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Seismic Retrofitting Techniques For Concrete Structures

Varsha Sahu[1], Ramcharn Nishad[2], Nitesh Kumar Tirkey[3], Pranav Choubey[4], Manoj Kumar Maitry[5]

[1]Assistant Professor, [2,3,4,5] Students
Civil Engineering Department, RSR Rungta College of Engineering & Technology Bhilai C.G

Abstract - *Seismic Retrofitting Techniques are required for concrete constructions which are vulnerable to damage and failures by seismic forces. In the past thirty years, moderate to severe earthquakes occurs around the world every year. Such events lead to damage to the concrete structures a well as failures. Thus the aim is to Focus on a few specific procedures which may improve the practice for the evaluation of seismic vulnerability of existing reinforced concrete buildings of more importance and for their seismic retrofitting by means of various innovative techniques such as base isolation and mass reduction. So Seismic Retrofitting is a collection of mitigation technique for Earthquake engineering. It is of utmost importance for historic monuments, areas prone to severe earthquakes and tall or expensive structures.*

Keywords - *Retrofitting, Base Isolation, Retrofitting Techniques, Jacketing, Earthquake Resistance*

I- INTRODUCTION

- Earthquake creates great devastation in terms of life, money and failures.
- Upgrading of certain building systems (existing structures) to make them more resistant to seismic activity (earthquake resistance) is rea of more importance.
- Structures can be (a) Earthquake damaged, (b) Earthquake vulnerable
- Retrofitting proves to be a better economic consideration and immediate shelter to problems rather than replacement of building.

Seismic Retrofitting of Concrete Structures:
It is the modification of existing structures to make them more resistant to seismic activity, ground motion, or soil failure due to earthquakes. The retrofit techniques are also applicable for other natural hazards such as tropical cyclones, tornadoes, and severe winds from thunderstorm

Need for Seismic Retrofitting:

- To ensure the safety and security of a building, employees, structure functionality, machinery and inventory
- Essential to reduce hazard and losses from non - structural elements.

II-LITERATURE REVIEW

The starting point for the presented literature review was the project bibliography of the SRP (Cancino et al. 2013). This bibliography compiles all published works known to the project members relating to earthen architecture in seismic areas worldwide. Reviewed literature includes, but is not limited to, the proceedings of a series of international conferences on the study and conservation of earthen heritage and the structural analysis of historical constructions (Terra, SIACOT, SAHC, STREMAH) and internationally published articles on the same subjects. This paper considers relevant works regarding retrofitting

or structural stabilization of adobe and applies these works to historic buildings, also taking into consideration a series of recommendations of professionals at the 2013 SIACOT (Seminario Iberoamericano de Arquitectura y Construcción con Tierra) Conference in Valparaìso, Chile (August 28–30, 2103). In addition, policies, standards and guidelines related to earthen buildings and the strengthening of historic structures were analyzed to provide the theoretical framework in Section 1.3. While the reference list in this article is limited to the works that are directly cited, a series of publications and articles have contributed indirectly. All these can be found in the bibliography of the SRP-project (Cancino et al. 2013).

III- CLASSIFICATION OF RETROFITTING TECHNIQUES

Adding New Shear Walls:

- Frequently used for retrofitting of non-ductile reinforced concrete frame buildings.
- The added elements can be either cast pin place or precast concrete elements.
- New elements preferably be placed at the exterior of the building.
- Not preferred in the interior of the structure to avoid interior mouldings.

Adding Steel Bracings

- An effective solution when large openings are required.
- Potential advantages due to higher strength and stiffness, opening for natural light can be provided, amount of work is less since foundation cost may be minimized and adds much less weight to the existing structure.

Jacketing (Local Retrofitting Technique):

This is the most popular method for strengthening of building columns.

IV- TYPES OF JACKETING

1. Steel jacket
2. Reinforced Concrete jacket
3. Fibre Reinforced Polymer Composite (FRPC) jacket

BASE ISOLATION (SEISMIC ISOLATION)

Isolation of superstructure from the foundation is known as base isolation. It is the most powerful tool for passive structural vibration control technique.

Advantages of Base Isolation

- Isolates Building from ground motion – Lesser seismic loads, hence lesser damage to the structure, -Minimal repair of superstructure.
- Building can remain serviceable throughout construction.
- Does not involve major intrusion upon existing superstructure

Disadvantages of Base Isolation

- Expensive
- Cannot be applied partially to structures unlike other retrofitting
- Challenging to implement in an efficient manner

V- CONCLUSION

- Seismic Retrofitting Techniques for concrete structures: Seismic Retrofitting is a suitable technology for protection of a variety of structures.
- It has matured in the recent years to a highly reliable technology.
- But, the expertise needed is not available in the basic level.
- The main challenge is to achieve a desired performance level at a minimum cost, which can be achieved through a detailed nonlinear analysis.
- Optimization techniques are needed to know the most efficient retrofit for a particular structure.
- Proper Design Codes are needed to be published as code of practice for professionals related to this field.

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