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A Review on Behaviour of Reinforced Concrete Beams Using Bamboo

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ABSTRACT

In this modern world, India is one of the fast growing country in technology aswell as infrastructure. Due to an intense rapid growth in infrastructure the demand of resources for construction has reached its peak. Steel is the major component for high rise buildings, Skyscrapers and modern structural elements etc. Steel is scared and expensive. But the infrastructure cannot be stopped because of the steel. So Bamboo is an alternative reinforcement material instead of steel. Bamboo is introduced in concrete after investigating and studying its physical and mechanical properties. The demand for this materials is also less in rural areas since it is one of the fast growing grass Bamboo is fully replaced with steel reinforcement.The reinforcement cannot be done with the whole bamboo for small cross section elements in construction. Soit is bisected into chams and tied with binding wires. The main aim to introduce bamboo as reinforcement is preferably cost and readily available raw material. This bamboo was the basic construction material in olden days even before content was introduced. It does not need any investment of money and time where it easily grows and easy to transport Bamboos can be highly recommended for the rural areas where low rise buildings are raised and with cheaper rates. Steel reinforcement was used for seismic activity and tensile property. But the manufacturing and transport cost is expensive. So an alternate is introduced and is also investigate whether it is suitable for the replacement with lower cost. This paper investigates the feasibility of bamboo reinforcement for concrete beams. If steel is replaced with bamboo then the behaviour of the structure is observed and results are recorded for improving the enhancement of the structure. **Keywords:** High performance fibre reinforced concrete, marble powder, silica fume, quartz powder, polypropylene fibre.

I. INTRODUCTION

In recent years, steel prices have soared. For developing countries, steel is difficult to obtain because of expensive prices, and for the construction industry, usage of steel is currently limited. The production of steel has high consumption of fossil fuels. So, the steel discharge in the construction of structures has been presented, showing the possibilities of drastic reduction by research institutes. Meanwhile, for developing countries, it is important to make the development of buildings construction: low cost, no requirement of sophisticated technologies and reliable construction methods.

Environmental destruction such as pollution of air and water has been occurring in some regions by rapid development and production of materials like iron, steel. glass, cement and aluminum that use limited mineral resources. On the other hand, plants and fibers are annually reproducible clean resources. Bamboo is a unique group of gigantic grasses the culm of which originates in underground rhizomes. It grows naturally in many parts around the world country but some species are artificially planted. Bamboo forests are found across tropic and sub tropic zones between latitudes of about 40 south, in areas with mean annual temperature of from 20 to 30" C. Bamboo suitable for water pipes grows at altitudes from 20 to 3,000 meters. The plant is fully mature at an age of three to four years. In recent years, many researches around the world are begun to explore the use of low-cost and low-energy substitute construction materials. Among the many possibilities for such substitutions, bamboo, which is one of the fastest growing plants, has got a great economic potential. Bamboo has been used in

II.LITERATURE REVIEW

The United States Naval Civil Engineering Laboratory (2000) Ford a study providing a set of instructions on how to properly construct a variety of and structural elements using

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bamboo This study suggested not to use seasoned bamboo for general construction, not to use un-waterproofed bamboo in concrete concerning bamboo reinforced concrete, it was found that the concrete mix design may be the same as that used with steel with a slump as low as workability will allow. it was recommended that the amount of bamboo reinforcement in concretede 3-4% of the concretes cross sectional area as the optimum amount. it concludes that bamboo reinforced is a potential alternative light construction method at low cost.

Limetal., (1999) Fiber reinforcement was studied on the mechanical behavior of reinforced concrete beams in shearing. Circular straight steel fibers with a diameter of 0.7 mm, a length of 42 mm and a final strength of 1784 MPa. Rectangular cross-sections of nine beams of 100 mm x 80 mm and 1300 mm in length were used and the beams were tested at four point loading conditions. The compressive strength increased by about 25% when 2% of the fibers were added by volume. The increase in flexibility was approximately 55% when the fiber content increased from 0% to 2% and the split tensile strength doubled when using the 2% fiber size. The crack cutting strength was significantly increased when the fiber content was applied at 1%. The analysis method allows the cut analysis of reinforced concrete structural members with steel fibers corresponding to the value of the test analysis.

Cucchiaraetal., (2004) The hook was made of steel fiber (ratio = 60) made of reinforced concrete without rectangular simply supported beams and strips. The compressive strength of hollow concrete is made using a cylinder with a diameter of 100 mm and a height of 200 mm. Eight types of beams, different sizes of strips and fibers were made. To determine the strength and tensile strength, 6 cylinders were cast using 0, 1% and 2% fibrous concrete. A two-point load test was performed with controlled displacement. As a result, in fiber reinforced concrete beams, a more progressive cracking process with lower cracking width was observed. The presence of fibers in beams controlled by the failure beam effect in the absence of adequate shear reinforcement proves to be very efficient. The addition of fibers can transform the brittle cutting mechanism into a flexible flex mechanism, thus allowing a large scattering of energy, which can be seen by observing the cracking pattern and the load-turning curves.

Altunetal., (2007) Types of concrete M20 and M30 were discussed with hook steel fibers with a ratio of 0 kg / m3, 30 kg / m3, 60 kg / m3 and their compressive strength, tensile strength, elasticity and hardness levels. . One study suggests that a 1-2% SF dose based on the absolute dose is the best from that aspect. Modular tests of compressive strengths, split tensile strengths and flexibility of hollow and SFA concrete are performed on cylindrical concrete specimens with dimensions of 150 mm x 300 mm. Fixed 150 x150 x 750 mm prisms for flexible strength and hardness for simple and SFA concretes. States that the hardness of steel-fiber-reinforced concrete of M20 and M30 increases significantly with an SF of 30 kg / m3, with significant losses in final strength and elastic modulus. As the mass of the SFs doubles to 60 kg / m3, small improvements in hardness occur, apparently the SFs size of 30 kg / m3 is better than 60 kg / m3.

Sivakumaretal., (2007) The test was performed on high-strength concrete reinforced with hybrid fibers (a mixture of hooked steel and non-metallic fiber) up to 0.5% size fraction. Various hybrid fiber additives such as steel-polypropylene, steel-polyester and steel-glass. Experimental tests were carried out to detect mechanical and 11 flexural properties. Can be replaced by non-metallic fibers (mainly polypropylene).

Raoetal., (2008) Experimental trials have been presented on the predictability of dilution and minimum flexibility reinforcement in reinforced concrete (RC) beams. Beams of 100 mm, 200 mm and 400 mm sizes were tested with different percentages of flex reinforcement of 0.15%, 0.30%, 0.60% and 1.0%. The beams were tested under four-point loading to study the flexible behavior under the uniform bending moment. Cracking in RC beams is a complex phenomenon in small beams, whereas cracking strength decreases when the depth increases above 200 mm. The flexural strength of RC beams decreases as depth increases. The tensile strength of RC beams increases as the percentage of flexural reinforcement increases. The minimum flexural reinforcement decreases as the beam depth increases, and the yield strength of the reinforcement decreases as it increases.

III.METHODOLOGY

1.Literature survey	2.Material collection & properties	3.Mix design
3.Test for workability	4.Improving the use of Bamboo	5.Casting of specimen

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6. Testing Strength	7.Results and Discussions	8.Conclusion

IV.MATERIALS

4.1 CEMENT

Cement, in general, adhesive substances of all kinds, but, in a narrower sense, the binding materials used in building and Civil Engineering construction Cements of this kind are finely ground powder that, when mixed with water, set to a hard mass. Setting and hardening result from hydration, which is a chemical combination of the cement compounds with water that yields submicro scopic crystals or a gel-like material with a high surface area. Because of their hydrating properties, constructional cements, which will even set and harden under water. are often called hydraulic cements. The most important of these is Portland Cement. Cement is a binding substance used in construction to bind other materials together The Ordinary Portland Cement (53grade) conforming to IS:81121989 is used. Many tests were conducted on cement and results are tabled.

4.2 FINE AGGREGATE

Sand, mineral, rock, or soil particles that range in diameter from 0.02 to 2 mm (0.0008-0.08 inch). Most of the rock-forming minerals that occur on the Earth's surface are found in sand, but only a limited number are common in this form. Although in some localities feldspar, calcareous material, iron ores. and volcanic glass are dominant constituents of sand, quartz is by far the commonest, for several reasons: it is abundant in rocks, is comparatively hard, has practically no cleavage so that it is not readily worn down, is nearly insoluble in water, and does not decompose Most quartzose sands contain a small quantity of feldspar, as well as small plates of white mica, which, though soft, decompose slowly mineral particle This river is obtained from the accordance of Zone I as per IS 383-1970. The physical properties of river sand like specific gravity, fineness modulus and water absorption are tested with results: Fine aggregate also known as river sand is a natural granular mineral practice. This river is obtained from the accordance of zone I as per IS 383-1970.

4.3 COARSE AGGREGATE

Coarse Aggregate is a broad category of coarse to medium grained particulate material used in construction, including sand, gravel, crushed stone, slag, recycled concrete and geosynthetic aggregates. Aggregates are the most mined materials in the world. Aggregates are a component of composite materials such as concrete and asphalt concrete, the aggregate serves as reinforcement to add strength to the overall composite material. Due to the relatively high hydraulic conductivity value as compared to most soils, aggregates are widely used in drainage applications such as foundation and French drains, septic drain fields, retaining wall drains, and roadside edge drains.

Aggregates are also used as base material under foundations, roads. and railroads. In other words, aggregates are used as a stable foundation or road/rail base with predictable, uniform properties (eg. to help prevent differential settling under the road or building), or as a low-cost extender that binds with more expensive cement or asphalt to form concrete. Coarse aggregate consists of natural disintegration of rock or uncrushed gravel, as per IS: 383.Coarse aggregate used in this project is of the size 20mm. The physical properties of coarse aggregate like specific gravity, fineness modulus and water absorption are tested in accordance with IS:2386-3

4.4 STEEL

Structural steel is a category of steel used for making construction materials in a variety of shapes. Many structural steel shapes take the form of an elongated beam having a profile of a specific cross section. Structural steel shapes, sizes, chemical composition, mechanical properties such as strength, storage practices, etc., are regulated by standards in most industrialized countries. Most structural steel shapes, such as I-beams, have high second moments of area, which means they are very stiff in respect to their cross- sectional area and thus can support a high load without excessive sagging.

Steel is introduced to give tensile property to the building as concrete is

strong in compression and weak in tension. It plays a crucial role on earthquake resistance due to its ductile property. The physical properties of steel like young modulus, grade, density and coefficient of expansion.

4.5 BAMBOO

Bamboo is a fast growing grass species which is high in strength, flexibility and toughness and is used as a substitute for steel as reinforcement in rural areas and after a few years of research it will be introduced in the urban areas after well seasoning and treated with various techniques. Its properties such as weight, specific gravity, modulus of rupture and modulus of elasticity are resulted

and tabulated.

4.6 WATER

The strength workability and durability of a concrete depends on the water added to the mix. The strength is also dependent on the days of curing the concrete Normally portable water is used in construction with a w/c ratio of 0.5

4.7 CURING AGENT

Since Bamboo is a vegetation species it expand contracts when it comes in contract with water so epoxy resins are used to bond the bamboo and concrete. Since bamboo expands and contracts when in contact with water the beam cannot be placed for curing. so a curing compound is added to avoid curing and to gain strength of the beam in earlier age The curing agent used in this project is Cera poly cure-R.

4.8 EPOXY RESIN

Epoxy resin is used as a coating for bamboo to avoid the decomposition or bamboo and to provide a good bonding strength between bamboo and concrete it is shake well before use and is applies with a brush to avoid contact with the skin Since bamboo is prone to bacteria and fungi this resin helps to prevent from microbial actions on bamboo which makes its weak

V.CONCLUSION

A literature study covering all aspects of fibre reinforced concrete has been carried out using Bamboo.

The outcome of their decision is discussed in this chapter.

- High strength
- Longer life
- Low penetration
- High work efficiency
- Economy
- Eco-friendly concrete
- Their main purpose is to increase the energy absorption capacity and hardness.
- Increase the tensile and flexural strength of concrete
- Good for dilution and stiffness.

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