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Seismic Performance Evaluation of Mivan Structural System V/S Conventional Structural System

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Abstract*—now* ***a days*** **due to globalization, the construction industry has started updating themself on new innovative ways of working,** ***the construction business has begun concentrating on new imaginative methods for working. The construction business has begun embracing new advances. One of such quickest strategy for development innovation is called mivan innovation. In display consider influenced an endeavour to concentrate to the non direct execution and conduct of mivan structures contrasted and customary structures. Both kind of structure is displayed with same material and stacking setup with indistinguishable arrangement and rise. Both kind of Structure is demonstrated for G+5, G+10, G+15 and investigated and composed according to IS codes. Straight and nonlinear outcomes where analysed. From the outcomes it is watched that Mivan structures gives preferred seismic execution over Conventional structures when subjected to gravity and seismic stacking.***

Keywords— Mivan System, Conventional System, Response spectrum Analysis, ETABS.

I. INTRODUCTION

The construction industry is rapidly changing. With changing times, new processes and the materials are being used. a lot of research and development is carried out in the construction industry throughout the globe. Time, economy and utility of space have become the important aspects of the construction industry. For construction of mass building works, it's important to have progressive technology that are capable of fast construction and are able to construct best quality and durable construction in cost intended manner. One of such technology is Mivan Construction system.

A. Mivan Technology

Mivan is an aluminum formwork system developed by a European construction company. in 1990,the mivan company Ltd. From Malaysia started manufacturing these formworks systems. Mass housing project is one of the solutions to the overgrowing problem. Speed of construction and quality of construction bolsters this technology. One of such fastest method of construction technology is mivan technology; the mivan Technology became advanced by means of mivan organization ltd from Malaysia overdue 1990s as a technology for construct of mass housing mission in developing nations. The Members were to be cast in situ, using aluminum as formwork and walls as load bearing walls. Same formwork is repeated throughout the construction providing economical and rapid construction method. In this system column and beams are replaced by shear walls.

B. Objective

- To study the building with conventional and mivan technology.
- To analyze the various buildings using linear and nonlinear procedure
- To find the performance of the building with the help of time period &mode shapes, lateral deformations, inter story drifts and base shear.
- The analysis and design of super structure was done by using etabs.

C. Response Spectrum Analysis

Response spectrum analysis is a linear dynamic statistical analysis method. the seismic analysis of structures cannot be carried out simply based on the peak value of the ground acceleration as the response of the structure depend upon the frequency content of ground motion and its own dynamic properties. To overcome the above difficulties, earthquake response spectrum is the most popular tool in the seismic analysis of structures. There are computational advantages in using the response spectrum method of seismic analysis for prediction of displacements and member forces in structural systems. The method involves the calculation of only the maximum values of the displacements and member forces in each mode of vibration using smooth design spectra that are the average of several earthquake motions.

II. METHODOLOGY

In the present study, two different structural systems, Mivan structural system and Conventional structural system G+5, G+10, G+15 structures are modeled with soil flexible support and analyzed using ETABS which have identical plan and elevation and results are compared.

A. Models

Model 1-Design of conventional structural building with g+15

Model 2-Design of mivan structural building with g+15

B. Geometrical Details of Plan

Table 2.1 Geometrical Details Of Plan

Grade Of Concrete	M25
Grade Of Steel	Fe500
Beam Dimensions	250*500mm
Column	250*450mm
Story Height	3m
Slab Thickness	150mm
Density of Concrete	25 kN/m3
Density of Brick Wall	20 kN/m3
Wall Thickness	150mm
Zone Type	V(fromIS1893:2002 Part II)
Importance Factor	1(fromIS1893:2002 Part II)
Response Reduction Factor	5 (fromIS1893:2002 Part II)
Wind Speed	50 (from IS 875 Part II)

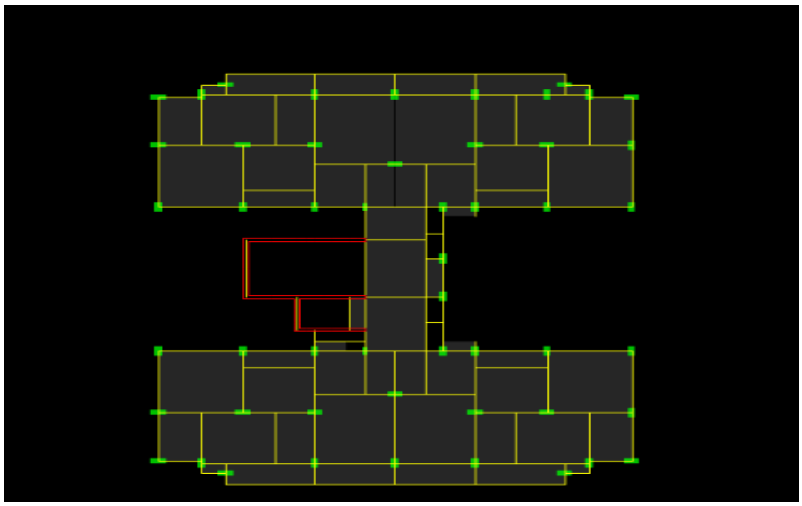

Fig: 5.1 plan

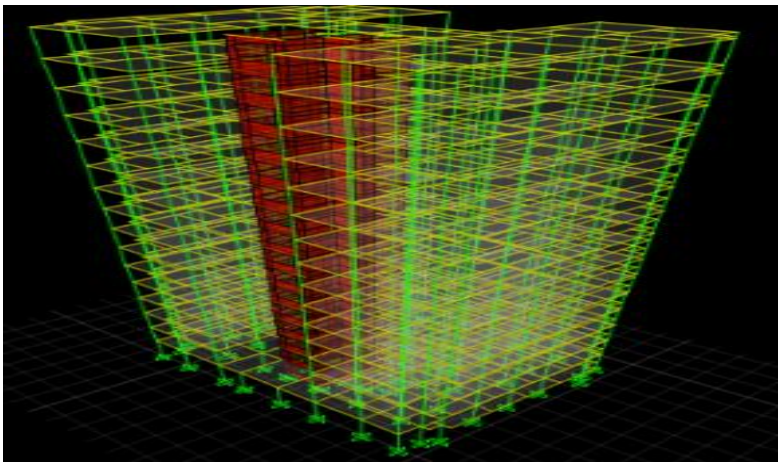

Fig: 2.2 Conventional structural system 3D view

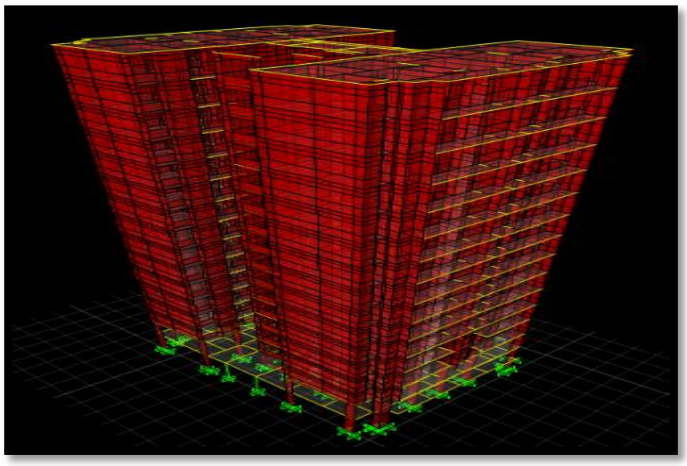

Fig: 2.3 Mivan Structural system 3D View

III. RESULTS AND DISCUSSIONS

A.GENERAL

The present study makes an effort to evaluate the seismic performance of Mivan structural system v/s Conventional structural system, using the codes specified design spectrum in the elastic and inelastic demine, using ETABS software.

B.STOREY DISPLACEMENT RESULTS

Graph showing the graphical variation of displacement at each storey level is shown in the Fig No. 3.1

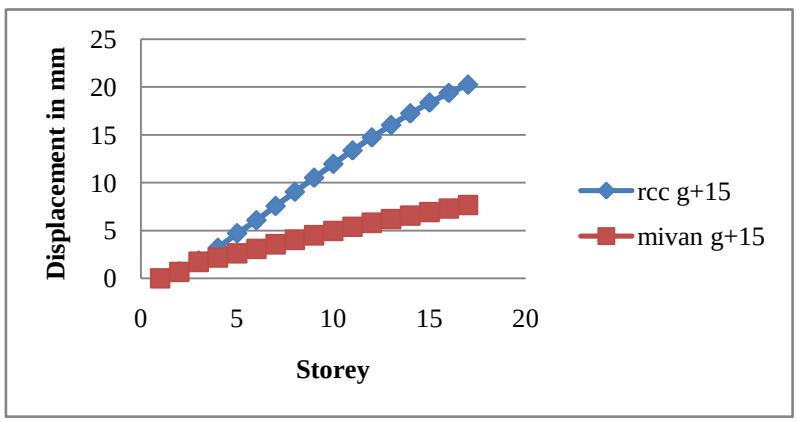

Fig no 3.1. Storey displacement of G+15 building with linear dynamic analysis (U x)

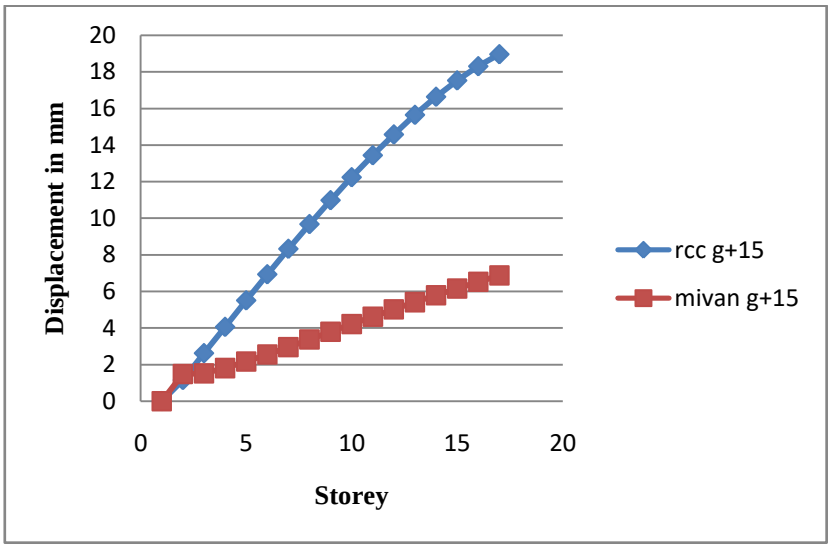

Fig No: 3.2 Storey displacements of G+15 building with linear dynamic analysis (U y)

The above graphs shows that Mivan structures have less displacement as compared to the Conventional structural system. Mivan structural system provides better lateral resistance to overall displacement. Displacement of the conventional structural system is 50-60% more than that of Mivan structural system.

C. BASE SHEAR RESULTS

Base shear is an estimate of the most predicted lateral force in an effort to arise because of seismic ground motion at the bottom of the structure.

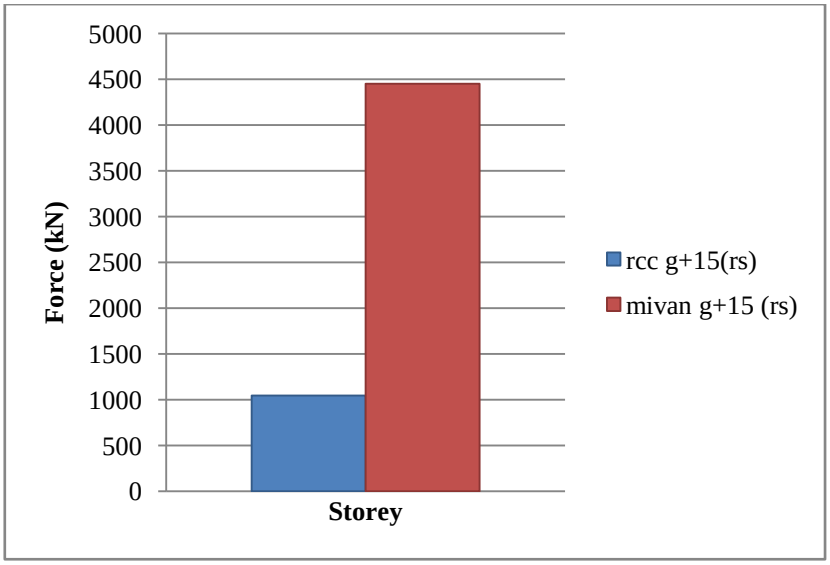

Fig: 3.3 Base shear for g+15 building with linear dynamic analysis

Mivan structural system in general decreases the natural period (increases the base shear), while the conventional structural system decreases the base shear.(increases the natural period), however mivan structural system is very predominant.

D.STOREY DRIFT RESULTS

Storey drift of a multi-storey building is relative lateral displacement to storey below. The drift of building is the ratio of maximum lateral drift of peak of the structure to the total height of structure. The maximum permissible inter storey drift as per is1893 is 0.004h the detail of storey drift obtained from analysis of the respective models is given below.

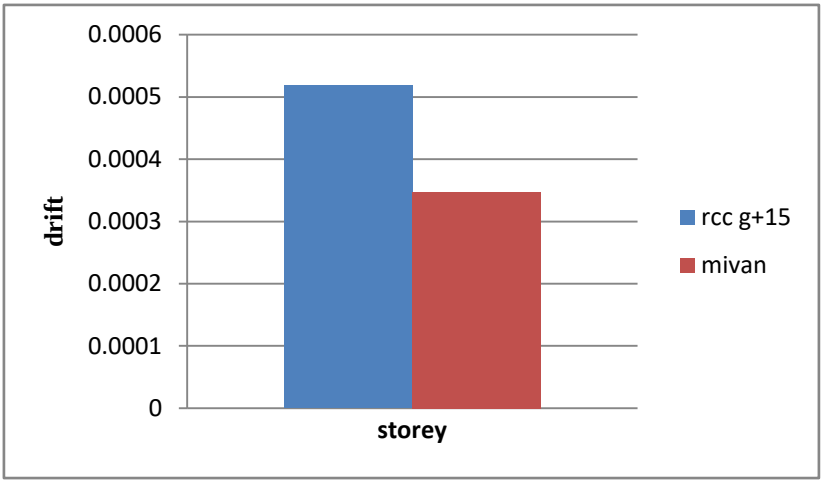

Fig: 3.4 Storey Drift for G+15 Building With Linear Dynamic Analysis

The storey drift of the respective models are shown in above Figs from the graph it is observed that the storey drift of mivan structure is very less as that of conventional structure both for linear and nonlinear cases. This is due to Mivan structural system provides better resistance to lateral loads.

E.NATURAL PERIOD RESULTS

Natural frequency and period characteristics plays tremendous role in evaluating the seismic behavior of a structure. The design codes of various nations provide some estimate of the natural period by using empirical formulas.

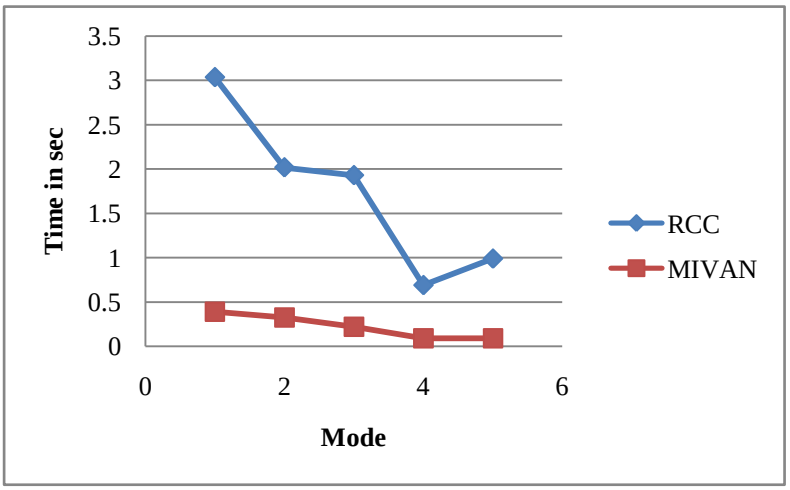

Fig: 3.5 Time Period for G+15 Building

From the Fig of natural period it is clearly visible that natural period is decreasing from conventional structural system to mivan structural system it shows that the mivan structural system is very stiff as compared to conventional structural system and conventional structural system is flexible as compared to mivan structural system.

F.STOREY SHEAR FORCE RESULTS

Storey force is an estimate of the most predicted lateral force in an effort to arise because of seismic ground motion at each storey level of the structure.

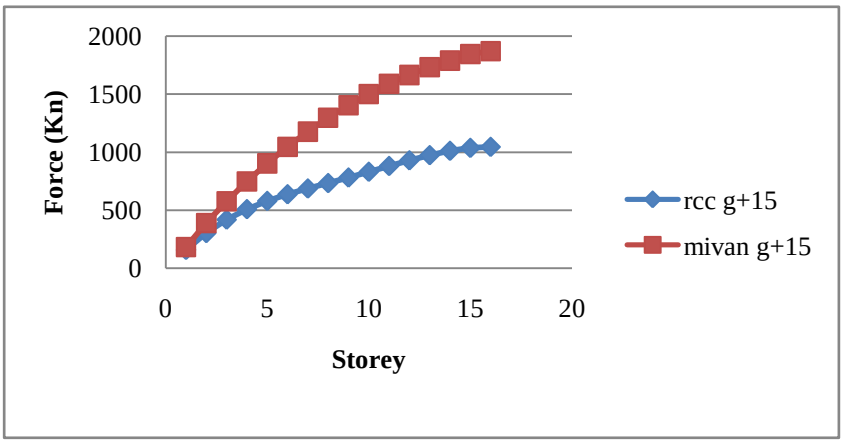

Fig: 3.6 Storey Shear for G+15 Building With Linear Dynamic Analysis

The above graph shows that conventional structure has lesser storey force as that of mivan structure. This is due to conventional structural system is more flexible as that of mivan structural system.

IV. CONCLUSIONS

1. Mivan structures have less displacement as compared to the Conventional structural system. Mivan structural system provides better lateral resistance to overall displacement. Displacement of the conventional structural system is 60% more than that of Mivan structural system.

2. Base shear of the Mivan structural system is very much high as that of conventional structural system. Mivan structural system base shear for all the three model is on an avg. 40% more than that of conventional structural system. This is due to increase in structural stiffness of shear wall as the shear wall increases the rigidity of structure leading to higher base shear values.

3. natural period is decreasing from conventional structural system to mivan structural system it shows that the mivan structural system is very stiff as compared to conventional structural system and conventional structural system is flexible as compared to mivan structural system.

4. Mivan structural system in general decreases the natural period (increases the base shear), while the conventional structural system decreases the base shear (Increases the natural period), however mivan structural system is very predominant.

5. Conventional structure has lesser storey force as that of mivan structure. This is due to conventional structural system is more flexible as that of mivan structural system.

6. The storey drift of mivan structure is very less as that of conventional structure both for linear and nonlinear cases.This is due to Mivan structural system provides better resistance to lateral loads. Mivan structural system has an average of 45% less storey drift as compared to conventional structural system.

7. From the results of non-linear analysis, this gives the realistic behavior of the structure to the ground motions. It can be observed that mivan structural system perform better than the conventional structural system as the hinges are within life safety performance level, and none of the hinges corresponds to the collapse performance.

REFERENCES

[1]**Mr.N.B. Baraskar, Prof.U.R. Kawade, (2015**) Structural Performance ofRC Structural Wall System over Conventional Beam Column System in G+15 Storey Building. *International Journal of Engineering Research and General Science.*

[2] **Rajesh M N, S K Prasad,(2014)** Seismic Performance Study on Rcc Wall Buildings from Pushover Analysis.*International Journal of Research in Engineering and Technology*.

[3]**Dhanashri and Desai,(2012)**Emerging Trends in Formwork - Cost Analysis & Effectiveness of Mivan Formwork over the Conventional Formwork, *Journal of Mechanical and Civil Engineering*,

[4]**Dr. M.N. Bajad, Rohan P. Shah, Harshkumar C. Ughareja**, (2016) A State Of Art Review On Aluminum Formwork Systems. *International Journal of Engineering Research online.*

[5]**S. Chavan, Lalit V. Rathod, Vishwas L. Nachare, Atul, B. Suryawanshi**. (2014) Cost Effective House by Using Various Construction Techniques and Materials.(*IJOAR*)

[6] **Mr. Shankar Bimal Banerjee**(**2015**)Mivan Technology. *International journal of innovations in engineering research and technology.*

[7] **D.M.Wijesekara (2012)** "Cost Effective and Speedy Construction for High-Rise Buildings in Sri Lanka by using Aluminum Panel System Formworks" *ACEPS.*

[8]**Mrs.P.Srilakshmi (2017)** Analysis of conventional beam column system over RC structural wall system in multi storey building. *International Journal of Engineering Research and General Science.*

[9]**Mr. Hemant L. Sonawadekar (2017)**Seismic performance evaluation of mivan structural system v/s conventional structural system with effect of SSI by pushover analysis.*International Journal of Engineering Research online*.