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A COMPARATIVE STUDY OF BAMBOO REINFORCEMENT, STEEL REINFORCEMENT AND COMBINATION OF STEEL MESH AND BAMBOO MESH IN FERROCEMENT SLAB PANELS

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ABSTRACT

This study includes the evaluation and study of the tensile behavior, compressive behavior and flexural behavior of ferro-cement slab panels.The slab panels studied in this report consists of bamboo mesh sheet and steel mesh sheet in a sandwich plate pattern arrangement.Ferrocement techniques are necessary to be taken into consideration for modifying and strengthening of various structure based on concrete.The main objective of the study is to maximize the strength to weight ratio of ferrocement slab panels.Here the Bamboo Mesh plate is reinforced on bottom side to resist tensile forces and the steel mesh plate provided at the top for resisting compressive forces.

Keywords*: Bamboo Reinforcement,Steel Reinforcement,Ferrocement*

I. INTRODUCTION

Ferrocement is a sort of thin divider fortified cement, regularly developed of water powered concrete mortar, strengthened with firmly separated layers of ceaseless and moderately little size wire work. The work can be of metallic or other appropriate materials.The wire mesh are provided for imparting tensile strength and ductility.Ferrocement is super reinforced concrete.It is different from ordinary concrete as the ratio of steel is higher than cement and mortar.The main concept behind altering the cement mortar ratio is to increase the properties of the material together which steel or concrete cannot exhibit individually.Bamboo is a characteristic enduring grass-like composite and contains ligno-cellulosic-based normal filaments. It happens in the normal vegetation of many parts of tropical, subtropical and gentle temperature locales, with around 1250 species recognized all through the world. Because of its better properties like high quality than weight proportion, high rigidity and different variables like ease, simple accessibility and safe to the earth amid administration, bamboo has continually pulled in the consideration of researchers and specialists for use as support in cementitious composites. As of late, numerous analysts have attempted to utilize bamboo as substitute of steel in fortified cement. wide utilizations of bamboo in structural building were restricted by its detriments before. The primary hindrances in its common frame are its poor bond with solid, low modulus of flexibility, high water-ingestion propensities, low sturdiness, and low imperviousness to flame. These days, some of these weaknesses can be fundamentally enhanced by subjecting the bamboo to suitable medications. Likewise, when bamboo is transformed to a plate frame, its execution can be enhanced further. This present review examined the arrangement and flexural properties of a recently created bamboo–fiberreinforced mortar overlay. The overlay was a sandwich plate joined with changed bamboo plate and expelled PVA fiber-fortified mortar sheet. Test comes about demonstrated that the changed bamboo plate can enormously reinforce the fiberreinforced mortar and diminish the aggregate weight of the composite, and the flexural quality estimations of the overlay can be enhanced to more noteworthy than 90 MPa.

II. MATERIALS USED

Ferrocement

Ferrocement methods is of late inception however have been broadly utilized as a part of numerous nations, generally observed in U.K., New Zealand and China. The attention to preferred standpoint of this procedure is expanding all over in little timeframe. It is realized that routine strengthened solid individuals are too overwhelming, weak, can't be tastefully repaired if harmed, create breaks and fortifications are at risk to be eroded. The above disservices of typical solid make it wasteful for specific sorts of work. Ferrocement is a moderately new material comprising of wire networks and bond mortar. Ferrocement comprises of firmly divided wire networks which are impregnated with rich bond mortar blend. The wire work is more often than not of 0.5 to 1.0 mm dia wire at 5 mm

to 10 mm dividing and concrete mortar is of bond sand proportion of 1 : 2 or 1 : 3 with water/bond proportion of 0.4 to 0.45. The ferrocement components are for the most part of the request of 2 to 3 cm. in thickness with 2 to 3 mm outer cover to the fortification. The steel content changes between 300 kg to 500 kg for every cubic meter of mortar. The essential thought behind this material is that solid can experience vast strains in the area of the fortification and the size of strains relies on upon the appropriation and subdivision of support all through of the mass of cement. Ferrocement is generally acknowledged in U.K, New Zealand and U.S. as a pontoon building material. It has likewise discovered different other intriguing structural designing applications. The primary focal points are effortlessness of its development, lesser dead weight of the components because of their little thickness, its high rigidity, less break widths contrasted with ordinary concrete, simple repairability, noncorrosive nature and less demanding mouldability to any required shape. There is additionally sparing in fundamental materials in particular, concrete and steel. This material is more reasonable to unique structures like shells which have quality through structures and structures like rooftops, storehouses, water tanks and pipelines. This is an exceedingly reasonable material for precast items, as a result of its simple flexibility to construction and lesser dead weight of the units cast. The advancement of ferrocement relies on upon appropriate throwing systems for the required shape. Improvement of appropriate construction strategies for ferrocement is still not a broadly investigated region and hole should be filled. The Bond utilized is OPC 53 review cement.Natural sand having molecule measure under 4.75mm is utilized.

Bamboo

Bamboo, which has a place with more than 10 genera including around 1450 species going from little annuals to mammoth timber bamboo, is one of the most seasoned building materials utilized by humankind. It is the quickest developing woody plant on the planet and is effectively open all around. Around 64% of bamboo estate starts from Southeast Asia, 33% is developed in South America and the rest originates from Africa and Oceania. The bamboo culm, or stem, has been made into a various scope of items from residential to mechanical applications. Cases of bamboo items are nourishment compartments, sticks, chopsticks, painstaking work, toys, furniture, flooring, mash and paper, water crafts, charcoal, melodic instruments, weapons, bikes, zeppelins, windmills, scales, holding dividers, ropes and links. With advances in science and innovation and the limited supply of timber, an extensive variety of advances have been produced as of late to process bamboo and make it more tough and usable as a building material. Bamboo has likewise picked up ubiquity as a "green" fi bre. It can be developed rapidly and is a characteristic fi bre (rather than well known synthetics like polyester) whose development really lessens nursery gasses. Filaments can be produced using the leaves, branches and trunks through compound process, mechanical needling and scratching or through a steam blast prepare. It is to a great degree flexible and tough as a fi bre and has filled in as an establishment structure. In studies contrasting it with cotton and polyester, it was found to have a high breaking determination, better dampness wicking properties and better dampness assimilation. Bamboo is additionally utilized as an added substance in biopolymers for development and in numerous different applications.

III. PHYSICAL PROPERTIES OF MATERIALS

Cement

Table No.01 Properties of cement

Sr.No	Description of Test	Results	AsperIS:12269-1987
1.	Fineness ofcement(residueonISsieveNo.9)	4%	>10%
2.	Specificgravity	3.08	3.15
3.	Standardconsistency ofcement	32%	-
4.	Settingtime ofcement a) Initial settingtime b) Finalsettingtime	34minute 455minute	>30minute <600minute
5.	Soundnesstest ofcement (withLe-Chatelier'smould)	5mm	10mm

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Sand

Table No.01 Properties of fine aggregate

Sr.No	Property	Results
1	ParticleShape,Size	Round,4.75mm down
2	Fineness Modulus	2.84
3	Siltcontent	3.2%
4	Specific Gravity	2.60
5	Water absorption	1.2%
6	Bulking of sand	4.15%
7	Bulk density	1785 kg/m^3
8	Surface moisture	Nil

IV. EXPERIMENTAL PROCEDURE

Fabrication of slab

A form box was set up by the measure of 490mm × 230mm × 50mm with the assistance of wood material. Before putting the solid in the form box oil or oil is connected on inside surface, to make it simple to evacuate them once the solid has set. The steel poles are precisely cut by 1m from the length pole with the extent of 8mm and 10mm measurement. At that point steel support tangle was set up by winding the steel bars with dividing of 250mm and giving the 300mm focus to focus dispersing of steel bars as in Figures 2a.Simultaneously bamboo sticks were dried in the climatic temperature for three days, with the measure of 8mm and 10mm square stick and 1m length bamboo stick.

Concrete Mixing

Measure the amount of sand and bond required and combine the sand and concrete until the blend has a homogeneous shading. Frame an empty in the center, gradually include a little water in the empty and dampen part of the blend. Rehash including water little by little until the entire blend is dampened (i.e.) in plastic consistency. The blend ought to have a firm, smooth appearance and furthermore it ought to sit on a trowel neatly. After solid blending the Steel and bamboo fortification tangle is set 15mm above from the substance of the solid base surface. In the wake of putting the solid blend is added to the fortification tangle and the solid is unequivocally slammed to fix the coarse totals.

V. EXPERIMENTAL TESTS

Flexural Test

The three-point flexural test was led by standard strategies for testing auxiliary boards in flexure. The flexural tests were done at a stacking rate of 0.5 mm/min on a PC controlled MTS810 general testing machine with a greatest heap of 100 kN. The traverse for examples was set as 300 mm. The heap was perused from the heap cell and the midspan diversion was measured by the LVDT. Plot of load versus avoidance was appeared on the PC screen amid the test.

Tensile Test

The tensile test example was set up by utilizing the aluminum pass on as in Figure 1b with the ASTM standard D638. At first the blend of epoxy LY 556 and the hardener HY 951 with the proportion of 1:10 was arranged and blending is made with the bamboo material by mixing at room temperature. After legitimate mixing for 10 minutes, the blend was filled reasonable molds to get a puppy bone shape and the composite is cured for 8 hours. In the wake of curing the bamboo fortified polymer composite is expelled from the aluminum kick the bucket. Three diverse bamboo-strengthened epoxy composites were manufactured by changing the measure of fortification as in Figure 1c. ASTM D638 standard testing techniques were utilized for pressure testing of plastic materials.

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VI. CONCLUSION

Thus the bamboo mesh and steel mesh can be used in the modern engineering constructions for improving the properties of ferrocement panels. The tensile strength of bamboo is relatively high hence it can be provided at bottom of the specimen due to its tensile loading applications. The bamboo and steel mesh ferrocement slab (57KN) has less more withstanding capacity than the steel mesh ferrocement slab (54KN)and bamboo mesh ferrocement slab (38KN). The bamboo and steel mesh ferrocement slab and steel mesh ferrocement slab are having high tensile stress than normal concrete without reinforcement.So that steel and bamboo mesh ferrocement panels can be replaced with individual steel mesh ferrocement panels in minimal loading for structural applications

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