

# COMPARATIVE STUDY ON SEISMIC RESPONSE OF MASONRY INFILLED RC FRAME BUILDINGS AND MIVAN BUILDINGS WITH DIFFERENT PERCENTAGE OF WALL OPENINGS

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**Abstract**— Mivan formwork is one of the type of formwork which is basically alluminium formwork, the study on comparison of masonry infilled RC frame buildings and mivan buildings with different percentage of openings were made by response spectrum analysis using E-TABS software. The 3D model of 10-storey and 20-storey of both masonry infilled and mivan buildings are compared with having wall openings of 20%, 40%, 60% and 80% for the comparing parameters MAX. DISPLACEMENT, MAX. STORY DRIFT, STORY SHEAR, OVERTURNING MOMENTS AND STORY STIFFNESS.

By these study the results obtained is In 10 storry masonry building having 20% wall opening the displacement increased by 60.5%, storry drift by 73.49%, storry shear by 18.15, over turning moment by 71.01% And storry stiffness decreased by 73.2%. When compared with 10 storry mivan building having 20% wall opening. In 10 storry masonry building having 40% wall opening the displacement increased by 89.15%, storry drift by 89.2%, storry shear by 120%, over turning moment by 112% And storry stiffness decreased by 1.32%. When compared with 10 storry mivan building having 40% wall opening. In 10 storry masonry building having 60% wall opening the displacement increased by 84.3%, storry drift by 83.3%, storry shear by 22.21%, over turning moment by 22.7% And storry stiffness decreased by 70.5%. When compared with 10 storry mivan building having 60% wall opening. In 10 storry masonry building having 80% wall opening the displacement increased by 114%, storry drift by 114.2%, storry shear by 5.86%, over turning moment by 18.48% And storry stiffness decreased by 8.11%. When compared with 10 storry mivan building having 80% wall opening. In 20 storry masonry building having 20% wall opening the displacement increased by 39.21%, storry drift by 33.5%, storry shear by 11.9%, over turning moment by 12.27% And storry stiffness decreased by 82.7%. When compared with 20 storry mivan building having 20% wall opening. In 20 storry masonry building having 40% wall opening the displacement increased by 13.54%, storry drift by 11.42%, storry shear by 25.26%, over turning moment by 25.3% And storry stiffness increased by 11.8%. When compared with 20 storry mivan building having 40% wall opening. In 20 storry masonry building having 60% wall opening the displacement increased by 27.77%, storry drift by 23.3%, storry shear by 14.97%, over turning moment by 15.2% And storry stiffness decreased by 63.87%. When compared with 20 storry mivan building having 60% wall opening. In 20 storry masonry building having 80% wall opening the displacement increased by 31.49%, storry drift by 26.8%, storry shear by 21.8%, over turning moment by 22.175% And storry stiffness decreased by 63.69%. When compared with 20 storry mivan building having 80% wall opening.

**Key Words:** MIVAN TECHNOLOGY, MASONRY INFILL RC FRAME BUILDING, ETABS, RESONSE SPECTRUM ANALYSIS, etc

**INTRODUCTION:** Construction is the important part of the development of nations and it is significant sector of Indian economy. India is having second largest population in world and in future demand of housing increases desperately with this problem India should desperately need to plan for acquilisation of land and rapid Creation of building units. Today there is growth in population for that speed of construction needs to be given greater importance especially for the large housing projects, fortunately some of the advance technologies for the faster speed construction are already available in the country one of the example is MIVAN TECHNOLOGY.

**MIVAN TECHNOLOGY:** MIVAN TECHNOLOGY system is the different type of alluminium formwork which was invited by mivan company ltd from Malaysia in 1990s as a system for constructing mass housing project in developing countries. The use of mivan formwork in construction having great potential, currently needs for construction in India; mivan technology can increase productivity, quality and performance of work. The concrete surface finish produced with the alluminium forms allows achievement of a high quality wall finish without the need of external plastering. This is one of the system identified to be very much suitable for Indian conditions for mass construction, where quality and speed can be achieved at high level.

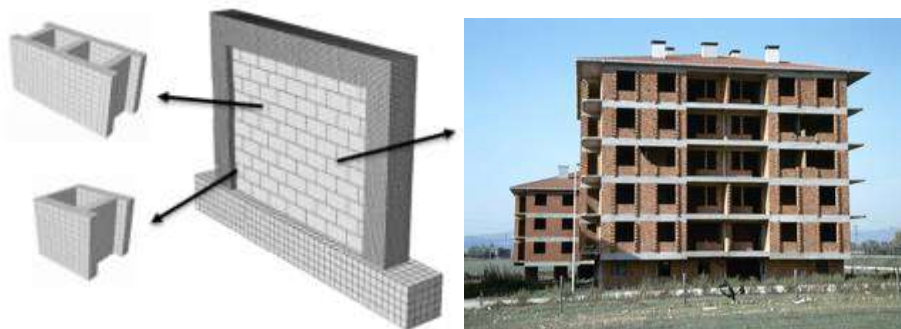


### MIVAN STRUCTURE

#### ADVANTAGES MIVAN TECHNOLOGY

- High quality formwork ensures consistence of dimension
- On removal of mould a high quality concrete finish is produced
- Total system forms the complete structures
- Construction of mivan structures is speed
- Panels can be reused up to 250 times
- Box-type of mivan formwork is more earthquake resistance to the structure
- Durability of mivan formwork is higher than the conventional formwork
- Carpet area is more may be due thin shrear wall

**MASONRY INFILLED RC FRAMES:** Since the early 1990s reinforced concrete frames with masonry infill walls have been a popular form of construction in earthquake region. Masonry infill are used to fill the spans between the vertical and horizontal resting elements of building frames, in contrary an infill wall considerably enhance the rigidity and strength of the frame structures. It has been observed that the frame considering no infill has comparatively less stiffness and strength than the infill frame and therefore their ignorance cause failure in many multistory building when subjected to seismic loads.



### MASONRY INFILLED STRUCTURE

#### ADVANTAGES OF MASONRY INFILLED RC FRAMES:

- On average initial stiffness of initial RC frame is about 4.3 times that of bare frame when masonry is unreinforced. And about 4 times that bare frame when reinforced
- On an average URM infilled frames have about 70% higher strength than the bare frame the value is about 50% higher in case of RM infilled frames
- Under cyclic load the yield displacement of infilled frame is much smaller than that of the bare frame
- It has been found that infill influence structure rigidity in a way that vibration period decrease is between 7% and 60% noting that the impact is greater if the frame stfness is lower and infill stiffness is higher.
- Can withstand large amounts of compressive weight load

**ETABS SOFTWARE:** Etabs is an engineering software product that is using to analysis and design of multi-story buidings, it is used all over the world by civil designers, engineers and architects. It is one of the most popular civil engineering designing tools used in the building industry , modeling tools and templates, code-based load prescriptions, analysis

method and solution technique all coordinates with the grid-like geometry unique to this class of the structure. Basic or advanced system under static or dynamic condition may be evaluated using ETABS.

**RESPONSE SPECTRUM:** response spectrum was first invented by M.A Biot in 1932 A.D aim was to study the ground motion. : The summation of response histories in terms of peak response of all SDOF system of different natural periods

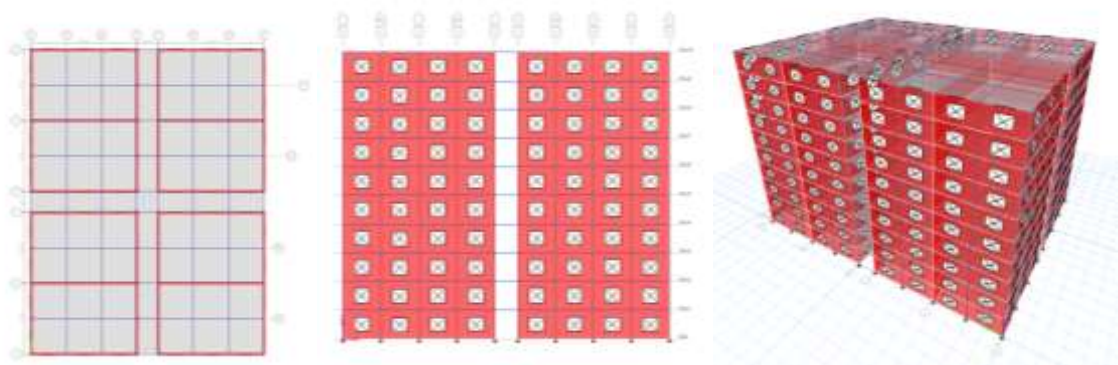
#### **Necessity of response spectrum analysis**

1. To study the study of the ground motion
2. To study the response of building regarding earthquake
3. gives the information about the period at which maximum acceralation can be expected if an earthquake caused to excite your building

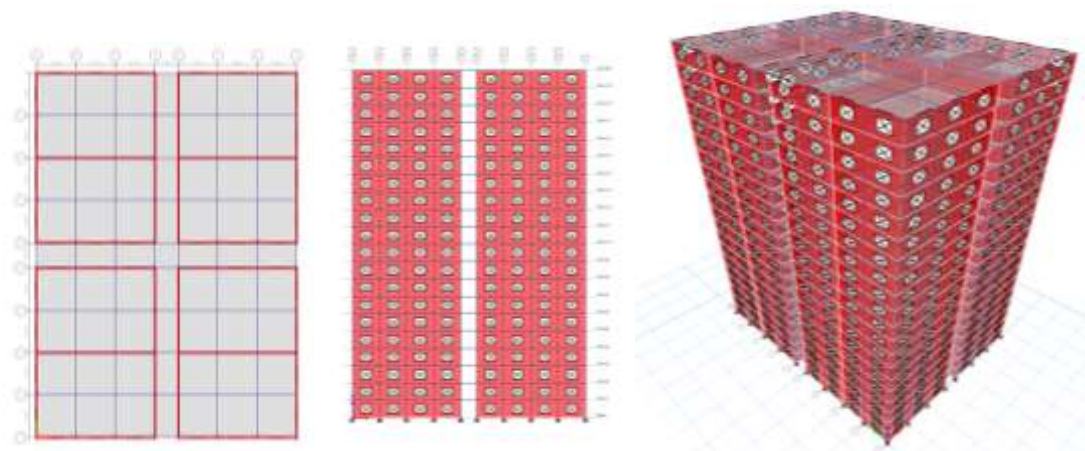
**OBJECTIVES:** The main objective of the paper is to compare masonry infilled RC frame buildings and mivan buildings with different percentage of openings in terms OF MAX. DISPLACEMENT, MAX. STORY DRIFT, STORY SHEAR, OVERTURNING MOMENTS AND STORY STIFFNESS

**METHODOLOGY:** By using E-TAB software the response spectrum analysis has been carried for 10 story and 20 story of both RC frame infilled structures and mivan structures with different percentage of wall openings are modeled and compared both masonry infilled frame buildings and mivan buildings with parameters LIKE MAX. DISPLACEMENT, MAX. STORY DRIFT, STORY SHEAR, OVERTURNING MOMENTS AND STORY STIFFNESS

#### **10 story masonry infill building with different % of wall openings**



#### **20 story masonry infill building with different % wall opening**





## DETAILS OF LOADS

**DEAD LOAD:** The load which is nit relatively not changes overtime, which depends upon the materials used in structure. IS-875-1987 PART1 gives the details of unit weight of materials used in structural elements.

**LIVE LOAD:** The load which is temporary part of the structure example table, chair on the structure.IS-875-1987 PART2 gives the describes the unit weight of materials used in structural elements.

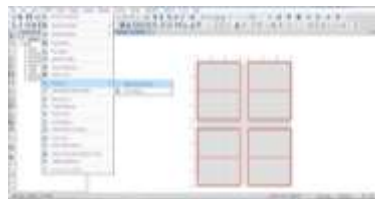
**SUPER DEAD LOAD:** These loads are same as dead load which includes roof finishing load, floor finishing load etc.IS-875-1987 PART1 gives the unit weight of materials used in structural elements.

**Earthquake Load:** **Earthquake** forces are generated by the inertia of buildings as they respond to ground motion. The procedure to calculate the earthquake are described in IS 1893 (Part- I). Since, to calculate earthquake/ seismic force IS 1893 (Part- I) is used.

**ANALYSIS:** In this study the response spectrum analysis has been carried out for the analysis. Response spectrum was first invented by M.A Biot in 1932 A.D aim was to study the ground motion. Which can be defined as the summation of response histories in terms of peak response of all SDOF system of different natural periods. The function damping ratio of 0.05 is taken, seismic zone factor Z 0.36, soil type of type-2, Response reduction of 3 is considered.

### THE FOLLOWING LOAD COMBINATIONS ARE CONSIDERED FOR ANALYSIS

1. 1.5 (DL+LL)
2. 1.2 (DL+LL±EQ)
3. 1.5 (DL ± EQ)
4. 0.9DL±1.5EQ



THE RESPONSE SPECTRUM ANALYSIS



DAMPING RATIO OF 0.05 IS TAKEN,



LOAD PATTERNS

SEISMIC ZONE FACTOR Z 0.36,

SOIL TYPE OF TYPE-2 IS CONSIDERD.



LOAD CASES



LOAD COMBINATIONS

## CONCLUSIONS

- In 10 storry masonry building having 20% wall opening the displacement increased by 60.5%, storry drift by 73.49%, storry shear by 18.15, over turning moment by 71.01% And storry stiffness decreased by 73.2%. When compared with 10 storry mivan building having 20% wall opening.
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- In 10 story masonry building having 60% wall opening the displacement increased by 84.3%, story drift by 83.3%, story shear by 22.21%, over turning moment by 22.7% And story stiffness decreased by 70.5%. When compared with 10 story mivan building having 60% wall opening.
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