of 43 grade.
2	Sand	<9.55mm diameter
3	Aggregate	20mm nominal size machine crushed angular granite metal

The physical properties of the above-mentioned materials are identified. Best quality materials are chosen.

1) Bamboo

Bamboo is lighter than steel. It absorbs shocks, so it is strong against earthquakes. Bamboo can help prevent pollution by absorbing large amounts of nitrogen from wastewater and reducing the amount of carbon dioxide in the air. Bamboo is one of the fastest growing plants in the world. They can grow more than 60 cm per day. However, the growth rate does not depend on local soil and climatic conditions.

Procedure:

Bamboo is split, chopped, seasoned, and water-repellent coated before being made into smaller pieces. The size of the bamboo is cut according to the area of the concrete. Cement, sand and aggregate are taken in the proportions of concrete M20 (1: 1.5: 3), a concrete mixture is prepared and poured with bamboo reinforcement in the form of the required size. Bamboo reinforced concrete will become unbreakable, well preserved and hardens within 28 days.

3. Test Conducted

A. Compressive Strength Test

This is the first of many tests on a sample. This test is performed to determine the compressive strength of the compression testing machine. The compressive strength is obtained by dividing the load by its cross-sectional area.

B. Flexural Strength Test

Bending tests indirectly evaluate the tensile strength of concrete. This tests the ability of a beam or slab to withstand bending failure. The result of a concrete bending test expressed as a modulus of rupture expressed in (MR) in MPa or psi.

C. Water Absorption Test

The ability of bamboo to absorb moisture increases with the

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number of knots. This is due to the powdery substance present in the node. Take 3 samples of uncoated bamboo at 1 or 2 knots to calculate their dry weight, and then place them in water. Weights are recorded after 1, 3, 9, 15 and 25 days. Remove the sample from the water and wipe the surface with a cloth. A record of water absorption for the sample is recorded after weighing.

4. Cost Efficiency

Bamboo is cost-effective and readily available, especially in growing regions. Bamboo construction usually does not require machines and can be easily performed with simple tools.

5. Advantages

Bamboo is easily accessible and light in weight. This makes construction cheaper. This reduces energy consumption and carbon dioxide emissions. Bamboo can absorb NO₂ from water and CO₂ from air. It can withstand 7.8 richer of seismic attack. This is an environmentally friendly building method.

6. Application

Bamboo reinforced concrete can be used in all construction fields where iron bars are used. It is just an alternative to steel rods. Common structures that can use bamboo as reinforcement for concrete structures are slabs, foundations, lintels, columns, roofs, floors, walls and walkways etc.

Table 2
Test results

Test	Results
Compressive strength	21.7N/mm ²
Flexural strength	17.8N/mm ²
Absorption test	0.32kg

7. Conclusion

Bamboo has been used as a building material since ancient times. Bamboo used as reinforcement can only be used for structures with light loads. Therefore, it can be concluded that the construction method presented in this report has advantages in terms of economic efficiency, safety, and eco-friendly construction as it is superior in structural application to the existing construction method and can be applied to all fields of civil engineering.

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