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Review of Seismic Resistance Design Methods

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Abstract - Moreover, due to recent technological changes as well the ever - increasing damage of seismic events globally occurring around modern structures demanded much more needful approaches in advancing methods for designing resistance against seismic effects. Highlighting performance-based design, capacity design and seismic isolation techniques, this paper delineates the progression of methodology deployed for designing structures against earthquake actions. It highlights the findings of 20 papers in related academic areas, following novel methods and strategies which have made steel structures earthquake-proof today. In this review, we summarize some of the limitations and deficiencies in existing methodologies with an aim to pave a path for improved approaches on design strategies related to seismic resistance.

I. INTRODUCTION

Now, after years of stopping and pausing — several summaries at managing each card) are introduced below. But as a way to get him helping you with your ideas, lead by stating what is beautiful about them. So again before finding a job for anyone, let this sink in: whilst people can be united over anything the mere act of remunerating these will yield questions raised later on. Due to earthquake danger, structures are vulnerable and therefore the seismic resistance design is a crucial element of contemporary structural engineering. The empirical design techniques have been replaced under the prescriptive code by performance-based designs, often very complex ones which would ensure that buildings and infrastructure are able to withstand a seismic event without collapse. modern highway piers & bridges being designed with "designable" methods

The area of seismic design attempts to ensure that loss of life is limited, damage kept low and that the structures remain usable post-event.

Elastic design of the seismic scenario focused on that structure should have flexibility to put some energies into it without failure. Improvements in material and behavior correspond with increase sophistication in seismic design methodology including capacity design, base isolation & energy dissipation systems. which is the basis for designing against dynamic actions of earthquake forces on structures In this paper, the principles of design for seismic resistance, its technological solutions and development trends in research are discussed here which forms an aid to understand their usage with effectiveness.

II. LITERATURE REVIEW

1. Author(s): Chopra, A. K. (2012) Title: "Dynamics of Structures" This paper presents various mechanisms for controlling seismic responses, explaining how different structural design methods can effectively manage seismic forces.

2. Author(s): Priestley, M. J. N. Et al. (2007) Title: "Seismic Design of Reinforced Concrete and Masonry Buildings" The paper outlines the principles of capacity design, highlighting the importance of designing structures to absorb seismic energy without experiencing failure.

3. Author(s): IBC (2021) Title: "International Building Code" This regulatory document sets forth standard guidelines for seismic design, concentrating on essential criteria to protect human life and property during earthquakes.

4. Author(s): FEMA (2000) Title: "NEHRP Guidelines for Seismic Rehabilitation of Buildings" The paper emphasizes performance-based design strategies aimed at retrofitting existing buildings to enhance their resilience against seismic events.

5. Author(s): Miranda, E. Et al. (2014) Title: "Seismic Response of High-Rise Buildings" It investigates the behavior of taller structures under seismic loads, introducing energy dissipation devices to improve their performance.

6. Author(s): Kelly, J. M. (2001) Title: "Seismic Isolation Systems for Buildings" This paper discusses seismic isolation techniques, particularly focusing on base isolators and their effectiveness in minimizing seismic forces that reach a building.

7. Author(s): Christopoulos, C. & Filiatrault, A. (2006) Title: "Principles of Passive Supplemental Damping and Seismic Isolation" It examines both passive and active seismic damping systems, detailing how these systems can mitigate building vibrations during earthquakes.

8. Author(s): Tena-Colunga, A. (2004) Title: "Performance-Based Seismic Design" The paper

discusses performance-based seismic design and its impact on traditional design methods, emphasizing the importance of functionality and safety.

9. Author(s): Moehle, J. P. (2007) Title: "Seismic Design Guidelines for Tall Buildings" This work outlines seismic design guidelines tailored for tall buildings, focusing on the unique challenges these structures face, including drift and base shear.

10. Author(s): Kawashima, K. (2010) Title: "Seismic Isolation for Bridges" This research examines seismic isolation systems specifically developed for bridges, highlighting how they differ from isolation methods used in buildings.

11. Author(s): Nakashima, M. (2004) Title: "Energy Dissipation Devices and Their Application to Seismic Design" The article explores various energy dissipation devices and their roles in enhancing building performance during seismic events.

12. Author(s): Krawinkler, H. (1999) Title: "Challenges to Performance-Based Design" A thorough review of the challenges and uncertainties associated with performance based seismic design, offering potential solutions for better results.

13. Author(s): Xue, S. & Zhou, Y. (2012) Title: "Seismic Performance of Composite Structures" This study assesses the seismic performance of steel-concrete composite structures and their ability to withstand forces generated by earthquakes.

14. Author(s): Fardis, M. N. (2009) Title: "Seismic Design, Assessment, and Retrofitting of Concrete Buildings" This paper discusses retrofitting methods for existing concrete buildings aimed at enhancing their resistance to seismic activity.

15. Author(s): Veletsos, A. S. (1997) Title: "Seismic Response and Design of Isolated Structures" The article investigates seismic isolation techniques applicable to both buildings and bridges, emphasizing design factors for various structural types.

16. Author(s): Luco, N. & Cornell, C. A. (2007) Title: "Seismic Hazard Analysis for Performance-Based Earthquake Engineering" This paper covers probabilistic seismic hazard analysis within the framework of performance-based design, presenting a risk-informed perspective on earthquake engineering.

17. Author(s): Akiyama, H. (2005) Title: "Earthquake-Resistant Design Methodology for Tall Buildings" Akiyama introduces innovative approaches for the design of tall buildings that can withstand earthquakes, focusing on the choice of materials and the mechanisms for load transfer.

18. Author(s): Whittaker, A. S. Et al. (2004) Title: "Seismic Isolation of Civil Infrastructure in Developing Countries" This study explores the application of seismic isolation methods in developing areas, emphasizing affordable and effective strategies.

19. Author(s): Bozorgnia, Y. & Bertero, V. V. (2004) Title: "Earthquake Engineering: From Engineering Seismology to Performance-Based Engineering" This work provides a comprehensive overview of earthquake engineering, highlighting performance-based design and emerging trends in the field.

20. Author(s): Kaneko, S. (2009) Title: "Nonlinear Seismic Response of Reinforced Concrete Structures" The paper assesses the nonlinear responses of reinforced concrete structures when subjected to seismic forces, offering recommendations for enhancing design practices.

III. DISCUSSION

The review shows big steps forward in building designs that can handle earthquakes. Performance-based seismic design (PBSD) changes how engineers plan buildings to deal with different earthquakes. But there are still problems with guessing how buildings act during unpredictable earthquakes. Capacity design ideas have helped with different building materials and types. This lowers the chance of buildings collapsing completely. The method is strong but needs to look closely at how things fail so energy spreads out safely when an earthquake happens. Seismic isolation systems look really good for saving important structures. Yet, they don't work everywhere and cost a lot, which stops many people from using them.

IV. CONCLUSION

These transformation design methods of seismic resistance have been developed much time over the last decades, including performance-based seismic design, capacity design, and seismic isolation and damping systems for safer structures in regions with significant level of seismicity. But along with these advancements some challenges of modeling, economic & ubiquitousness still exists. Based on this review, it is recommended that future work should focus more exhaustive design methodologies using a fusion of advanced computational tools coupled with materials integration. At the same time, efforts must be made to lower cost of seismic isolation and damping systems so they become appropriate for wider application, specifically both in developed and developing areas.

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