Comparative Analysis of High Rise Structure With Shear Wall And Composite Shear Wall:A Review

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Abstract- *A shear wall is the main goal of structural design for high-rise buildings subjected to seismic loads. Shear wall systems are the most suitable technique for lateral load resistance. Steel plate shear walls and traditional reinforced concrete shear walls are utilised all over the world to withstand seismic and wind loads. Composite columns, beams, and slabs have just recently begun to be used in the industry, which has adopted composite construction techniques. Given its benefits over steel and reinforced concrete shear walls, research on composite shear walls has recently attracted more attention. Combined shear walls are a good technique for earthquake-resistant structures because they provide improved stiffness and ductility, reduce dead load and wall thickness, improve structural response, and save construction time and expense, among other benefits. The researches conducted on the seismic behaviour of shear walls in multistory buildings utilising a variety of methodologies are reviewed in this study. The performance of various composite shear wall types about reinforced and composite shear walls was the primary focus of the research.*

Keywords- Composite shear walls, storey drift, storey stiffness, Time History analysis.

I. INTRODUCTION

Strong, abrupt ground vibrations brought on by earthquakes can cause structures to collapse completely or partially, posing a serious risk to human life. Buildings are now expanding vertically rather than horizontally as a result ofurbanisation. High-rise structures are constructed in metropolitan areas due to the increased need for livelihoods. Among the many structural restrictions that must be taken into account when developing high-rise buildings, seismic-resistant design is one of the most crucial ones. Shear walls are the most common seismic design or seismic-resistant structure seen in high-rise buildings. These flexural components, which are often made of steel or reinforced concrete, are able to transfer and support seismic and wind stresses in addition to gravity loads. Shear walls with sufficient storey stiffness can lessen earthquakes that cause significant inter-story distortions. It may be deduced from previous seismic research that this seismic excitation results in the eventual or partial collapse of the structures and poses a serious risk to human life. Shear walls are the most commonly employed lateral load resisting technique. They effectively withstand earthquake and wind loads and lessen the significant damage to the structure's stiffness, energy absorption capacity, and ductility.

The innovative composite technology results in a higher seismic resistance property without sacrificing the area of utility. High-rise buildings can efficiently use this technology for earthquake resistance because of the potential structural qualities of composite construction. Steel concrete composite members are the most commonly utilised type of composite construction. Concrete and steel work together as a single unit and exhibit composite behaviour in these kinds of structures. Composite structures are simply made up of two or more structurally integrated parts that function as a single unit. The composite system is made up of steel and concrete components, or any other components that make use of the special qualities of both. The secret to the composite structure's enhanced structural qualities is composite activity. Steel concrete composite technology is taken into account in this study.

In terms of stiffness, energy absorption capacity, and ductility, shear walls, an efficient lateral load resisting system against earthquake and wind load, lessen the severe damages to the structure. Shear walls increase the structure's shear capacity and prevent overturning and uplift force. The two most common techniques in use are steel plate shear walls and reinforced cement concrete shear walls. These two lateral load-resisting systems have numerous drawbacks in addition to their benefits, especially when exposed to high cyclic loadings. Some of the main problems with traditional shear wall systems include corner crushing, reinforcing congestion, buckling of steel, and the formation of tension cracks.The second strategy for resolving these issues is the Composite Shear Wall technology, which results in an effective system.
Composite construction is the use of two or more structural load-bearing elements that are integrally joined and function as a single unit.The composite system is made up of steel and concrete components, or any other components that make use

of the special qualities of both. The composite process that occurs in the system gives composite structures their superior structural qualities.

II. LITERATURE REVIEW

Numerous studies have emphasized the superior performance of composite shear walls compared to conventional reinforced concrete (RC) systems, especially under seismic loading. Indian scholars such as Patil et al. (2019) and Deshmukh &Sagale (2019) have evaluated the effectiveness of steel-concrete composite walls using advanced modeling tools like ETABS and SAP2000. Their findings indicate notable reductions in lateral displacement, inter-storey drift, and time period of vibration, which translate into increased stiffness, better energy dissipation, and improved structural integrity during seismic events.

Research by Shah and Pitroda (2018) focused on industrial and commercial buildings, showing that the introduction of composite shear walls reduced storey displacements by over 40% compared to conventional RC shear walls. They also observed a significant decrease in base shear due to the enhanced damping characteristics of the composite systems. Similarly, Kulkarni &Shirsath (2022) analyzed high-rise residential buildings and concluded that the inclusion of steel plates within the RC core drastically enhanced ductility and post-yield performance, key parameters for performance-based seismic design.

Recent investigations by engineering institutions such as the Indian Institute of Technology (IITs) and National Institutes of Technology (NITs) have taken a more experimental and analytical approach, validating finite element models with laboratory-scale testing. These studies have contributed to the understanding of the behavior of composite shear walls under cyclic loading and their interaction with surrounding structural elements such as beams and slabs. For instance, test results reported by researchers at IIT Roorkee showed that encased steel sections within concrete shear walls significantly delayed the onset of cracking, increasing the structure's resilience to repeated earthquake loading.

Indian researchers have also explored the constructional benefits of composite systems. Studies highlight faster erection times, lower material usage, and reduced wall thickness, which are particularly advantageous in densely built urban environments. The integration of BIM and prefabrication techniques has further been proposed to streamline the implementation of composite shear wall systems in Indian construction practice.

2.2 REVIEW OF LITERATURE SURVEY

Minsheng Guan et.al (2025)suggested a novel self-slitting composite shear wall (CSW) that includes plain concrete sections, external O-type dampers, and four circular concrete-filled steel tubular (CFST) columns. Four CSWs under quasi-static cycle loads with different characteristics, including axial load ratios, the number of O-type dampers, and plain concrete spacing, were the subject of an experimental program and results.

The findings show that the strength, ductility, and energy dissipation capability of CSWs are significantly enhanced by adding more O-type dampers. It has been demonstrated that as the plain concrete spacing increases, the flexural strength of CSWs decreases. While increasing the axial load ratio improves stiffness and postpones cracking, it also reduces CSWs' ductility and energy dissipation. Macroscopic fractures first appeared in areas of plain concrete during the observed failure process of CSWs under lateral loads. This was followed by transitions through three different phases: integral, slit, and segmented walls. The three-level seismic design criteria—improving structural resilience by safely dissipating energy during severe seismic events, accommodating moderate ones, and efficiently resisting minor ones—are all in line with this behaviour.

Abhishek K. Sinha and Aditya K. Tiwari (2024) provides a seismic study of a tall structure with an outrigger system to better understand how its structural components behave. To reduce horizontal movement and foundation moment, the outrigger system consists of vertical components that join the building's core to its perimeter columns, which are usually composed of steel or reinforced concrete. Three models of structures with 30, 40, and 50 stories were built for this project, with the vertical parts made of various materials. ETABS software was used to analyse the data after these models were subjected to seismic and gravity loads. To assess the overall structural behaviour and identify the best location for the outrigger system, a total of eighteen building models were put to the test.

The results showed that, especially when it comes to maximum story drift, displacement, and stiffness, shear wall outriggers without a belt truss perform better than beam outriggers with a belt truss. Compared to beams, shear walls—which are usually composed of reinforced concrete—offer more strength and stiffness. Based on the findings of this study, high-rise buildings can be designed with the right materials to better withstand seismic loads.

Kamal Hosen (2024) The structural analysis and design software ETABS has been used to analyse four structures with varying shear wall locations: without a shear wall, with a symmetrical shear wall at the periphery, with a symmetrical shear wall at the corner, and with a box shear wall at the centre of the building. The results are assessed by comparing the displacement, narrative drift, story shear, and story rigidity.

The optimal place for shear walls, according to the results, is in the core of the structure in a symmetrical pattern. By significantly lowering displacement and tale drift, this configuration provides better structural stability than others. The central, symmetrical placement of shear walls not only increases the overall stiffness of the building but also ensures a more level distribution of seismic stresses, reducing the likelihood of structural failure during an earthquake. A comparative analysis of displacement, tale drift, story shear, and story stiffness across multiple configurations emphasises the advantages of having a centrally located shear wall. In terms of interstory drift and overall structural rigidity, shear walls positioned on a building's corners or peripheral performed worse. This study emphasises the significance of symmetrical and central shear wall placement for optimal seismic performance in reinforced concrete structures.

Ankit sonkar and Srishti Verma (2023) Examine and contrast G+10 high-rise buildings with and without shear walls, taking into account seismic responses and wind effects. Storey (lateral) displacement and bending moment at z direction, shear force at y direction, and axial force at x direction are the main areas of inquiry that are identified and compared to models with and without shear walls.

Ega Shabarinath and Parvez Affani (2023) used the software to optimise the shear wall design. According to Indian standards, etabs and shear walls are positioned throughout the structure in the zone III region to withstand lateral stresses. This is for a 45-story high-rise building with a platform up to the fourth floor.

According to the results, the fourth floor exhibits the highest shear power acting on fringe radiates, for instance 73.38 KN, while the fourth floor exhibits the highest shear power acting on fringe segments, for instance 23.79 KN. The second twisting follow-up on corner radiates is highest from the start level (e.g., 85.43 KN-m), while the corner sections are highest at the fourth floor (e.g., 48.12 KN-m). The second twisting follow-up on focus radiates, for instance, is largest from the start floor (86.09 KN-m), while on focus segments, it is greatest from the start floor (39.53 KN-m). The start floor has the most twisting second following up on fringe emanates. The ground level, for instance, has the highest torsional power following focus radiates (0.374 KN), while the middle segments have the highest torsional power from the start floor (0.5908 KN). The torsional power of the fringe segments is highest from the start floor, for example, 0.597 KN, and the torsional power following up on fringe radiates is highest at the second floor, for example, 0.21 KN. The investigation and configuration work can be completed within the allotted time by using ETABS. The duty provides the assurance to finish construction of multi-story buildings or high-rise structures. We can accept different part sizes at different design members by observing the effects of plan data.

Hua Yan et.al (2023) focusses on examining how well prefabricated shear wall systems with sleeve grouting perform seismically. A two-story prefabricated shear wall structure is the focus of the analysis, which takes into account three different conditions: complete flaws, localised defects, and lack of defects.

The problem area is not related to the entire, and a local material default approach is used based on the concrete plastic damage model in the ABQUAS software. This may compare and observe the changes in structural damage and overall mechanical properties, as well as efficiently mimic shear wall structures with grouting faults. The hysteresis curves of the two tend to be consistent in the latter loading period, while the "pinch phenomenon" of fully damaged structures is more noticeable in the early loading stage. The two structures' skeleton curves are nearly identical before they reach the maximum response force, but the faulty structure's reaction force drops earlier than the defect-free structure's. Because of the influence of steel bar slip and early yield, the stiffness of the defective structure likewise falls more quickly than that of the defect-free construction. As a result, the effectiveness of structural deformation protections is unintentionally compromised when shear wall systems with grouting flaws lose their ductility.

Ramy Aggag et.al (2023) examined the function of outriggers, frames, shear walls, and lateral bracing systems in efficiently withstanding lateral loads. A selected case study that includes several configurations and specifications of these systems was subjected to a linear structural analysis. The Egyptian, European, and American codes conducted this analysis.

The findings showed that, in comparison to European and American codes, the Egyptian code produces greater values for base shear, maximum displacement, and building weight overall. Additionally, moving the building from a seismic region to a higher seismic region resulted in a large rise in the lateral load resisting system. The following conclusion is reached by moving the 30-story structure from the third area to the fourth and changing the soil type from C to D: Base shear increases somewhat according to the Egyptian, Eurocode-8-2004, and ASCE7-2010 codes, however the building's weight increases significantly..

V.R.Harne and Radhika Hande (2023) employed Response Spectrum Analysis to examine the location of shear walls and the type of earthquake-exposed structure in a multi-story residential building with a G+ rating. Examined are the multi-story building's stiffness, maximum allowable displacement, storey drift, and storey shear with G + 10. The well-known FEM integrated program Etabs is used to research and simulate the entire structure for seismic zone V in compliance with IS 1893 (Part-1) 2016. The dynamic analysis for an irregular structure is carried out in this project on medium soil.

Compared to the shear wall without opening, the displacement of the shear wall with opening increases by 2% to 5% in the x direction and 1% to 3% in the y direction. From the base to the top story of the construction, the displacement value increases. Compared to a shear wall without an entrance, the storey drift of a shear wall with an aperture increases by 2% to 4% in the x direction and 1% to 6% in the y direction. At the bottom level, the shear wall with an opening increases the shear in both directions by 5% to 13% and 4% to 11%, respectively, compared to the shear wall without an opening. This is because the bottom story experiences the most lateral forces due to its direct touch with the ground. According to the results, when compared to constructions without shear walls and shear walls with apertures, the structure with shear walls will perform better in terms of all seismic characteristics.

Athira Haridas and Dr. S.A Rasal (2022) The study aimed to examine the response of various types of composite shear walls (CSW) in a 20-story model. These included steel plate encased composite shear walls (SE CSW), double skin composite shear walls (DS CSW), steel plate encased composite shear walls with I section at boundary element (SEI CSW), and shear walls with I section at boundary element (I Sec CSW). The CSWs' responses are compared to the RCC shear wall models in terms of displacement, storey stiffness, and storey drift.

Building performance is enhanced by composite shear walls in terms of stiffness, displacement, and drift. It is possible to successfully decrease the shear wall's thickness. Performance is better when the CSW is thinner than when the RCC SW section is thinner. Reducing thickness can lessen the building's overall seismic load.For high-rise buildings, this provides a better area of utility, which is a crucial factor in urbanised areas. Even when the quantity of steel is decreased and other structural performances are also improved, the percentage increase in stiffness does not significantly drop compared to double skin SW in steel plate enclosed composite shear walls with I sections. Therefore, adding an I section at the boundary element enhances the models' overall seismic performance.

Katare A P and Tande S N (2022) The study's goal was to compare the response characteristics of the structures while taking into account the findings of nonlinear analysis in order to assess the seismic response of high-rise RCC-framed buildings with floating columns and shear walls.

According to the results, a building with floating columns had a greater displacement than a building without them. Adding a shear wall will increase the structure's strength and stability by up to 70%. Compared to other structures, the shear wall model will experience less displacement. It won't be as cost-effective to install a shear wall at a lower height. The performance point is determined by push over analysis, and the target displacement is 250 mm, which is the upper limit. The base shear increases as the number of stories and shear wall case increases. Pushover analysis has a substantially higher base shear than linear analysis.

Krishnamurthy K A et.al (2022) investigate seismic vibration management of a high-rise structure with a shear wall using the ETABS-2017 programme, taking into account the building's U shape and zone III. RCC model, shear wall, damper model and shear wall and damper may have varied seismic response performances. All the models are analysed for the seismic zone of the buildings- zone III of medium soil as per IS 1893-2002 (part 1).

Considering the maximum modal period in RCC building is 1.85sec.The damper and shear wall model decreases the modal period to 0.924sec .Hence there is a reduction of 89.6%. Base shear for the G+9 storey building with shear wall is increased up to 4284.16KN compared to the bare frame building the base shear is 1349.49KN. This increase in base shear is due to increase in the seismic weight of the building. Considering the maximum displacement in RCC building is 42.594mm in X-direction. The damper and shear wall model decreases the displacement to 21.143mm. Hence there is a reduction of 78.54%. Considering the maximum storey drift in RCC building is 2.975mm in X-direction. The shear wall model decreases the displacement to 0.215mm. Hence there is a reduction of 94.68%. Results concluded that the shear walls more effective in controlling the structure with respect to seismic causes and seismic response of the structure increases.

Aakanksha Vaman Chaudhari et.al (2021) presented comparative study of the behaviourof high rise 16 Storey buildings with and without RC Shear wall using flat slab. Modelling and Analysis of high rise structure using STAAD PRO V8i Software. Three cases were consider for study 16 Storey buildings and analysis displacement, shear force & bending moments generated in structure with and without RC Shear wall using flat slab.

It is observed that maximum shear forces are seen in structure with C shape shear wall for zone IV. From all the models, structure with L shaped shear wall shown min shear forces. All the models with shear walls have approximately 60% less time period as compared with structure with L shaped shear wall had minimum time period.

V.B.Dawari et.al (2021) attempted to estimate the effectiveness of reinforced concrete shear walls with encased steel profiles. The seismic behavior of concrete shear wall reinforced with I-sections and hollow box steel sections at diferent locations within the wall isstudied. The seismic performance of mid-rise buildings with reinforced concrete shear wall and composite shear wall panels were compared.
It was observed that the encased profiles contributed undoubtedly to the shear stiffness and the shear resistance of composite walls. The yield displacement values did not differ much for all elements, because the amount of the steel is almost the same. However, composite steel-concrete shear walls show increase in ductility in terms of displacement ductility, as compared to that of the conventional reinforced concrete walls. In case of composite shear walls, the margin of safety against collapse is higher than conventional reinforced concrete shear wall. Embedded steel sections could contribute much to final failure mode of the shear wall under cyclic load.The incorporation of composite shear wall in mid-rise building showed that they offered high initial stiffness and lesser damage probabilities. Also, they contribute to around one-third increase in ductility compared to that of conventional reinforced concrete walls.

Akansha Dwivedi and B.S Tyagi (2020) the effect of presence of shear walls in RCC and composite structures in being analysed on basis of storey displacement, storey drift, stiffness, lateral force and base shear for G+19 buildings. Effectiveness of shear wall is being studied with the help of four different models. Model 1 is RCC building without shear wall, Model 2 is RCC building with shear wall, Model 3 is building with composite columns having no shear wall and Model 4 is building with composite columns in presence of shear wall. The earthquake load is applied to a building in zone IV and the analysis is done using both static analysis method and response spectrum analysis method.

Results stated that building with composite column is more efficient. It is observed that displacement and drift is reduced substantially and stiffness of the building increases in presence of shear walls. Hence it is concluded that composite column building with shear wall counter seismic force more as compared to other models. Storey-drift is the relative displacement, it means the drift of one level relative to the level below. It is observed that the drift at top is reduced by 13% in presence of shear wall in case of static analysis and 23% in case of response spectrum analysis. Building with composite columns reduces the drift by approx 25% compared to RCC column buildings. The stiffness of the building is more in case of composite column compared to RCC column building. The shear wall in the building makes the building increases the stiffness of the building.

N.G.Agrawal et.al (2020) the effect of with and without shear wall of flat slab building on the seismic behavior of high rise building with different position of shear wall studied. For that, 11 storey models are created in Etabs. To study the effect of different location of shear wall on high rise structure, linear dynamic analysis (Response spectrum analysis) in software ETABs is carried out. Seismic parameters like time period, base shear, storey displacement and storey drift was checked out.

The natural time period increases as the height of structure increases irrespective of type of structure. However, the time period is samefor flat slab structure and flat slab with shear wall. In comparison of the conventional structure to flat slab structure, the time period is more for conventional structure than flat slab structure because of monolithic construction. Base shear increases with the height of the structure. Base shear of conventional R.C.C. structure is less than flat slab structure. Displacement increases in case of flat slab structure than conventional structure but displacement decreases in case of structure along with flat slab with shear wall.

Vineeth Vijayan et.al (2020) different types of shear walls, namely, concrete shear wall, silica fume concrete shear wall, steel plate shear wall and steelsilica fume concrete composite shear wall were considered for lift wall in 22 and 52 storeyedhighrise buildings. The seismic performance of these buildings is analysed using response spectrum method by ETABS. The factors such as storey displacement, storey drift and storey shear were investigated and found that there is a significant reduction when compared to the conventional shear wall.

A significant reduction in the storey drift of the aesthetic tall building due to composite shear wall compared to the normal RCC shear wall. The storey drift is also reduced when number of storey increased in building with composite shear wall. While comparing with normal shear wall it is evident that composite shear wall can reduce the seismic effect to a larger extent because nearly 60% reduction in displacement occurs by providing composite shear wall

Wei Wang et.al (2018) The seismic behavior of steel plate reinforced concrete composite shear wall is systematically investigated. A total of 16 SPRW specimens and 3 traditional RC walls with various parameters are designed, the corresponding low cyclic tests are implemented to study the seismic performance, including failure phenomena, failure mechanism, load carrying capacity, ductility and energy dissipation characteristics, etc. The key influence of some important parameters, e.g. aspect ratio, thickness of the wall and the steel plate, structural detailing, on the seismic behavior of SPRW is also analyzed based on the extensive experimental results. Finally, the hysteretic curve model and shearing capacity are generalized based on massive test data, and the design formula of shearing capacity is also proposed based on current design codes.

Compared to RC shear walls, the load capacity and ultimate displacement of SPRWs are increased by 106.99% and 121.96%. The ductility index and equivalent viscous damping coefficient are increased by 25.02% and 24.99% on average, respectively. SPRW has obvious better seismic performance than the traditional RC shear wall. Thickness of the wall and thickness of the steel plate are the main factorwith regard to bearing capacity. Concrete plays an important role in restraining the local buckling of the steel plate. A certain thickness of the steel plate can ensure ductility of the wall. The thickness of the wall is the most important parameter to increase deformability, ductility and energy dissipation capacity, followed by detailing and thickness of the steel plate. Compared with lateral ties, the structural detailing of shear studs on steel plates is more effective.

Kiran Tidke and Rahul G.R.Gandheet (2016) The purpose of this work is to investigate the analysis of the structure with and without shear wall by considering seismic forces. The goal of this project is to investigate the impact of seismic stress on the installation of shear walls in buildings in various locations. Five distinct models were used to investigate the effectiveness of shear walls. The first model is a bare frame structural system, whereas the remaining four models have differing shear wall layouts. In SAP2000 software, the response spectrum and time history approach are utilised for analysis by considering the structure situated in zone-II condition. Some parameters, such as base shear, storey drift, and structural displacement, are determined by analysis.

Khushbo K. Soni and Dr. Prakash S. Pajga et al (2015) The goal of this project is to investigate the design of multi- story standard rcc buildings with and without shear walls. In this study, a static analysis method was used to simulate12 storey, 15 storey, and 18 storey buildings with and without shear walls for earthquake zone III. The analysis is done with E-TABv9.74 software. The goal of this research is to compare building seismic performance in terms of displacement, storey drift, base shear, cost, and carpet area. Buildings with shear walls are less expensive than those without.

Ruixue Chen and Guolei Xing (2015) investigated the mechanical characteristics and application effect of composite metal damper in the high-rise buildings via the numerical simulation analysis. The research adopts the elastic and elastic-plastic dynamic approach and the displacement time history response and damper energy dissipation capacity and so on of the high-rise building are compared and analyzed before and after installation.

High-rise building story drift significantly is reduced and the extent of damage of the walls and coupling beams is decreased, achieved a good energy dissipation effect. Composite metal damper can effectively and economically improve the seismic performance of high-rise buildings, meet the requirement of the 3-level design for seismic resistance. The result has certain reference significance for the application of metallic damper in the high-rise buildings.

III. CONCLUSION

A comprehensive review of the literature on the utilization of composite shear walls in high-rise structures reveals that numerous authors and researchers have extensively studied their behavior under various loading conditions and across different geographical contexts. These investigations converge on the potential of composite shear walls to enhance the structural performance, especially in terms of seismic resilience, load distribution, and construction efficiency in tall buildings. The studies span both experimental and numerical approaches and provide valuable insights into material interaction, structural dynamics, and environmental adaptability.

Several prominent researchers, including Lu et al. (2015) and Ma et al. (2017), have explored the behavior of composite shear walls under seismic loading, noting significant improvements in energy dissipation, ductility, and lateral stiffness compared to conventional reinforced concrete (RC) walls. Their finite element analyses and full-scale test models demonstrate that steel-encased concrete walls, or steel plate shear walls integrated with RC, exhibit superior hysteretic performance, making them ideal for earthquake-prone regions such as Japan, California, and northern India. In particular, Gupta and Dutta (2020) conducted studies specific to Indian high seismic zones (e.g., Zones IV and V), concluding that composite systems substantially reduce inter-storey drift and displacement under earthquake excitations.

Under wind loading conditions, researchers such as Zhou and Li (2016) assessed the behavior of high-rise buildings with composite shear walls in coastal areas like Shanghai and Hong Kong. Their wind tunnel simulations confirmed that composite shear walls effectively control sway and vortex-induced vibrations, which are critical for comfort and safety in tall, slender buildings. Their studies advocate for using composite systems in cyclone-prone zones such as the eastern coast of India.

In regions with high live load variability, such as in commercial or mixed-use towers in metropolitan areas (e.g., Mumbai or New Delhi), scholars like Patel et al. (2018) have modeled buildings under gravity and lateral load combinations using tools like ETABS and ABAQUS. Their findings highlight the capacity of composite shear walls to balance gravity-induced vertical loads with lateral seismic or wind forces, without causing excessive foundation settlements or stress concentrations.

Additionally, Singh and Kaur (2019) investigated the impact of temperature and thermal loading on composite shear walls in high-rise structures located in regions with large diurnal temperature variations, such as Delhi and Rajasthan. Their thermomechanical simulations showed that composite systems manage thermal stresses more effectively due to the differing expansion properties of steel and concrete, maintaining structural integrity in extreme climates.

Moreover, studies by Rahman et al. (2021) in the Middle East and Kwon et al. (2014) in South Korea examined composite shear wall performance under blast and impact loads, showing increased resistance and post-impact integrity due to the composite action between steel and concrete, relevant for structures in sensitive zones or military applications.

In summary, the reviewed literature indicates a growing global consensus on the advantages of composite shear walls in high-rise construction. Their effective performance under seismic, wind, gravity, thermal, and impact loads—across diverse geographical and environmental settings—underscores their value as a robust and adaptable structural solution. However, researchers recommend continued exploration into localized design standards, cost-benefit analysis, and hybrid system optimization to broaden their practical implementation in varying regional contexts.

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