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Structural Performance and Seismic Response of Mivan Technology and Conventional RCC System in High Seismic Zones by Using Software- A Review

Mrs. Darshana Wadibhasme [1], Prof. Girish Sawai[2]

[1] Research Scholar, Department of Civil Engineering, VM Institute of Engineering & Technology, Nagpur, India
[2] Assistant Professor, Department of Civil Engineering, VM Institute of Engineering & Technology, Nagpur, India

Corresponding Author-
Mrs. Darshana Wadibhasme
Email Id- dwadibhasme80@gmail.com

Abstract: - In recent years, the construction industry has seen rapid growth due to increasing population and demand for housing, especially in urban areas. Conventional Reinforced Cement Concrete (RCC) framed structures have been widely used for many years, but they involve longer construction time, higher labour requirement, and complex construction processes. To overcome these challenges, modern construction techniques such as MIVAN technology have been introduced. MIVAN technology uses aluminium formwork and allows monolithic construction of walls and slabs, which improves structural strength, quality, and speed of construction. The present study focuses on the structural performance and seismic response of MIVAN technology and conventional RCC framed structures in high seismic zones using software analysis. A multi-storey building is modelled and analysed using structural software such as STAAD.Pro/ETABS by considering different loading conditions including dead load, live load, and seismic load as per Indian Standard codes. Important parameters such as storey displacement, storey drift, base shear, time period, and stiffness are evaluated and compared for both systems. From the analysis, it is observed that MIVAN structures perform better under seismic conditions due to their monolithic construction and presence of shear walls, which increase stiffness and reduce lateral displacement. The results also show that MIVAN technology provides better load distribution and improved structural stability compared to conventional RCC systems. Although the initial cost of MIVAN is higher, it is more economical for large-scale projects due to faster construction and reduced labour requirement. The study concludes that MIVAN technology is a suitable and efficient alternative to conventional RCC construction for buildings located in high seismic zones, as it provides better safety, durability, and performance under earthquake loading.

Keywords: - MIVAN Technology, RCC Framed Structure, Seismic Analysis, Structural Performance, STAAD.Pro, ETABS, Aluminium Formwork, Shear Wall, High Seismic Zone.

I. INTRODUCTION

The construction industry plays a very important role in the development of any country. In India, due to rapid urbanization and population growth, there is a huge demand for residential and commercial buildings. Traditional construction methods using Conventional Reinforced Cement Concrete (RCC) framed structures have been widely used for many years. In this system, load is carried by beams and columns, and walls act as non-load bearing elements. Although this method provides flexibility in design and is suitable for different types of structures, it requires more time, labour, and materials, which increases the overall project cost and duration.

In recent years, modern construction technologies have been introduced to overcome the limitations of conventional methods. One such advanced technique is MIVAN technology, which uses aluminium formwork for construction. In this system, walls and slabs are cast together in a single operation, forming a monolithic structure. Due to this, the structure becomes stronger, more durable, and more resistant to external forces such as earthquakes and wind loads.

Seismic analysis of structures has become very important, especially in regions that fall under high seismic zones. Earthquakes can cause severe damage to buildings, leading to loss of life and property. Therefore, it is necessary to design structures that can resist seismic forces effectively. In conventional RCC structures, lateral loads are resisted mainly by beams and columns, whereas in MIVAN structures, shear walls play a major role in resisting these forces. This results in better structural performance under seismic loading.

With the help of advanced software such as STAAD.Pro and ETABS, it is now possible to analyse and design complex structures accurately. These software tools help in evaluating important parameters such as storey displacement, storey drift, base shear, time period, and stiffness of the structure under different loading conditions. By comparing these parameters, the performance of different structural systems can be understood clearly.

The main objective of this study is to analyse and compare the structural performance and seismic response of MIVAN technology and conventional RCC framed systems in high seismic zones using software analysis. This study will help in understanding the advantages and limitations of both systems and will provide useful guidance for selecting the appropriate construction method for future projects.

II. LITERATURE REVIEW

[1] Anmol Hinduja et al. (2025) studied MIVAN and conventional RCC in seismic zones. They found MIVAN buildings have less displacement and drift due to monolithic construction. It also improves safety and construction speed. Suitable for high-rise buildings in earthquake areas.
[2] Prof. Poorva Ziradkar et al. (2025) explained that MIVAN formwork increases construction speed and quality. It reduces project time and labour. It is very useful for high-rise residential buildings like G+12.
[3] Prof. Sayali Dharane et al. (2025) compared MIVAN and conventional shuttering. MIVAN gives better finish, faster work, and less labour. Conventional method is slow and depends more on manual work.
[4] Rohan Rathod et al. (2025) analysed cost, time, and efficiency. They found MIVAN allows wall and slab casting together. It gives better strength and accuracy compared to traditional formwork.
[5] Asad Sayyad et al. (2025) compared RCC frame and MIVAN structure. MIVAN reduces construction time and improves quality. It is economical for large projects but has higher initial cost.
[6] Sameer Kasegaonkar & V. S. Dhote (2024) compared MIVAN, conventional, and precast methods. MIVAN gives better strength, finish, and speed. It is suitable for mass housing projects.
[7] M. Ganga Jamuna & Dr. P. Anuradha (2024) studied seismic performance using ETABS. MIVAN structures showed less displacement and more stiffness. It performs better in earthquake conditions.
[8] Amith B. N. & Akash T. N. (2023) studied cost and time efficiency. MIVAN reduces project duration and labour dependency. It is more reliable than conventional methods.
[9] Gautam Singh & Antim Sharma (2023) compared construction quality. MIVAN gives smooth finish and fewer cracks. Traditional method shows more defects and uneven surfaces.
[10] Darshankumar Patel et al. (2023) reviewed MIVAN vs conventional systems. MIVAN is faster, economical, and reliable. It is best for repetitive housing projects.
[11] Ankita Dandekar et al. (2022) studied sustainability and efficiency. MIVAN improves speed and quality. It is better than traditional methods in modern construction.
[12] Nisarga K & Madhukaran (2022) analysed structural performance. MIVAN showed less displacement and better stability. Suitable for urban housing demand.
[13] Nikhil Thote & Aditi Deshmukh (2022) studied G+9 building. MIVAN gave better stiffness and seismic performance. It is suitable for large-scale housing.
[14] Chethan M & B. S. Sureshchandra (2021) analysed seismic behavior. MIVAN reduced displacement and improved stability. Shear walls help in better load resistance.
[15] Abhijit Bidare & Deepali Bhagaje (2021) compared cost and time. MIVAN reduces construction time and labour. It is economical for large projects.
[16] Prof. Manish Mata & Gauravi Chaudhari (2021) studied construction techniques. MIVAN gives better speed, quality, and uniformity. It improves project efficiency.
[17] Deep Mistry & Dr. Pitroda (2021) reviewed MIVAN technology. It provides faster construction and better quality. Higher cost but economical for mass housing.
[18] Aarti Kote & Aahuti Nandeshwar (2020) studied construction duration. MIVAN reduces time significantly. It also improves finish and durability.

[19] Mohan Sai Gaddam & Aravindan Achuthan (2020) studied modern formwork systems. Aluminium formwork improves speed and quality. Conventional method is slower.
[20] Anantkumar Patil et al. (2020) compared cost and duration. MIVAN allows faster completion of projects. It reduces labour and time.
[21] Manan Joshi & Ruchika Lalit (2019) compared conventional and PERI formwork. Modern formwork reduces time and improves quality. Conventional is labour-intensive.
[22] Azharuddin Ansari & Anwar Ahmad (2019) studied affordable housing. MIVAN reduces time and cost in mass housing. It gives better finish and durability.
[23] Sreenath V. et al. (2018) studied modular aluminium formwork. MIVAN is economical in long term. It gives faster construction and better quality.
[24] Bhanulatha G. N. et al. (2018) studied seismic behavior with openings. More openings reduce stiffness. MIVAN works better with fewer openings.
[25] Vasav Rakholia & Srinil Soni (2017) compared techniques. MIVAN reduces construction time and improves finish. Conventional method is slow and labour-heavy.
[26] Pawan Walvekar & Hemant Sonawadekar (2017) studied seismic performance. MIVAN shows better stiffness and less displacement. It is safer in seismic zones.
[27] Aaqib Khan & Chitranjan Kumar (2017) studied field performance. MIVAN improves speed, quality, and reduces waste. Conventional method has more errors.
[28] Hemendrasinh Chauhan & Dr. Parikh (2017) analysed efficiency. MIVAN gives better finish and durability. It is suitable for large projects.
[29] Nileshkumar Ganwani & Dr. Jamka (2016) compared RCC and composite buildings. Composite structures perform better in seismic conditions. RCC has higher load and lower efficiency.
[30] Ganar A. S. & Patil S. D. (2015) compared cost and time. MIVAN reduces construction duration. It is economical for large-scale projects despite higher initial cost.

III. RESEARCH GAP

After reviewing all the above 30 research papers, it is clearly observed that many researchers have studied the comparison between MIVAN technology and conventional RCC construction systems in terms of structural performance, cost, time, and quality. Most of the studies have focused on parameters like displacement, drift, base shear, construction duration, labour requirement, and surface finish. The majority of the research concluded that MIVAN technology provides better structural performance, faster construction, and improved quality due to its monolithic construction and use of aluminium formwork. However, even after reviewing all these studies, some important research gaps are identified which need further investigation. Firstly, most of the previous studies have focused only on structural analysis using software like ETABS or STAAD.Pro under limited loading conditions such as seismic and wind loads. Very few studies have included a complete design approach covering all structural components like slab, beam, column, shear wall, and foundation in detail. There is a lack of integrated study which combines planning, analysis, and design together for both systems in a single research work. Secondly, many researchers have compared MIVAN and conventional systems based on general parameters like time and cost, but detailed cost analysis including initial investment, lifecycle cost, maintenance cost, and cost-benefit ratio is not properly discussed. Most studies simply conclude that MIVAN is economical for large projects without providing detailed numerical justification.

Another important gap is related to practical implementation. Most of the studies are theoretical or software-based and do not include real field data, site challenges, or practical construction issues such as formwork handling, alignment problems, skilled labour availability, and construction errors. There is a need for more case studies based on actual construction sites. Further, many studies have focused on high-rise buildings like G+10, G+12, etc., but very limited research is available for low-rise and medium-rise buildings. It is important to study whether MIVAN technology is suitable and economical for small-scale projects or not, as conventional RCC is still widely used in such cases. Also, seismic analysis is done in many papers, but detailed study considering different soil conditions, foundation types, and soil-structure interaction is not fully explored. Only a few researchers have included SSI (Soil Structure Interaction), and more detailed work is required in this area. Another gap is that most studies consider standard building shapes and regular structures. There is very limited research on irregular buildings, complex geometries, and buildings with different architectural requirements. MIVAN technology has limitations in design flexibility, but this aspect is not deeply analysed in previous works.

In addition, environmental and sustainability aspects are not properly covered. Only a few studies mention eco-friendly construction or material saving, but detailed analysis of carbon footprint, energy consumption, and sustainability comparison between MIVAN and conventional construction is missing.

Moreover, there is lack of study on long-term performance such as durability, crack development, repair requirements, and maintenance issues. Most research focuses on initial performance only and ignores the life cycle behaviour of structures. Another important research gap is related to service integration. In MIVAN construction, electrical and plumbing services are embedded within walls, but detailed studies on maintenance, repair difficulty, and service life are not available. Also, the effect of wall openings (doors, windows) on structural performance is studied only in limited papers. More detailed analysis is required to understand how different opening percentages affect stiffness and strength of MIVAN structures. Further, very few studies have compared different design codes or updated codes like IS 1893:2016 in detail. Many studies still use older codes, and there is a need to analyse structures based on latest standards. Another gap is related to construction quality control and workmanship. Although MIVAN is said to provide better finish, there is no detailed study on quality control methods, inspection techniques, and defect analysis. Lastly, there is lack of combined study which compares structural performance, cost, time, sustainability, and practical feasibility together in a single research work. Most papers focus on only one or two aspects.

CONCLUSION

In this study, a detailed comparison has been carried out between Conventional RCC framed structure and MIVAN structural system by reviewing 30 research papers and understanding their results and findings. From the overall study, it is clearly observed that the construction industry is rapidly moving towards modern construction techniques due to increasing demand for fast, economical, and high-quality housing. The conventional RCC framed structure is a traditional method which is widely used in India for many years. It provides good flexibility in design and is suitable for different types of buildings, especially small-scale and irregular structures. However, this method involves more construction time, higher labour requirement, and multiple stages such as shuttering, reinforcement, concreting, brickwork, and plastering. Due to these steps, there is more chance of human error, poor quality finish, and delay in project completion. On the other hand, MIVAN technology is a modern construction technique based on aluminium formwork system, which allows monolithic casting of walls and slabs in a single operation. This results in a strong, durable, and uniform structure. From the literature review, it is found that MIVAN structures show better structural performance compared to conventional RCC structures, especially under seismic and wind loads. The presence of RCC shear walls in MIVAN construction increases stiffness and reduces displacement, storey drift, and deflection. Another important advantage of MIVAN technology is its construction speed. Many studies have shown that the cycle time of one floor can be reduced significantly, which helps in faster project completion. This makes MIVAN highly suitable for mass housing projects, where repetitive construction is required. The use of aluminium formwork also provides smooth surface finish, reducing the need for plastering and finishing work. In terms of cost, it is observed that MIVAN technology has a higher initial cost due to the use of aluminium formwork and system setup. However, in large-scale projects, this cost is balanced by savings in time, labour, and finishing work. Therefore, MIVAN becomes economical for large and repetitive projects. In contrast, conventional construction has lower initial cost but becomes expensive in long term due to higher labour cost and longer construction duration. The study also shows that MIVAN technology reduces dependency on skilled labour and improves construction quality due to its systematic and standardized process. It also minimizes material wastage and improves site management. However, it has some limitations such as less flexibility in design, difficulty in making changes after construction, and requirement of proper planning and skilled supervision.

REFERENCES

[1] Amith, B. N., & Akash, T. N. (2023). Comparative study of Mivan and conventional formwork structures. International Journal of Civil Infrastructure Research, 7(2), 89–98.
[2] Ansari, A., & Ahmad, A. (2019). Utilisation of aluminium formwork in affordable housing. Journal of Emerging Technologies and Innovative Research (JETIR), 6(4).
[3] Bhanulatha, G. N., Sreenivasulu Reddy, M., & Ramalinga Reddy, Y. (2018). Study of dynamic behaviour of MIVAN structure with different percentage of openings and different seismic zones. International Journal of Advances in Scientific Research and Engineering (IJASRE), 3(9), 7–16. DOI: 10.31695/IJASRE
[4] Bidare, A. V., & Bhagaje, D. (2021). Comparative analysis of conventional technology and Mivan technology. Journal of Emerging Construction Technologies, 5(2), 33–44.

[5] Chauhan, H., & Parikh, K. B. (2017). Comparison and effectiveness of Mivan formwork over the conventional formwork. Journal of Emerging Technologies and Innovative Research (JETIR), 4(12), 185–190.
[6] Chethan, M., & Sureshchandra, B. S. (2021). Seismic analysis comparison of G+11 storey conventional RC frame structure and Mivan structure. International Journal of Trend in Scientific Research and Development, 6(1), 290–295.
[7] Dandekar, A., Wade, D., Meshram, S., Kawale, S., Rangari, M., & Khobragade, N. (2022). Literature study on comparison between Mivan formwork and conventional formwork in construction. European Journal of Advances in Engineering and Technology, 9(4s), 14–18.
[8] Dharane, S., Choudhar, U., Chavan, V., Deokar, A., & Bhoir, S. (2025). Analysis and comparative study of Mivan formwork system with conventional shuttering. International Journal of Creative Research Thoughts (IJCRT), 13(11).
[9] Gaddam, M. S., & Achuthan, A. (2020). A comparative study on newly emerging type of formwork systems with conventional type of formwork systems. Materials Today: Proceedings, 33(1), 736–740. DOI: https://doi.org/10.1016/j.matpr.2020.06.090
[10] Ganar, A. S., & Patil, S. D. (2015). Comparative analysis on cost and duration of MIVAN formwork building and conventional formwork building. International Journal on Recent and Innovation Trends in Computing and Communication, 3(12), 6472–6474. DOI: https://doi.org/10.17762/ijritcc.v3i12.5077
[11] Ganwani, N. V., & Jamkar, S. S. (2018). Comparative study of RCC and steel–concrete composite building based on seismic analysis. International Journal of Engineering Research & Technology (IJERT). DOI: 10.17577/IJERTCONV4IS30022
[12] Ganga Jamuna, M., & Anuradha, P. (2024). Comparative study of conventional structure and Mivan structure using ETABS. International Journal of Earthquake Engineering & Dynamics, 9(3), 101–112.
[13] Hinduja, A., Sankle, T., & Ahmed, M. (2025). Comparative study of Mivan technology and conventional RCC structures in high seismic zones. International Journal of Structural Engineering Studies, 4(2), 15–28.
[14] Joshi, M., & Lalit, R. (2019). Comparative study between conventional and PERI formwork system on the basis of time and cost. Journal of Emerging Technologies and Innovative Research (JETIR), 6(4).
[15] Kasegaonkar, S., & Dhote, V. S. (2024). Examining aluminium formwork (MIVAN) with conventional formwork and investigating precast methods: A comprehensive study. Journal of Harbin Engineering University, 45(3).
[16] Khan, A. M., & Kumar, C. (2017). Impact of Mivan formwork over conventional formwork. International Journal of Science and Research (IJSR), 6(7).
[17] Kote, A. N., & Nandeshwar, A. R. (2020). Duration comparison of Mivan formwork over the conventional formwork. International Journal for Research in Engineering Application & Management (IJREAM).
[18] Mata, M., & Chaudhari, G. A. (2021). Comparative study of various construction techniques. International Journal of Infrastructure Development Studies, 8(1), 59–73.
[19] Mistry, D. J., & Pitroda, J. R. (2021). Comparison between MIVAN formwork over conventional formwork: A review. Turkish Online Journal of Qualitative Inquiry, 12(7), 1094–1104.
[20] Nisarga, K., & Madhukaran, M. (2022). Structural performance of Mivan structural system over conventional structural system. International Journal of Scientific Research and Modern Technology, 1(1), 12–20.
[21] Patil, A. M., Awati, V., & Rashmi, J. V. (2020). Comparative analysis of conventional formwork and Mivan formwork based on duration and cost. International Research Journal of Engineering and Technology (IRJET), 7(6).
[22] Patel, D., Pawar, S., Pawar, V., Vasave, S., Bhamare, P., & Patil, N. (2023). A review paper on comparative analysis of MIVAN formwork technology and conventional formwork technology. International Journal of Construction Engineering and Technology, 11(4), 142–156.
[23] Rakholia, V. R., & Soni, S. H. (2017). Comparative studies of construction techniques (Conventional vs Mivan). International Research Journal of Engineering and Technology (IRJET), 4(11).
[24] Rathod, R., Yash, S., Lohar, A., Jadhav, B., & Habeebi, A. (2025). Comparative analysis of Mivan formwork technology and conventional formwork technology. International Journal of Scientific Research in Engineering and Management (IJSREM), 9(4).
[25] Sayyad, A., Lokhande, A., Shelar, N., Taware, V., More, D., & Gaikwad, A. M. (2025). Comparative study between regular framed structure and Mivan structure. International Journal of Innovative Research in Technology (IJIRT), 11(12).
[26] Singh, G., & Sharma, A. (2023). Comparative analysis of the quality of buildings constructed using Mivan construction versus traditional construction methods. TIJER – International Research Journal, 10(5).
[27] Sreenath, V., Prakash Rao, B., Sebastian, A. W., & Chengappa, K. K. (2018). Suitability of modular aluminium formwork in RCC framed structures. Journal of Civil Engineering and Environmental Technology, 5(4), 221–230.
[28] Thote, N. S., & Deshmukh, A. H. (2022). Comparative analysis of framed structure vs Mivan structure. International Journal of Structural Design & Analysis, 6(3), 77–89.

[29] Walvekar, P. M., & Sonawadekar, H. L. (2017). Seismic performance evaluation of Mivan structural system vs conventional structural system with effect of SSI by pushover analysis. International Research Journal of Engineering and Technology (IRJET), 4(6), 1857–1863.
[30] Ziradkar, P. M., Shinde, A., Shamsuddhin, M. A., Pawar, S., & Rashid, M. S. (2025). Use of Mivan formwork in RCC G+12 building. International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), 5(6), 265–270. DOI: 10.48175/IJARSCT-25337