



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 4, April 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 ijirset@gmail.com

 www.ijirset.com

Comparative Analysis Between Conventional and Mivan Construction using Etabs Software

**Prof. Ghatol C. B, Tanishka S. Nimbalkar, Arjun Pale, Ashish Kharat, Kalpesh Kharat,
Kamal Dulat, Rajan Ahire**

Professor, Department of Civil Engineering, MGM's Polytechnic, Chh. Sambhajinagar,
Maharashtra, India

Student, Department of Civil Engineering, MGM's Polytechnic, Chh. Sambhajinagar,
Maharashtra, India

ABSTRACT: This study presents a comparative analysis between conventional construction methods and Mivan construction technique using the ETABS software. Conventional construction methods typically involve the use of formwork made of wood, steel, or other materials, while Mivan construction employs lightweight aluminium formwork systems. The aim of this analysis is to evaluate the structural performance, construction efficiency, and economic viability of both construction methods. The analysis is conducted using ETABS software, a widely used structural analysis and design tool. ETABS allows for detailed modeling and simulation of structural systems, enabling engineers to assess various factors such as load distribution, deflection, and stability.

KEYWORDS: Conventional Construction, Mivan Construction, ETABS Software, Structural Analysis, Comparative Analysis, Construction Efficiency, Cost Analysis, Sustainability.

I. INTRODUCTION

The construction industry continuously evolves, adopting innovative techniques and technologies to enhance efficiency, cost-effectiveness, and structural performance. Two prominent methods widely employed in the construction of buildings and structures are conventional construction and Mivan construction. Conventional construction relies on traditional formwork systems made of materials like wood or steel, while Mivan construction utilizes lightweight aluminum formwork systems. Each method has its unique characteristics, advantages, and challenges. In recent years, the demand for faster construction, higher quality, and cost optimization has led to a growing interest in comparing these two construction techniques. This comparative analysis aims to evaluate and contrast conventional construction and Mivan construction using advanced structural analysis software, specifically ETABS. ETABS is a powerful tool commonly utilized by structural engineers for the design and analysis of buildings and other structures. It enables comprehensive modeling, simulation, and analysis of various structural systems, allowing for detailed examination of factors such as load distribution, structural integrity, and performance under different loading conditions. By conducting this comparative analysis using ETABS software, valuable insights can be gained to inform decision-making processes in the construction industry. The findings of this study can help stakeholders, including engineers, architects, and project managers, make informed choices regarding the selection of construction techniques for various building projects, ultimately contributing to improved efficiency, quality, and sustainability in construction practices.

II. LITERATURE REVIEW

1. **Danish Ansari et.al (2016), Comparative Analysis of MIVAN Formwork Building and Conventional Formwork Building Based on Cost and Duration:** The project involves detailed cost estimation and duration analysis of a building constructed by MIVAN formwork and Conventional formwork. The buildings are of G+21 floors where the saleable area of building with mivan formwork is 8747.28 sq. ft and that with Conventional Method is 9786.67 Sft on each floor with 3.0 m as the height of each floor. Later comparative analysis is done on cost and duration of both the buildings.

2. **P.P. Pattanshetti et.al (2018), Mivan Technology:** Mivan is an upcoming technology which has empowered and motivated the mass construction projects throughout the world. In this project, we have discussed about the pioneering and yet pragmatic approach of this technology with provisions of speed, quality, financial incentives and construction aspects which is required for a successful completion of mass housing project, with the help of a case study of a renowned company. The project also includes comparison of aluminum formwork technology and conventional system. This comparison reveals the reduced total cost. Other aspects include its box type construction which proves much advantageous as far as earthquake resistant structure is considered.
3. **Darshankumar Patel et.al (2022), A Review Paper on Comparative analysis of MIVAN Formwork Technology and Conventional Formwork Technology:** Mivan is an upcoming technology which has empowered and motivated the mass construction projects throughout the world. In this project, we have discussed about the pioneering and yet pragmatic approach of this technology with provisions of speed, quality, financial incentives and construction aspects which is required for a successful completion of mass housing project, with the help of a case study of a renowned company. The project also includes comparison of aluminum formwork technology and conventional system. This comparison reveals the reduced total cost. Other aspects include its box type construction which proves much advantageous as far as earthquake resistant structure is considered.
4. **Sanjeet Haldankar et.al (2023), Mivan Construction Technology:** Construction is one of the significant sectors of Indian economy and is an integral part of the development. Today India's urban population is the second largest in the world and its future development leads to increased demand for housing to cope with this problem India should desperately need to plan for acquisition of land and rapid creation of dwelling units. Construction is a complex process involving basically the areas of Architectural planning, Engineering & Construction. There is growing realization today that speed of construction needs to be given greater importance especially for large housing projects. This is not only essential for the faster turnover of equipment and investment leading possible to the reduction in the housing cost but also for achieving the national objective of creating a large stock to overcome shortest possible time. Fortunately, some of the advanced technologies catering to faster speed of construction are already available in the country. For e.g. Prefabrication, autoclaved blocks, tunnel formwork, aluminium formwork (MIVAN Technology) of construction etc. The aluminum formwork system was developed by the Malasiyan Company, which is why the aluminum formwork technology is named after it . Mivan is coming up with new construction technology for the successful completion of the mass housing project in India.
5. **Akshay Gulghane et.al, (2018) Time and Cost Optimization of Construction Project Using Mivan Technology:** Construction is one of the significant sectors and integral part of Indian economy. Also, it is of the important parameter in development of country. India is desperately planning for rapid manufacturing and creation of dwelling units for economical construction facilities Formwork enables to cast and construct the important elements and components of any construction facilities, which are required to be strong and effectively handle the structure. Mivan is comparatively a new construction technology upcoming for successful completion of mass project especially repetitive in nature. In this paper we have discussed about cost as well as time comparison of mivan technology with conventional formwork technology. The Mivan technology is appreciably efficient with cost, quality and time saving as compare to conventional one. The basic ideology is to reach a sturdy conclusion regarding the superiority of the two techniques over another.
6. **Hemendrasinh Chauhan et.al, (2017) Comparison and Effectiveness of mivan formwork over the convectional formwork:** The formwork is temporary structure to support the building structure and it is the main factor for successful of completion of project with respect to speed, quality, economic and safety. In building construction most effective way is the speed of the work early as possible that depend on selection type of formwork. Such type of formwork is Mivan formwork. Mivan formwork is one of the most method for concrete pouring in single operation of wall with roof so that less consume time and it is on light in weight than conventional so that easily handle. This paper represent comparison of Mivan over the conventional formwork.
7. **Vedika Prasad Mahale et.al, (2024) Optimizing Construction Efficiency with Mivan Formwork System:** Mivan technology, also known as Aluminum Formwork System, is a modern construction technique that utilizes aluminum formworks to create cast-in-place concrete structures efficiently. This method replaces traditional formwork made of wood or steel with lightweight and reusable aluminum panels, resulting in faster construction cycles, improved quality, and cost-effectiveness. Mivan technology is widely used in residential, commercial, and

industrial projects due to its versatility, speed, and sustainability. Mivan technology used in India and its comparative analysis with conventional formwork with its cost, time and construction efficiency.

8. **Amith B N et.al, (2023) Comparative study of mivan and convectional construction formwork structure:** Any nation's progress in the building sector is regarded as evidence of that nation's development. Formwork comes in a wide variety of forms that are typically employed in construction and vary depending on the needs and difficulties of the project. About 35 to 40 percent of the cost for an RCC member is made up by formwork. Formwork must be designed and detailed well because it accounts for a sizeable portion of the project's overall cost. This paper involves the study and review of various research papers dealing with comparative study between Mivan and conventional formwork structures. In this paper, we compare the costs and timeliness of MIVAN formwork to those of conventional formwork. MIVAN technology is vastly more effective than conventional technology in terms of cost, dependability, and endurance. The major objective is to definitively determine which of the two techniques is superior to the other. To conclusively establish which of the two methods is superior to the other is the main goal.
9. **Yadav P.D et.al, (2018) Review Paper on Conventional and Mivan Formwork used for Construction:** The progress made by construction industry of any country would be consider as development of that country. Concrete formwork is the use of support structures and moulds to create structures out of concrete which is poured into the moulds. There are many different types of formwork used in construction, usually differing according to what the building requirements and challenges are. Formwork comprise about 35 to 40 percent of cost required for RCC member. As formwork has a considerable cost share in total project cost, Hence it is necessary to adopt proper design detailing of formwork. Formwork is used by creating moulds out of wood, steel, aluminium or prefabricated forms into which the concrete is poured. This is then allowed to harden and set after which it is stripped, or in the case of stay-in-place formwork it is left as part of the structure. Formwork allows contractors to cast and construct the main parts of a building which are required to be strong and support the structure such as floors and walls, as well as smaller parts of a building such as stairs relatively quickly.

III. METHODOLOGY

Collected of Formwork used for construction:

Mivan Construction: Mivan construction formwork, also known as aluminum formwork, is a modern construction technique widely used in the building industry for its efficiency and durability. Developed by a European company, Mivan technology involves creating formwork from high-grade aluminum panels, enabling rapid construction of concrete structures with remarkable precision.

The system is based on assembling lightweight yet sturdy aluminum panels into formwork molds, which serve as the framework for pouring concrete. These panels are easily interconnected using simple locking mechanisms, reducing construction time significantly compared to traditional methods. Moreover, the reusable nature of the aluminum panels makes Mivan formwork cost-effective and environmentally friendly, minimizing material wastage and enhancing sustainability in construction projects.

One of the key advantages of Mivan formwork is its adaptability to various architectural designs and structural requirements. It can be customized to form walls, columns, slabs, beams, and other components of a building with ease. Additionally, the smooth finish achieved with Mivan formwork eliminates the need for plastering, saving both time and resources.

The speed and efficiency of Mivan construction also contribute to cost savings by reducing labor expenses and shortening project timelines. Furthermore, the inherent strength of aluminum ensures the structural integrity of the formwork, even under high pressure from the concrete pour. This reliability results in fewer defects and greater overall quality in the finished construction.

Overall, Mivan construction formwork represents a significant advancement in the field of building technology, offering builders and developers a practical solution for fast, efficient, and high-quality construction projects. Its widespread adoption across the globe underscores its effectiveness in meeting the demands of modern construction practices.

Components of Mivan Formwork:

1. Beam Side Panel
2. Prop Head for soffit Beam
3. Beam Soffit Panel
4. Deck Panel
5. Deck Prop
6. Prop Length
7. Deck Mid-Beam
8. Soffit Length
9. Deck Beam Bar
10. Internal soffit corner
11. External Soffit Corner
12. External Corner
13. Internal Corner
14. Wall Panel
15. Rocker
16. Kicker
17. Stub Pin

Conventional Formwork: Conventional construction formwork is the traditional method used in the building industry to shape concrete structures. It involves creating temporary molds or frameworks into which concrete is poured and allowed to harden, thus forming walls, columns, beams, slabs, and other structural elements of a building. The materials typically used in conventional formwork include timber, plywood, steel, and sometimes even plastic. Timber and plywood are commonly employed for smaller-scale projects or where budget constraints are a concern, offering a cost-effective solution that can be easily customized on-site to meet specific design requirements. Steel formwork, on the other hand, is favored for its strength and durability, making it suitable for larger and more complex structures. Plastic formwork, though less common, provides advantages such as lightweight construction and resistance to corrosion.

The process of conventional formwork involves the assembly of these materials into the desired shape and size on-site, often requiring skilled laborers to ensure accuracy and precision. Once the formwork is in place, concrete is poured into the molds, and reinforcements such as steel bars (rebar) may be added to enhance the structural integrity of the final product. After the concrete has cured and achieved sufficient strength, the formwork is removed, allowing the finished structure to be revealed.

While conventional formwork has been the cornerstone of construction for centuries and offers flexibility in adapting to various project requirements, it does have limitations. One significant drawback is the time and labor involved in both setting up and dismantling the formwork, which can lead to increased project timelines and costs. Additionally, the materials used in conventional formwork may not always be reusable or environmentally sustainable, contributing to waste and resource depletion.

Despite these challenges, conventional formwork remains a widely used method due to its versatility, familiarity, and adaptability to different construction scenarios. However, advancements in construction technology have led to the development of alternative formwork systems, such as Mivan construction formwork mentioned earlier, which prioritize efficiency, speed, and sustainability. As the construction industry continues to evolve, the choice between conventional and modern formwork techniques will depend on factors such as project size, budget, timeline, and environmental considerations.

Components of Conventional Construction:

1. Plywood Sheeting
2. Struts
3. Timber Sheeting
4. Vertical Props
5. Horizontal Members
6. Wedges



7. Side and End Planks
8. Yoke
9. Nut and Bolt
10. Beam Plates
11. U-Head (Head Tree)
12. Planks
13. Wooden Battens
14. Ledgers
15. Vertical and Inclined Posts
16. Inclined Members
17. Wooden Planks
18. Stringer
19. Rises.

Sr. No.	Characteristics	Aluminium Formwork	Conventional Formwork
1.	Speed of Construction	4 Days cycle per floor	Min. Cycle time is 18 days
2.	Quality of Surface finish	Excellent Plastering not required	Not Satisfactory- Plaster is needed
3.	Pre-Planning of Formwork	Required	Not Required
4.	Type of Construction	Cast in situ cellular construction	Simple RCC framed construction
5.	Wastage of Materials	Very Less	In great amount
6.	Accuracy of Construction	Accurate Construction	Accuracy is Less

IV. EXPERIMENTAL RESULTS

In this project we have done the analysis of mivan building and conventional building of G+4 building with having 1200 sq.ft area off each flat and there are 4 flats on each storey or floor with one side staircase and lift on other side. Both the building have same external view and other analysis are different

V. CONVENTIONAL CONSTRUCTION

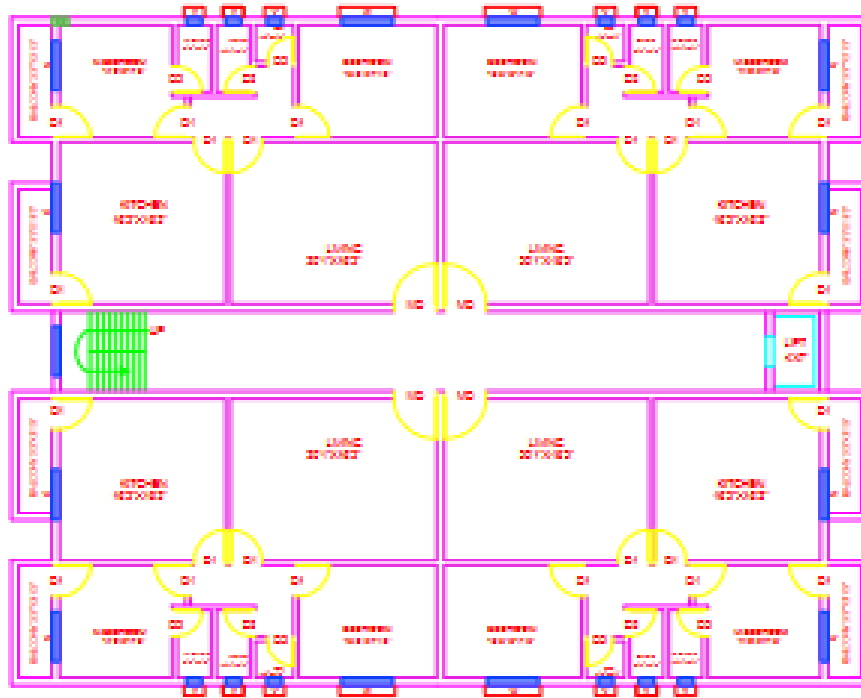


Figure 1: Floor Plan for Conventional Construction

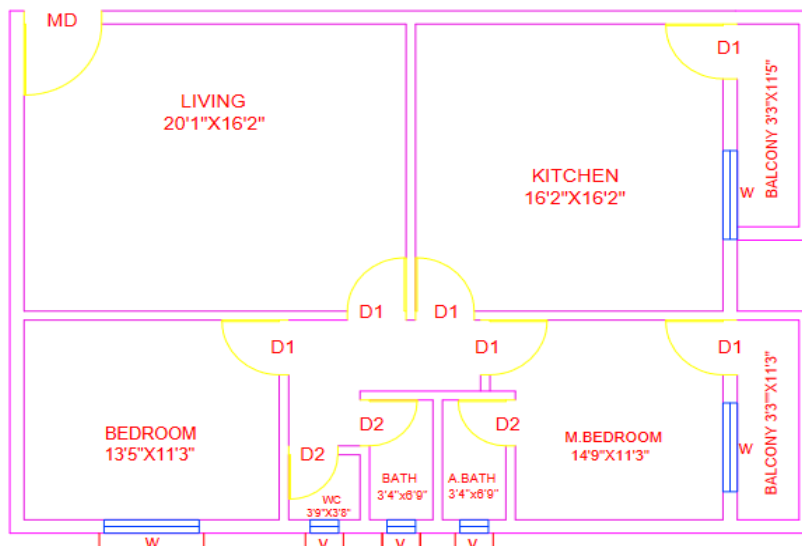


Figure 2: Plan one flat for Conventional Construction

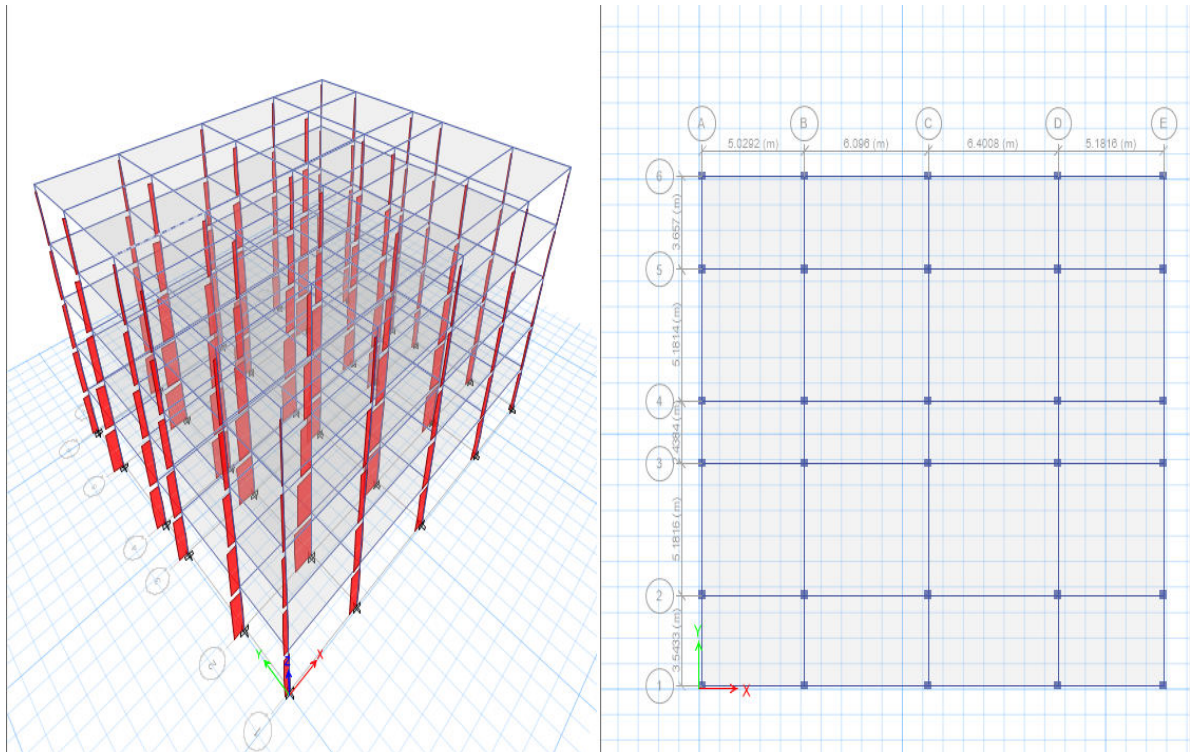


Figure 3: Axial Force for Conventional Construction

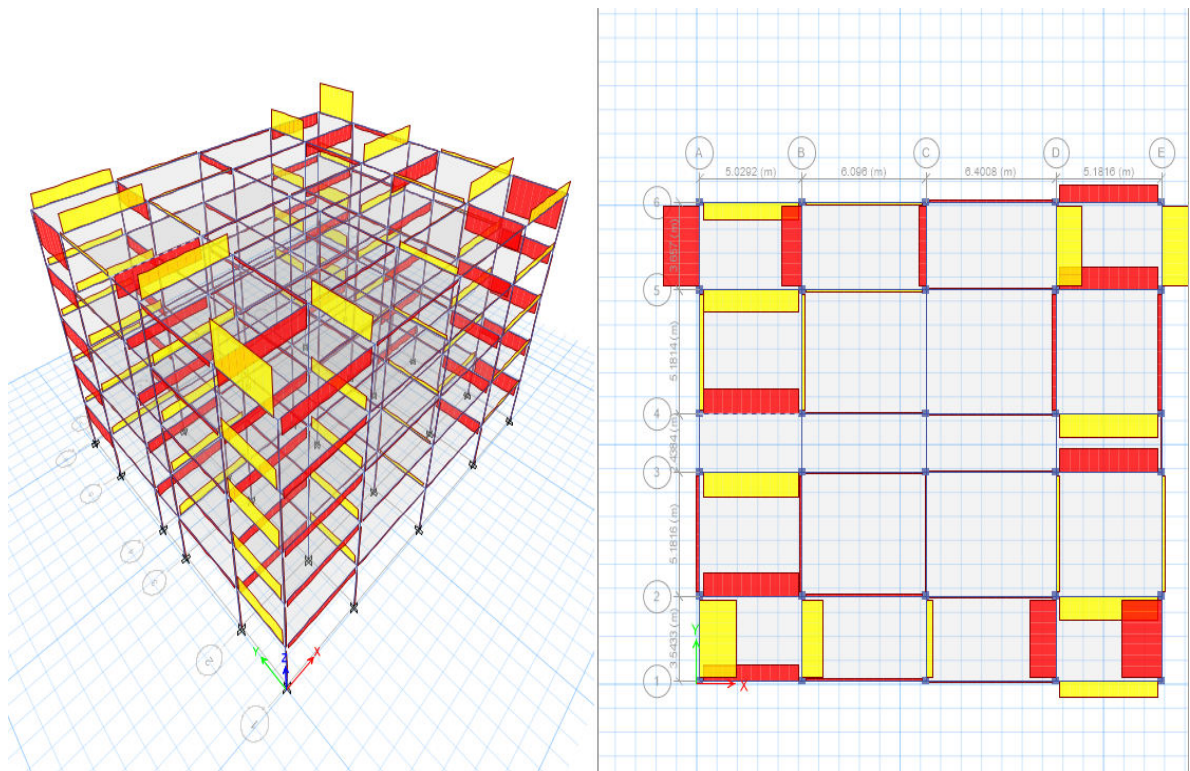


Figure 4: Torsion for Conventional Construction

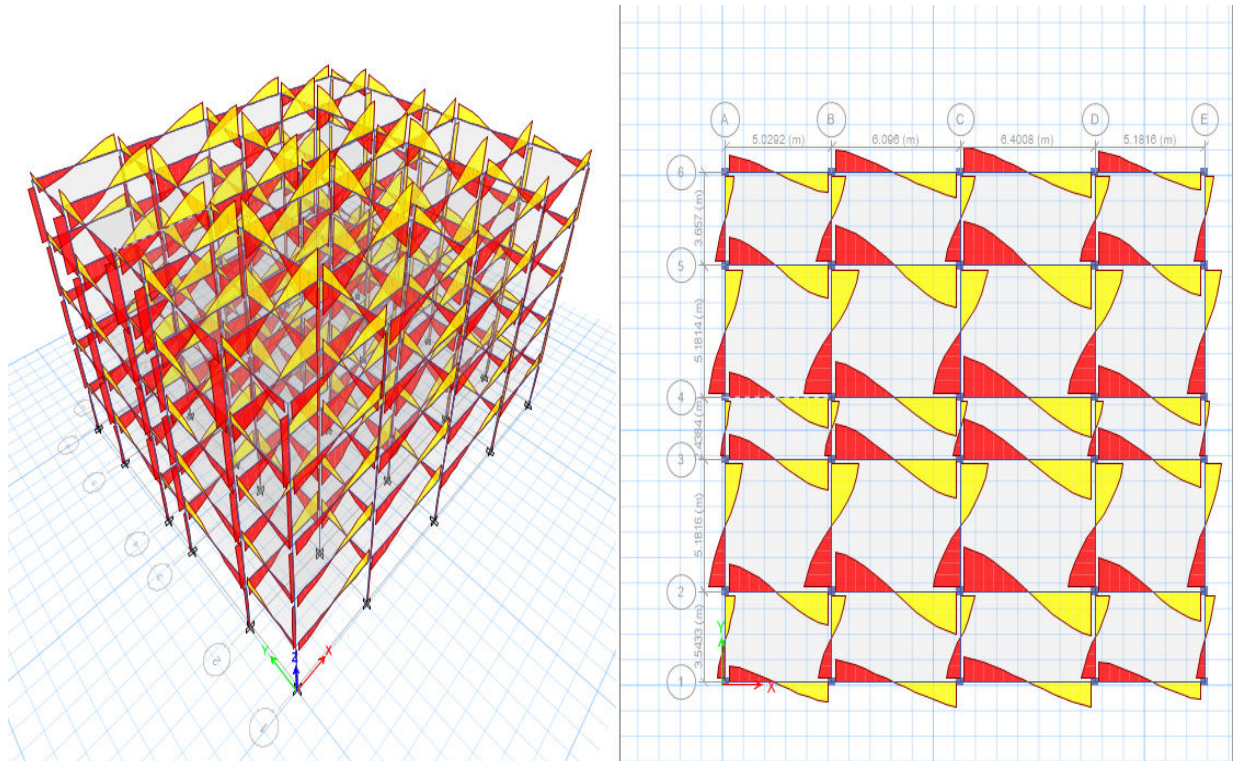


Figure 5: Shear Force 2-2 for Conventional Construction

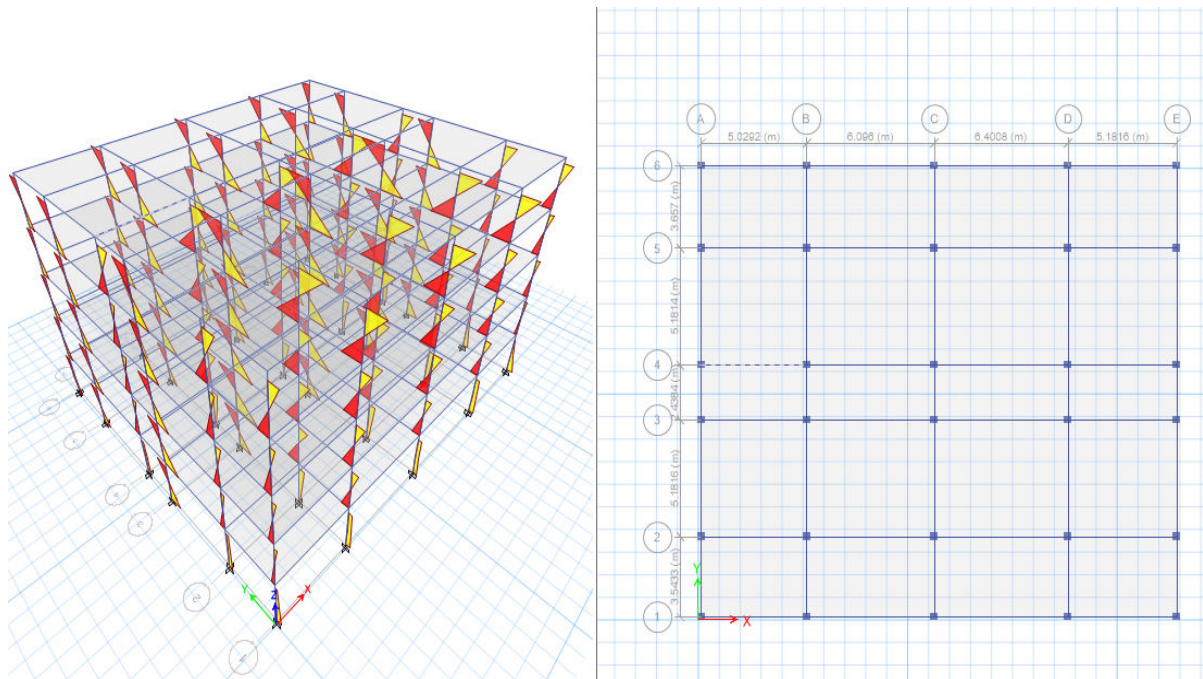


Figure 6: Moment 2-2 for Conventional Construction

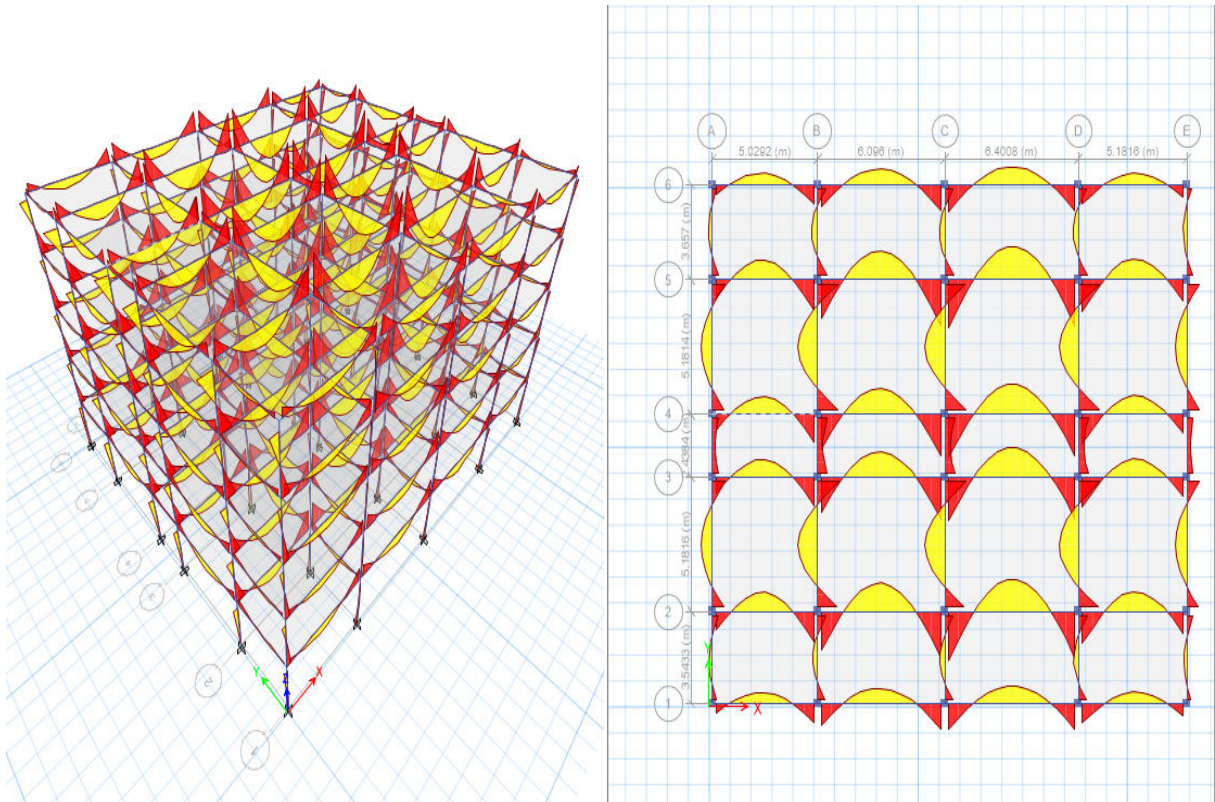


Figure 7: Moment 3-3 for Conventional Construction

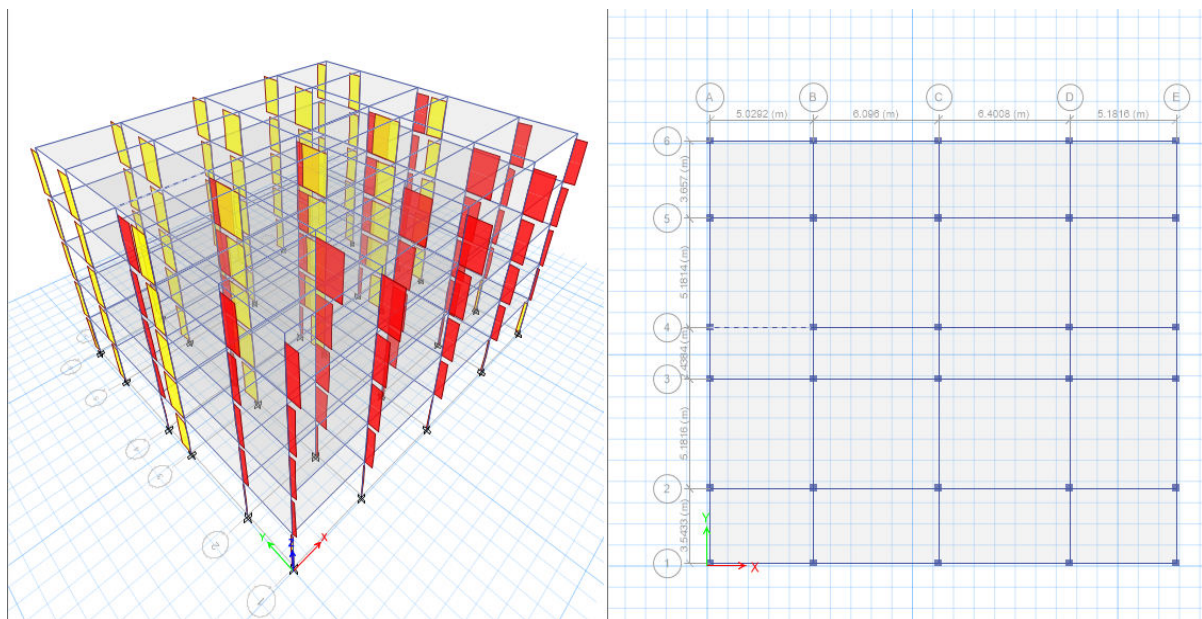


Figure 8: Shear Force 3-3 for Conventional Construction

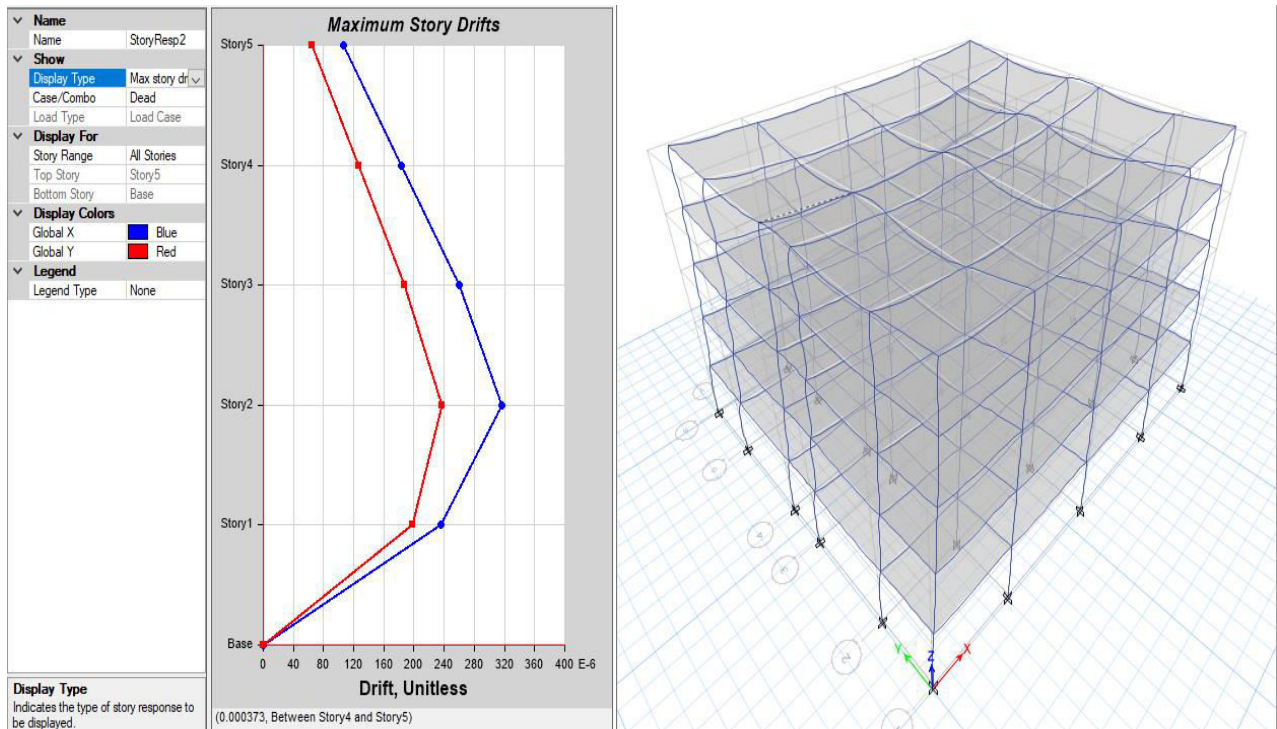


Figure 9: Maximum Storey Drifts Graph for Conventional Construction

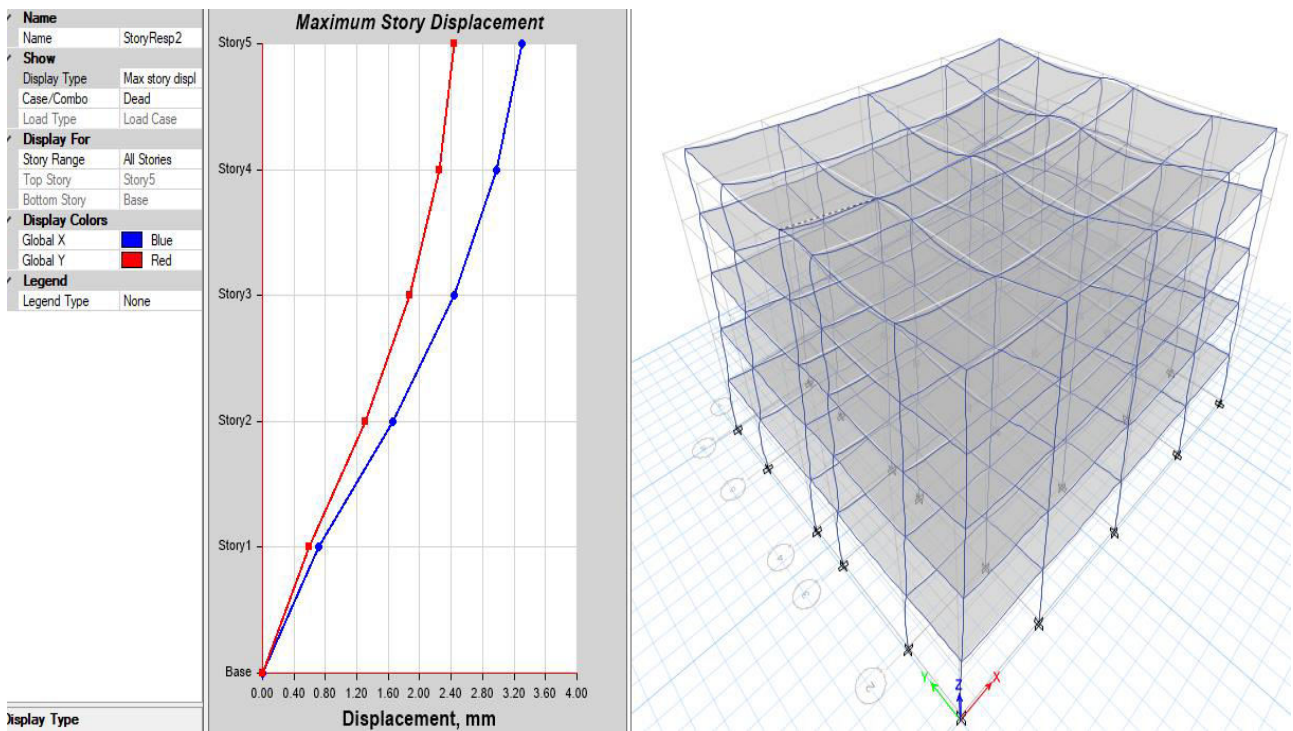


Figure 10: Maximum Storey Displacement Graph for Conventional Construction

V. MIVAN CONSTRUCTION

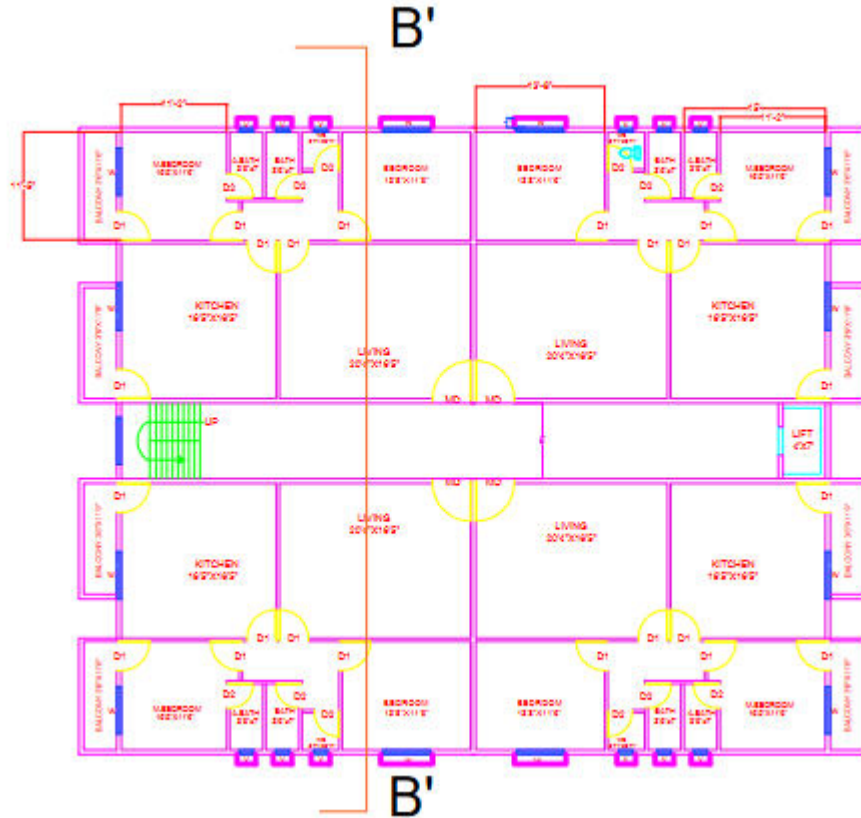


Figure 11: Floor Plan for Mivan Construction

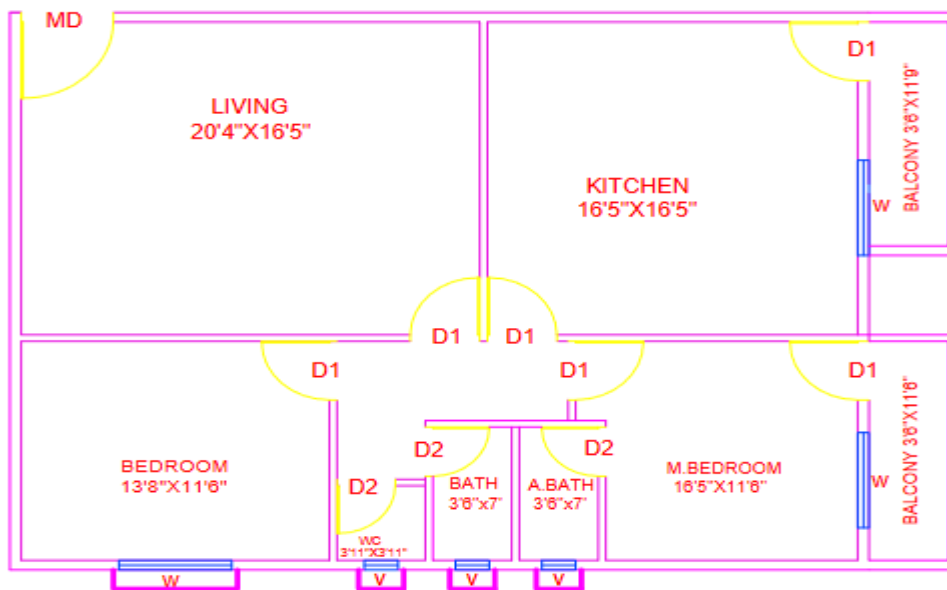


Figure 12: Floor Plan of one flat for Mivan Construction

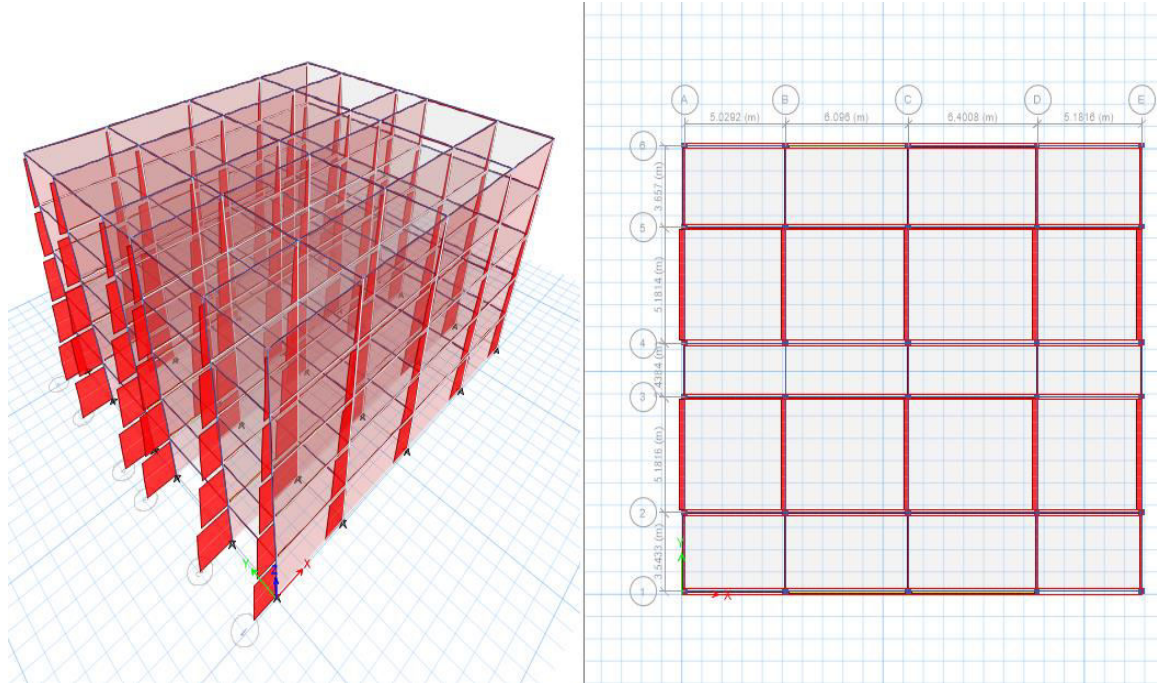


Figure 13: Axial Force for Mivan Construction

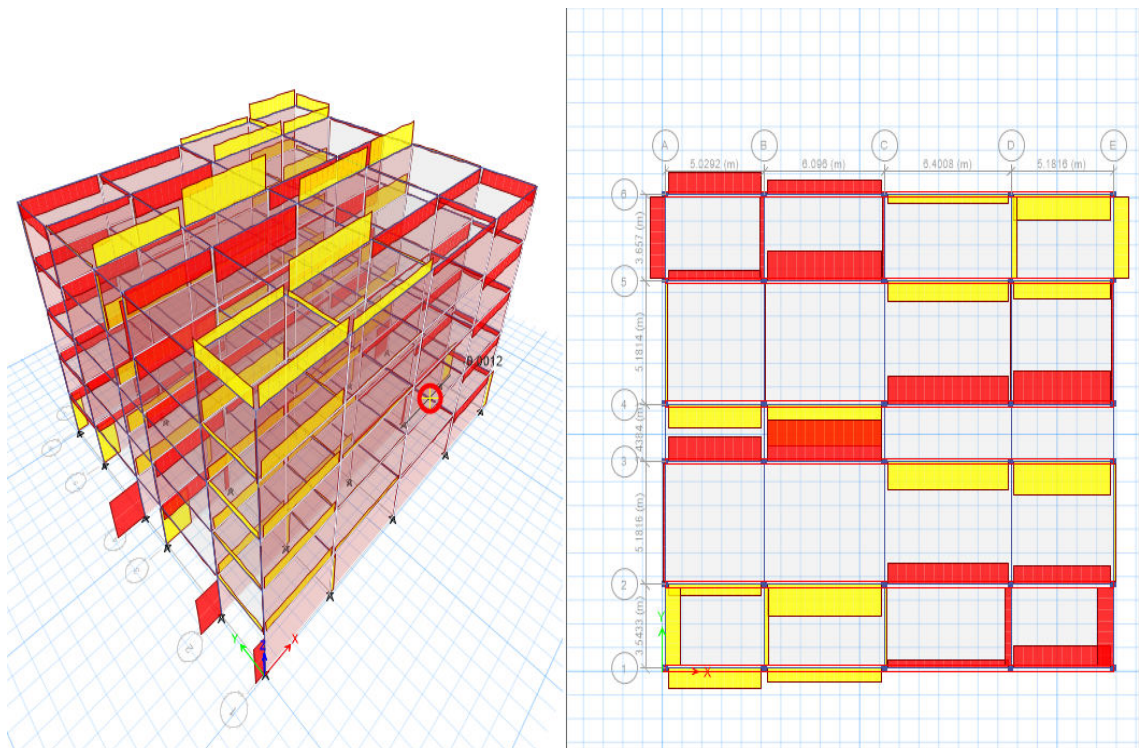


Figure 14: Torsion for Mivan Construction

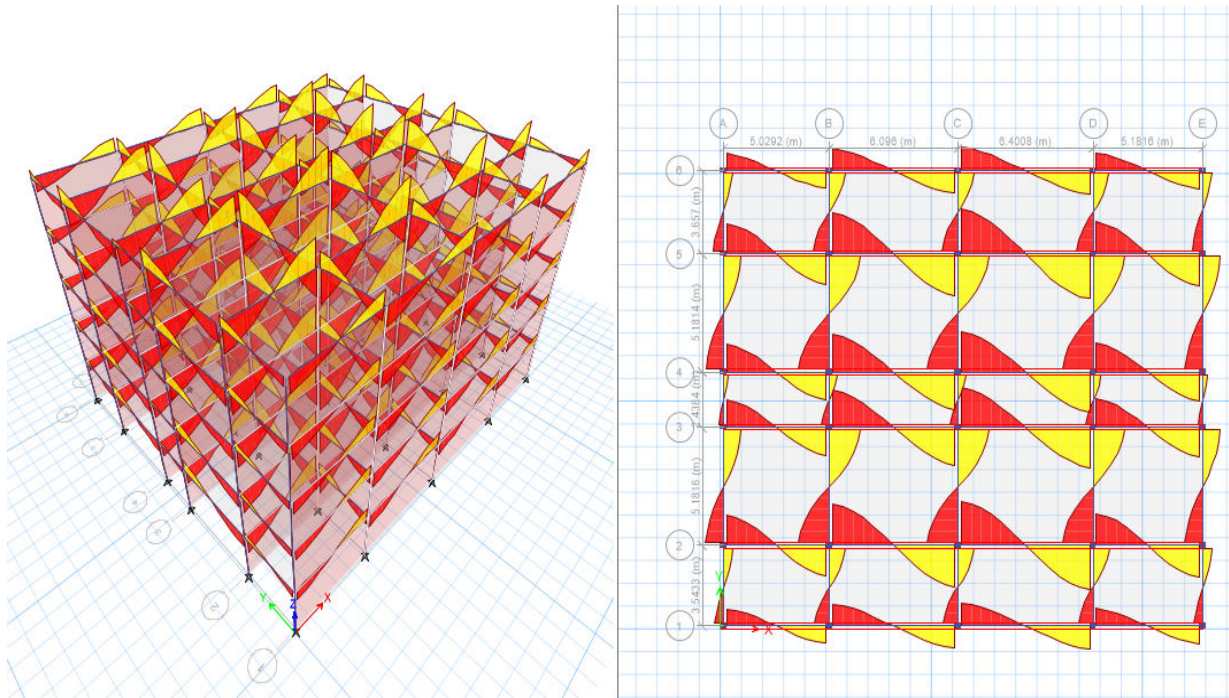


Figure 15: Shear Force 2-2 for Mivan Construction

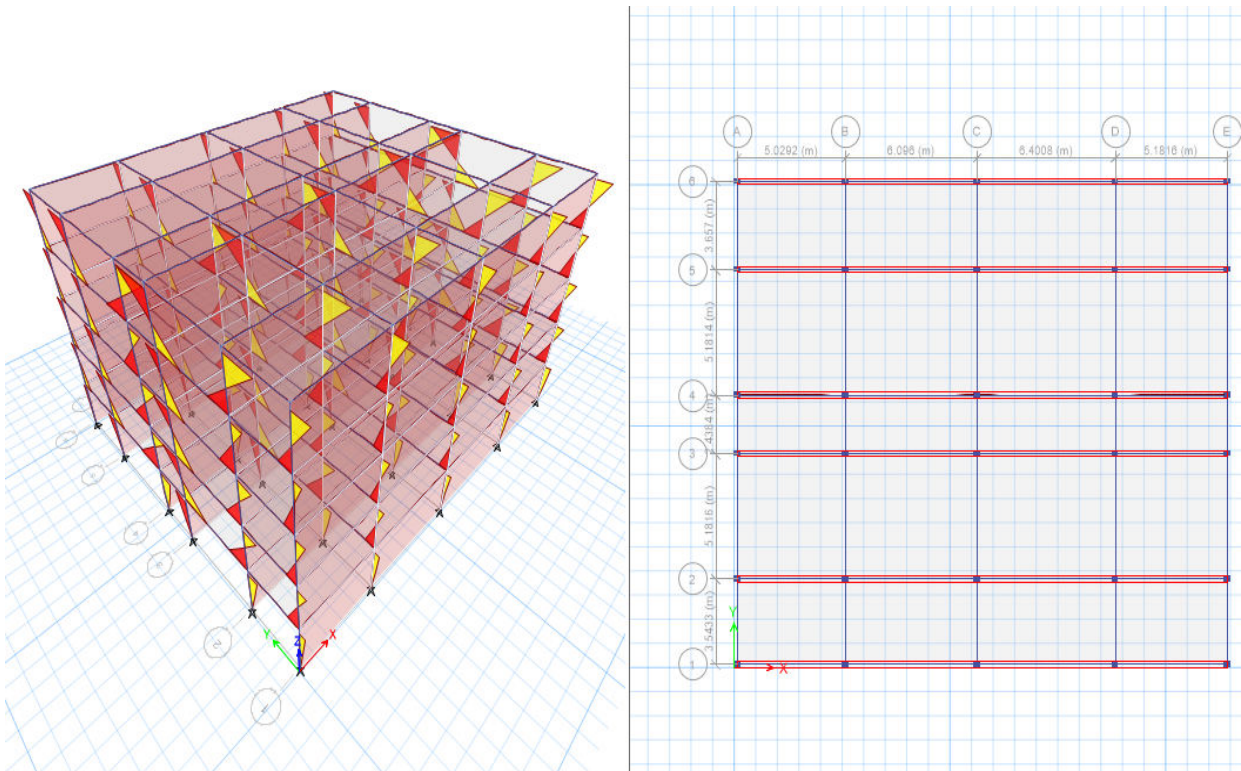


Figure 16: Moment 2-2 for Mivan Construction

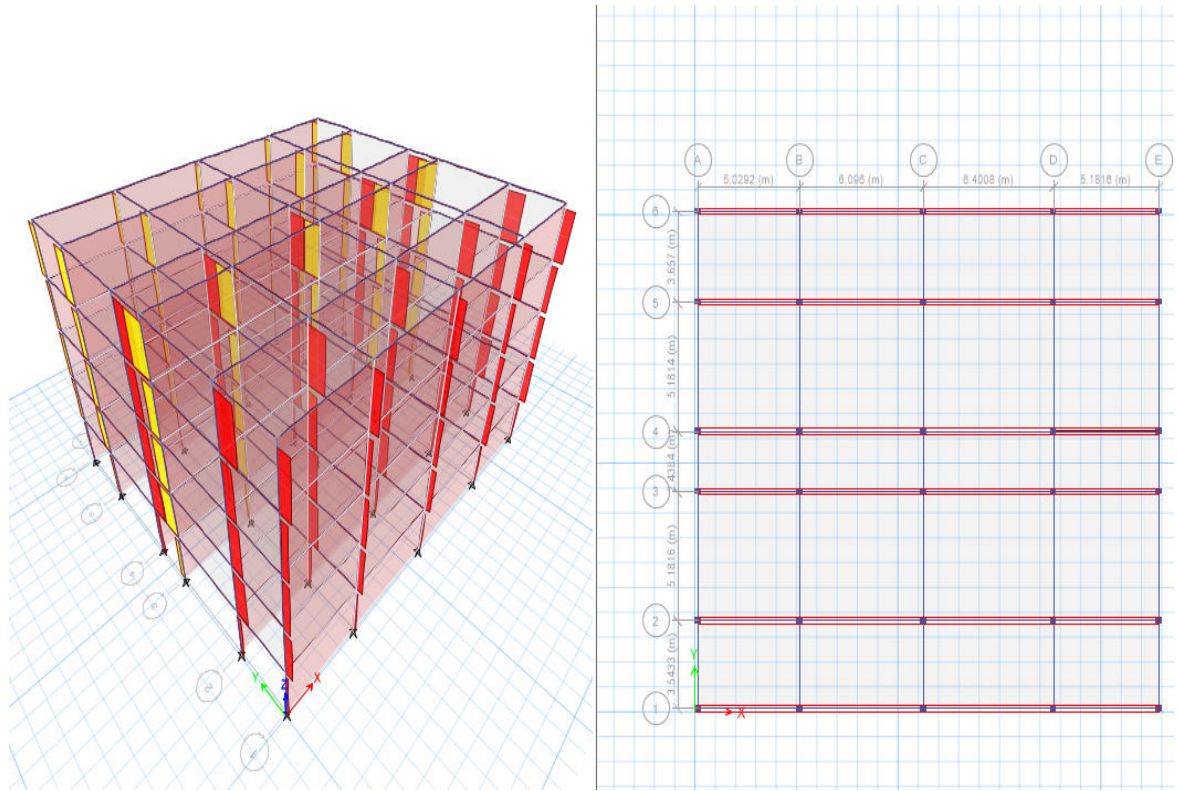


Figure 17: Shear Force 3-3 for Mivan Construction

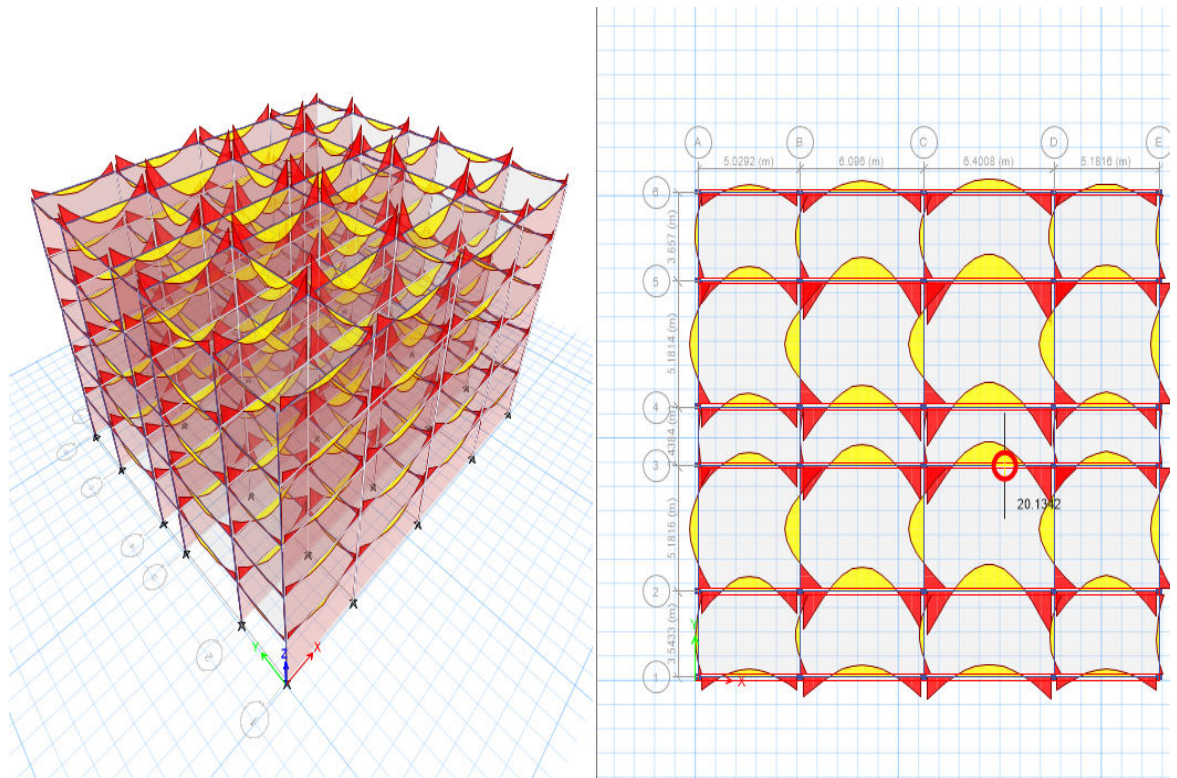


Figure 18: Moment 3-3 for Mivan Construction

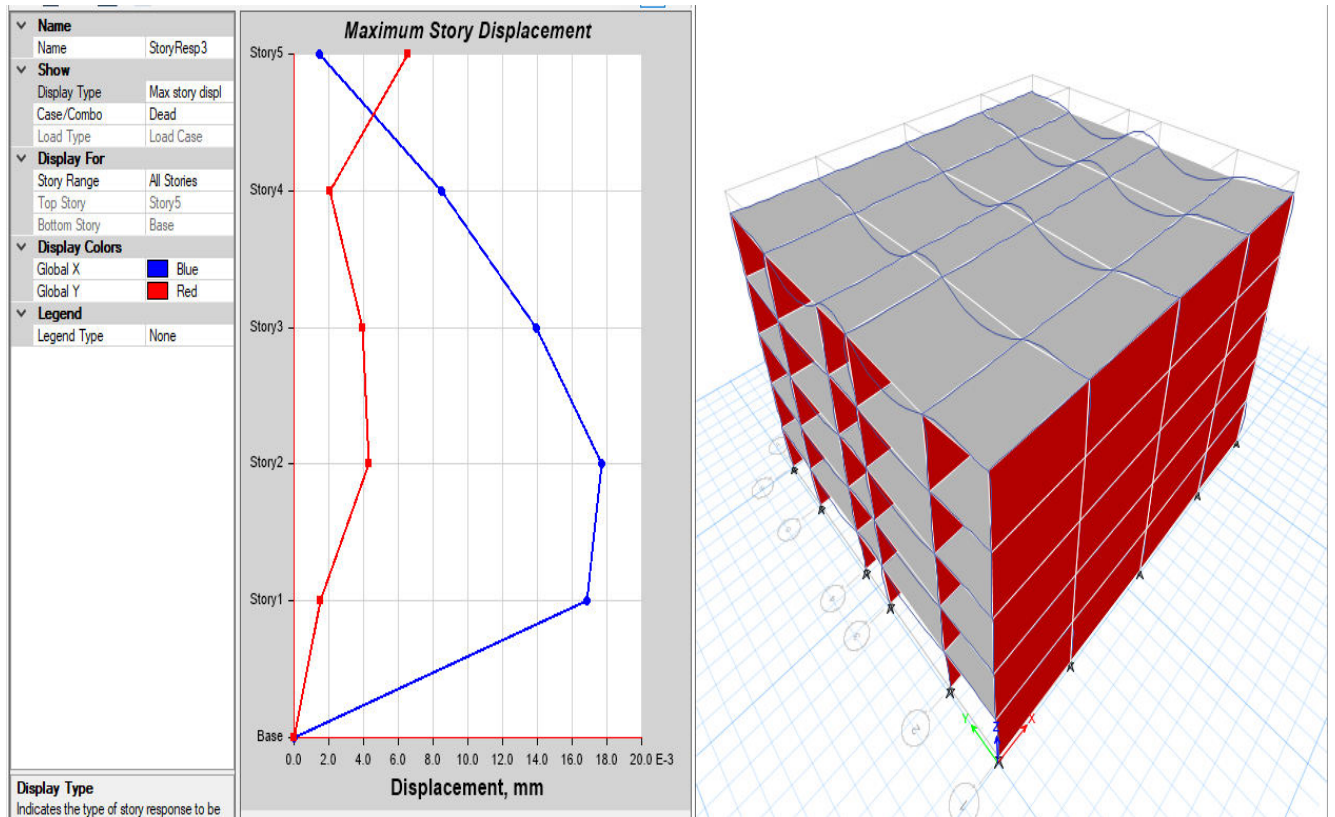


Figure 19: Maximum Storey Displacement Graph for Mivan Construction

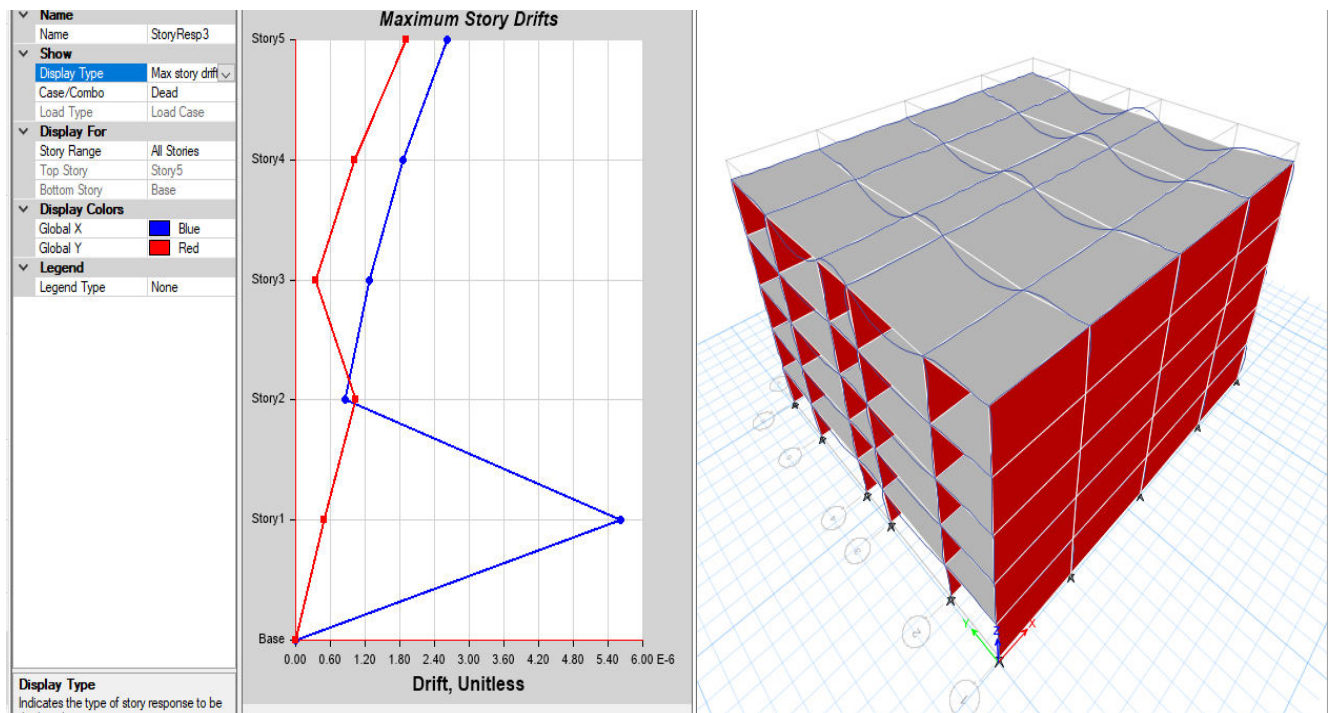


Figure 20: Maximum Storey Drifts Graph for Mivan Construction



Figure 21: External View of Mivan Construction and Conventional Construction Building

VI. CONCLUSION

The challenge of housing, fueled by a growing population, looms larger by the day. Thankfully, our technical capabilities offer a vast reservoir of potential just waiting to be tapped into. However, the construction industry, known for its conservative nature, has been slow to embrace innovation. Yet, it's high time we delve deep into the issue and unearth effective solutions.

Enter aluminum formwork—a game-changer in the realm of mass housing projects worldwide. This ingenious tool doesn't just promise cost efficiency but also streamlines project timelines by leveraging modern construction techniques and equipment to their fullest potential.

What's more, our findings speak volumes: when compared to conventional formwork systems, using aluminum formwork not only slashes project costs but also significantly reduces project durations. It's a win-win situation, offering a beacon of hope in the face of our monumental housing challenge.

REFERENCES

- 1) <https://www.homes247.in/blogs/mivan-construction-27>
- 2) <https://theconstructor.org/building/mivan-formwork-components-procedure-comparision/37256/>
- 3) <https://www.civilera.com/post/structural-system-for-mivan-technology>
- 4) <https://www.constructionplacements.com/mivan-technology/>
- 5) <https://theconstructor.org/building/mivan-formworkcomponents-procedure-comparision/37256/>
- 6) <https://chat.openai.com/>



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details