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Analysis of a Tall Structure Considering Mivan Technology Under Lateral Load Using ETABS - A Review

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ABSTRACT

High rise structures are prepared to resist seismic loads besides such massive stcutures are even subjected to wind load due to the magnitude and nature of wind load, hence such load factors are determined to understand its behaviour. This research is primarily focused to understand the behaviour of the wind response on high rise structures considering a G+15 structure. Mivan structure was analyzed in the study considering slab wall system instead of moment resisting fame for the structure. This study focuses on the level anomalies by considering various shapes in the arrangement of the building.

In this paper presenting review of literatures related to analysis of tall structures

Keywords : Mivan Technology, Horizontal Irregularities, wind analysis, forces. Stresses, displacement.

I. INTRODUCTION

Urbanization is responsible for population growth which has further led to a race between entities for new architecture and such competition has led to rise in the economy around the globe. This peculiarity has prompted development vertical, as the level developments have arrived at a degree of immersion. Henceforth High ascent structures have become more predominant in the greater part of the urban communities, supplanting huge spaces of little houses. The race towards new statures and design is related to many difficulties. In tall structures, Lateral load will be of essential concern rather than just gravity loads. Lateral forces initiate weighty moments and forces on the tall structures. The presence of unevenness in the arrangement of the great ascent building adds intricacy to the structure as it presents torsional impacts. Henceforth the investigation of reactions of various kinds of underlying components utilized and the various states of the building took on is vital to pick the ideal blend of the primary component and the state of a structure that limits the lateral displacement.

Advancement in structural engineering is primarily motivated towards safe guard of new structures towards lateral loads whether its wind load or seismic load. This research is focused towards presenting comparative analysis of a conventional framework and a mivan framework. Here the modelling and analysis of both the cases was done using analytical application ETABS. The primary framework considered is an underlying divider framework which is broadly embraced because of its sufficient benefits, in the development of tall structures in recent years.

Here we are presenting literature survey of past researches and publications related to analysis of high rise and tall structure under effect of lateral loads and utilization of lateral load resisting techniques.

II. LITERATURE REVIEW

Hemanthkumar M S and Kiran.T (2017) research focused on the wind produced response of the high rise building by taking G+20 Storey building. The structure under study is a Mivan structure wherein which the slab wall system is adopted in place of the moment resting frame for the building. This review focuses on flat abnormalities by taking into account various shapes in the arrangement of the design. The destinations of the exploration were to concentrate on the Dynamic Wind reaction of skyscraper unpredictable Mivan divider working by Gust factor strategy for wind investigation and relate the Gust Wind reaction of various states of High ascent sporadic Mivan divider building. The designing and analysis of the model was done using analytical application ETABS.

Results stated that building models with wind loads applied in the form of pressures have exhibited more displacements compared to those building models with wind loads applied in the form of diaphragm loads and joint loads. C-shape, L-shape, T-shape building models have more displacement in comparison with H-shape models. H-shape model has less values of storey displacement, storey drift and storey shear compared to C-shape, Lshape and T-shape building models. This implies that H shape models have better behaviour against wind loads. Even though, T-shaped building model has fewer values of displacements and storey drifts for comparison of results under consideration of wind flow in certain individual direction. As a whole H shape model has least value for both maximum storey displacement and maximum storey drift for wind loads.

K. Suhanth Reddy et al (2017) main objective of research was to analyse the multi-storey building with RC Structural wall system over the conventional beam-column system. For this design software, ETABS is be used. The results are obtained by applying Response Spectrum Analysis to the selected building models. Structural wall system was presented considering a total of thirty six models has been analysed. Basically there are six types of models G+30, G+20 and G+10 with beam-column system and RC structural wall system. For each model seismic zones of zone IV, zone III and zone II was considered, for each such building model is considered with two soil types soil I, soil II.

The percentage change in maximum storey displacements in beam-column system and RC structural wall system is almost the same for different soil types (I, II) and different seismic zones (II, III, IV) considered. The percentage increase of maximum story displacements in beam-column system comparing with RC structural wall system is reduced by increasing the number of stories. Average decrease in maximum storey displacements in beam-column system from seismic zone IV to zone II for the models considered is 56.78%. The average decrease in maximum storey displacements in shear wall system from seismic zone IV to zone II for the models considered is 57.53%. The percentage change in storey shear in beam-column and RC structural systems is almost the same for different soil types (I,II) and seismic zones (II,III,IV) considered. The percentage increase in storey base shears in beam-column system compared with RC structural wall system is reduced by decreasing the number of stories. RC structural wall System has high structural performance to worst loading than conventional beam-column system.

Radha D. Potdar and Dr. P.P.bhangale (2019) research paper presented nonlinear performance and behaviour of Mivan Structures compared with

Conventional Structures. Both types of structure were modelled with the same material and loading configuration with identical plan and elevation. Line-of-balance (LOB) is a variety of direct booking strategies that permits the adjusting of tasks with the end goal that every action is consistently performed. The significant advantage of the LOB approach is that it gives creation rate and term data as an effectively deciphered illustrations design. The LOB plot can show initially what's up with the advancement of a movement and can recognize expected future bottlenecks. Clearly, LOB permits a superior handle of a task made out of monotonous exercises than some other planning method, since it permits the likelihood to change exercises' paces of creation. It permits a smooth and effective. The goal of the exploration was to introduce the idea of LOB and MIVAN Technology, comprehend the connection between LOB and MIVAN Technology and assessment of LOB in MIVAN Technology utilizing the product.

The outcomes expressed that the Conventional formwork framework is generally taken on the planet yet it has more burn-through time and is expensive in a development project. Ordinary formwork isn't reasonable where the populace is huge, less land accessible and development project work is needed rapid. These all conditions fulfil in the MIVAN formwork framework. Mivantechnology gives better outcomes in Cost-viability, Speed of development with the higher solidness of building structure. In Mivan formwork, the speed of development can be accomplished by a 4-day cycle per floor. Eliminating floor chunk structures without eliminating prop is conceivable, while in ordinary unrealistic. Relocation of the customary framework is 86% more than that of the Mivan primary framework.

Abhijit V Bidare and Deepali Bhagaje (2021) the primary objective of the research paper was to check the dominance of conventional structure and mivan structures under earthquake loading and investigate the form works of conventional and mivan structures. Comparing the number of structures depending on the materials needed in every one of them and do the relative investigation between the traditional and mivan development, considering factors base shear, recurrence, time-frame, story floats, story shear and story solidness. The examination has been completed utilizing ETABS 2013 Version programming interface. Straight Dynamic examination is thought of and assess their general presentation. Underlying Modeling was finished 15story's R.C building and the Mivan building was examined with various Seismic Zones.

Results stated that Mivan building was more dominant and it shows more stability compared with a conventional structure, base shear is more in mivan structure and less in conventional structure. Story Stiffness is more in Mivan structure and Less in Conventional Structure. Story Stiffness is increasing with seismic parameter and Low in Zone 3 and High in Zone 5. Mivan Structure required more steel quantity and Conventional structure required Less quantity of Steel.

Pawan M. Walvekar and Hemant L. Sonawadekar (2017) research paper investigated the nonlinear performance and behaviour of Mivan Structures compared with Conventional Structures. Two different structural systems viz, Mivan structural system and Conventional structural system G+3, G+6, G+9 structures are modeled with soil flexible support and analysed using ETABS which have identical plan and elevation Linear and nonlinear results where compared for gravity loading, and inelastic seismic loading with soil flexible support.

Results expressed that Mivan underlying framework gives better horizontal protection from in general relocation. The uprooting of the regular underlying framework is 86% more than that of the Mivan primary framework. The regular underlying framework has lower base shear as contrasted with and mivan primary framework. The base shear of the mivan primary framework is 40% more than the

customary underlying framework. The underlying solidness of the mivan primary framework is exceptionally high and henceforth draws in bigger base shear. Mivan underlying framework in everyday declines the normal time frame (expands the base shear), while the customary primary framework diminishes the base shear. (builds the regular time frame), but mivan underlying framework is extremely overwhelming. Mivan primary frameworks have a normal of 82% less story float when contrasted with the traditional underlying framework. Subsequently, the end expressed that Mivan structures give preferable seismic execution over Conventional designs when exposed to gravity just as seismic loading.

Sajeet.S.B and Supreeth S Gowda (2015) objective of the exploration paper was to research seismic tremor reaction of various states of tall unpredictable Mivan divider building utilizing reaction range investigation and analyze the quake reaction of various states of Tall sporadic Mivan divider building. As coordinated in IS 1893:2002, multistoried on a level plane sporadic structures were demonstrated in program ETABS 2013. Unpredictable arrangement like L - shape, H - shape and C - shape displayed for 10 story with same arrangement region was thought of. Investigation was ruined Imposed burdens, Dead loads and Earthquake load according to IS 1893: 2002. Mixes of burdens are driven according to the suitable Indian Standard codes. For the appraisal, boundaries like time-frame, recurrence, story float proportion, relocation, and base shear are utilized. Results were classified and plotted for time-frame, recurrence, story float proportion, relocation, and base shear for various shapes.

Results expressed that L Shape mivan divider model showed huge decrease in the scope of half to 91% (in removals float proportion) and base shear in the scope of 13% to 31% . Accordingly, the exhibition of L Shape mivan divider building was better among other sporadic mivan structures.

Aarti Nanasaheb Kote and Aahuti Ramesh Nandeshwar (2020) research introduced cost examination of mivan innovation with ordinary development innovation. The innovation of Mivan was totally fine with cost, quality and efficient as contrast with regular.

Contrasted with the ordinary technique, development costs with MIVAN formwork are ascending by Approximately 25-30 percent.Construction cost for every individual. Sq.ft in MIVAN is pretty much as high as 33% contrasted with the regular method.T he per distinction. Sq.ft development cost increments by right around 392 Rs/Sq.ft in MIVAN. The term of development in MIVAN is not exactly the regular technique by Almost 25% and 534 days, for example 1.5 years.

Anagha M and Anoop P P (2016) research paper focuses to check the reduction of seismic response for different shapes. L shape, O shape and H shape for ten storey's conventional and Mivan wall building having stiffness and mass irregularity were analyzed by Response Spectrum Method using ETABV.9.7.1 software. Structures with 40 x 24m arrangement aspect and story number ten are made by utilizing ETAB V.9.7.1 programming. Then, at that point, they are changed to get L, H and O shape the Vertical way. The underlying models have a similar story stature of 3m.

Results expressed that time-frame, story dislodging and story shear are least for L shape Mivan building. Every one of the aftereffects of Mivan divider building is not exactly that of ordinary structure and Mivan structures were exceptionally powerful in opposing the horizontal powers incited by the tremor. As a result of the container impact of the measured kind plan, it is expanding the general firmness of the structure in this manner, decreasing the influence

issue in the construction. It was reasoned that L moulded Mivan building is the best shape as far as their reaction qualities.

Anuj Choubey and Savita Maru (2020) research paper focused on the context the use of MIVAN technology for super high rise building and check the seismic response for different shapes i.e. Rectangle Shape, C shape, L shape and I shape of high rise building having irregularity were analyzed by Response spectrum Method using Etab software. G+10 building models with plan dimension 35*40 m was modelled.
Results stated that displaced value also maximum Drift of Mivan wall buildings are less than conventional building. For the Displacement and storey drift Perspective in irregular structure I shape is better than other irregular shapes. Results concluded that Concrete wall structure are very efficient in resist the earthquake forces as compare to Conventional building. Performed seismic analyses by Response spectrum for different regular and irregular tall conventional & Mivan structures and conclude that Mivan grow the overall rigidity of the building.

Bhanulatha G N et al (2017) research paper conducted a detailed investigation on structural behaviour of the building with and without openings in MIVAN building. The analysis was carried out for different percentage of openings considering a 10 storey structure with the provision of with and without openings for various percentage i.e. 20%, 40% and 60%. Response Spectrum method is used for linear dynamic analysis by ETABS.
From the modal direction factor criterion it was preferable to have openings between less than 60% since for structure with opening more than 40% induces torsional displacement in the very first mode which is highly undesirable. The torsion induces higher forces on the walls which results in higher area of reinforcement required. Hence walls with less than 60% behave much better under modal direction considerations. Base shear decreases with increase in the percentage of openings in all the zones, for walls with 60% opening base shear is very less and for walls without openings base shear is too high. This shows that stiffer the building more will be the forces induced in the elements due to earthquake, which intern increases the demand for higher capacity of the elements making the building more uneconomical. But if the flexibility of the building is more the base shear will decrease but the lateral displacements will increase, which is not desirable for tall buildings. So it is preferable to adopt suitably stiffer or flexible system so that the base shear and the lateral displacements are within the limits. From the lateral drift consideration buildings with higher percentage of openings induces higher and higher drifts for increased seismic zones. But lower percentage of openings show lesser storey drifts in all the seismic zones.

N. Kalithasan et.al (2016) in Aluminium formwork all members are constructed using concrete, which consist of only walls and slab. Framed structure is beam, column, and slab. The wall is 250mm thick brickwork. This task chooses a similar arrangement of the construction and looks at foundational layout, assessment and venture term in aluminium formwork and customary technique. Aluminium formwork underlying manual plan and examination is simple in multi-story structures. Be that as it may, outlined construction manual plan is troublesome and not precise in multi-story structures. along these lines, the outlined construction configuration is investigated in the PC supported program of STADD PRO. The aluminium formwork structure is all the more expensive contrasting with the outlined construction. Yet, project time is half of the outlined construction. In this way, consider diminishing work costs in aluminium structures. The aluminium formwork

structure is more solid and quake oppose contrast with the outlined design.

Danish Sadruddin Ansari and Pratik Sudhakar Kudale (2016) reserach paper included point by point cost assessment and term investigation of a structure built by MIVAN formwork and Conventional formwork. The structures are of G+21 floors where the saleable area of working with Mivan formwork is 8747.28 S.ft and that with Conventional Method is 9786.67 Sft on each floor with 3.0 m as the stature of each floor. Later similar investigation is done on cost and term of both the structures. Research was finished a live undertaking right now under development at Hinjewadi stage 3, by PEGASUS PROPERTIES PVT.LTD.
Results expressed that expense of development with MIVAN formwork increments by right around 25-30 % when contrasted with the regular technique. Cost of development per.Sq.ft in MIVAN is pretty much as high as 33 % when contrasted with the Conventional Method. The distinction in per.Sq.ft cost of development increments by right around 392 Rs/Sq.ft in MIVAN. Term of Construction in MIVAN is not exactly Conventional Method by right around 25 % and 534 days i.e 1.5 yrs.

Deepak Suthar et al (2014) research paper focused to check the feasibility of the new scheme (replacing Columns and beams by R.C.C. walls using Aluminum modular formwork) and its effectiveness over the regular scheme. The necessity of transfer mechanism was discussed. The residential high rise building was analyzed for seismic forces by both static and dynamic method considering two type of structural system. Model I - standard edge framework for example ordinary segment shear divider bar section framework and Model II - measured divider chunk framework. The practicality of the plan is read up for the two choices. The investigation was completed by utilizing the standard bundle ETABS. The examination of these models for various boundaries like Story Drift, Story Displacement and Story shear is introduced for different burden cases.
Results expressed that the story float, lateral displacement and time span is more in the model I was contrasted with model II. It was seen that the outcomes are more moderate in Static investigation when contrasted with the unique technique coming about uneconomical design. It is observed that model II is exceptionally successful in opposing the horizontal powers actuated by Earthquake. As a result of the Box impact of the secluded sort conspire, it is expanding the general solidness of the structure in this way, lessening the influence issue in the design. As the structure is in a sporadic "L-shape" the conduct in the two ways isn't comparable. Further, the examination among customary and measured sorts shows the general achievability of the plan without influencing its strength in gravity just as lateral loads.

Sravani. K et al (2020) objective of the research paper was to investigate the quality of the construction material according to Indian Standards, manage the problems raised during site execution and understand and manage the relationship between quality control and site execution. The test was conducted on different parameters of the construction materials used on site.

Quality control and site execution are important factors considered in any construction project. As there is an increase in demand for quality which is mostly influenced by the quality of construction material and execution process among other processes. So, there was a need to improve the techniques and methods to test the materials and maintain processes, due to this there may be an increase in the speed and accuracy of project completion.

Mrunal S. Khobragade and Dr. A. V. Patil (2018) in the research paper, the comparison of two structural

systems i.e. Conventional structural system and Frameless R.C.C structural system was done where E-TABS Software was used for modeling, analysis and design of both structural systems from G+1 to G+5 for all four zones. IS 1893 (2016) part-I was used for seismic analysis. Lightweight Foam Concrete is used in Frameless R.C.C structural system.

Results stated that Base storey shear is more in the conventional structural systems as compared to RC wall structural systems as the seismic weight of conventional is more than RC wall structure. Story displacement is less in the RC divider underlying framework when contrasted with the regular primary framework in light of the fact that the parallel solidness of the RC divider structure is more than the ordinary construction. The time frame is less in the RC divider underlying framework when contrasted with the regular primary framework. As the time-frame of the RC divider, the underlying framework is almost equivalent to zero to the regular primary framework, the speed increase is likewise zero during vibration of the design. For every one of the zones, in the RC divider primary framework, the planned support of the divider for each of the five designs with various statures is continuing as before. The parallel power following up on RC divider for example in RC divider underlying framework is viewed as less when contrasted with the opposing limit of the divider. The amount of cement needed for an RC divider underlying framework is more than that of the traditional primary framework. The amount of steel needed for a traditional primary framework is more than that of an RC divider underlying framework. As the tallness of the construction is expanding the expense needed for an RC divider underlying framework is diminishes when contrasted with an ordinary primary framework.

III. CONCLUSION

Here authors examined various structures considering lateral load resisting but none of them introduces mivan technology in their research work.

IV. REFERENCES

[1]. Hemanthkumar M S and Kiran.T, [Analysis of Wind Response on Different Shapes of High Rise Mivan Wall Buildings by Using Gust Factor Method], International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 09 | Sep -2017.

[2]. K. Suhanth Reddy, CH.Rajesh and P. Srilakshmi, [Analysis of Conventional Beam Column System over RC Structural Wall System in Multi Storey Building], International Journal & Magazine of Engineering, Technology, Management and Research, ISSN No: 2348-4845, Volume No: 4 (2017), Issue No: 5 (May).

[3]. Radha D. Potdar and Dr. P.P.bhangale, [Evaluation of Lob in MIVAN Technology Using Software], Journal of Emerging Technologies and Innovative Research (JETIR), February 2019, Volume 6, Issue 2.

[4]. Abhijit V Bidare and Deepali Bhagaje, [COMPARITIVE ANALYSIS OF CONVENTIONAL TECHNOLOGY AND MIVAN TECHNOLOGY], International Research Journal of Engineering and Technology (IRJET), Volume: 08 Issue: 09 | Sep 2021.

[5]. Pawan M. Walvekar and Hemant L. Sonawadekar, [Seismic Performance Evaluation of Mivan Structural System v/s Conventional Structural System with Effect of SSI by Pushover Analysis], International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 06 | June -2017.

[6]. Sajeet.S.B and Supreeth S Gowda, [EARTH QUAKE RESPONSE OF DIFFERENT SHAPES OF MIVAN WALL TALL BUILDINGS], International Journal of Research in Engineering and Technology, Volume: 04 Issue: 10 | Oct-2015.

[7]. Aarti Nanasaheb Kote and Aahuti Ramesh Nandeshwar, [Duration Comparison of Mivan Formwork over the Conventional Formwork], International Journal for Research in Engineering Application & Management (IJREAM) ISSN : 2454-9150, 2020.

[8]. Anagha M and Anoop P P, [Earthquake Response of Different Shapes of Tall Vertically Irregular Mivan Wall Building], International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 5 Issue 08, August-2016.

[9]. Anuj Choubey and Savita Maru, [Optimum Shape for High Rise Mivan and Conventional Structure in Seismic Loading], International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-5, January 2020.

[10]. Bhanulatha G N, M.Sreenivasulu Reddy and Dr.Y.Ramalinga Reddy, [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, Vol.3 (9) Oct - 2017.

[11]. N.KALITHASAN, K.SHANTHI, B.JOSE RAVINDRARAJ and R.VIJAYASARATHY, [STRUCTURAL DESIGN OF ALUMINIUM FORMWORK STRUCTURE OVER FRAMED STRUCTURE], International Journal of Advanced Research in Biology Engineering Science and Technology (IJARBEST) Vol. 2, Issue 4, April 2016.

[12]. Danish Sadruddin Ansari and Pratik Sudhakar Kudale, [Comparative Analysis of MIVAN Formwork Building and Conventional Formwork Building Based on Cost and Duration], International Journal of Engineering Research, Volume No.5, Issue No.8, pp : 672-675, 1 August 2016.

[13]. DEEPAK SUTHAR, H.S.CHORE and P.A. DODE, [HIGH RISE STRUCTURE SUBJECTED TO SEISMIC FORCES AND ITS BEHAVIOR], Proceedings of 12 th IRF International Conference, 29th June-2014.

[14]. Sravani. K, Sindhu. K, Soumya. J, Venu Malagavelli and Ch. Balakrishna, [Study of Quality Control and Site Execution on Monolithic Buildings using Mivan Technology], IJESC, June 2020.

[15]. Mrunal S. Khobragade and Dr. A. V. Patil, [Comparative Study in Analysis, Design and Material Requirement of Conventional Structural System and Frameless R.C.C structural System], International Journal of Innovative Research & Studies, ISSN NO : 2319-9725, Volume 8, Issue IV, APRIL/2018.

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