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DIFFERENT BASE ISOLATION TECHNIQUES USED ON RC BUILDINGS

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Abstract: Buildings that can survive seismic conditions are necessary in today's world. Due to the increasing density of modern cities, every structure that collapses will also affect nearby structures. Our building method is changing from fixed to flexible structures to address this issue. Because they can dissipate the seismic energy, flexible structures are safer than stiff and traditional ones. The most common "base isolation technique" is utilized extensively worldwide as technology advances.

Keywords: Base Isolation, Seismic Design, Story Drifts, Story Displacements, Base Shear.

I-INTRODUCTION

BASE ISOLATION: - This method involves inserting an isolator between the construction and its foundation. The structures cannot, however, be completely dissociated from their supporting structure. With base isolation, you may reduce the amount of energy that seismic activity transfers from ground motion to the building. The earthquake protection system with the highest usage is this one. Due to their flexibility, the isolators are useful for dissipating seismic energy. To reduce displacements, drifts, base shear, and other phenomena, isolation systems are primarily used. For the reasons listed below, base isolation approach is required:

- When a building is situated in a region with strong seismic activity.
- Unsafe is the current structure.
- Reduce the harm to the primary and secondary structural elements.
- The building's economic and cost costs.

II. LITERATURE REVIEW

1-S. K. Jain and S. K. Thakkar (2004): Maximum storey drift is decreased with the hardening of the superstructure. Storey shear, base displacement increases. Maximum displacement at isolation level rises with increased isolated system flexibility.

2- S.D. Bharti, S.M. Dumne, and M.K. Shrimali (2015): Compared to semiactive control, hybrid control systems are more successful at reducing seismic reaction. H2 is also less likely to experience bearing displacement, making it more effective at reducing pounding. When compared to semiactive controls, hybrid controls resulted in a greater reduction in displacement and base shear.

3-Fabio De Angelis and Donato Cancellara (2016): In this study, two base isolation systems—the High Damping Rubber Bearing (HDRB) actuated in parallel with a Friction Slider (FS) and the Lead Rubber Bearing (LRB) operated in parallel with a Friction Slider (FS)—have been taken into consideration in the analysis. In comparison to the equivalent values of the fixed base construction, the maximum values of base acceleration and base shear indicate reduction of 1/5 to 1/10. The LRB isolators exhibit a higher dissipative capacity, ranging from 15% to 30% more than HDRB isolators.

4- M. Spizzuocob, S. Stranoc, M. Terzo, and A. Calabrese (2018): They found that RR-FRBs often resulted in a 55% reduction in top floor acceleration and an average reduction of the interstorey drift of 33% was achieved. RR-FRBs exhibit a stable behaviour and have strong re-centering skills.

5- Donato Cancellara and Fabio De Angelis (2019): For the base isolated structure, the ratio of the inter-storey drift over the inter-storey height is 0.01%, whereas it is always less than 0.4% for the fixed base retrofitted structure at each level. The base isolation system calculates a reduction of the shear force at each level of the structure, averaging out to a reduction of about 70%.

6- Ricky W.K. Chana, Yan-Shing Lina, and Hiroshi Tagawa (2020): When there is no earthquake warning signal, the movable parts of a sliding-type base isolation are locked, giving the main structure substantial lateral resistance and preventing the base isolation from moving excessively because of wind loads. The base isolation shear keys are retracted when an EEW signal indicating approaching ground motion is received, allowing the main structure to move freely in the horizontal plane.

7- Aniruddha Sengupta, J. Chattopadhyay, Y.M. Parulekar, Srijit Bandyopadhya (2021): Although the peak floor/roof acceleration of the base isolated structure is 4.1 times lower than that of the conventional structure for the same ground motion, it has been observed that the FRS peaks of the base isolated structure at some frequencies have acceleration almost equal to the FRS of conventional structure. In contrast to a typical building subjected to the same earthquake, base separated buildings have a floor acceleration response that is reduced by 4.1 times. When compared to a normal building, it is seen that the reaction of the base isolated building is reduced by almost 4 to 5 times at the roof level.

8- Amir Ali, Chunwei Zhang (2021): It was found that the isolated structure's acceleration and inter-story drift might be decreased by 40–60%. It was discovered that the isolated model dissipated roughly 70% more seismic energy than a fixed base model did.

9- Reza Zamani, Mohamad Safaie, and Sayed Behzad Talaeitaba (2021): When compared to non-isolated structures, the story drift for the LRB-equipped structures ranges from 18.5 to 28.66%. The RRB counterpart's statistics show a drop of 35.33 to 59.66%. The average drift decreases in all LRB isolated base stories when compared to fixed base is 23.53%, while it is 49.87% for RRB. The results for the structures with the RRB reveal a 42.16 to 57.16% decrease in tale acceleration compared to the non-isolated structures, however the story acceleration with the LRB (lead rubber bearing) has decreased by 23.33 to 37.5%.

10- E.J. Hernandez, B.A. Olmos, J.M. Jara (2021): When compared to BIB structures, building height and epicentral distance clearly had a greater impact on the seismic response of DIB models. Demands for MRF drift were reduced. Drift ratio reductions in isolated structures depend less on the location of the building than do BRF and DIB. The floor acceleration ratios in the DIB model were extremely near to unity, whereas the 10-story building's BIB increased this ratio by as much as 2.2.

11- Ayoub Shakouri, Yasaman Jalali, and Gholamreza Ghodrati (2021): Effect of DFPBs on similar fixed-based steel concentrically bracing frames' seismic reactions when used in isolation. Peak floor acceleration, peak drift ratio, and base shear all had the greatest reductions, which were assessed to be respectively 30%, 88%, and 62%.

12- James Michael, Iswandi Imran, and Dionysius M. Siringoringo (2021): The optimum seismic performance is provided by the DCFP type with all low friction bearings. Comparatively to the other DCFP base-isolated models, this one has the greatest reductions in acceleration, base shear force, amplification ratio, and interstorey drift ratio.
13-Hongping Zhu, Songye Zhu, Yamin Li, Heng Wang, Wenai Shen, and Yamin Li (2021): The peak relative displacement of the base floor, the superstructure, and the absolute acceleration of the superstructure have reduction ratios that are up to 56.57%, 60.00%, and 52.11%, respectively, as compared to the conventional BIS.

III-CONCLUSION

❖ In a seismically active area, base isolation approach is really helpful. They not only withstand seismic energy but also ensure that the building may continue to be used after an earthquake. Base isolators like LRB have low horizontal stiffness compared to vertical but strong vertical stiffness, which lowers base shear and inter-storey drift as height rises. They decrease the seismic energy and lengthen the time it takes for a structure to respond.

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