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Comparative analysis of building with and without column jacketing

Gunderao V Nandi[1], Sudharani[2]
[1] Asistant Professor, SECAB Institute of Engineering and Technology, vijayapura, karnataka
[2] Student, SECAB Institute of Engineering and Technology, vijayapura, karnataka
Corresponding Author: Gunderao V Nandi

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ABSTRACT: Seismic protection of buildings is a need-based concept aimed to improve the performance of any structure under future earthquakes. Earthquakes of varying magnitude have occurred in the recent past in India, causing extensive damage to life and property. Some recently developed materials and techniques can play a vital role in structural repairs, seismic strengthening and retrofitting of existing buildings, weather damaged or undamaged. The primary concern of a structural engineer is to successfully restore the structures as quickly as possible. Selection of right materials, techniques and procedure to be employed for the repair of a given structures have been a major challenges. Innovative techniques of the structural repairs have many advantages over the convectional techniques. Some guidelines regarding selection of materials for repair work such as steel, fiber reinforced polymer, has been discussed in the paper. The selection of material and techniques to be used on many aspects that may be viewed from different prospective. i.e, requirement and availability of financial resources, applicability and suitability of material for the repair of damaged structures. Use of standard and innovative repair materials, appropriate technology, workmanship and quality control during implementation are the key factors for successful repair, strengthening and restoration of damaged structures.
KEYWORDS: Concrete jacketing, Existing building

I. INTRODUCTION

Recent earthquakes have exposed the vulnerability of reinforced concrete (RC) buildings. The earthquake at Bhuj, Gujarat, in 2001 has been a watershed event in the earthquake engineering practice in India. The Indian code of practice for seismic analysis has been revised to reflect the increased seismic demand in many parts of the country. Many existing buildings lack the seismic strength and detailing requirements of the current codes of practice, because they were built prior to the implementation of these codes. Failure of columns can lead to the failure of a storey and the building. The columns in a typical multi-storeyed RC building in India, especially with an open-ground storey (i.e., a ground storey without any infill walls for vehicle parking), are found to be deficient with respect to their flexural and shear strengths as compared to the corresponding demands. Under moderate to severe earthquakes, an undesirable column side-sway can lead to a soft-storey collapse mechanism.

One way of retrofitting the columns is by column jacketing. There are various types of column jacketing viz steel column jacketing, fiber column jacketing and concrete column jacketing. Concrete jacketing involves placing an additional layer of concrete covering the existing column, together with additional longitudinal bars and ties to enhance the flexural and/or shear capacities. The retrofitting of columns by concrete jacketing is not sufficiently documented. In a conventional analysis of a jacketed column, strength is determined based on an interaction diagram for the composite section or for some equivalent section.

II. LITERATURE REVIEW

1] N.Islam studied the strengthening techniques of Reinforced concrete (RC) column. Most of the investigations were focused on the effect of strengthening configuration on load carrying capacity, ductility, lateral strength strength and flexural strength, it reveal that the overall increase in axial strength ranges from 18.65% to 109% and that of lateral strength from 63% to 68%.

2] Eduarado N.B.S.Julio et.al experimental study performance to analyze the influence of the interface treatment on the seismic behaviour of columns strengthened by reinforced concrete(RC) jacketing to increase their ultimate bending moment. for undamaged Columns with a bending moment/shear force ratio greater than 1.0 it is not

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necessary to consider any type on interface treatment before casting a RC jacket with a thickness less than 17.5% of the column width.

III. OBJECTIVES

- Analysing existing building of 8 and 10 storey by using Etabs 2016 version according to the IS15988:2013 and IS456:2000 codes for gravity loading .
- Designing column for retrofitting according to the IS15988:2013 in section designer according to the need of seismic provisions.
- Analysing concrete jackete retrofitted building and comparing base shear, stresses in columns with existing buildings.
- To study the behaviour of exiting building of RC column retrofitted with RCC jacketing in ETAB-2016 version for static and lateral loading.

IV. METHODOLOGY

Response spectrum analysis procedure:

Load cases considered for present study Partial safety factors for limit state design of reinforced concrete and prestressed concrete structures In the limit state design of reinforced and prestressed concrete structures, the following load combinations shall be accounted for:

1) 1.5(DL+LL)
2) 1.2(DL+ZL+EL)
3) 1.5(DL+EL)
4) 0.9DL* 1.5EL

Seismic Zone	II	111	Iv	v
Zone factor	0.10	0.16	0.24	0.36

Design Spectrum

For the purpose of determining seismic forces, the country is classified into four seismic zones

The design horizontal seismic coefficient Ah for a structure shall be determined by the following expression:

$$A_h = \frac{Z I S_a}{2 R g}$$

Where Z is zone factor
I is Importance factor
R is response reduction factor and Sa/g=Average response acceleration coefficient

The material properties are 25 MPa for concrete, and 415 MPa for strength of steel. Concrete jacketing is done with M30 grade concrete The live load on the floor is 4 kN/m^2 and the wall load on the beam is considered as 17.6 kN/m. Also, the base of columns at the ground floor is assumed to be fixed.

Table 1: Details of columns and beams

Components	Sizes
Columns	800x800 mm
Beams	300x500 mm

Table 2. Percentage of Imposed Load to be Considered in Seismic Weight Calculation

Imposed Uniformity Distributed Floor Loads (kN/ m^2)	Percentage of Imposed load
(1)	**(2)**
Upto and including 3.0	**25**
Above 3.0	**50**

Response reduction factor is adopted from code IS 1893-2002(part-1)

V. RESULTS AND DISCUSSION

5.1 Storey Displacement

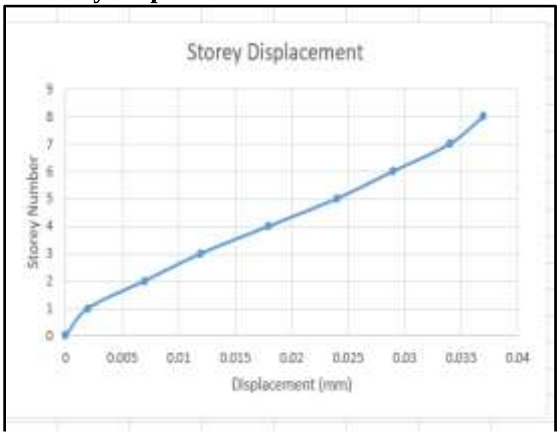

Fig 5.1.1 Storey Displacement of 8 Storey Building (Without Jacketing)

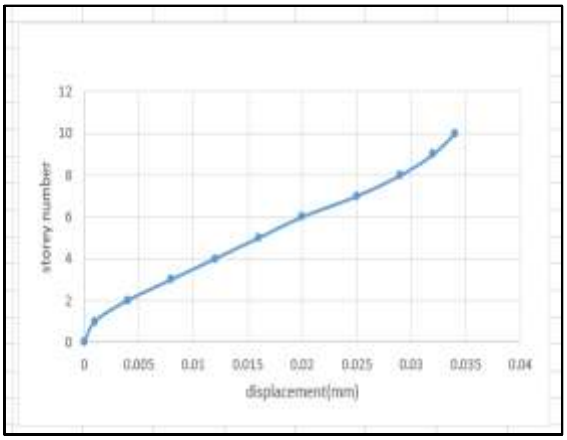

Fig 5.1.2 Storey Displacement of 10 Storey Building (Column with Jacketing)

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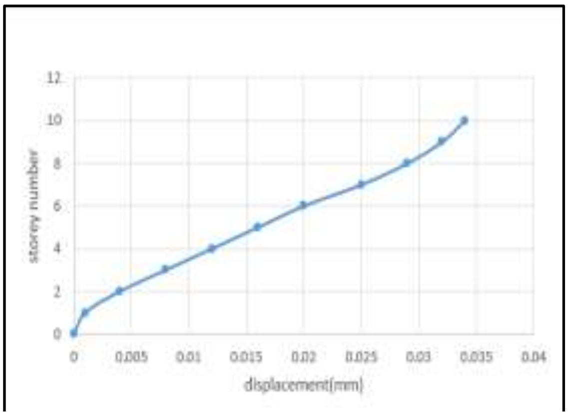

Fig 5.1.3 Storey Displacement of 8 Storey Building (With Jacket)

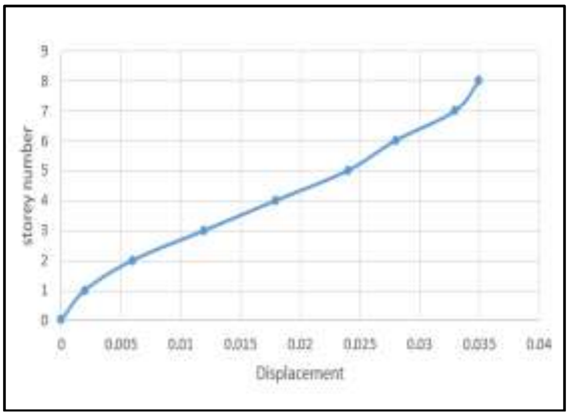

Fig 5.1.4 Storey Displacement of 10 Storey Building (With Jacket)

From the above graph it has been observed that in case of RC building with column jacketing the storey displacement has been reduced by 5.5% in 8 storey building & 10% in 10 storey building compared to without jacketing.

5.2 Storey Shear:

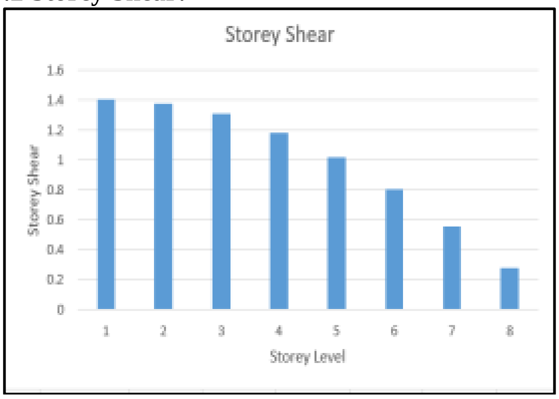

Fig 5.2.1 Storey Shear of 8 Storey Building (Without Jacket)

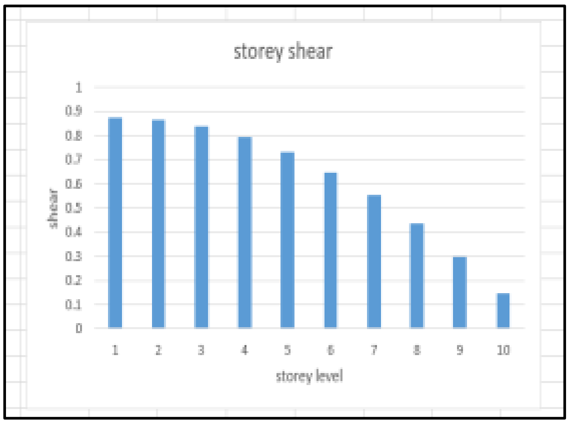

Fig 5.2.2 Storey Shear of 10 Storey Building (Without Jacket)

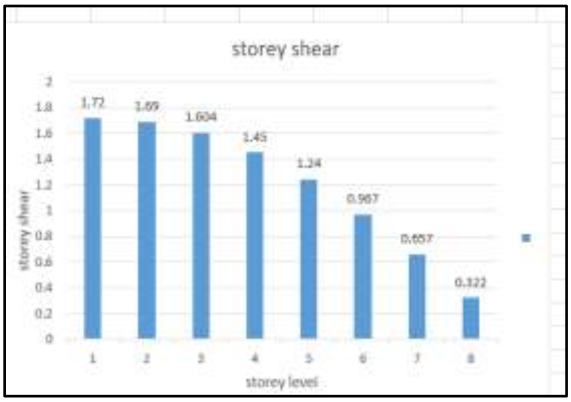

Fig 5.2.3 Storey Shear of 8 Storey Building (With Jacket)

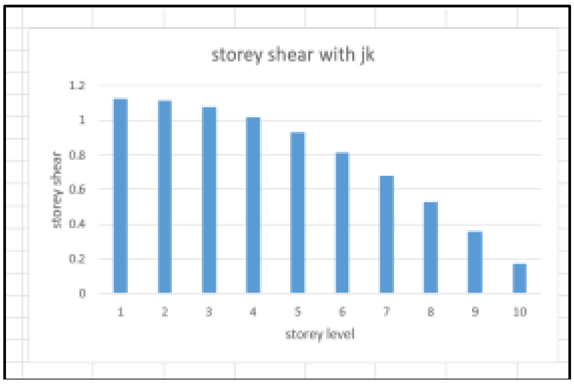

Fig 5.2.4 Storey Shear of 10 Storey Building (With Jacket)

From the above graph it has been observed that in case of RC building with column jacketing the storey shear has been increased by 15% in 8 storey building & 20% in 10 storey building compared to without jacketing.

5.3 Base Shear

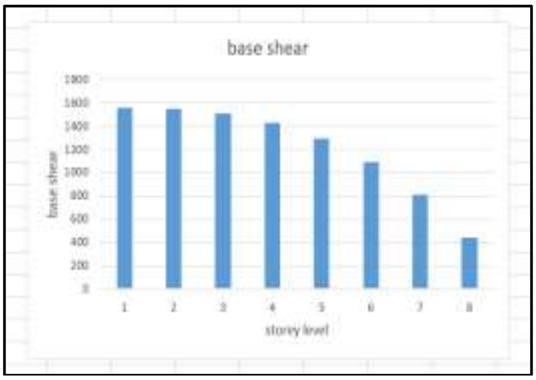

Fig 5.3.1 Base Shear of 8 Storey Building (Without Jacket)

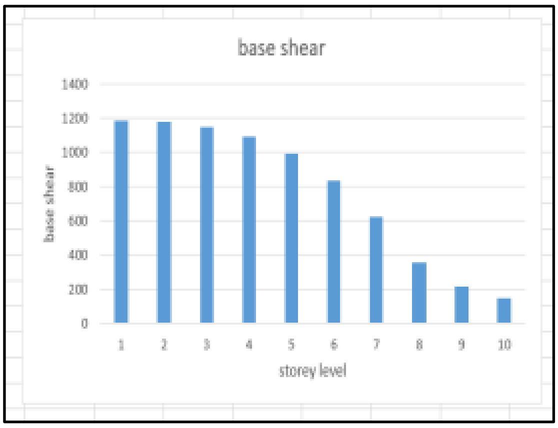

Fig 5.3.2 Base Shear of 10 Storey Building (Without Jacket)

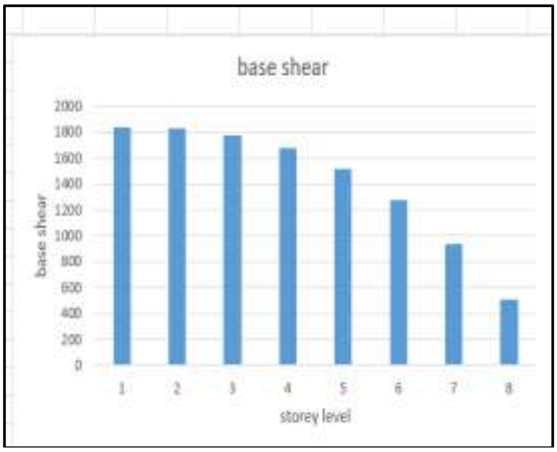

Fig 5.3.3 Base Shear of 8 Storey Building (With Jacket)

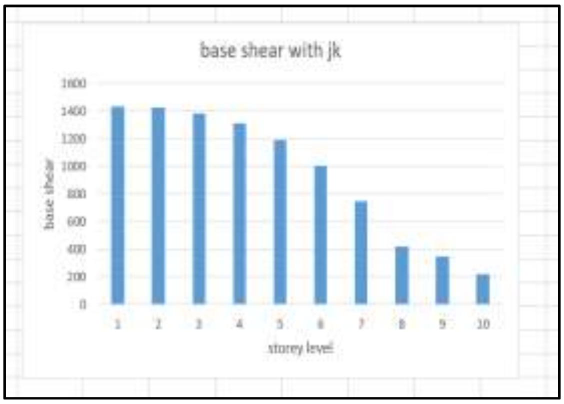

Fig 5.3.4 Base Shear of 10 Storey Building (Without Jacket)

From the above graph it has been observed that in case of RC building with column jacketing the Base shear has been increased by 18% in 8 storey building &22% in 10 storey building compared to without jacketing.

VI. CONCLUSION

The RC jacketing strengthening method, unlike other techniques, leads to a uniformly distributed increase in strength and stiffness of columns & also increases the durability of the original columns.

- RC building with column jacketing the storey displacement has been reduced by 5.5% in 8 storey building & 10% in 10 storey building compared to without jacketing.
- Building with column jacketing the storey shear has been increased by 15% in 8 storey building & 20% in 10 storey building compared to without jacketing.
- RC building with column jacketing the Base shear has been increased by 18% in 8 storey building & 22% in 10 storey building compared to without jacketing.

REFERENCES

[1]. Naimul Islam “Strengthening of Reinforced Concrete Columns by Steel Jacketing: A state review” IEEE transaction on Engineering Management Vol 5, issue 3, pp 6-14, July 2015.

[2]. Eduarado N.B.S.Julio “Reinforced concrete jacketing-interface influence on cyclic loading response” ACI Structural Journal, pp 1-7, July-August 2008.

[3]. IS: 1893(I)-2002, “Indian standard criteria for earthquake resistant design of structures” BIS, New Delhi.

[4]. IS: 456-2000, "Plain and reinforced concrete – code of practice", BIS, New Delhi.
[5]. IS: 15988:2013 " Seismic Evaluation and Strengthening of Existing Reinforced Concrete Buildings-Guidelines" BIS, New Delhi.