Retraction

Retraction: A Review on Structural Behaviour of Natural Fibre Reinforced Polymer Laminate (IOP Conf. Ser.: Mater. Sci. Eng. 1145 012091)

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IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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A Review on Structural Behaviour of Natural Fibre Reinforced Polymer Laminate

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Abstract. This paper will review the behavior of structural elements using natural fiber reinforced polymer laminate is going to be examined. In construction industry, the structural elements are strengthened by using fiber reinforced polymer laminate which is highly effective, but since the laminates which we use here has fabricated using steel. This is a drawback since, the initial production of synthetic fiber reinforced polymer laminate is highly expensive. So here in this paper we have come up with an alternative by giving an ecofriendly solution as well as cost effective one, here the laminates are going to be fabricated using natural fibers like jute and abaca and the behavior of both the materials are going to examined and the best one from it is going to be produced. The fabrication of laminates using natural fibers will provide a very good shear strength to structural elements, as well as, it is cost effective.

1. Introduction

Most of the building’s losses the strength of the structure due to ageing of the structure or due to natural disasters like earthquakes, tsunami etc. We civil engineers are the one to find solutions to all these issues. Lots of strengthening methods have been found and is still being with materials carried out like fiber reinforced cementsations matrix and fiber reinforced polymer composites. This usage of various types of FRP has found to be highly effective [1]. It provides a very good shear strength to the structural elements. Among these fibers the most commonly used in practice are carbon FRP and glass FRP. The use of Fiber reinforced polymer laminate has found to be highly effective in providing high strength to structural elements, apart from this it has lots of advantages because the properties of fiber reinforced polymer laminate has found to be light in weight, highly corrosion resistance, and thus provides good stiffness properties.

2. Literature Review

The [2] proposed structural member by applying pre-stressed FRP laminates without the use of anchorage.
The work is based on controlling of stresses in the bonding line by using a pre stressing force profile. It eliminates the use of mechanical anchorage to the laminates which has given a lot of merits compare to conventional methods like anchor plates, in proving ease in availability of the material, minimum time consumption during construction, it produces corrosion free as well as durability.

In [3] carried an experiment and stated that the effectiveness of glass fiber reinforced polymer laminate in enhancing flexural strength of the concrete beam. All the beams which were casted was carried out a four point bending test in loading frame, thus after carrying out the experiments the results concluded that glass fiber reinforced polymer laminate improved strength, ductility, deformation capacity and composite action until the failure occur.

The [4] had studied FRP jackets in upgrading RC corroded columns with substandard detailing. This paper investigates the long-term flexural fatigue strength by using the CFRP and GFRP laminates. The different corroded column has been investigated by using carbon fiber laminates and glass fiber laminates. The test result shows that CFRP laminates are given the better results when comparing to the GFRP laminate in terms of strength and durability.

The [5] carried out experiment in FRP in the concrete column by strengthening of an existing member; they use light weight FRP materials. FRP strengthening is the techniques recently used for much research work for the improvement of flexural and axial strengthening [5]. These type of strengthening method is mainly used because of lack of structural design provisions. The FRP has been used in this work with diagonal and to avoid the shear failure.

The [6] after his research came to a conclusion that rehabilitation of infrastructure has become a priority or got a vital role in recent years instead of demolishing and rebuilding structures. Traditional repair methods have drawbacks but many of such drawbacks can be overcome by usage of FRP laminate. For example, to strengthen an RC beam or slab for flexure FRP laminate are bonded externally on the structural element. This helps the structure to gain strength and last longer. Current models for predicting the bond strength between the laminates and concrete are also scrutinized.

In [7] analyzed the performance of different mechanical and anchorage systems used in FRP strengthening applications. Every anchorage system is discussed in terms of purpose of use and performance. Advantages and disadvantages are discussed and areas in need of further research are explored selection of anchorage system is done after the discussion gives a conclusion.

Author [8] stated that fiber reinforced polymer composite have used for many applications in the defense sector, aerospace and structural fields. The present work was investigated the CFRP with different fiber orientation. The Carbon fiber reinforced plastic has been included for shear testing and to calculate in-plane shear capacity. The model was made for cutting of the specimen with different fiber orientation.

The paper [9] investigated the strengthening of seismically damaged reinforced concrete interior joints by using L-Shaped FRP laminates. They have used CFRP laminates and GFRP laminates for the damaged structure. Results show that the use of GFRP in strengthening the joints will give 10-20% additional performance. Further they have investigated the specimen by using the both CFRP and GFRP laminates the strength was increased and it
was controlled by de-bonding of FRP laminates near critical section of the specimen. In this study they used proposed formulas for predicting the externally bonded fiber reinforced polymers in strengthening the damaged reinforced concrete interior joints.

In [10] conducted the study the behavior of beams with GFRP laminates by enhancing the flexural capacity. Seven beams are casted with the size of 0.15 m x 0.25 m x 3 m. The casted beams are tested after 28 days by using four-point bending test in a loading frame. After the testing failure specimens are retrofitted by using GFRP laminates. Comparison of results shows that the use of GFRP laminates will give better strength, increase of deformation capacity, and ductility until the failure occur.

3. Development of strengthening techniques

The literatures review shows that the use of FRP will improve the crack resistance and this FRP can be categorized in to different types i.e., carbon Fibre, steel fibre, glass fibre and Mixed Natural Fibre Reinforced polymer. Many research works have been carried by using FRP confinement [11] - [17]. Figure 1 shows the Steps in strengthening techniques. Initially the test specimens are first damaged and further retrofitting work has been carried by using different tested specimens by means of strength, durability, deformability, and shear capacity of the structural member.

![Figure 1. Steps in strengthening techniques](image-url)
4. Conclusion

1. The Retrofitting of walls using FRP composites improves the ductility and load-carrying capacity of walls with a significant level.
2. The strengthening of Bridge components using FRP laminates improves the stiffness and strength of the structure.
3. Nonlinear static pushover analysis (NSPA), and incremental dynamic analysis result of bridge piers strengthened by FRP improves its stability and shows improvement in other parameters.
4. While investigating seismic behaviour, the normal column having low lateral strength, deformation, degradation compared to column retrofitted with FRP composites.
5. In a beam-column joint, the use of the CFRP joint improves the shear strength of the retrofitted specimen. The use of wraps is quite useful in improving its shear strength.
6. The ultra-high performance of fiber-reinforced jackets used in the bottom of the pier improved the flexural behaviour of the pier.
7. The crack pattern and the seismic response should be easily analyzed experimentally using LabVIEW software. This software will process the data obtained during testing and shows better result compared to other software.

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