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Bamboo Reinforcement Performance Enhancement through Innovative Coating Technologies

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ABSTRACT:

In recent period, concrete is the most consumed construction material in the entire world. Concrete is set up to have excellent compressive strength but poor in tensile strength. To take of the tensile strength sword is generally used buttressing material. Due to adding cost, attainability, erosion and other downsides of the sword executed to use an indispensable material as underpinning. A large section of society in Urban India is unfit to go introductory dwelling units. lately, in the attention in response to global warming issues and sustainable society, the manufacturing using natural material has come laboriously. Bamboo, low cost, fast growing, and broad distribution of growth, is anticipated to contribute significantly in the developing countries. From early times bamboo is used as a construction material. Studies have been made on the use of bamboo as structural material and underpinning in concrete. The main handicap for the operation of bamboo as a underpinning is lake of sufficient information about its commerce with concrete, strength and continuity.

Keywords: Keywords are important word in paper Example Weather Prediction, forecast accuracy

Introduction:

In recent times, sword prices have soared. For developing countries, sword is delicate to gain because of precious prices, and for the construction assiduity, operation of sword is presently limited heavily. The product of sword has high consumption of fossil energies, so, the sword discharge in the construction of structures has been presented, showing the possibility of drastic reduction by exploration institutes. Meanwhile, for developing countries, it's important to make the development of structures construction; low cost, no demand of sophisticated technologies and dependable construction styles. Environmental destruction similar as pollution of air and water has been being in some regions by rapid-fire development and product of accoutrements like iron, sword, glass, cement and aluminium that use limited mineral coffers. On the other hand, shops and fibres are annually reproducible clean coffers. Bamboo is a unique group of gigantic meadows the culm of which originates in underground rhizomes. It grows naturally in numerous corridor around the world country but some species are instinctively planted. Bamboo timbers are set up across tropic andsub-tropic zones. The factory is completely mature at an age of three to four times

Numerous inquiries around the world are begun to explore the use of low- cost and low- energy cover construction accoutrements. Among the numerous possibilities for similar negotiations, bamboo, which is one of the fastest growing shops, has got a great profitable eventuality.

Bamboo has been used in constructions of islands and houses for thousands of times in Asia. Bamboo takes lower energy to crop and transport, thus, bamboo has low manufacturing costs compared with sword, bamboo is extensively anticipated to be possible indeed in countries and regions that have no advanced manufacturing technology and construction ways. The use of renewable coffers by the construction assiduity will help to achieve a more sustainable pattern of consumption of structure accoutrements

.What is the oil paint, Epoxy Resin, Bitumen Coating

An oil painting makeup coating for bamboo is a type of makeup designed to cleave to and cover bamboo shells. It's generally oil painting- grounded and can come in colorful colors, offering both aesthetic appeal and practical benefits. oil painting- grounded makeup effectively protects bamboo products, adding their continuity and oilskin, and extending their service life.

One significant advantage of oil painting- grounded makeup is its capability to repel humidity, which helps help spoilage and decay.

EpoxyResin resin is regarded as a dependable option for sheeting advanced accoutrements owing to its outstanding strength, adhesion, and stability. still, its fairly weak durability compared to common accoutrements has limited its operation. in this study, the durability of epoxy resin resin was enhanced by incorporating bamboo filaments, and a new polymer coating material for bamboo- fiber- corroborated epoxy resin resin was developed. different fiber

pretreatment styles were employed to address the issue of poor interfacial performance between bamboo filaments and epoxy resin resin, aiming to optimize

Bitumen coating is a defensive subcaste made from bitumen, a petroleum- deduced hydrocarbon, which is frequently modified with complements to enhance its parcels. When applied to bamboo, it provides waterproofing, erosion resistance, and chemical defense, making it a cost-effective and long-continuing result.

Applying bitumen coating to bamboo offers several benefits. It helps cover the bamboo from water damage, enhances its continuity, and increases its resistance to erosion and chemicals.56 also, bitumen coating can ameliorate the aesthetic appearance of bamboo by furnishing a livery and smooth finish.

Teflon tape recording, also known as PTFE tape recording, is a sealant and slicking material generally used in plumbing and pipeline operations to help leaks and insure tight seals. Ground granulated blast furnace sediment(GGBS) is a by- product of iron manufacturing that's frequently used as a partial relief for cement in concrete fusions to enhance continuity and reduce environmental impact. When considering the combination of Teflon tape recording and GGBS in relation to bamboo, it's important to note that Teflon tape recording is primarily used for sealing purposes in pipes and fittings, whereas GGBS is generally used in concrete composites.

Combining GGBS with bamboo filaments in mixes can lead to bettered mechanical parcels and enhanced sustainability, making these accoutrements suitable for colorful operations similar as construction, automotive, and wind power sectors

What is the use of oil paint, Epoxy Resin, Bitumen Coating teflon Taps with GGBS ? a bamboo makeup coating, epoxy resin is a better choice compared to bitumen. Epoxy resin can enhance the natural beauty of bamboo by providing a clear, glossy, and protective finish. Bitumen coating, on the other hand, would not be suitable as it is designed for waterproofing and corrosion protection rather than enhancing aesthetics. In summary, epoxy resin is the preferred coating for oil paintings and bamboo due to its protective and aesthetic benefits, whereas bitumen coating is more appropriate for waterproofing and corrosion protection protection purposes.

Methodology:

1. Material surveying With Proprety

Bonding strength :- The main factors that affect the bonding are adhesive properties of cement matrix, the compression friction forces appearing due to shrinkage of concrete. The dimensional change of bamboo due to moisture and temperature influences the bond strength. Some studies report average bond stresses ranging from 1.40 to 1.70 N/mm² for different bamboo series, with some reaching 3.085 MPa after specific treatmentsProbabilistic weather predictions indicate the likelihood of weather occurrences occurring in a specific place over a specific time period, such as a storm lasting a few days. Climate change caused by excess greenhouse gases in the atmosphere, on the other hand, frustrates forecasters since it becomes more difficult to predict whether that varies due to any outside influence that does not follow seasonal trends or averages.

Bond Between bamboo & Cement Matrix For the more effective consummation of the eventuality of bamboo as a buttressing material, good bond with the cement matrix is necessary. Several factors contributes to the rather poor bond between bamboo and matrix. The natural face of bamboo is smooth. Good bond thus can not be anticipated indeed though the bumps with their projections could act as intermediate harborage. A dimensional changes of bamboo due to humidity and temperature variations affects its bond characteristics seriously. The lump of bamboo during the casting and curing of the cement matrix and its posterior loss results in a voids around the underpinning. The bond strength is therefore significantly reduced. So, also the discriminational thermal expansion of bamboo in cement concrete, due to the commerce of the several factors involved, the principle factors impacting average bond strength includes the treatment and condition of the bamboo, size of projections and the distance of bumps, age and curing conditions of the concrete itself. Seasoned bamboo possesses advanced bond strengths compared to used(green) bamboo due to lower water immersion and the reduced lump and loss of bamboo.

Preparation and casting of cubes for Pull out Test

Type of bamboo - we selected two different bamboo species, Dendrocalamus As per and Bamboos Oldham, which grew in a similar environment and were around 3 years of age. They forecast the weather for a given day and based on previous weather conditions for that day in the preceding several years.

Type of coating - we selected the traditional asphalt emulsion coating and the experimental polydimethylsiloxane (PDMS) polymer as the coatings for our experiment. As you can see from the structure of PDMS(figure3.3), there are the CH3methyl groups surrounding its structure. These are hydrophobic which prevent polar molecules such as water from permeating to the surface of the bamboo therefore producing swelling. And more importantly, PDMS is more sustainable than the traditional asphalt emulsion coating. Control samples with no coating were also made for comparis

- 1. Oil paint coating
- 2. Epoxy Resin
- 3. Bitumen coating
- 4. Teflon Tape with GGBS

Drying is the final stage of the treatment process before bamboo can be used for construction. Drying bamboo is critical because when bamboo starts drying it'll shrink and if it is n't taken care of also it tends to have uneven loss performing in cracking and demeaning its strength. Also if it is n't dried duly itleadstoearth. Once the bamboo is treated duly, it needs to be taken out from the tank and the external face of the bamboo(the silica) needs to be washed with water using a high- pressure cleanser to clean the face because the combination of the swab chargers and the sun can produce cracks in the silica and the culm wall. And also it helps to take off any lichens, dust, and slime over it before it's taken to drying

.How Does experimental Analysis ?

1. PULL-OUT TEST

Objective: To find out the bond strength of the bamboo splints with concrete.

Test Specimen : locally available bamboo is spitted into four parts , external diameter of bamboo approximately 40 mm and wall thickness 8 mm. about 60 cm lengths from different splits are taken . apply coatings on each bamboo specimen at the lower part of specimen approximately 15cm on the other triangular end part of the specimen nalls are hammered for not to slip out the specimen from the jaws of U.T.M.

Treatment	Length of bonded interface	Grade of concrete	No of specimen	
Plain cubes	150 mm	M20	3	
Oil paint coating	150mm	M20	3	
Bitumen coating	150mm	M20	3	
Teflon Tape with GGBS	150mm	M20	3	

Shows the details of specimen

Pull out method :

Test Procedure: Prepare the specimens and measure the perimeter of each. Prepare the concrete of grade M20. Fill up the cubes (15cm*15cm*15cm) with specimens of centre by concrete. After 28 days curing take out the cubes from water. Find out pull- out load of each specimen with the help of universal testing machine. Find out bond stress of each specimen.

Bond stress is calculated by following formula

 τ b=F/LS

Where,

F = the maximum pull-out load and

S = the perimeter of the bamboo splint and L = 150 mm is the length of bonded

2. Flexural Test Forbuilding structure component (Beam) Dimensions 1200 x 250 x 150 :

A beam is a horizontal structural element designed to resist bending, shear forces, and vertical loads. It's a fundamental part of building and bridge construction, transferring loads from upper elements like floors and roofs to supports like columns or walls. Beams come in various shapes, materials, and types, each suited for specific structural needsNumerical Weather Prediction Method:

Test Setup

Flexural tests were conducted on Universal Testing Machine with model TUN 600. The test was conducted with two point loading. Test setup to perform flexural test on Bamboo reinforced Concrete Beam is as shown in Fig.6. flexural setup types

- 1. Three-Point Flexural Test
- 2. Four-Point Flexural Test (used in test setup)

For Bamboo Reinforced beam

Diameter of Bamboo=450mm

Cutting length of bamboo beam =Total length -nominal cover

=1200-2x25

=1150mm

Cutting length of stirrups = Total length+Hook Length-cover

=800+100-160

=740mm

No of stirrups=1150/100

=12 no of stirrups Cutting

length of bamboo in running meter =1150 x 4

=4600mm

Weight of stirrups for 6mm Bar =1.150 x 2 x $(6^2)/162$

=1.97kg

Cost Calculation for Bamboo Lintel Beam

22ft of bamboo purchased at Rs 170/- 22ft in Running Meter =6.70 M

For Bamboo as a beam we split bamboo into 6 parts means each part of bamboo having 6.70 M length so the price of one split part of bamboo=170/6 =28 Rs.

Results

Test result for pull out test

Sr. No	Different Pattern of Bamboo Specimen	Average Load in KN	Average Bond Slippage	
1	Plain	3	18	
2	Oil Paint	4.8	15	
3	Bitumen	16.82	13	
4	Teflon Tape with GGBS	17.11	10.5	
5	Epoxy Resin	19.47	9	

Result of Flexural strength of bamboo and steel reinforced concrete beams

The load and the deflection at the mid-span were recorded. The first crack (crack 1) was started appearing at the mid-span at the bottom of the beam as shown in Figure 6.2 and 6.3. The crack, which appeared at the recorded load of 30.8 kN and at deflection at mid-span of 9.2 mm, extended nearly vertically towards the top of the beam as the load increased. This was followed by two cracks (crack 2, 3), at a load of 34 kN which initiated at offset of 350mm centre right and left at the bottom of the beam and extended up towards the centre top, the first crack also propagated further upwards as load proceeds. At a load of 38 kN, two more cracks (crack 4, 5) initiated at 200 mm from the loading points almost symmetric with the mid-span and extended up towards the centre top. For further increase in load, all the cracks propagated further at faster rate and four new cracks appeared simultaneously (crack 6, 7, 8, 9) as shown in the Figure at the recorded load of 41.5 kN as shown in Figure 6.2 and 6.3. As load increased all cracks propagated further the beam failed by prompted widening of crack 1, 4, 5 at the recorded load of 42.2 kN. cost comparison

Sr.no	Descriptionof item of work	Size of beam	Dia of bar	Total weigh t in Kg	Cost of steel	Cost of bamboo
1	Steel reinforcement beam	1200x	10mm	1.39		
		150x	8mm	0.897		
		2 50	6mm	1.97		
2	Bamboo reinforce beam	1200x 150x2 50	6mm	1.97		
Total cost				179 rs	28 rs	

Conclusion

From above studies we know that the bamboo underpinning can potentially be used as cover for sword underpinning.

- * There's a need to introduce formal education on the use of bamboo as a structural material in design.
- * Bamboo is a protean material because of its high strength- to- weight rate, easy plasticity and vacuity. The Analysis of the relief of sword with bamboo as underpinning shows that underpinning with bamboo is relatively cheaper than that of sword underpinning.
- * The positive attributes of Bamboo are listed, supporting its terrain-friendly nature.
- * There are some negative attributes of Bamboo were also given, fastening on its tendency to absorb water. Of those, the cling between the Bamboo and concrete is considered the biggest problem due to immersion of water.
- * Also there's a need for the development of a simple design law for the operation of Bamboo as a Construction material. Several inquiries are on- going to overcome these problems. numerous new ways are being developed which may make bamboo the stylish constructional material in future. It has wide compass in Low Cost Constructions.
- * By using synthetic resins and synthetic fibres the water repellent treatment is carried out for bamboo.

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