# Study on Seismic and Gust Wind Effects on G+30 Residential Mivan Structure Using Different Stiffness Modifiers for Structural and Non Structural Walls

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**Abstract:** ***Structures encounter lateral deflections under earthquake loads. Extent of these parallel lateral deflections is identified with numerous factors, for example, auxiliary framework, mass of the structure, stiffness modifiers and mechanical properties of the basic materials. Structures should be designed such that they can resist seismic tremor and wind gust effects actuated deflections and internal forces. Structural stiffness modifiers are important factors which gives the behaviour of structure after cracking due seismic or wind forces on the structures. Structures which have auxiliary abnormalities may encounter distinctive floats of drifts of adjacent stories, excessive torsion, and so forth as indicated by inconsistency compose and come up short amid a seismic tremor. In this study, impacts of Stiffness Modifiers on structures, drifts, displacement, modal mass participation, time period, frequency are examined. Building models, which have same number of floors with different stiffness modifiers as per codal provision of IS 16700-2017 are produced by a FEM PC program and calculations are made. Results are compared and safeguards are given with avoid harms caused by Stiffness Modifiers under seismic tremor loads are analyzed.***

**Keywords:** Shear wall, Displacement, Drift, Equivalent static method, Response spectrum method

## 1. Introduction

The mivan technology system was created by Malaysian organization as a proficient framework for building the mass lodging ventures in the creating nations. To be raised by the auxiliary components many time that to of a tedious structure, the framework guarantees a quick and conservative strategy for development. The solid surface completion delivered with the aluminum structures permits accomplishment of a phenomenal quality divider finish without the requirement for outside just as inside putting. This specific framework is recognized to be a lot of reasonable for Indian conditions for mass basic development, where quality and speed can be accomplished at astounding level that too at affordable expense. The speed of development by this specific framework will outperform the speed of a large portion of the other ongoing development technique and advances utilized. Mivan is one of the advance built formwork manufactured in aluminum monolithic pouring. Dividers, sections, pieces and bar are poured together specifically framework. The usage of mivan formwork in the development business of India is nearly less regarding the other creating or created nations around the world. The usage of mivan formwork innovation in development industry has the more prominent potential. This formwork as a modern development material however it is likewise affordable in overwhelming kind of development. This ongoing technique for development by this innovation can apparently build the profitability of development, fabricated quality and sturdiness of development work using effective development apparatuses, development materials and time for development sparing contrasting with ordinary advancements or strategies. This innovation is one of the ongoing development advances up and coming at the more prominent speed for the effective finishing different development venture across Indian development industry, particularly, mass lodging venture. This specific examination is extremely fundamental sinc it can give the essential significant data on the structure absolute expense and complete length correlation between the traditional accessible frameworks and Mivan building framework in Indian development industry, where economy and time both assume significant job.

### A) Objectives of Study

- Creation of 3D model of multistory (G+30) RC Building using different stiffness modifiers for structural and non structural walls.
- To examine the Seismic Response of Multistory (G+30) RCC Frame Building using Seismic and Gust wind effect for same geometry & loading, using ESA & RSA.
- To examine the seismic response of multistory (G+30) RCC Frame Building for differential stiffness modifier for structural and non structural same loading & geometry using ESA & RSA.
- To find deflection out at every storey using ESA & RSA.
- To find the storey drifts at every storey, applying ESA & RSA.
- To find the storey stiffness at every storey by using ESA & RSA.
- To get the base shear, by applying ESA & RSA.
- To find out time period by applying ESA & RSA.
- To find out frequency by applying ESA & RSA.

**B) Scope of Study**

- The principle extent of the examination is to dissect the efficiency of mivan and regular formwork and their reasonable under various conditions.
- To decide the profitability of mivan and regular formwork for various months.
- To follow the variety of profitability from target efficiency.
- To ascertain covering utilization proportion for regular formwork.
- Cost examination among mivan and regular formwork.

**C) Analysis Method Used**

As mentioned in Indian Standard Code 1893:2016after technique for examination have been prescribed to discover the plan sidelongs, loads.

a) Equivalent Static Analysis (ESA)
b) Response Spectrum Analysis (RSA)

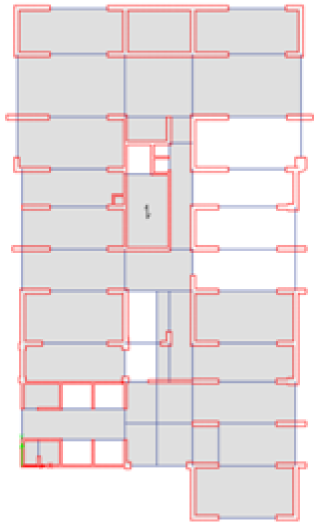
**Equivalent Static Analysis (ESA):** The Equivalent Static Analysis (ESA) is a smoothed out strategy to substitute the effect of dynamic stacking of a typical Earthquake by a a static power transfered at the edge on a structure for arrangement purposes.

**Response Spectrum Analysis (RSA):** Response Spectrum Analysis (RSA) is a straight amazing happening examination strategy which gauges the quality from each customary technique for vibration to show the possible most extraordinary seismic response of a fundamentally flexible structure.

## 2. General

**Model 1:** Base Model With No Stiffnes Modifiers Storey Displacement
**Model 2:** Model With Stiffnes Modifiers(Unfactored) Storey Displacement.
**Model 3:** Model With Stiffnes Modifiers(Factored) Storey Displacement.
**Model 4:** Model With Inplane Shear Cracked Stiffnes Modifiers For Non-Structural Walls(Unfactored)
**Model 5:** Model With Inplane Shear Cracked Stiffnes Modifiers For Non-Structural Walls (Factored).
**Model 6:** Model With Inplane Shear And Out Of Plane Cracked Stiffnesmodifier For Non-Structrural Walls (Unfactored).
**Model 7:** Model With Inplane Shear And Out Of Plane Cracked Stiffnesmodifiers For Non-Structurak Walls (Factored).

## 3. Plan Used in Analysis



**Structure Data**

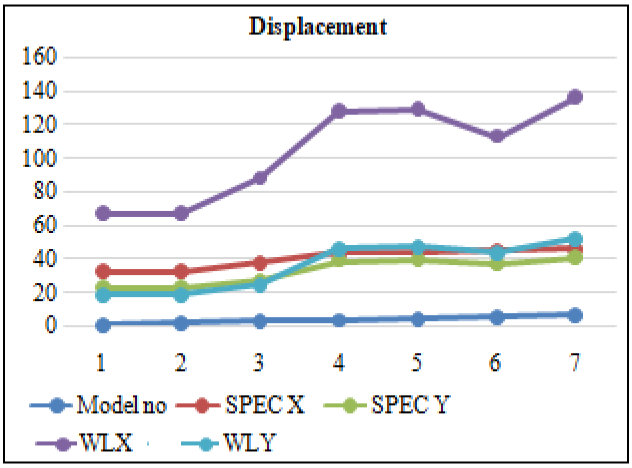
The structural plan layout of RC of 30 storied is shown in above Fig. In this study, the plan layout is purposely kept similar for all building models to study the effect of (SP) Shear wall located at different position for different stiffness modifiers for structural &non structural walls. The height of bottom storey is kept 3m & typical height of upper storeys. i.e, GF to30th storey is 3.2m in all building models. The structure is considered to be placed in seismic Zone 2 and Hard soil Condition.. 25% of Floor Live Load(LL) is considered in calculating of seismic weight.

**Materials Used & Geometrical Properties**

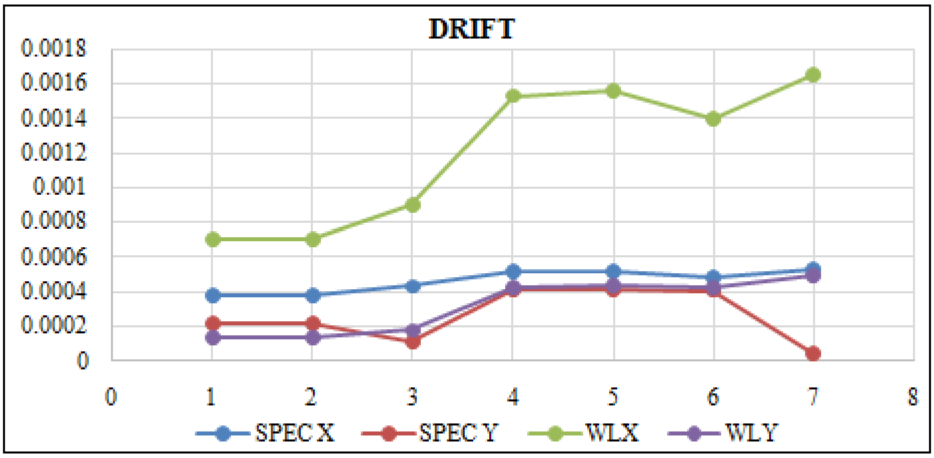
| Description | Parameters considered in Design |
|---|---|
| Type of Building | Residential Building |
| Building Dimension | 23.9 x 42.9524m |
| No of Stories | 30 Stories |
| Total Height of Building | 107.5m |
| Floor to Floor Height | 2.95m |
| Type of Steel | HYSD415 HYSD500 |
| Grade of Concrete | M30,M40, M50 |
| Zone Factor (Z) | 0.1 for Zone II |
| Seismic Importance Factor (i) | 1.2 |
| Approximate Time Period | 0.075h^0.75/sqrt (AW) greater than or equal to 0.09h/sqrt(d) |
| Soil Type | Rock or Hard soil |
| Sa/g (Per IS 1893 for appropriate Soil Condition) | 1/T |
| Minimum design seismic lateral force | 0.7%* W for Zone 2. |
| Response reduction factor (R) | 3 RC Structural Wall |
| Seismic Weight (W) | DL+SDL+0.25LL/0.5LL (0.5LL, |
| Story Drift Limitation (Section 7.11) | Where Live Load is greater than 3KN/sq.m) 0.004*h story |

## 4. Results of Analysis

| Displacement | | | | |
|---|---|---|---|---|
| MODEL NO | SPEC X | SPEC Y | WLX | WLY |
| 1 | 32.352 | 23.406 | 67.002 | 18.917 |
| 2 | 32.352 | 23.406 | 67.002 | 18.917 |
| 3 | 37.623 | 27.543 | 88.055 | 25.143 |
| 4 | 43.545 | 39.137 | 127.869 | 46.367 |
| 5 | 44.486 | 39.516 | 129.06 | 47.398 |
| 6 | 44.565 | 37.5 | 112.89 | 43.865 |
| 7 | 46.252 | 40.98 | 136.327 | 52.136 |

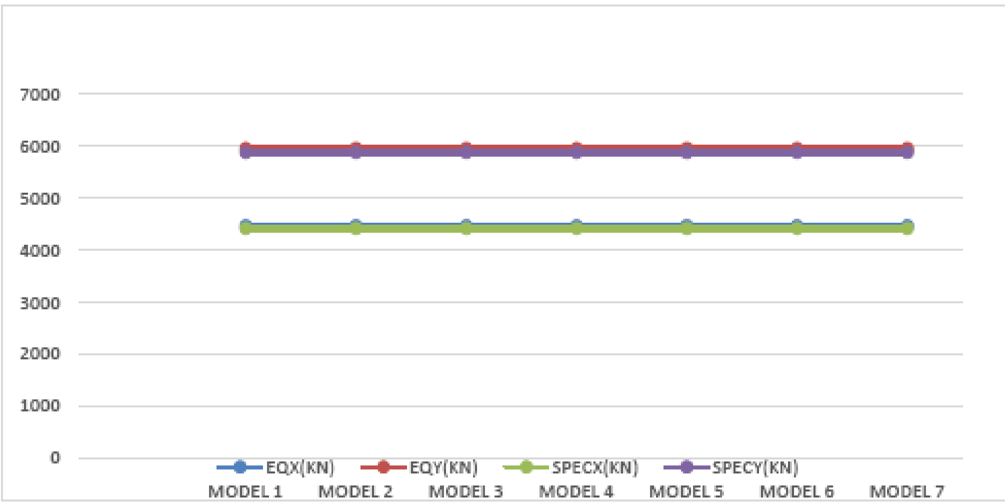



| DRIFT | | | | |
|---|---|---|---|---|
| Model no | SPEC X | SPEC Y | WLX | WLY |
| 1 | 0.000377 | 0.000221 | 0.000704 | 0.00014 |
| 2 | 0.000377 | 0.000221 | 0.000704 | 0.00014 |
| 3 | 0.00043 | 0.000115 | 0.000901 | 0.000183 |
| 4 | 0.000511 | 0.000409 | 0.001531 | 0.000429 |
| 5 | 0.000517 | 0.000414 | 0.001563 | 0.000442 |
| 6 | 0.000479 | 0.000408 | 0.001401 | 0.000433 |
| 7 | 0.000527 | 0.0000435 | 0.001656 | 0.0005 |

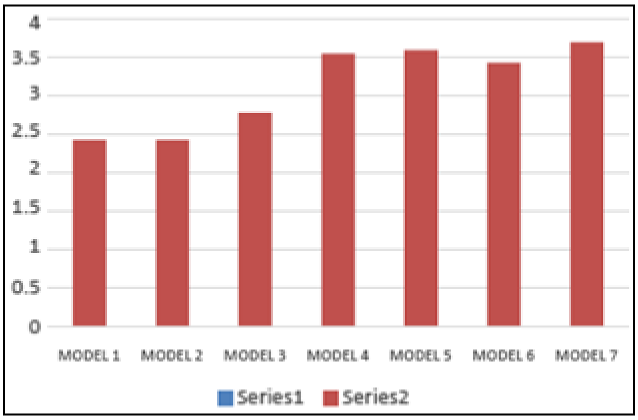



| BASE SHEAR | | | | |
|---|---|---|---|---|
| MODEL NO | EQX (KN) | EQY (KN) | SPECX (KN) | SPECY (KN) |
| MODEL NO 1 | 4466 | 5954 | 4415 | 5877 |
| MODEL NO 2 | 4466 | 5954 | 4415 | 5877 |
| MODEL NO 3 | 4466 | 5954 | 4415 | 5877 |
| MODEL NO 4 | 4466 | 5954 | 4415 | 5877 |
| MODEL NO 5 | 4466 | 5954 | 4415 | 5877 |
| MODEL NO 6 | 4466 | 5954 | 4415 | 5877 |
| MODEL NO 7 | 4466 | 5954 | 4415 | 5877 |

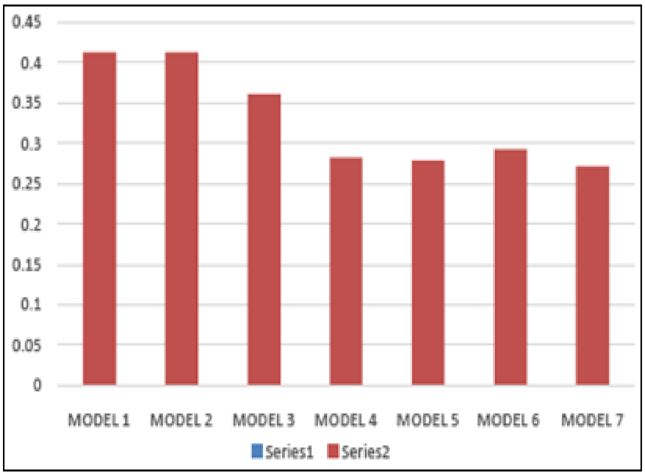
**Base Shear**



| TIME PERIOD | |
|---|---|
| MODEL NO. | TIME |
| MODEL 1 | 2.425 |
| MODEL 2 | 2.425 |
| MODEL 3 | 2.78 |
| MODEL 4 | 3.545 |
| MODEL 5 | 3.592 |
| MODEL 6 | 3.425 |
| MODEL 7 | 3.692 |




| FREQUENCY | |
|---|---|
| **MODEL NO.** | **FREQ** |
| MODEL 1 | 0.412 |
| MODEL 2 | 0.412 |
| MODEL 3 | 0.36 |
| MODEL 4 | 0.282 |
| MODEL 5 | 0.278 |
| MODEL 6 | 0.292 |
| MODEL 7 | 0.271 |




## 5. Conclusion

1) It has been noticed that model with no stiffness modifiers gives least displacement and model with factored stiffness modifiers gives highest displacement.
2) It has been noticed that the maximum drift takes place at the center of the structure for both seismic as well as wind.
3) Base shear for all the structure are same for all unscaled and scaled model.
4) Soft story is observed only at transfer level because of the variation of mass due to heavy 1.5 m depth slab.
5) Time of model without stiffness modifiers has least time period where and model with factored stiffness modifiers has maximum time period.
6) Frequency of model factored stiffness modifiers has least frequency where and model without stiffness modifiers has maximum frequency.

## 6. Acknowledgements

The authors sincerely thank to, Professor S.M. Hashmi Head of the Department of Civil Engineering, Khaja Bandanawaz College of Engineering, Gulbarga for their encouragement and for providing facilities to carry out this research work as a part of M. Tech project.

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