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Retrofitting of Beam-Column Joints in RC Buildings using Jacketing Techniques along with Cross Bars- Review Paper

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Abstract: ***Seismic Retrofitting Techniques, which is used for constructions which are vulnerable to damage and failures by seismic forces. The Paper is illustrated by retrofitting of the beam column joint which is the critical zone in reinforced concrete structures. In this study, the retrofitting was done by jacketing methods like carbon fibre reinforced polymer sheets (CFRP), Glass fibre reinforced polymer mesh, Sisal fibres etc. This report discusses about the performance of the retrofitted beam column joint; and was compared with the conventional specimen.***
Index Terms -Seismic Retrofitting, Beam -column, CFRP, GFRP, Sisal fibre

I. INTRODUCTION

One of the recent developments in this field is the strengthening of Reinforced Concrete structures with externally bonded Fibre Reinforced polymer (FRP) composites which is a better alternative than demolishing and subsequently rebuilding. In Reinforced Concrete buildings, portions of columns that are common to beams at their intersections are called beam-column joints. Since the constituent materials have limited strengths, the joints have limited load carrying capacity. CFRP is a composite materiel, consisting of various carbon fibres and thermosetting resins. The confinement of the CFRP wrap enhances the compressive strength of the concrete and increases the load bearing capacity, which can effectively improve the seismic performance and durability of the structures.

II. LITERATURE REVIEW

A. Ahmed Ghobarah, A. Said (2002)

In this paper, the research is to develop effective rehabilitation schemes for reinforced concrete beam-column joint and different fibre-wrap rehabilitation schemes were applied to the joint panel with the objective of increase the shear strength of the joint, GFRP jacketing technique is used. Finally, the comparison is made between the performance of original specimens and rehabilitated ones shows that the GFRP jacket can increase the shear resistance of the joint and enhancing the performance of the connection from a ductility point of view.

B. Cengizhan Durucan, Murat Dicleli (2010)

In this paper, a seismic retrofitting technique PRS can easily designed and applied in the case of conventional seismic retrofitting methods, it possesses a steel shear link that absorbs energy (It behaves like a dampers). The link-brace system was directly applied as a simple retrofitting solution.

C. Gee Joo Ha, Luciano Feo (2012)

In this paper, research was carried out to try and improve the seismic strength and performance of reinforced concrete exterior beam- column joints by applying embedded carbon fibre-reinforced polymer (CFRP) bars combined with CFRP sheets. CFRB bars have a flat –typed hexagonal cross section. The specimens using strengthen concept undergoes cyclic load reversals tests. It's not only increase the ultimate load carrying capacity, ductility, energy dissipation capacity of non-seismic designed RC beam column joints but also minimize flexural cracks.

D. Varinder singh, prem pal bansal, S.K. Kaushik, Maneek Kumar (2014)

Strengthening of existing RC structures is now a major part of the construction activity all over the world. Beam –column joints in RC framed structures are identified as most vulnerable structural element subjected to seismic force or lateral loads. In this paper, the beam column joints are initially stressed to three different stress levels, retrofitted with CFRP Jackets. where jackets have been

provided in L shape and 45degree orientation to the joint in two layers. The ultimate load carrying capacity of joints increased nearly 15%. CFRP retrofitting of joints transfer the failure of joint from the column portion to the beam portion of the joint which will prevents the progressive collapse of the structures.

E. Amritha Ranganadhan , Anju Paul (2015)

This paper deals with seismic retrofitting, which is mainly done to provide existing structures with more resistance to seismic activity due to earthquake. In this paper, a building that was designed for seismic zone II is selected and the analysis of the structure is carried out and the structure is redesigned for seismic zone III based on the upgraded codal provisions. Retrofitting techniques are adopted for providing the better seismic resistance to the building. Here Fibre Reinforced Polymer jacketing is used, when compared to concrete jacketing and steel jacketing, FRP wrapping has several advantages. (low weight to strength ratios, high elastic modulus, resistance to corrosion).

F. Margherita, Daniele, Gaetano Russo (2015)

This paper deals with the determination of shear strength of exterior RC beam-column joints under seismic action. A struct & tie model, which proposes for determining shear strength of exterior RC beam-column joints and to evaluate the tensile stress trend in the longitudinal reinforcing.

G. Esmaeel, Fakhreddin, Kong Fah (2016)

This paper deals with seismic strengthening of shear deficient joints of 3D reinforced concrete corner (Beam-column connections) by using the jacketing techniques which consist of GFRP sheets and a steel cage. Finally, the experimentally obtained joint shear strength of retrofitted beam-column joint comparatively more than the control specimens

H. Priyadarshan, Gerry Varghese Daniel (2016)

The research is carried out the major disadvantages they possess are that they get severely damaged during earthquakes in seismic zones and are affected by certain other factors like cracking, corrosion, lack of detailing and disposal. These fibre materials enhance the properties like flexural, shear and axial loading capacity of the beam element. Natural fibre reinforcements are accepted over the synthetic ones as they exhibit excellent properties such as good fatigue, damping resistance, resistance to weathering and corrosion, high strength weight ratio and easily degradable.

I. Aditya Kumar Tiwary, Mani Mohan (2015)]

In this paper, the technique using crossed inclined bar at beam column junction is a feasible solution for increasing the shear capacity. Thecrossed inclined bars introduce an additional mechanism for shear transfer. Exterior beam-column joints with crossed inclined bar modelled in ANSYS workbench showed high strength. The crossed inclined bars improve the load carrying capacity, Stiffness and ductility of joints in both loading and unloading conditions, which is observed from the analytical study.

III. OBSERVATION FROM LITERATURE REVIEW

From this study, it is observed that Seismic retrofitting of Beam-column joints in RC structures is efficient only by the jacketing techniques like wrapping of CFRP, GFRP Natural fibres etc. The wrapping of fibres in beam-column increases the load carrying capacity, shear capacity, stiffness and ductility, which in turn prevent the shear failure in the joints.

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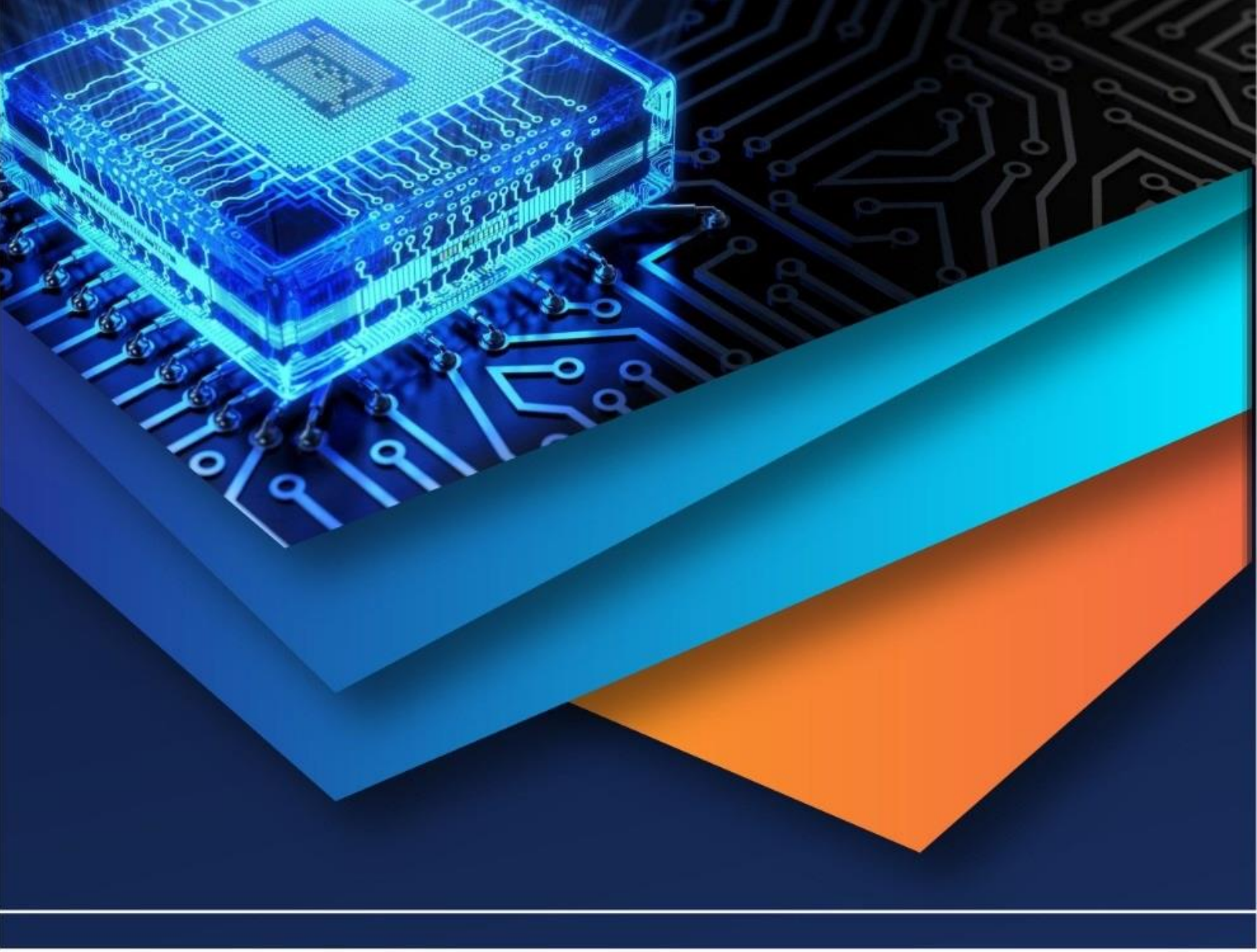

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