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A REVIEW ON STRENGTHENING OF BEAM USING BAMBOO FIBER AND GLASS FIBER

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***Abstract**: Concrete is the most utilized material in the construction industry with steel as reinforcements. The present-day situation is seeing a quick change in the building material industry and step by step new innovations are replacing the ordinarily utilized materials. Scientists throughout the world are trying to enhance concrete by the utilization of fibers, pozzolanas and different admixtures. Steel is given in the pressure side fundamentally in order to balance the powerless zone of concrete that is tension. In spite of the fact that it is thought to be the best for this work yet at the same time it gets eroded by the activity of the nature in this way, emerges the point of searching for an option. A standout amongst the most well-known choices is Fiber strengthened polymer rebars (FRP's).*

This study comparatively evaluated the flexural performance and deformation characteristics of concrete elements reinforced with bamboo, Glass fiber and the steel rebars. The yield strength, ultimate tensile strength and the deflection of 9 specimens of the three materials were determined using a universal testing machine. These beams of concrete strength 25 N/mm^2 at age 7, 14 and 28 days were separately reinforced with bamboo, glass fiber and steel bars of same percentage, while the stirrups were essentially mild steel bars. It is observed that out of three material samples mixture of bamboo and glass fiber is suitable rebars for non-load bearing and lightweight RC flexural structures.

***Keywords**: Flexural, UTM , Tensile strength , Bamboo, Fiber, flexural strength.*

1. Introduction

Reinforced Concrete (RC) structures represent dominant part of the developed infrastructures universally and their execution is significantly impacted by the properties of the fortifying bars. The exchange of stress from cement to steel is made conceivable through competent bond amongst concrete and the fortification. Past investigations on the substance, physical and quality attributes of steel fortifying materials uncovered the risks of boosting benefit to the detriment of value, a circumstance that represent a noteworthy test to the basic dependability and strength of structures and common framework. Albeit broad examinations have been completed on manufactured and characteristic non-ferrous fortifying materials in the previous decades, common support still remains a dynamic field of further examination.

Early endeavors for understanding the reaction of plain cement subjected to unadulterated torsion uncovered that

the material bombs in pressure instead of shear. Structured members curved in design, members from a space outline, capriciously stacked bars, bended box braces in spans, spandrel shafts in structures, and winding stair-cases are average cases of the auxiliary components subjected to torsion minutes and torsion can't be disregarded while planning such individuals. Auxiliary individuals subjected to torsion are of various shapes, for example, T-shape, transformed L– shape, twofold T-shapes and box segments.

2. Literature Survey

Different Papers Cited the Overall Review Present Follow:

1. **Siew Choo Chin et al (2019).** Represented presents the structural behaviour of reinforced concrete (RC) beams with and without openings strengthened externally with bamboo fiber reinforced composite (BFRC) plates in shear and flexure, respectively. Mechanical properties include tensile and flexural strength of epoxy, polyester and vinyl-ester based BFRC plates with 0%, 10%, 20%, 30% and 40% fiber volume fractions were evaluated. A total of fourteen beams were cast to evaluate the structural behaviour of RC beams strengthened with BFRC plates. All the beams were tested to failure under four-point bending. The results presented were in terms of load–deflection behaviour, failure mode and crack pattern. A comparison was also made between the performance of epoxy, polyester and vinyl-ester based BFRC plates in shear strengthening of RC beams with openings. Results revealed that the presence of openings in the shear zone reduced the original beam capacity of the control beam to about 52–55%. Shear strengthening of RC beams with openings using epoxy based BFRC plates showed significant improvement in regaining the beam structural capacity to approximately 32–36% higher than the un-strengthened beams. Meanwhile, strengthening of RC beams in flexure with epoxy based BFRC plates managed to regain the beam original capacity up to 98% of the control beam. Bamboo fiber composite reinforced with epoxy, polyester and vinyl-ester resins of 40% fiber volume fraction managed to regain the beam original capacity up to 82%. It was found that BFRC plates could divert and mitigate the formation of cracks away from the strengthened region as well as improved the beam ductility.

2. **Chand et al. (2017)** Established that the Tensile quality of bamboo has been tentatively decided parallel and opposite to the fiber course. Distinctive properties are shown in two ways in bamboo because of the essential basic contrast introduce in the two bearings. Striking contrasts exist in the appropriation of cells inside one culm, both evenly and vertically. Anxiety estimations of bamboo under elastic burdens are additionally dictated by utilizing the Finite Element Method (FEM) programming ABAQUS and the disappointment stack designs have been created and analyzed. Flexural quality and redirection in bamboo decided tentatively matches intimately with the FEM produced values.

3. **A. S. Jeyabharathy et al.(2019)** studied that Reinforced Concrete (RC) structures frequently need restoring or potentially strengthening, because of a difference in use, growing or disintegration of materials delivered by natural components, or material damage because of unexpected loads. One fundamental implementation of this retrofitting modernism with fiber sheets to give external detention to RC structures when the limit of the existing structure is inadequate. In this paper, we present a novel experimental examination dependent on retrofitting reinforced concrete beams with regular hybrid fibers comprising of sisal and coir fiber. The concrete was blended with specific design ratio dependent on the evaluation of M20, M25, M30, and M35 grades. The specimens are cast and restored before testing. The behavior of the beams is inspected with the assistance of deflection, ductility, Load Carrying Capacity (LCC), and Energy Absorption Capacity (EAC). The experimental outcomes were investigated with simulation modeling that has been completed to simulate the behavior of the considerable number of beams. For validation purpose, we have utilized Artificial Neural Network (ANN) with structure optimization process. The optimal result is finding out by comparing the retrofitted specimen into control specimens. The result found that hybrid fiber retrofitted specimen performs low deflection and ductility at high loads and then increase the LCC and EAC compared to Control beams (CB1 and CB2). The soft computing strategies decrease computational time and limit the expense in a compelling way.

4. **Alireza Javadian et al. (2020)** observed that

- Flexural test results demonstrate the suitability of the ACI 440.1R-15 guidelines for the application of newly developed bamboo composite reinforcement in structural concrete beams.
- The results of the concrete beam test series carried out in this study validate the expected performance that has been indicated from small-specimen tests of tensile and pull-out properties of bamboo composite materials.
- The results of this study can be utilized for the design of low-cost and low-rise housing units where

reinforcing steel is hard to obtain, where the demand for ductility is low, and where secondary-element failure provides adequate warning of collapse.

5. **Nigarwal et al. (2016)** Arranged a relative report between the DC network conduct of bamboo fiber gathered from upper and base part of bamboo, arranged a hypothesis diagram confirmed with the exploratory outcomes.

6. **Akinyele et al. (2015)** Discovered that the interfacial bond qualities of rattan-concrete were in the range 0.082 - 0.598 N/mm2 rely upon the species, concrete grade and other normal conditions. The trial consequences of 0.34 - 0.38 N/mm2 got by fall inside the range. Additionally, Youssef gave 0.56 - 0.68 N/mm2 for some bamboo species fortified with concrete. Every one of the discoveries fall in the vicinity of 3.94 and 28.86% of steel-solid bond quality of 2.07 N/mm2 of practically identical solid review (Neville and Brook). It was discovered that the moduli of flexibility for three types of Rattan were 3396, 516 and 11,106 N/mm2 for C. deerratus, E. macrocarpa and L. secundiflorum separately (Lucas and Dahunsi). The utilization of rattan support in lieu of traditional steel fortifications requires better comprehension under hub stacking and execution conditions. examined the flexural conduct of two-way pieces strengthened with rattan and regular fortifications under pivotal stacking.

7. **Andonianet et al. (2015)** Various examinations have been done on normal strengthening materials, for example, wood jute bamboo raffia palmand palm stalk. Consideration is bit by bit been centered around the utilization of bamboo (Bambusa vulgaris), rattan (Calamusdeerratus) and other characteristic fiber fortifying materials as elective fortifications in concrete particularly for minimal effort lodging for rustic networks. In provincial networks of Ghana, babadua is utilized as a part of covering and its stems are integrated with structure of houses before smearing with mud (Schreckenbach and Abenkwa).

8. **Thomas and Shehata (2014)** have examined the twisting of cementations materials, for example, Portland concrete, silica smoke, and fly fiery debris. Thesematerials are having noteworthy points of interest over different mixes and surprisingly better upgrades over plain Portland concrete.

9. **Lam et al. [2014]** contemplated the impact of fly fiery debris and silica smolder on compressive and break practices of concrete and closed upgrade in quality properties of cement by including distinctive level of fly powder and silica rage.

10. **George et al. (2013)** detailed a work on the pre-focused on fiber-reinforced polymer (FRP) reinforcing framework which can be a proficient technique to improve the productivity of FRP materials and the conduct of the fortified individuals under administration conditions. A technique utilizing somewhat impregnated carbon-basalt cross hybrid fiber sheets (CBHFS) was proposed to enhance the malleable limit of dry fiber sheets. The test outcomes showed that the malleable limit of dry fiber sheets can be improved adequately and that it isn't impacted by the example length when fiber hybridization and halfway impregnation are connected together.

11. **Gang et al. (2013)** exhibited a trial ponder on the flexural conduct of RC shafts fortified with steel-wire nonstop basalt fiber composite plates. This work investigated a technique for flexural fortifying reinforced cement (RC) shafts utilizing recently created steel-wire nonstop basalt fiber composite plates (SBFCPs) that comprises of steel wires and persistent basalt-fiber-reinforced polymer (BFRP) composites. The test outcomes uncovered that the SBFCP reinforced examples performed predominant than the un strengthened example regarding load limit and part solidness. A parametric report affirmed that the volumetric proportion of steel wires in the SBFCPs impact the heap limit and firmness of examples fortified with SBFCPs. The outcomes likewise demonstrated that harbor by steel plates and jolts enhances the heap limit and pliability of fortified examples.

4. Conclusions

- In light of the basic perceptions produced using the study of existing literary works and to accomplish the target illustrated in the past section, the extent of the present research consider is condensed as takes after:
- To examine the shear conduct of rectangular shape section RC, glass fiber and bamboo fiber bars under static stacking condition.
- To inspect the shear conduct and methods of disappointment of RC shear lacking bars remotely fortified with various fiber strengthened polymer.
- To explore the impact of various test parameters, for example, fiber sum and dispersion, reinforced surface, number of layers, fiber introduction and end harbor framework on the shear limit of RC pillars fortified with remotely reinforced composites.

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