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Analysis of Hybrid Structure with Shear Wall and Bracing for Seismic Forces

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ABSTRACT: India has increased its development and implementation of hybrid structural technology to build extraordinarily high-rise skyscrapers in recent years. In this study chose steel concrete as hybrid constructions, which have RC core walls. It's conceivable to conclude that the hybrid structure's right design resulted in better seismic performance. The seismic design of a hybrid structure is described in this project. This project is a multi-purpose building with a height of 64 meters, of G+20 building. Super-high-rise building, as we all know, is a complex system including aesthetics, safety, and economics. On the other side, an all-steel construction has better structural performance; hybrid designs offer substantial benefits in terms of self-weight, structural members. In this study consider a parameter like story displacement, story drift and story stiffness. The results of RCC structure are more compared to hybrid structure.

KEYWORDS: Hybrid structure, RCC structure, Shear wall, Bracing

I. INTRODUCTION

A “hybrid structure” is a method of developing structures that incorporates a variety of materials to produce unique structures and spaces. The idea behind hybrid structure is to give the designer the freedom to try different materials in order to complement the project’s vision and help meet a variety of goals such as aesthetics, thermal, resistance, sustainability, and local impact, as well as to remove small barriers in the structure. Style of building is employed to provide a mixed material solution that meets all project requirements, including environmental, structural, and cost concerns; this is accomplished by utilizing each material in the most effective method possible. Steel types of steel bar Mild steel bar, HYSD(High yield strength deformed bar), TMT(thermo mechanically treated bar),TMX ,CRS, SD, TOR. The main objective of a shear wall is to stop a structure, especially vertical members like columns, from being sheared, thus increasing the overall structure’s safety and serviceability. Shear walls are built, whether using overhanging action or Struss action, with the idea that they will operate structurally as the load is applied. When a load or force is given to a structure or system, those forces always attempt to pass down the weakest path, which results in the structure cracking or failing. Furthermore, the diagonal plane is well known to be the path to shear failure in a structure. The main objective of bracing is to maintain the building and prevent collapse due to seismic, strong winds, or the impact of moving loads like cranes. It guarantees the building's security. Bracing's main function is to move lateral loads from the structure to the building's base.



Fig 1.1 Steven Holl linked Hybrid Beijing China

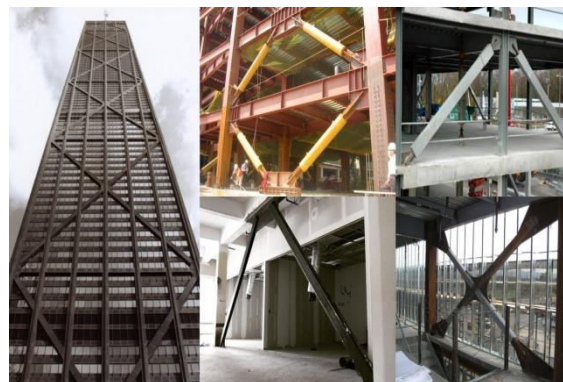


Fig 1.2 Hybrid structure with bracing

II. RELATED WORK

Mir rahman naseri¹, balwinder, [1] Hybrid systems are frequently used for big and massive projects around the world, and this structure has the benefit of demanding little investment. This essay examines a high-rise hybrid's earthquake study in a seismic setting. In comparison to the RCC system, the hybrid model has a wider nature and adequate limit parameters, claims the comparison analysis. Jiang jun¹ you bing [2] In China, hybrid structures are frequently employed for ultra-high-rise buildings, and this superstructure has the advantages of reducing costs. This research focuses on the earthquake resistance of a super high-rise hybrid structure that combines linear elastic research and nonlinear elasto-plastic analysis. The hybrid structure is composed of steel reinforced concrete (SRC) columns, concrete filled square steel tubular (CFSST) columns, SRC beams, and steel beams. Danish ahmed & andi asiz [3] Cross-laminated timber (CLT), in particular, has recently gained popularity in North America as a prominent alternative building material that provides competitive advantages over standard RC slabs for moderate applications. This kind of wood plate is typically utilized as a floor or as a component of a multi-story building's shear wall. This study aims to investigate the lateral strength and ductility of a floor diaphragm loaded under earthquake action and built of CLT slabs, RC, and steel floor frame. Mir rahman naseri, balwinder singh [4] A hybrid structure corrects for weak regions while also boosting strength by combining more than two different types of materials. Hybrid steel and concrete frameworks as well as other contemporary material are combined at the member or frame work unit. Analyzing the response spectrum of hybrid and 41-story RCC structures with and without shear walls. The study's findings demonstrated that shear walls in RCC and hybrid buildings had lower numbers for story displacement, story drift, and story displacement when compared to RCC and hybrid buildings without shear walls. The study's conclusions will serve as a manual and a tool for analyzing hybrid structures' vulnerability to earthquakes. David carradine [5] This paper discusses the earthquake design and analysis of 12-story seismic-resistant hybrid timber structure made of post tensioned Cross Laminated Timber (CLT) walls, Laminated veneer lumber (LVL) frames braced with buckling Restrained Braces (BRB), and steel braces with shape memory alloy (SMA) devices. The prototype construction is analyzed using the Chilean seismic standard NCh433. Theoretically, the suggested hybrid timber systems are determined to be suitable for construction in Chile, but more study and experimental testing are needed. Aditya Kumar Tiwary [6] The response of single shear walls and bracing to different configurations and material quality is currently the subject of much research on structures with distinctive structural configurations. According to seismic design principles, reinforced steel and concrete structures must meet Life Safety and Performance Level. The optimal structure is chosen based on the results of comparing the study's criteria, which include time period, base share, overturning moment, story drift ratio, and story displacement to several models. The basic time period and story displacement are decreased, but the shear and overturning moment are not raised, according to comparison results between the hybrid structural system and other configured models.

III. METHODOLOGY

Using CSI ETABS 2019, a response spectrum analysis is utilised to assess an RCC and steel-concrete hybrid high-rise building with and without shear walls.

Description of the structure

The building's dimension 20m x 29m dimensions are regarded as standard.

The study makes use of a seismic Zone V. G+20 storey RCC and hybrid structure with shear walls and bracing. Each storey is 3.2 m tall.

IV. EXPERIMENTAL RESULTS

1. In chart 4.1 it is observed that at the top story for RCC structure for seismic behavior there is more displacement (144.821 mm) and it is gradually decreasing by the bottom story. For hybrid structure the values are reduced to 49.84 %.
2. In chart 4.2 it is observed that at the top story for RCC structure the response behavior is more displacement (131.363mm) and it is gradually decreasing by the bottom story. For hybrid structure the values are reduced to 63.97 %.
3. In chart 4.3 it is observed that at the top story for RCC structure for seismic behavior there is more story drift (0.002739 mm) and it is gradually decreasing by the bottom story. For hybrid structure the values are reduced to 56.15%.
4. In chart 4.4 it is observed that at the top story for RCC structure the response behavior is (0.002426 mm) and it is gradually decreasing by the bottom story. For hybrid structure the values are reduced to 63.97 %.
5. In chart 4.5 it is observed that story stiffness for RCC structure for seismic behavior is 278552.2 KN/m. For hybrid structure values are increased by 81.37%. Story stiffness is more at bottom story for hybrid structure.
6. In chart 4.6 it is observed that story stiffness for RCC structure for response is 135392.7 KN/m. For hybrid structure values are increased by 90.86%.

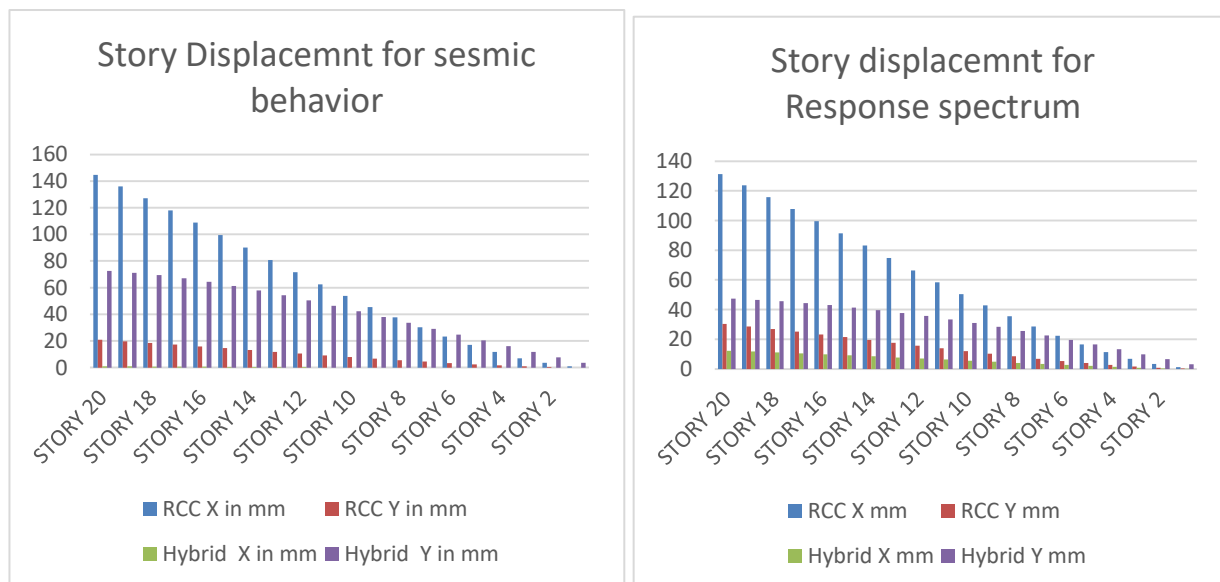


Chart 4.1 Story Displacement for seismic behaviour Chart 4.2 Story displacement for Response Spectrum

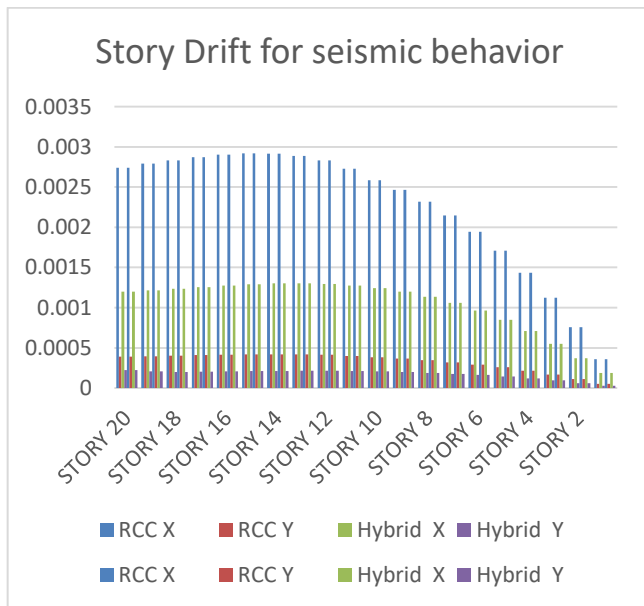


Chart 4.3 Story drift for seismic behaviour

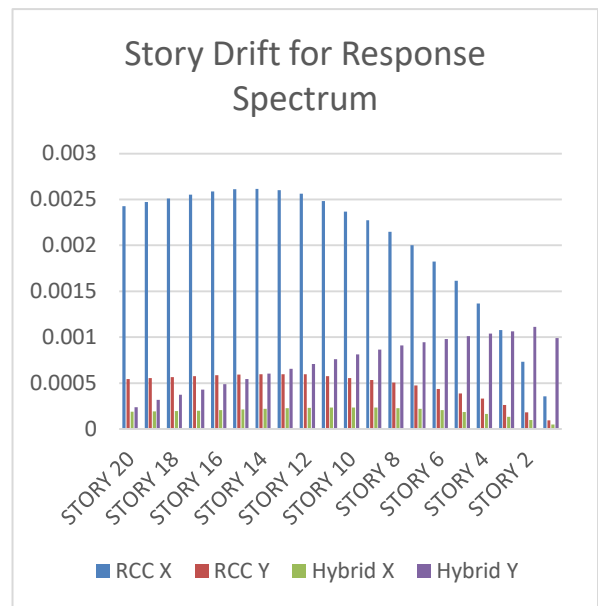


Chart 4.4 Story drift for Response spectrum

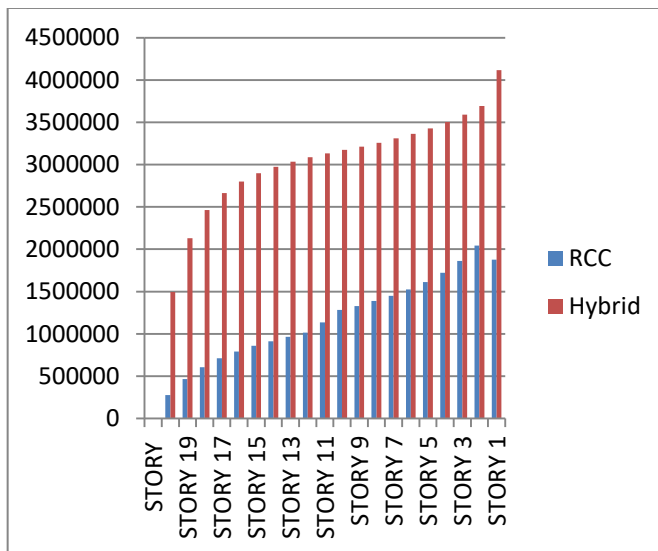


Chart 4.5 Story stiffness for seismic behaviour

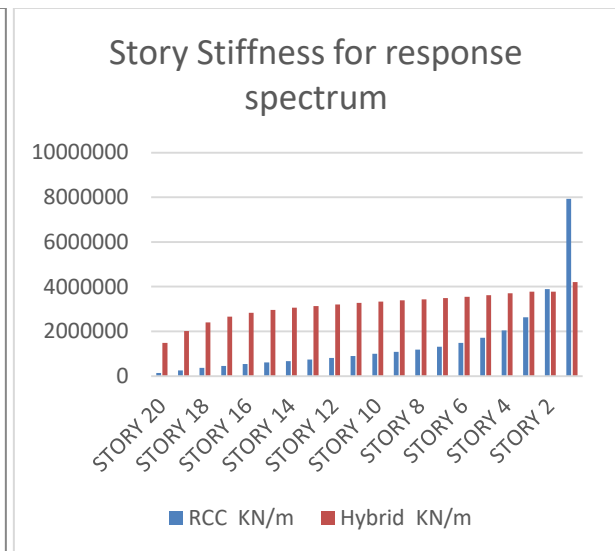


Chart 4.6 Story Stiffness for Response spectrum



V. CONCLUSION

1. The hybrid structure is more economical than the RCC structure.
2. Hybrid structure requires less area for construction compared to RCC Structure.
3. Hybrid structure is more vulnerable to the seismic impact than RCC structure, so for high earthquake zones hybrid structure is more preferable.
4. In order to reduce story displacement and story drift value and maintain them within restricting value, it is recommended to go for steel-concrete hybrid structure.
5. For Hybrid structure stiffness is more compared to the RCC Structure.
6. The findings of the response spectrum study measured by the CSI ETABS Programs illustrate the measurement model's correctness. The findings indicate that the hybrid structure has strong seismic efficiency.

REFERENCES

- [1] A review on seismic analysis of hybrid structures: mir rahman naseri¹, balwinder, lallotra² Source : international research journal of engineering and technology (IRJET) e-issn: 2395-0056 volume: 08 issue: 04 | apr 2021.
- [2] Seismic design of a super high-rise hybrid structure . jiang jun¹ you bing ¹, 2 hu ming² hao jiping¹ li yangcheng¹ source: the 14 th world conference on earthquake engineering october 12-17, 2008, beijing, china.
- [3] Structural performance of hybrid multi-story buildings with massive timber-based floor elements loaded under extreme lateral loads. DANISH AHMED & ANDI ASIZ source: D. Ahmed & A. Asiz, int. J. Comp. Meth. And exp. Meas., Vol. 5, no. 6 (2017)
- [4] Seismic analysis of hybrid structures with and without shear walls. Mir rahman naseri¹ , balwinder singh². Source : COSMEC 2021 IOP conf. Series: earth and environmental science 889 (2021) 012045
- [5] Seismic analysis and design of a 12-storey hybrid timber structure combining lvl frames, clt rocking walls and brb and sma steel braces ricardo rubio¹ , patricio quintana gallo² , and david carradine³ .Source: WCTE 2020
- [6] Analysis of multi-story buildings with hybrid shear wall - steel bracing structural system. Aditya Kumar Tiwary
- [7] IS 875(Part1): 1987 Code Of Practice For Design Loads (Other Than Earthquake) For Buildings And Structures, Part 1 Dead Loads.
- [8] IS 875(Part2): 1987 Code Of Practice For Design Loads (Other Than Earthquake) For Buildings And Structures, Part 2 Imposed Loads.
- [9] IS 875(Part3): 2015 Code Of Practice For Design Loads (Other Than Earthquake) For Buildings And Structures, Part 3 Wind Loads.
- [10] IS 1893: 2016 Criteria For Earthquake Resistant Design Of Structures.
- [11] IS 13920: 2016 Code of Practice For Ductile Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces.
- [12] IS 800:2007 code of practice for Design of steel.
- [13] IS 456: 2000 Code of Practice For Plain and Reinforced Concert.



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