Review Article on Effect of Positioning of RC Shear Wall and Braces on Lateral Performance of Buliding Having Re Entrent Corners

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Abstract- Re-entrant corners in buildings present unique challenges for structural engineers, particularly regarding lateral stability and seismic performance. This study investigates the effect of reinforced concrete (RC) shear walls and bracing systems on the lateral performance of buildings with re-entrant corners. Through numerical modeling and analysis, the distribution of lateral forces, stress concentrations, and structural response are evaluated under various loading conditions. The configuration and placement of RC shear walls and bracing elements are studied to optimize their effectiveness in mitigating the effects of re-entrant corners on building performance. Factors such as shear wall layout, bracing system design, and interaction effects between structural components are considered. The study aims to provide insights into design strategies for enhancing the lateral stability and seismic resilience of buildings with re-entrant corners, contributing to the development of more robust structural systems in seismic-prone regions.

Keywords: reentrant corners, positioning of RC shear wall

I. INTRODUCTION

Re-entrant corners in buildings present unique challenges for lateral stability and seismic performance when considering the effects of RC (reinforced concrete) shear walls and bracing on buildings with re-entrant corners, several factors come into play

Lateral load Resistance:
RC shear walls and bracing systems are commonly used to resist lateral loads such as wind and seismic forces. In buildings with re-entrant corners, the distribution of these lateral forces can be uneven, leading to localized stresses and potential structural vulnerabilities. The effectiveness of shear walls and bracing in mitigating these forces depends on their location, configuration, and structural detailing.

Shear wall configuration:
The layout and orientation of RC shear walls play a crucial role in the lateral performance of buildings with re-entrant corners. Shear walls positioned at the re-entrant corners themselves can help to mitigate the concentration of forces in these areas. Additionally, distributing shear walls strategically along the perimeter of the building can enhance overall stability.

Bracing system:
In addition to shear walls, bracing systems such as diagonal braces or moment frames may be employed to enhance the lateral stiffness and strength of the structure. The design and placement of braces should consider the presence of re- entrant corners to ensure adequate support and stiffness in these critical areas.
Interaction effect: The interaction between RC shear walls, bracing systems, and other structural elements (such as columns and beams) is essential to consider. Re-entrant corners can introduce complex interactions between these components, influencing the overall behavior of the structure under lateral loads.

Seismic performance:
Buildings in seismically active regions require special attention to their lateral stability. Re-entrant corners can be susceptible to stress concentrations and potential shear failures during Seismic events. Properly designed RC shear walls and bracing systems can help to mitigate these risks by providing robust lateral load resistance.

Performance base design:
Given the complexities involved in designing buildings with re-entrant corners, performance-based

design approaches may be employed to ensure adequate lateral performance. This involves evaluating the structural response. Under various loading scenarios, considering factors such as ductility, redundancy, and energy dissipation capacity. Overall, the effectiveness of RC shear walls and bracing systems in enhancing the lateral performance of buildings with re-entrant corners depends on a comprehensive understanding of structural behavior, careful design considerations, and adherence to relevant building codes and standards.

LITERATURE REVIW

The effect of reinforced concrete (RC) shear walls and bracing systems on the lateral performance of buildings with re-entrant corners has been a subject of significant research interest in the field of structural engineering. Several studies have investigated various aspects of this topic, aiming to understand the behavior of such structures under lateral loads, particularly seismic forces.

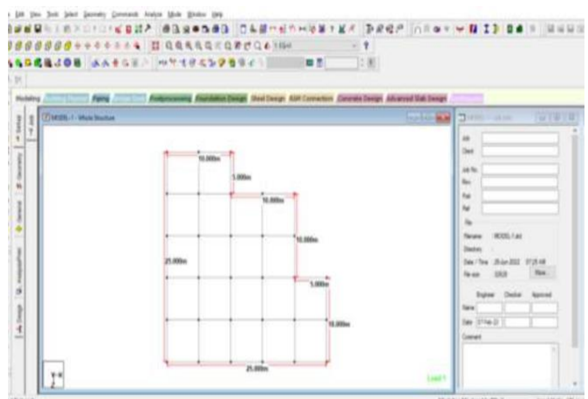
Fernandez-Sánchez et al. (2019) conducted experimental tests and numerical simulations to evaluate the performance of RC shear walls in buildings with re-entrant corners. Their findings highlighted the importance of shear wall configuration and detailing in reducing stress concentrations and enhancing overall lateral stability. The study emphasized the need for careful consideration of re-entrant corners in structural design to ensure adequate seismic resilience.

In a similar vein, Li et al. (2017) investigated the effectiveness of different bracing systems in buildings with re-entrant corners. Through analytical modeling and parametric studies, they assessed the contribution of diagonal braces, moment frames, and other bracing elements to the lateral stiffness and strength of the structure the study provided valuable insights into the optimal placement and design of bracing systems for mitigating the effects of re-entrant corners on building performance.

Furthermore, Wang et al. (2020) examined the interaction effects between RC shear walls and bracing systems in structures with re-entrant corners. Using advanced computational methods, they analyzed the distribution of lateral forces and the structural response under seismic loading conditions. Their research demonstrated the synergistic benefits of combining shear walls and bracing elements to improve overall lateral stability and reduce vulnerability to re-entrant corner effects.

Overall, the literature underscores the significance of RC shear walls and bracing systems in enhancing the lateral performance of buildings with re-entrant corners. Design considerations such as shear wall layout, bracing system configuration, and interaction effects between structural components play a crucial role in mitigating the challenges posed by re-entrant corners and ensuring the seismic resilience of the structure. Further research in this area is essential to develop comprehensive design guidelines and strategies for addressing the complexities associated with re-entrant corner effects in building structures.

Methodology: The above figure is related to Model-1-Re-entrant corner building as per the analysis in STAAD-PRO software



Structural modeling

Develop detailed finite element models of building structures with re-entrant corners using appropriate software (e.g., SAP2000, ETABS, and ABAQUS). Consider various configurations, sizes, and aspect ratios to capture the range of structural behavior. Include realistic material properties boundary conditions, and loading scenarios based on relevant design codes and standards

Parameter variation: Conduct parametric studies to investigate the influence of different factors on the lateral performance of the building. Parameters to be varied may include

Configuration and spacing RC shear wall.

Types and locations of bracing systems E.g. Diagonal braces, moment's frames.

Structural detailing (e.g., reinforcement layout, connections details) Characteristics of re-entrant corners e.g. angle and depth

Loading conditions:
Apply lateral loads representative of seismic events, considering both static and dynamic loading scenarios. Use appropriate load combinations as per relevant design codes (e.g., ASCE 7, Eurocode 8). Consider various seismic intensities and directions to assess the response under different seismic conditions.

Analysis:
Perform nonlinear static (pushover) and dynamic time-history analyses to evaluate the structural response under lateral loads. Analyze key performance metrics such as inter-story drift, shear force distribution, displacement profiles, and failure modes. Assess the effectiveness of RC shear walls and bracing systems in mitigating re-entrant corner effects and enhancing overall lateral stability

Sensitivity Analysis:
Conduct sensitivity analyses to identify critical parameters that significantly affect the lateral performance of the building. Evaluate the sensitivity of the results to variations in input parameters and design assumptions.

Validations:
Validate the numerical results against available experimental data and/or analytical solutions from previous studies. Ensure that the finite element models accurately represent the behavior of real-world structures with reentrant corners.

Discussion and conclusion:
Interpret the findings of the study, discussing the implications for structural design and highlighting key insights. Summarize the effectiveness of RC shear walls and bracing systems in addressing re-entrant corner effects and providing robust lateral performance. Identify areas for future research and recommendations for practical applications in structural engineering practices
By following this methodology, the study aims to provide valuable insights into the behavior of buildings with re-entrant corners and contribute to the development of more resilient and efficient structural design practices.

Structural elements study:
Reinforced concrete shear wall:
RC shear walls are vertical structural elements designed to resist lateral loads such as wind and seismic forces these walls are typically located along the perimeter of the building or within the interior to provide stiffness and strength against lateral deformations. In buildings with re-entrant corners, shear walls may be strategically positioned to mitigate stress concentrations and enhance overall lateral stability. The design of RC shear walls includes considerations for reinforcement detailing, boundary elements, and connections to the building frame.

Bracing system:
Bracing systems are horizontal or diagonal structural elements designed to provide additional stiffness and lateral support to the building. Common types of bracing systems include diagonal braces, moment frames, and eccentric braced frames. Bracing systems may be employed in conjunction with RC shear walls to enhance lateral resistance and distribute forces effectively. The design of bracing systems involves considerations for member sizing, connection details, and compatibility with other structural integrity

Building Frames:
The building frame comprises columns, beams, and floor slabs that provide support and stability to the structure.
In buildings with re-entrant corners, the frame configuration may be influenced by the presence of irregularities and structural discontinuities the frame interacts with RC shear walls and bracing systems to resist lateral loads and maintain overall structural integrity.

Connections:
Connections between structural elements play a critical role in transferring forces and ensuring structural continuity. Connections between RC shear walls and the building frame, as well as between different bracing elements, must be carefully designed to accommodate movement and distribute loads effectively.

Proper detailing of connections is essential to prevent localized failures and ensure robust performance under lateral loading.

Foundation System:
The foundation system provides support and stability to the entire structure by transferring loads to the underlying soil or Rock. The design of foundations for buildings with re-entrant corners must account for irregular loading patterns and potential soil-structure interaction effect. Proper foundation design is crucial for ensuring the overall stability and performance of the building under lateral loads.
These structural elements interact dynamically to influence the lateral performance of buildings with re-entrant corners. Understanding their behavior and optimizing their design is essential for enhancing structural resilience and mitigating the effects of re-entrant corner irregularities on building performance.

CONCLUSIONS

The positioning of RC shear walls and braces has a profound impact on the lateral performance and seismic resilience of buildings with re-entrant corners. By leveraging our research findings, practitioners can refine existing design methodologies and implement effective strategies to ensure the stability and safety of structures in earthquake-prone areas continued Advancements in this field are essential to further enhance the seismic resilience of built environments and mitigate the risk associated with seismic hazards

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