INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

e-ISSN : 2583-1062

Impact Factor : 5.725

www.ijprems.com
editor@ijprems.com

Vol. 04, Issue 01, January 2024, pp : 9-12

ANALYSIS OF WORST POSITION OF TELECOMMUNICATION TOWER OVER HOUSING APARTMENT WITH INTRODUCTION OF OUTRIGGER SYSTEM AT JABALPUR CITY UNDER EARTHQUAKE LOADING: A REVIEW

Madan Muvel[1], Rahul Sharma[2]

[1]M. Tech Scholar, Department of Civil Engineering, Prashanti Institute of Technology & Science, M.P., India.

[2]Assistant Professor, Department of Civil Engineering, Prashanti Institute of Technology & Science, M.P., India.

ABSTRACT

One of the key difficulties in this time of construction biosphere is the problematic of empty and steady land. This lack in city parts has showed to the plumb construction magnification of low-rise, medium-rise, tall buildings and even sky-scraper (over 50 meters tall). These structures usually used framed structures exposed to lateral loads along with vertical loads. In these structures, the lateral loads from strong winds and earthquakes are the main concerns to keep in mind while designing rather than the vertical loads caused by the structure itself. These both factors may be inversely proportional to each other as the building which is planned to withstand perpendicular loads or resist the lateral loads. The loads mentioned here are lateral are the principal one as they are different against one another as the vertical loads are supposed to increase linearly with height; on the other hand crosswise loads are fairly changeable and rise quickly with elevation. When lateral loads of a uniform wind or an earthquake load arrives the overturning moment at base of the structure is humongous and varies proportionally to square of the building height. This causes the building to act as cantilever as these lateral loads are especially higher in the topmost storied comparatively different than the bottom storied. These lateral forces from the sideways have a tendency to influence the frame of the structure. The earthquake affected areas where the chances of earthquakes are comparatively higher the buildings collapsed which have not been designed in concern to these seismic loads. All these above stated reactions make it major to study the source and effects of lateral loads and lead us how to erect this.

Keywords— Seismic activities, Multistoried Building, Response spectrum method, telecommunication tower

1. INTRODUCTION

For elevated buildings having fifth teen to twenty stories, clean rigid frame system is not passable because it does not provide the essential lateral stiffness and causes extreme deflection of the building. These requirements are satisfied by two ways. Firstly, by increasing the members size above the requirements of strength but this approach has its limitation and secondly, by adding one additional part of structure as tower over it in different parts considering with different cases. This increases the structure's stability and rigidity and also restricts the deformation requirement.

When we are talking about human civilization, the major disaster was earthquake. This can harm lives, structures and property. There has been experimental work going on around the world to resolve this problem and provide a harmless environment so that one can easily live his life hassle free. Now a day's massive and huge structure designed with special techniques to withstand earthquake forces. This includes special buildings which have much higher cost of manufacture than its performance. But when we are thinking from safety point of view, there is not much greater than one's life. Due to unsystematic ground motions, in all possible directions coming from epicenter creates earthquake. These seismic effects which have horizontal shaking effects causing a inertia effect above the surface of the earth crust. These inertial forces then applied to structures causes setback of stresses in the components of the structure. From that compression forces changes to tension forces and vice versa. It then creates yielding of structures and ultimately unserviceable. A large amount of drift will then be generated which will ultimately fails from the joint of the building frame.

2. LITERATURE REVIEW

Narendra Tak et. al. (2020)

Researcher said that we can conclude that tower on building saves the extra land cost and if the analysis and modeling of the structure is accurate we can easily find out the safety of the structure against lateral loads and against sliding. The main aim of the paper is to study and analysis and comparison between buildings on plane ground and sloping ground with different angle.

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

e-ISSN : 2583-1062

Impact Factor : 5.725

www.ijprems.com
editor@ijprems.com

Vol. 04, Issue 01, January 2024, pp : 9-12

Narendra Taket. al. (2020)

Researchers conclude that the structures are fundamentally manufactured on a typical plain ground. These days due to lack of land area, construction has been done on a sloping ground. The mountainous areas are the majority exaggerated due to earthquake activity. High damage experienced by the high rise structure in the mountainous region, as outcome causes harm and breaking up; hence reason of designing towards protection in opposition to natural disasters. The key point is to analyze the seismic task applied by Multi-Storied RC structure on a sloping ground with specific angle 29 degree. The Multi-Storied building is taken at different position of tower of slope angle. The outcomes have been evaluated with the structure taken without slope and with sloping ground 29 degree angle having on plane ground. Thus the seismic analysis is the part of Dynamic analysis. There are two types of arrangements taken for the study along sloping ground .i.e. set back and step backset back. Hence G+10 RCC building is considered with different location of building with sloping ground with set back and step back condition for analyzing. The analysis was carried by the Seismic Analysis Method. The whole process and the methods are carried out by IS-1893-2016. STAAD pro software is used to explore the Response Spectrum Method. All the operations performed are the part of procedure which gives the result that the step back set back building is more suitable than other methods.

Suyash Malviya et. al. (2019)

Response of Multistorey Building with Rooftop Telecommunication Tower in Different Positions: An Approach to Efficient Case has been discussed in their research article. The location of position of telecommunication tower over a multistoried building gives detail information that in future, when their will a provision of telecommunication tower requires, it ultimately increases the load over the building and the optimum position will require supporting the structure over horizontal seismic load.

Mohd. Arif Lahoriet. al. (2018)

The plain construction land is not available easily now a day's therefore it is shifted on hill sites. On hill sites it is not easy to construct on steep slopes and also it is not easy to maintain structure under seismic loads. The main aim of the paper is to study and analysis and comparison between buildings on plane ground and sloping ground.

Mohd. Arif Lahoriet. al. (2018)

The construction of R.C. structures are commonly assymetrical in shape on slope of mountains. The main aim of the study is to investigate, compare and earthquake analysis of the structure under five different configurations like step back building 20 degree, regular building, step back building 30degree and the response spectrum method is used in it.

Shailesh S. Goral et. al. (2015)

The telecommunication industry is the fastest growing industry in human society and therefore it catches more attention than any other industry. The earthquake and wind analysis plays an important role in telecommunication structure like towers. Natural hazards like earthquake and wind storms are the major issues for the safety of towers.In this research the staad-pro software is used for the analysis of seismic and wind loads. The square shape plan and different bracing systems has been used in the design of these towers. Non linear dynamic method is used in the analysis of these towers.

Hemal J shah et. al. (2014)

The television towers are constructed for the purpose of transmitting signals from one place to another they also transmit the radio signals and telecommunication signals. Therefore their design and construction are most important under seismic zones. This study presents seismic response of 4 towers of different height and different bracing system of towers. The SAP 2000 software is used to analyses these towers.

Vafaeiet. al. (2014)

The design codes say wind load is the major lateral load except for some cases in the design of telecommunication towers. This study shows the seismic performanceof total no. of 10 four-legged telecommunication towers. The investigation is done on towers whose height is in between 18 to 67 meters and the origin of investigation is country Iran.

K. Jagan Mohan et. al. (2013)

Transmissiontowers consume about 28 to 42 percent of the transmission line cost. The requirement of electricity is increasing rapidly all over the world therefore to meet its demand economically development of light weight tower is in use. In this paper, the effort is made to make cost effective transmission line by converting the shape and type of transmission line structures. By Using STAAD-PRO software analysis is carried on three towers. The wind load calculation is carried out and repeated again and again for the analysis and design of the towers.

NitinBhosaleet. al. (2012)

Mobile communication growth has increased from last three years. Therefore the need of communication towers and buildings is increased. The competition between mobile operators is also increased therefore the need of rooftop antenna has increased from last three years. The operators are adopting rooftop antennas now a day because it cost less than cost of land. In the present study, the comparison is shown in between ground tower members and rooftop tower at the same elevation.

S. R. Massahet. al. (2007)

The telecommunication structures are basic structures now a day all over the world. Therefore it seems important to keep it safe from natural disasters like earthquake and heavy wind loads. This paper shows the investigation of seismic reaction of four legged self supporting towers. Total ten no. of telecommunication towers are studied in Iran under the seismic and wind effect with the help of Iranian seismic code of practice.

M.A. Barkhordariet. al. (2007)

Telecommunication towers are steel structure and their seismic response against seismic loads is different than concrete structure therefore an analysis is carried out against seismic loads on steel telecommunication towers in iran. This analysis is done on four legged telecommunication tower of height of 18 to 67 meters. The Dynamic, shear and vertical reaction of the tower are calculated.

Ghyslaine Mcclureet. al. (2004)

In today's modern world telecommunication business at its top and the need of telecommunication rooftop towers increasing day by day because of increasing Teli-users. And they are obviously builted in dense populated areas therefore it safety against seismic loads, lateral loads, wind loads is more important.

The study shows the time history analysis for maximum seismic base shear and also for the overturning moment of rooftop towers by showing correlation between them.

3. CONCLUSION

After reading all of the research we can conclude that tower on building saves the extra land cost and if the analysis and modeling of the structure is accurate, we can easily find out the safety of the structure against lateral loads and against sliding. Important point is to be designing building with tower is the location of tower. While consider a tower on building where will be tower is located is must need to know. Also apply proper arrangement for building for enhancing the property of building can be considered. Also one should have known the efficient case and the worst case will be erected by the help of some extent, since as per practical approach, it is not possible to always use the efficient location of the telecommunication tower and this study describes the practical approach too.

4. REFERENCES

[1] Tak, N., Pal, A. and Choudhary, M. (2020). Analysis of Building with Tower on Sloping Ground International Journal of Current Engineering and Technology, DOI: https://doi.org/10.14741/ijcet/v.10.2.10 E-ISSN 2277-4106, P-ISSN 2347-5161 pp 247-254.

[2] Tak, N., Pal, A. and Choudhary, M. (2020). A Review on Analysis of Tower on Building with Sloping Ground. International Journal of Advanced Engineering Research and Science, 7(2), pp.84-87.

[3] Suyash Malviya, Sagar Jamle, (2019), "Response of Multistorey Building with Rooftop Telecommunication Tower in Different Positions: An Approach to Efficient Case", International Research Journal of Engineering and Technology, (ISSN: 2395-0072(P), 2395-0056(O)), vol. 6, no. 4, pp. 3783-3790

[4] Mohd. Arif Lahori, Sagar Jamle, (2018), "Investigation of Seismic Parameters of R.C. Building on Sloping Ground", International Journal of Advanced Engineering Research and Science, (ISSN: 2349-6495(P), 2456-1908(O)), vol. 5, no. 8, pp.285-290 AI Publications, https://dx.doi.org/10.22161/ijaers.5.8.35

[5] Mohd. Arif Lahori, Sagar Jamle, (2018), "Investigation of Seismic Parameters of R.C. Building on Sloping Ground", International Journal of Advanced Engineering Research and Science, (ISSN: 2349-6495(P), 2456-1908(O)), vol. 5, no. 8, pp.285-290 AI Publications, doi: 10.22161/ijaers 5.8.35.

[6] Shailesh S. Goral, Prof. S. M. Barelikar (2015), "Influence of Structure Characteristics on Earthquake Response Under Different Position of Rooftop Telecommunication Towers", International Journal of Engineering Sciences & Research Technology, ISSN 2277-9655, Vol. 4, Issue 10, pp. 73-78.

[7] Hemal J shah Dr. Atul K Desai 2014 "Seismic analysis of tall tv tower cosidering different bracing systems" International Journal of Engineering, Business and Enterprise Application ISSN (Print): 2279-0020 ISSN (Online): 2279-0039s pp113-119.

[8] Gholamreza Soltanzadeh, Hossein Shad, Mohammadreza Vafaei, Azlan Adnan (2014), "Seismic Performance of 4-Legged Self-supporting Telecommunication Towers", International Journal of Applied Sciences and Engineering Research, ISSN 2277-9442, Vol. 3, Issue 2, pp. 319-332.

[9] C. Preeti and K. Jagan Mohan (2013), "Analysis of Transmission Towers with Different Configurations", Jordan Journal of Civil Engineering, Vol. 7, Issue 4, pp. 450-460.

[10] Nitin Bhosale, Prabhat Kumar, Pandey A. D. (2012), "Influence of Host Structure Characteristics on Response of Rooftop Telecommunication Towers", International Journal of Civil and Structural Engineering, ISSN 0976-4399, Vol. 2, Issue 3, pp. 737-748.

[11] G. Ghodrati Amiri, M A. Barkhordari, S.R. Massah and M.R. Vafaei (2007), "Earthquake Amplification Factors for Self-supporting 4-legged Telecommunication Towers", World Applied Sciences Journal, ISSN 1818-4952, Vol. 2, Issue 6, pp. 635-643.

[12] Massah, S.R., Barkhordari, M.A. and Ghodrati Amiri, G. (2007), Base Shear Amplification Factors for Self-Supporting 4-Legged Telecommunication Towers under Seismic Excitations, Proceedings of the 5th International Conference on Seismology and Earthquake Engineering, International Institute of Earthquake Engineering and Seismology, Tehran, Iran, May 14-16.

[13] Ghyslaine Mcclure, Laura Georgi, Rola Assi (2004), "Seismic Considerations for Telecommunication Towers Mounted on Building Rooftops", 13th World Conference on Earthquake Engineering Vancouver, B.C., Canada, Paper no. 1988, pp. 1-14.