IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

"ANALYSIS OF A MULTI STORIED BUILDING SITUATED IN SEISMIC ZONE V AS PER IS 1893-2016 ON SLOPING GROUND"

[1] Dhruv Sharma,[2] Dr.Rajeev Singh parihar,[3]Dr.Abhay Kumar jha[4]Barun Kumar

1Research Scholar, 2 Associate Professor, 3Associate Professor, 4Assistant Professor

1, 2, 3,4 Department of Civil Engineering, LNCT, Bhopal, Madhya Pradesh, India

Abstract: The seismic study of a multi-story building located in seismic zone V according to IS 1893-2016 on sloping land with angle of inclination 0°, 10°, and 20° on soft, medium, and hard strata is investigated in the current dissertation work. In accordance with IS 1893-2016, the seismic analysis of a multi-story building built on filled slope ground (level ground) with soft, medium, and hard strata is also studied. The seismic reactions of the aforementioned structures, including horizontal displacement, bending moment, shear force, torsion, and storey drift, are examined in order to understand their seismic behaviour. These buildings have also had their costs analysed. Using the software Etabs, the multi-story building's seismic analysis is conducted.

Keywords - seismic, multi-story, seismic zone, sloping, structures, horizontal.

I. INTRODUCTION

Indian tectonic plate being one of the most active tectonic plates, India has faced a number of deadly earthquakes that left thousands of people dying each time. The Bureau of Indian standards (BIS) has been doing a considerable effort to mitigate the hazards due to these earthquakes. Scientists in India have concentrated on bringing up a code of practice for seismic resistant design (IS 1893), which gives guidelines to engineers on the amount of forces to be accounted in the seismic regions. Development of seismic zoning map has been a subject of research in India for the past 40 years. Seismic zoning map is a map that divides entire country into different regions according to the earthquake potential in those regions.

II.SLOPING GROUND

The scarcity of plain land in hilly areas, majority of the buildings is constructed on the hill slopes with irregular structural configuration having foundations at different levels. Such buildings pose special structural and constructional problems. The construction of building on a sloping ground has to face severe earthquakes. The impact of step-like incline geology on buildings has not been completely inspected previously. Actually, this type of surface geology has drawn minimal consideration among researchers, when contrasted with slopes and ravines. One conceivable reason is the non-symmetric geometry of step-like inclines, which entangles expository arrangements and supports for the most part site particular numerical reenactments as shown in Figure 1.2. The seismic failure of building on these sloping grounds is a main challenge for the structural designers. In Sikkim earthquake, 2011 in India exposed the RC frame buildings on hill slopes to ground shaking.

III LITERATURE SURVEY

Chauhan and Banerjee (2021) studied G+10 RCC Step back building having each storey of height 3.6m with a horizontal angle of inclination 20°, 30°, 40º, and 45° on the sloping ground. They analyzed the building in seismic zone V by Response Spectrum method for the purpose of commercial with two of the top storey to be used for setup of machinery equipment which induces as Mass irregularity and ground to top of the storey at the edge of the planned building used as an opening for the purpose of natural lighting and stair which induces as Diaphragm irregularity. The analysis and modeling of the Stepback building are carried out by ETABS ver. 18.0.2 software as per IS 1893:2016. They compared the building based on their dynamic response properties like mode Period, Base Shear, Story deflection, Story drift, and story shear and also find out the frame vulnerability in irregularities of structure on the sloping ground.

IV STRUCTURAL METHODS OF ANALYSIS

Once the structural model has been selected, it is possible to perform analysis to determine the seismically induced forces in the structures. There are different types of analysis which provide different degree of accuracy.

The analysis procedure can be categorized on the basis of three factors:

(i) The types of externally applied loads,
(ii) The behavior of structural materials,
(iii) The types of structural model selected.

V FIGURESANDTABLES

Figure 1.Plan view of RC G+10 building

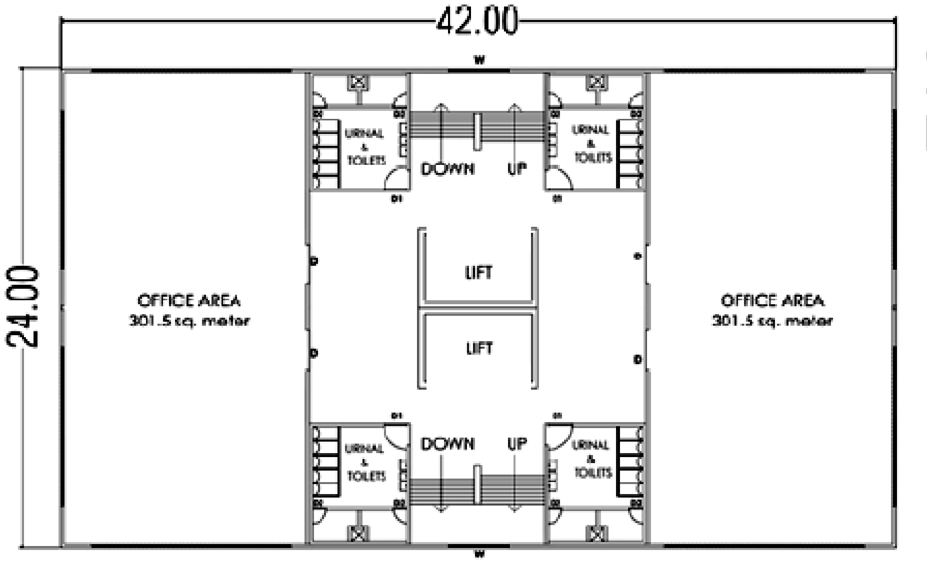


Figure 2. 3-D rendered view of RC G+10 building

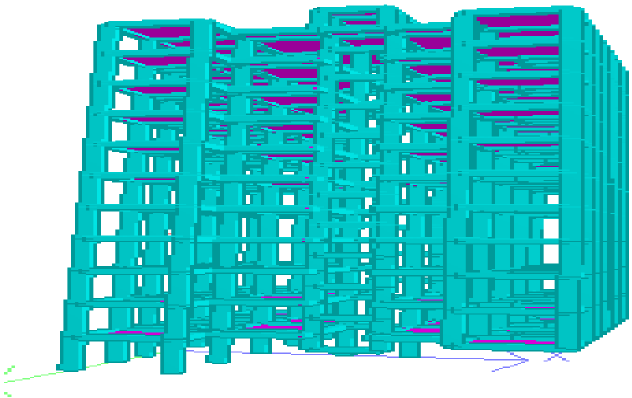
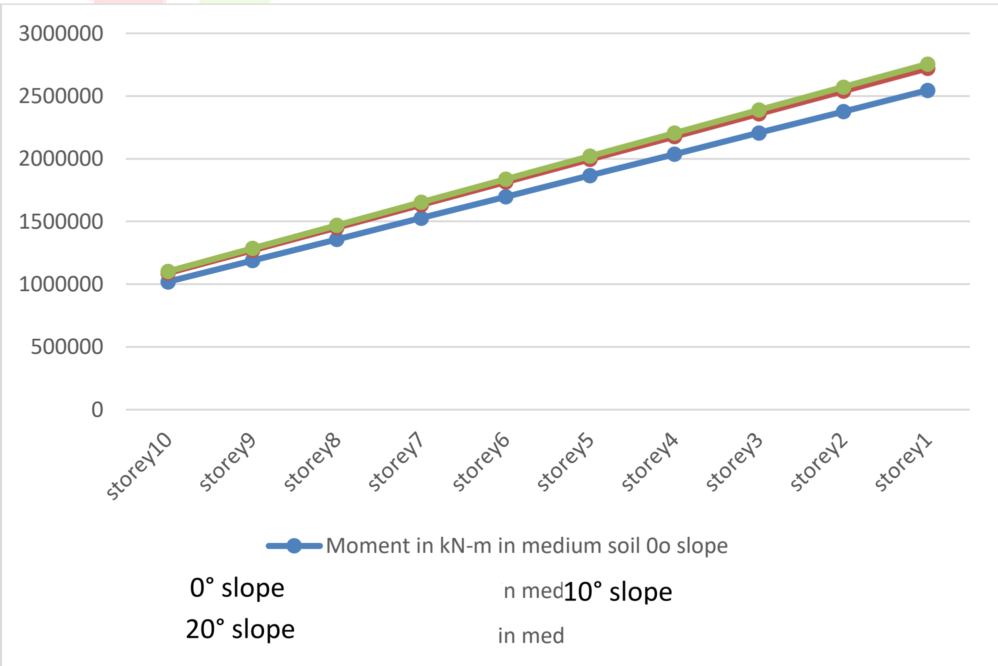


Table 3.3 RCC structure member size

Reinforced concrete member size		
	RCC column	RCC beam
foundation to ground floor	0.85 m × 0.85 m	main beam 0.3 m × 0.6 m
		secondary beam -0.3X0.53m
ground floor to 5th floor	0.85 m × 0.85 m	main beam 0.3 m × 0.53 m
		secondary beam 0.3 m × 0.45 m
6th floor to 8th floor	0.7 m × 0.7 m	main beam 0.3 m × 0.53 m
		secondary beam 0.3 m × 0.45 m
9th floor to 10th floor	0.53 m × 0.53 m	main beam 0.3 m × 0.45 m
		secondary beam 0.3 m x 0.45 m
stairs cabin	0.53 m × 0.53 m	main beam 0.3 m × 0.45 m
		secondary beam 0.3 m × 0.45 m

Graph: 1. Maximum bending moment (kNm) in medium soil



VI.CONCLUSIONS

From the present study, it can be concluded that hard soil, plain ground is effective and best. Soft soil is worst, medium soil is second best and hard soil is best because it provide least displacement and forces developed in the building under seismic forces. In case of different inclination of ground (0o, 10o and 20o) among all 0o is best, as it provide better stability due to plain ground and also reduces the effect of short columns and variation in stiffness.

VII.ACKNOWLEDGMENT

This work was completed with the grants and facilities of Lakshmi Narain College Of Technology, Bhopal (M.P.). Authors are thankful to this institute and faculties for extending this cooperation.

VIII.REFERENCES

1. MD Akram Khan, Prof. Dharmendra Singh (April 2019) "A detailed analysis of Multistory Structure constructed on Sloping Ground by STAAD" International Journal For Technological Research In Engineering Volume 6, Issue 8, Apr25 2019 ISSN:2347-4718.
2. Nagargoje S.M. and Sable K.S. (2012) "Wind performance of multi-storeyed building on sloping ground", Elixir Elec. Engg. Journal, 53, 11980-11982.
3. Paul D.K. and Kumar S. (1997) "Stability Analysis of Slope with Building Loads", Soil Dynamics and Earthquake Engineering, Volume 16, Issue 6, pp 395-405.
4. Prashant D and G Kori Jagdish (2013)."Sesmic Response of One Way Slope RC Frame Building With Soft Storey", IJETED Vol-5 Issue-3.ISSN 2249-6149, pp 311-320.
5. RaminKeyvan, MehrabpourForoud (2014), "Study of Short Column Behavior Originated from the Level Difference on Sloping Lots during Earthquake" (Special Case: Reinforced Concrete Buildings)'. Open Journal of Civil Engineering. Vol. 4.Issue 1, pp 23-34.
6. Shivanand B and H. S. Vidyadhara.(2014)."Design of 3D RC Frame on Sloping Ground", International Journal of Research in Engineering and Technology. Vol. 3, Issue 8. 307- 317.
7. Sreerama Ajay Kumar, Ramancharla Pradeep Kumar (2013) "Earthquake behavior of reinforced concrete framed building on hill slopes", International Symposium on New Technologies for Urban Safety of Mega Cities in Asia, USMCA, Report No: IIIT/TR/2013/-1, pp1-15.
8. Sripriyaarjun, Arathi S. (2016) "A Study on Dynamic Characteristics of RC Buildings on Hill slopes", International Journal of Science and Research, ISSN: 2319-7064 Vol. 5 Issue 7, pp 1116-1119.
9. Suresh G. and Arunakanthi E. (2014) "Wind Analysis of Buildings Resting on Sloping Ground and Considering Brace System" International Journal of Engineering Research & Technology, Vol.3, Issue 9, ISSN:2278:018, pp 1107-1113.
10. Tanuja V Keneror and Vaijanath Halhalli (2020) "Seismic Analysis of Multistoried Building on Sloping Ground with Ground, Middle and Top Soft Storey" International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-9 Issue-11, September 2020.