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Comparative Study of Mivan Technology and Conventional RCC Structures in High Seismic Zones- A Review

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Abstract- The rapid growth of urbanisation and population in developing countries such as India has significantly increased the demand for fast, economical, and earthquake-resistant construction techniques. Conventional Reinforced Cement Concrete (RCC) framed structures have been widely used for residential and commercial buildings; however, these systems often face limitations in construction speed, labour dependency, quality control, and seismic efficiency. To overcome these challenges, modern construction technologies such as Mivan aluminium formwork systems have emerged as effective alternatives for mass housing and high-rise developments. Mivan technology enables monolithic construction through simultaneous casting of walls and slabs, resulting in improved structural rigidity, reduced construction time, enhanced surface finish, and better seismic resistance. This review paper presents a comprehensive comparative study of Mivan technology and conventional RCC construction systems with special emphasis on high seismic zones. A detailed literature review of previously published research articles from 2017 to 2025 has been carried out to analyse structural behaviour, construction efficiency, cost implications, seismic performance, quality control, and project execution aspects. The reviewed studies indicate that Mivan structures generally exhibit lower storey displacement, reduced inter-storey drift, higher stiffness, and improved overall seismic performance compared to conventional RCC framed structures due to their monolithic shear wall behaviour. Additionally, Mivan technology significantly reduces construction duration and labour requirements, making it suitable for large-scale housing projects. Despite numerous advantages, the literature reveals certain research gaps related to lifecycle cost analysis, environmental impact assessment, long-term durability, soil-structure interaction, performance under extreme seismic conditions, and comparative sustainability analysis. Most studies are limited to software-based analytical modelling and lack experimental validation under real seismic conditions. Therefore, further research is required to evaluate the comprehensive structural and economic performance of Mivan systems in diverse seismic and environmental conditions. The findings of this review will assist researchers, structural engineers, contractors, and policymakers in understanding the advantages, limitations, and future research directions associated with Mivan technology in earthquake-prone regions.

Keywords: Mivan Technology, Conventional RCC Structure, Aluminium Formwork, Seismic Analysis, ETABS, High Seismic Zones, Structural Performance, Formwork System, Earthquake Resistance, Monolithic Construction.

I. INTRODUCTION

The construction industry plays a vital role in the economic development and infrastructure growth of any nation. Rapid urbanisation, industrialisation, and population growth have created a massive demand for residential, commercial, and public infrastructure projects. In developing countries such as India, the increasing requirement for affordable housing and high-rise buildings has encouraged the adoption of modern construction technologies that can ensure faster execution, improved quality, and enhanced structural safety. Conventional Reinforced Cement Concrete (RCC) framed structures have been the most widely adopted construction system for decades due to their flexibility in

design and ease of construction. However, conventional RCC construction methods are often time-consuming, labour-intensive, and susceptible to quality variations because of extensive manual operations and multiple construction stages such as brickwork, plastering, and shuttering. In recent years, the occurrence of earthquakes in different parts of the world has highlighted the importance of constructing earthquake-resistant buildings, particularly in high seismic zones. Structural safety and lateral load resistance have become major concerns in modern construction practices. Conventional RCC framed systems primarily resist seismic loads through beam-column action, but their performance may be affected by poor workmanship, weak joints, and inadequate stiffness. Therefore, there is a growing need for alternative structural systems that can provide enhanced seismic performance along with faster construction speed.

Mivan technology, also known as aluminium formwork technology, has emerged as one of the most efficient modern construction techniques for mass housing and high-rise buildings. The Mivan system was developed by a European company and later manufactured in Malaysia. It consists of lightweight aluminium formwork panels that allow simultaneous casting of walls and slabs in a single continuous operation. Unlike conventional RCC framed structures, Mivan construction forms a monolithic structure with integrated shear walls, resulting in improved stiffness, durability, dimensional accuracy, and seismic resistance. The technology also minimises construction joints, reduces labour dependency, enhances surface finish, and significantly decreases construction duration. The adoption of Mivan technology has increased rapidly in India due to government initiatives such as affordable housing schemes and urban development programmes. Several researchers have conducted comparative studies between Mivan technology and conventional RCC systems focusing on parameters such as construction time, cost efficiency, structural behaviour, seismic performance, quality control, and labour requirements. Many studies using ETABS software and Response Spectrum Analysis have shown that Mivan structures perform better under seismic loading conditions due to their box-type behaviour and shear wall action.

Although numerous studies have highlighted the advantages of Mivan technology, several aspects still require detailed investigation. Most available research focuses mainly on analytical comparisons and construction efficiency, while limited studies address long-term durability, lifecycle cost assessment, environmental sustainability, and experimental validation under actual seismic conditions. Therefore, a comprehensive review of previous research is essential to identify the current state of knowledge and determine the existing research gaps. This review paper aims to present a detailed comparative analysis of Mivan technology and conventional RCC structures in high seismic zones based on previously published research articles. The paper also identifies the major research gaps and suggests future directions for improving the understanding and implementation of Mivan technology in earthquake-resistant construction.

II. LITERATURE REVIEW

2.2.1 Comparative Study of Mivan Technology and Conventional RCC Structures in High Seismic Zones (2025) By Anmol Hinduja, Tarun Sankle, and Mahroof Ahmed- Analysed the seismic and wind performance of a G+12 residential building constructed using both MIVAN technology and conventional RCC systems. Using advanced structural analysis software, the authors evaluated key parameters including storey displacement, inter-storey drift, base shear, and natural time period. The results indicated that MIVAN structures, owing to their monolithic, joint-free construction, exhibited lower displacement and drift values under lateral forces compared to conventional systems. Additionally, MIVAN technology demonstrated advantages in construction speed and labour efficiency, making it highly suitable for high-rise mass housing projects in seismic-prone areas. The study concluded that MIVAN formwork not only enhances structural resilience but also improves project delivery timelines, thereby offering a balanced solution for safety and efficiency in earthquake-sensitive regions.

2.2.2 Use of Mivan Formwork in RCC G+12 Building (2025) By Prof. Mrs. Poorva Ziradkar, Ajinkya Shinde, Momin Ayyaj Shamsuddhin, Shravan Pawar, and Momin Shayan Rashid- Highlighted the significance of formwork technology in accelerating construction speed and improving economic efficiency. The authors emphasised that with the rising population and growing housing demand, rapid construction techniques like MIVAN formwork have become essential in the building industry. Their analysis demonstrated that MIVAN technology not only reduces project duration but also enhances quality due to its precision-engineered aluminium formwork, making it suitable for high-rise residential projects such as G+12 buildings. The study concluded that adopting MIVAN formwork can provide considerable advantages in time, cost, and quality, thereby meeting the urgent housing needs of densely populated regions.

2.2.3 Analysis and Comparative Study of Mivan Formwork System with Conventional Shuttering (2025) By Prof. Sayali Dharane, Utkarsh Choudhar, Vijay Chavan, Abhijeet Deokar and Sward Bhoir – This study

focused on the analysis and comparison of Mivan formwork with conventional shuttering systems in terms of construction efficiency, cost, and quality. The research highlighted that the construction industry in India is undergoing rapid transformation due to the increasing demand for affordable housing and faster project execution. Formwork plays a crucial role in determining the strength, quality, and speed of construction, as it directly influences the casting of structural components. The study explained that Mivan formwork, being an advanced aluminium system, enables casting of structural elements such as walls, slabs, and openings in a single operation. This results in a monolithic structure with improved durability and strength. The lightweight nature of aluminium panels makes them easy to handle and assemble, thereby reducing labour efforts and construction time. A detailed comparison between Mivan and conventional shuttering revealed that traditional methods are relatively slower, labour-intensive, and prone to quality variations due to manual operations. In contrast, Mivan technology ensures better dimensional accuracy, smoother surface finish, and reduced need for plastering. The study also emphasised that Mivan technology is highly suitable for repetitive and large-scale projects due to its reusability and systematic construction approach.

2.2.4 Comparative Analysis of Mivan Formwork Technology and Conventional Formwork Technology (2025) By Rohan Rathod, Salvi Yash, Akshay Lohar, Buddhabhushan Jadhav and Prof. Aasif Habeebi – This study presented a comparative analysis of Mivan formwork technology and conventional formwork systems with respect to cost, time, and construction efficiency. The research emphasised that the construction industry is highly dependent on time and cost factors, and traditional construction methods alone are insufficient to meet the growing demand for rapid housing development in India. The study explained that formwork plays a critical role in shaping and supporting fresh concrete until it gains sufficient strength. Conventional formwork, typically made of timber or plywood, is labour-intensive, time-consuming, and less efficient for high-rise construction. With advancements in construction technology, aluminium formwork systems such as Mivan have been developed to overcome these limitations. The research highlighted that Mivan technology enables simultaneous casting of walls and slabs, resulting in a monolithic structure with higher strength and better surface finish. The precision of aluminium panels ensures uniformity and dimensional accuracy in construction. Additionally, the system allows easy integration of electrical and plumbing services due to consistent formwork dimensions.

2.2.5 Comparative Study Between Regular Framed Structure and Mivan Structure (2025) By Asad Sayyad, Aditya Lokhande, Nikhil Shelar, Vivek Taware, Digvijay More and A. M. Gaikwad – This study presented a comparative analysis between conventional framed structures and Mivan structures with respect to construction time, cost, and quality. The research highlighted the growing housing demand in India due to rapid urbanisation and population increase, emphasising the need for faster and more efficient construction techniques. The study involved modelling of a G+1 building and preparation of structural drawings using AutoCAD. A detailed cost estimation and market survey were carried out to compare both construction systems. The results indicated that Mivan technology significantly reduces construction time due to its monolithic casting process and repetitive formwork system. The research also found that Mivan structures provide better quality finish, reduced labour dependency, and improved seismic resistance due to their box-type structural behaviour. Although the initial cost of Mivan technology is higher, it becomes economical in large-scale housing projects due to faster execution and reduced finishing work.

2.2.6 Examining Aluminum Formwork (MIVAN) with Conventional Formwork and Investigating Precast Methods: A Comprehensive Study (2024) By Sameer Kasegaonkar and V. S. Dhote – This study presented a comprehensive comparison between MIVAN aluminium formwork, conventional formwork, and precast construction methods. The research highlighted the increasing adoption of MIVAN technology in India due to its efficiency, speed, and suitability for mass housing projects. The study explained that MIVAN formwork, developed by a European company and manufactured in Malaysia, enables monolithic construction by casting walls, slabs, beams, and staircases in a single continuous operation. This results in improved structural strength, dimensional accuracy, and high-quality surface finish, eliminating the need for plastering. The research also emphasised that MIVAN formwork panels are lightweight, precision-engineered, and easy to assemble, which reduces labour requirements and enhances construction productivity. Techniques such as early form removal further accelerate the construction process, making it highly suitable for repetitive and large-scale housing projects. A detailed comparison with conventional formwork revealed that traditional methods are slower, labour-intensive, and prone to quality variations. The study also included analysis of precast construction methods and highlighted that while precast systems offer speed advantages, MIVAN technology provides better integration, continuity, and on-site adaptability. The findings indicated that MIVAN technology offers significant advantages in terms of cost-effectiveness, construction speed, quality control, and durability. It also improves site coordination and project scheduling, leading to faster completion of projects.

2.2.7 Comparative Study of Conventional Structure and Mivan Structure Using ETABS (2024) By M. Ganga Jamuna and Dr. P. Anuradha- To evaluate the structural performance of both construction methods under seismic loading. Using ETABS software with Response Spectrum analysis, they analysed conventional RCC structures and MIVAN technology-based structures with varying wall thicknesses. The results revealed that MIVAN structures with a wall thickness of 300 mm in an I-shaped configuration demonstrated significantly lower displacements, story drifts, and time periods compared to conventional systems. Additionally, these structures exhibited higher story shear and stiffness, indicating enhanced seismic resilience. The study concluded that adopting MIVAN technology, particularly with 300 mm wall thickness, offers superior performance and stability for tall buildings, especially in seismic-prone regions.

2.2.8 Comparative Study of Mivan and Conventional Formwork Structures (2023) By Amith B. N. and Akash T. N.- Examined the cost, time efficiency, and overall performance of MIVAN formwork compared to conventional systems. The authors noted that formwork accounts for approximately 35–40% of the cost of an RCC member, making its design and selection critical to project economics. Their comparative analysis of various research findings showed that MIVAN technology offers higher efficiency, reliability, and durability while significantly reducing project duration and labour dependency. The study concluded that MIVAN formwork is superior to conventional techniques in terms of cost-effectiveness, construction speed, and long-term performance, making it highly suitable for modern construction demands.

2.2.9 Comparative Analysis of the Quality of Buildings Constructed using Mivan Construction versus Traditional Construction Methods (2023) By Gautam Singh and Antim Sharma – This study focused on comparing the quality of buildings constructed using Mivan construction technology and traditional construction methods. The research emphasised the rapid evolution of the construction industry and the increasing need for modern technologies to improve efficiency, quality, and project delivery. The study was conducted through analysis of literature and case studies of completed projects using both construction techniques. It highlighted that Mivan construction offers superior quality due to its monolithic casting process, which reduces joints, cracks, and leakage issues. The use of aluminium formwork ensures better dimensional accuracy, smooth surface finish, and uniform construction quality. In contrast, traditional construction methods were found to be more prone to quality variations due to manual operations, dependence on skilled labour, and multiple stages of construction such as brickwork and plastering. These factors often lead to defects like uneven surfaces, cracks, and poor finishing. The findings indicated that Mivan technology significantly improves construction quality, reduces maintenance requirements, and enhances durability.

2.2.10 A Review Paper on Comparative Analysis of MIVAN Formwork Technology and Conventional Formwork Technology (2023) By Darshankumar Patel, Shubham Pawar, Vishwadeep Pawar, Sagar Vasave, Prasad Bhamare, and Nikhil Patil- Evaluated the economic and performance aspects of MIVAN technology in comparison with conventional prefabrication methods. The authors highlighted the urgency in India's construction sector to adopt rapid, cost-effective, and high-quality building systems for large-scale housing projects. Their analysis indicated that MIVAN formwork is significantly superior in terms of cost-efficiency, reliability, and construction duration, making it a favourable option for mass housing developments. The study concluded that MIVAN's monolithic approach and speed of execution offer a clear advantage over traditional prefabrication technologies, particularly in projects requiring repetitive design elements and high output.

2.2.11 Literature Study on Comparison between Mivan Formwork and Conventional Formwork in Construction (2022) By Ankita Dandekar, Divya Wade, Sneha Meshram, Subodh Kawale, Mansi Rangari and Neha Khobragade – This study presented a literature-based comparison between Mivan formwork and conventional formwork systems, focusing on construction efficiency and sustainability aspects. The research highlighted the increasing need for adopting eco-friendly and efficient construction practices due to rapid infrastructure development and its environmental impact. The study explained that Mivan formwork is an advanced aluminium-based system known for its strength, durability, and ease of installation. It is widely used in mass housing and residential construction due to its ability to accelerate construction speed. The research also discussed modern construction techniques such as precast and cast-in-situ methods, emphasising the role of aluminium formwork in improving productivity. The findings indicated that Mivan technology provides significant advantages over conventional formwork, including faster construction, improved quality, and better structural efficiency. It was also noted that formwork contributes a considerable portion of total construction cost, making its proper selection crucial for achieving economy and performance.

2.2.12 Structural Performance of Mivan Structural System Over Conventional Structural System (2022) By Nisarga K and Madhukaran- Investigated the structural behaviour of Mivan systems compared to conventional RCC framed structures. The study addressed India's urgent housing demand due to rapid urban population growth and evaluated the efficiency of aluminium formwork (Mivan) incorporating RC shear wall systems. Using ETABS software and response spectrum analysis, the authors compared key parameters such as storey displacement, storey drift, base shear, time period, and frequencies. Results demonstrated that Mivan systems, due to their monolithic RC shear wall design, exhibited superior performance under lateral loads, offering reduced displacements and improved stability over conventional framed structures. The research concluded that Mivan technology provides both structural and time efficiency advantages, making it suitable for large-scale residential projects in high-demand urban areas.

2.2.13 Comparative Analysis of Framed Structure Vs Mivan Structure (2022) By Nikhil S. Thote and Aditi H. Deshmukh- Examined the performance of a G+9 residential building using both RCC framed construction and Mivan (Aluform) technology. The study emphasised the growing adoption of modern construction methods to enhance speed, quality, and cost efficiency, especially for large-scale housing projects. Using ETABS 2016 software, both structural systems were analysed in accordance with IS 456:2000 and IS 1893:2002 (Part I) for Zone III with medium soil conditions. Key parameters such as maximum displacement, storey drift, storey shear, and storey stiffness were compared. Results indicated that the Mivan system, due to its monolithic design and reduced jointing, provided improved stiffness, lower displacements, and better seismic performance compared to the conventional framed system, making it more suitable for rapid and large-scale housing developments.

2.2.14 Seismic Analysis Comparison of G+11 Storey Conventional RC Frame Structure and Mivan Structure (2021) By Chethan M and B. S. Sureshchandra – This study focused on the comparative seismic analysis of a G+11 storey building using conventional RCC frame structure and Mivan structural system. The analysis was carried out using both Equivalent Static Method and Response Spectrum Method as per IS 1893:2016, considering seismic Zone V and medium soil conditions. The structural modelling and analysis were performed using ETABS 2017 software. The study evaluated key structural parameters such as storey displacement and storey shear in both longitudinal and transverse directions. The results indicated that Mivan structures exhibit better seismic performance compared to conventional RCC frame structures due to their monolithic construction and higher lateral stiffness. It was observed that the Mivan system reduces lateral displacement and improves structural stability under earthquake loading. The continuous wall system in Mivan construction acts as shear walls, which enhances resistance against seismic forces and ensures better load transfer.

2.2.15 Comparative Analysis of Conventional Technology and Mivan Technology (2021) By Abhijit V. Bidare and Deepali Bhagaje- Examined the differences in cost, time, and quality between conventional RCC construction and MIVAN technology. The authors highlighted that the Indian construction industry is moving towards rapid industrialization and modular methods to meet increasing demands. Their analysis revealed that MIVAN technology, with its aluminium formwork system, enables faster construction, better quality, and significant time savings compared to traditional formwork. Moreover, it was found to be cost-effective in large-scale projects due to reduced labour requirements and shorter project durations. The study concluded that MIVAN technology holds superiority over conventional methods in terms of efficiency, economy, and quality, particularly for mass housing and high-rise structures.

2.2.16 Comparative Study of Various Construction Techniques (2021) By Prof. Manish Mata and Gauravi Anil Chaudhari- Analysed the differences between MIVAN technology and conventional construction methods, focusing on their suitability and performance in modern infrastructure development. The authors highlighted that the construction industry plays a vital role in national economic growth and that adopting efficient, fast-paced construction techniques is essential to meet the rising infrastructure demands. Their study compared the technological, structural, and economic aspects of MIVAN and traditional RCC systems. They noted that MIVAN technology offers superior advantages in terms of speed, quality of finish, reduced labor dependency, and uniformity of structural components. The research further emphasized that proper selection of construction technology significantly enhances project delivery timelines, structural performance, and durability, particularly in housing and public infrastructure. The paper ultimately concluded that MIVAN technology, with its monolithic formwork system, provides an efficient alternative to conventional RCC construction for large-scale, time-bound projects requiring high precision and repeatability.

2.2.17 Comparison Between MIVAN Formwork over Conventional Formwork: A Review (2021) By Deep Jayesh Mistry and Dr. J. R. Pitroda – This study presented a comprehensive review of MIVAN formwork in

comparison with conventional construction techniques, focusing on parameters such as cost, construction speed, quality, and efficiency. The research highlighted that rapid urbanisation and population growth in India have significantly increased the demand for mass housing, which cannot be efficiently met using traditional construction methods. Conventional techniques often suffer from slow construction speed, poor quality control, and higher labour dependency. The study emphasised that MIVAN technology, an aluminium formwork system developed in Malaysia, offers a modern solution for fast-track construction. It enables casting of walls and slabs in a single operation, resulting in a monolithic structure with improved strength and durability. The findings indicated that MIVAN technology reduces construction time, enhances quality, and ensures better dimensional accuracy compared to conventional methods. Furthermore, the study analysed cost aspects and concluded that although MIVAN technology involves higher initial investment, it becomes economical for large-scale projects due to savings in time, labour, and finishing work. The research also discussed other advanced construction techniques such as prefabrication and tunnel formwork, but identified MIVAN as one of the most effective systems for mass housing in India.

2.2.18 Duration Comparison of Mivan Formwork over the Conventional Formwork (2020) By Aarti Nanasaheb Kote and Aahuti Ramesh Nandeshwar – This study focused on the comparison of construction duration between Mivan formwork and conventional formwork systems. The research highlighted that Mivan technology, developed by a Malaysian company, is highly suitable for mass housing projects in India due to its ability to achieve high construction speed and quality simultaneously. The study explained that formwork is a crucial temporary structure that supports fresh concrete and determines the quality, safety, and efficiency of construction. Conventional formwork, typically made of timber and plywood, is flexible and easy to handle but requires more time for erection, dismantling, and finishing activities. In contrast, Mivan formwork, made of aluminium panels, enables rapid construction by allowing simultaneous casting of walls and slabs, resulting in a monolithic structure. The system is capable of handling significant loads and can be reused up to 200–250 times, making it efficient for repetitive construction projects. The findings indicated that Mivan technology significantly reduces construction duration and improves surface finish, eliminating the need for plastering. It also enhances structural durability and seismic resistance due to its shear wall behaviour. Additionally, the study identified key factors influencing formwork selection such as cost, time, quality, labour availability, and safety.

2.2.19 A Comparative Study on Newly Emerging Type of Formwork Systems with Conventional Type of Formwork Systems (2020) By Mohan Sai Gaddam and Aravindan Achuthan – This study presented a comparative analysis between conventional formwork systems and newly emerging formwork technologies such as aluminium formwork (Mivan system) and jump formwork. The research highlighted that formwork contributes approximately 20–25% of the total construction cost, making it a critical factor in project planning and execution. The study emphasised that with globalisation and technological advancements, modern formwork systems have significantly improved construction efficiency. Aluminium formwork systems allow faster casting of larger structural elements compared to conventional methods, thereby reducing construction time and labour requirements. The research analysed multiple construction projects where modern formwork techniques were implemented and compared their performance with traditional systems. The findings indicated that emerging formwork systems provide better speed, quality, and sustainability in construction. The study also highlighted that aluminium formwork ensures higher dimensional accuracy, improved surface finish, and better structural performance due to its monolithic casting capability. However, it was noted that such systems are not yet widely adopted in India and require proper planning and investment.

2.2.20 Comparative Analysis of Conventional Formwork and Mivan Formwork based on Duration and Cost (2020) By Anantkumar M. Patil, Vishwanath Awati and Rashmi J. V. – This study presented a comparative analysis between conventional formwork and Mivan formwork systems focusing on construction duration and cost. The research highlighted that the construction industry in India is rapidly growing, and there is a strong need for adopting advanced construction techniques to meet increasing infrastructure demands efficiently. The study analysed both systems using project management tools such as Microsoft Project to evaluate construction timelines and cost parameters. It was observed that conventional formwork methods are time-consuming and require more labour due to sequential construction activities such as formwork installation, reinforcement, concreting, and finishing works. In contrast, Mivan technology was identified as a modern construction method that enables faster completion of projects by allowing monolithic casting of walls and slabs in a single operation. The study emphasised that aluminium formwork panels can be reused up to 200–250 times, making the system highly efficient for large-scale projects.

2.2.21 Comparative Study between Conventional and PERI Formwork System on the Basis of Time and Cost (2019) By Manan Joshi and Ruchika Lalit – This study focused on the comparative analysis of conventional

formwork and PERI formwork systems based on construction time and cost parameters. The research highlighted that formwork constitutes approximately 30–40% of the total cost of RCC construction, making it a critical factor in project planning and execution. The study involved analysis of two different construction sites, where conventional formwork was used at one site and PERI formwork at another. Data regarding labour, material, and equipment costs were collected and analysed to determine the efficiency of each system. The results indicated that conventional formwork is more labour-intensive and time-consuming due to manual operations and sequential construction processes. In contrast, PERI formwork, being a modern system, showed improved efficiency in terms of reduced construction time and better quality of work. The study also highlighted that modern formwork systems provide better alignment, improved finish, and faster execution compared to traditional methods.

2.2.22 Utilisation of Aluminium Formwork in Affordable Housing (2019) By Azharuddin Ansari and Anwar Ahmad – This study focused on the utilisation of aluminium formwork (Mivan technology) in affordable housing projects, with emphasis on cost, time, and quality parameters. The research highlighted that formwork contributes approximately 35–40% of the total cost of RCC construction, making its selection a crucial factor in project execution. The study analysed the growing housing demand in India, particularly among low-income groups (LIG) and economically weaker sections (EWS), and discussed government initiatives such as Pradhan Mantri Awas Yojana (PMAY), which require large-scale construction within a limited time frame. It was observed that conventional formwork is suitable for small projects, whereas aluminium formwork is more appropriate for mass housing and high-rise buildings. The research findings indicated that aluminium formwork significantly reduces construction time due to its ability to cast walls and slabs monolithically in a single operation. It also provides superior surface finish, eliminating the need for plastering and reducing maintenance costs. Additionally, the system can be reused 200–250 times, making it economical for repetitive construction.

2.2.23 Suitability of Modular Aluminium Formwork in RCC Framed Structures (2018) By Sreenath V., B. Prakash Rao, Anup Wilfred Sebastian, and Chengappa K. K.- Assessed the applicability of Modular Aluminium (MIVAN) formwork in large-scale residential and commercial projects in India. Using the Salarpuria Sattva Divinity project in Bangalore as a case study, the authors compared quality, speed of construction, labour requirements, and cost between modular aluminium, MIVAN, and conventional formwork systems. Cost estimations for one floor in different formwork types revealed that while initial costs of modular aluminium formwork were comparable to conventional systems, MIVAN technology proved to be more economical in the long term due to higher repetition cycles. The study highlighted MIVAN's advantages in achieving superior quality, increased carpet area, and structural stability through monolithic construction, along with significantly faster execution times, making it well-suited for high-rise RCC framed structures.

2.2.24 Study of Dynamic Behaviour of MIVAN Structure with Different Percentage of Openings and Different Seismic Zones (2018) By Bhanulatha G. N., M. Sreenivasulu Reddy, and Dr. Y. Ramalinga Reddy- Examined the seismic performance of a 10-storey MIVAN structure by analysing different percentages of wall openings—20%, 40%, and 60%—under multiple seismic zones while keeping soil conditions constant. Using the Response Spectrum Method in ETABS, the study compared structural parameters such as storey displacement, storey drift, base shear, and lateral stiffness for models with and without openings. Findings showed that increasing the percentage of openings significantly reduces stiffness and increases displacement, leading to poorer seismic performance. The study concludes that lower opening percentages are more suitable for MIVAN structures in high seismic zones, ensuring better safety, uniform load distribution, and structural efficiency.

2.2.25 Comparative Studies of Construction Techniques (Conventional vs Mivan) (2017) By Vasav R. Rakholia and Srinil H. Soni – This study analysed the comparison between conventional formwork systems and modern Mivan formwork technology with respect to cost, time, and construction quality. The research emphasised that formwork plays a vital role in concrete construction as it directly influences project efficiency and overall performance. The study highlighted that conventional formwork, typically made of timber and plywood, is time-consuming and requires significant labour effort. The cycle time for completing one floor using conventional formwork was observed to be approximately 3–4 weeks, along with additional time required for brickwork and plastering to achieve the final finish. In contrast, Mivan formwork was identified as a modern construction technology suitable for mass housing projects in India. The system allows faster construction by enabling monolithic casting of structural elements, thereby reducing construction time and improving quality. The research also pointed out that modern formwork systems help overcome issues related to shortage of skilled labour, poor workmanship, and construction delays. The findings indicated that although contractors are hesitant to adopt new technologies due to higher initial costs and lack of familiarity, Mivan

technology offers long-term benefits in terms of reduced construction duration, improved surface finish, and better structural performance.

III. RESEARCH GAP

Based on the detailed review of previous studies, the following research gaps have been identified:

1. Most studies focus primarily on analytical modelling using ETABS software, while very limited experimental investigations have been carried out under actual seismic conditions.
2. The majority of research compares only structural parameters such as displacement, drift, stiffness, and base shear, whereas lifecycle cost analysis and maintenance cost evaluation are rarely addressed.
3. Very limited studies investigate the environmental sustainability and carbon footprint of Mivan technology compared to conventional RCC systems.
4. Soil-Structure Interaction (SSI) effects have not been extensively analysed for Mivan structures in high seismic zones.
5. Most studies are limited to regular building configurations; irregular structures and torsional behaviour require further investigation.
6. Long-term durability performance of Mivan structures under varying climatic and environmental conditions remains insufficiently explored.
7. The influence of different grades of concrete, wall thicknesses, and reinforcement detailing on the seismic behaviour of Mivan systems has not been comprehensively studied.
8. Few studies evaluate the post-earthquake repairability and damage assessment of Mivan structures.
9. Comparative studies considering fire resistance, acoustic performance, thermal efficiency, and occupant comfort are limited.
10. Most research focuses on residential buildings; limited investigations are available for commercial, industrial, and infrastructure applications of Mivan technology.
11. There is inadequate research on optimisation of openings in shear walls and their effect on structural stability in high seismic regions.
12. The integration of Building Information Modelling (BIM), automation, and smart construction techniques with Mivan technology has not been widely explored.
13. Limited studies investigate the economic feasibility of Mivan technology for small- and medium-scale projects.
14. Few researchers have compared Mivan technology with other modern construction systems such as tunnel formwork, precast systems, and modular construction under seismic loading.
15. Dynamic analysis considering nonlinear behaviour, pushover analysis, and performance-based seismic design of Mivan structures requires further detailed study.

CONCLUSION

This review paper presented a comprehensive comparative study of Mivan technology and conventional RCC structures in high seismic zones based on previously published research articles from 2017 to 2025. The reviewed literature clearly indicates that Mivan technology offers significant advantages over conventional RCC construction systems in terms of structural performance, construction speed, quality control, and labour efficiency. The monolithic construction approach of Mivan technology enhances lateral stiffness and reduces storey displacement, inter-storey drift, and structural irregularities under seismic loading conditions. The integrated shear wall action of Mivan structures improves earthquake resistance and overall structural stability, making them highly suitable for high seismic zones and high-rise residential projects. Additionally, the aluminium formwork system enables rapid construction, better dimensional accuracy, smoother surface finish, reduced plastering work, and lower labour dependency. Although the initial investment cost of Mivan technology is comparatively higher than conventional RCC construction, it becomes economical for large-scale and repetitive projects due to reduced construction duration, improved productivity, and lower maintenance requirements. The reviewed studies also highlight the suitability of Mivan technology for affordable housing and mass housing schemes in rapidly urbanising regions. However, several research gaps still exist in the areas of experimental validation, lifecycle cost analysis, environmental sustainability, soil-structure interaction, nonlinear seismic analysis, and long-term durability assessment. Most existing studies are based on software simulations and lack real-time field investigations under actual seismic conditions. Therefore, future research should focus on experimental studies, advanced seismic performance evaluation, sustainability assessment, and integration of modern digital technologies such as BIM and smart construction systems. Overall, Mivan technology has emerged as a promising and efficient alternative to conventional RCC construction, especially for earthquake-prone regions requiring rapid, durable, and high-quality construction solutions. The findings of this

review paper can provide valuable guidance to researchers, structural engineers, contractors, and policymakers for the effective implementation of Mivan technology in future infrastructure development.

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