[Gaeande, 5(4): April, 2016] ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

COMPARATIVE STUDY OF SEISMIC ZONES ON G+9 STRUCTURE ON DIFFERENT GROUND SLOPES CONSIDERING DIFFERENT SOILS.

Sandeep Gawande*, Prakash D. Porey, Praveen Singh Tomar
P.I.E.S. Bhopal M.P. INDIA

DOI: 10.5281/zenodo.50390

ABSTRACT

The execution of a multi-story surrounded working amid strong seismic tremor movements relies on upon the dispersion of mass, solidness, and quality in both the even and vertical planes of the building. In multi-storeyed structures, crush up from seismic tremor ground movement for the most part starts at areas of auxiliary shortcomings present in the sidelong load opposing edges. In a few cases, these shortcomings might be created by discontinuities in solidness, quality or mass between abutting stories. Such discontinuities between stories are frequently partnered with sudden varieties in the edge geometry along the tallness. A typical sort of irregularity is vertical geometrical abnormality emerging from the quick drop of the tallness. This work demonstrates the execution and conduct of customary and vertical geometric unpredictable RCC encircled structure under seismic movement. Five sorts of building geometry are taken in this task: one normal edge and four sporadic casings. A similar study is made between all these building setups stature savvy and inlet insightful. All building outlines are displayed and investigated in programming Staad.Pro V8i. Different seismic reactions like shear force, bending moment, storey displacement, story deflection, and so forth are acquired. The seismic examination is done by 1893:2002 section (1). Seismic zonesII,III IV & V and soft, medium & hard soil strata are taken for every one of the cases. The change in the distinctive seismic reaction is seen along distinctive stature.

KEYWORDS: seismic zone,staad.pro,soil,structure analysis,deflection,Axial force.

INTRODUCTION

The monetary development and quick urbanization in uneven area has quickened the land advancement. Because of this, populace thickness in the sloping area has expanded immensely. The effect of step-like inclination topography on seismic ground development has not been through and through reviewed some time recently, notwithstanding that there is unquestionable verification of its significance even from the late 1960s. To be sure, this sort of surface geology has drawn insignificant thought among specialists, when diverged from inclines and crevasse, paying little heed to its vitality in building rehearse. One possible reason is the non-symmetric geometry of step-like slopes, which convolutes analytic game plans and backings generally site specific numerical propagations whose conclusions are difficult to total up. An investigations for the reaction of step-like ground inclines in various soils, under vertically spreading seismic waves with various sesmic zones to investigate the impacts of slant geometry, prevalent excitation recurrence and length of time, and additionally of the dynamic soil properties on ground movement in a parametric way, and give subjective and quantitative knowledge to the marvel.

It is seen from past quakes that the structures on inclines serve more harm and crumple Occurs. Seismic tremors causes honest to goodness mischief to structures, for instance, disillusionment of people in the building and if the force of tremor is high it prompts breakdown of the structure. In late years populace has been extended unquestionably and as a result of which urban ranges and towns started spreading out. In view of this reason various structures are being implicit slanting zones. India has a far reaching shoreline cutting edge which is secured with mountains and inclines. The Himalayan run moreover has significant mountains and various towns are spread over these mountains. Various resorts are being produced in uneven zones to give strategies to guests.

The structures in these zones are created on inclining grounds. An expansive part of the rough ranges in India go under the seismic zone II, III and IV zones in such case building in light of slanting grounds are exceedingly weak against seismic tremor. This is a direct result of the way that the portions in the ground floor contrast in their statures as demonstrated by the inclination of the ground. Areas toward one side are short and on flip side are long, in light of which they are exceedingly frail. Poor behavior of short segments is a result of the way that short section is stiffer when diverged from the long fragment, and it attracts greater tremor power. Solidness of a segment is the impenetrability to misshapening – the greater is the immovability, greater is the force required to wind it. In case a short area is not tastefully expected for such a considerable compel, it can persevere through basic damage in the midst of a quake.

METHODOLOGY

This work deals with comparative study of seismic activities on G+9 unsymetrical frame with different soil types and sloping ground. The followings steps has been taken:

Step1: Selection of geometry of building frames.

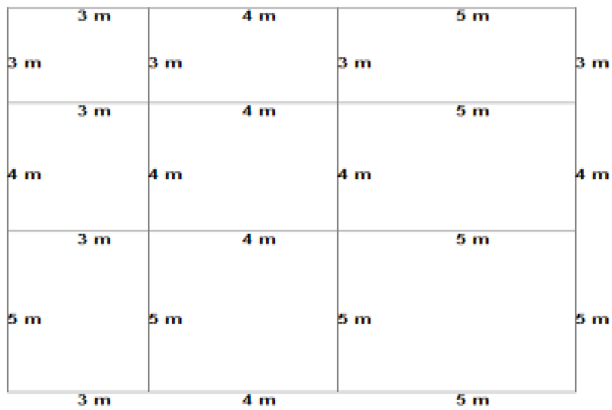

Fig.1: Plan of building

Step2. In present work we are taking sloping angels of 0^{O}, 8^{O} and 12^{O}.

Step 3: Selection of seismic zones IS- 1893 (part I) – 2002 in Table 2

Table 1: Various seismic zones

Seismic zone	II	III	IV	V
Seismic intensity	Low	Moderate	Severe	Very Severe
Z	0.1	0.16	0.24	0.36

Step-4 Formation of load combination

Table 2: Number of load cases details

Load case no.	Load cases
1	D.L
2	L.L
3	EQ X

4	EQ Z
5	1.5(D.L+L.L)
6	1.5(D.L+EQ X)
7	1.5(D.L-EQ X)
8	1.5(D.L+EQ Z)
9	1.5(D.L-EQ Z)
10	1.2(D.L+L.L+EQ X)
11	1.2(D.L+L.L-EQ X)
12	1.2(D.L+L.L+EQ Z)
13	1.2(D.L+L.L-EQ Z)

Step-5 Modeling of building frames using STAAD.Pro V8i software.

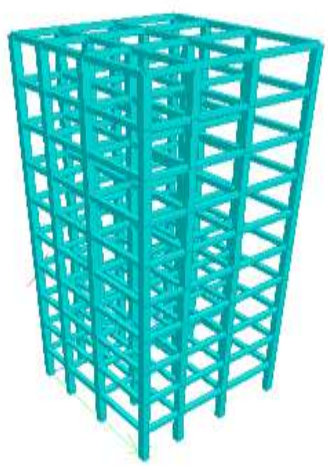

Fig.1: 3d view

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

Step-6 seismic analysis of different cases as per I.S. CODE 1893 (part-1)

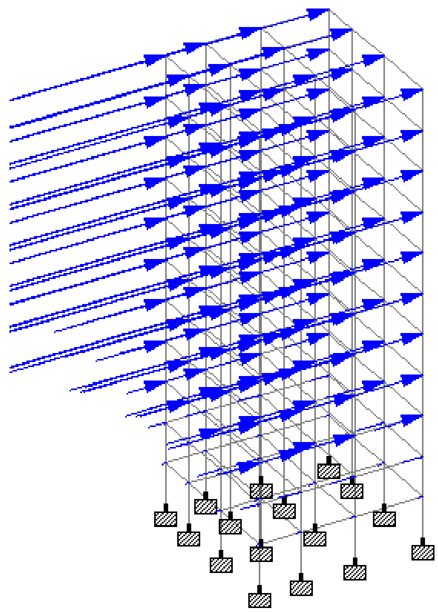

Fig.2: seismic loading

Step-7 Comparative study of results as Max bending moments, Max displacements, story wise displacement, Maximum shear force

MODELLING AND PROBLEM FORMULATION

Material and geomerical properties:

Following material properties as been considered in modeling:-

Density of RCC: 25 kN/m^3

Density of Masonry: 19 kN/m^3

The unsymmetrical plan in x direction is 3.0x4.0x5.0 meter (12m) and in z direction is 3.0mx4.0mx5.0m (12 m) the typical storey height floor to floor is 3.0m. The sections of columns are considered of 450 x 450 mm, and the section of beam size is 400 x 300 mm.

ANALYSIS AND RESULT

The following results are carried out in different slopes:

Maximum bending moment:

Maximum bending moment in 0 degree slope

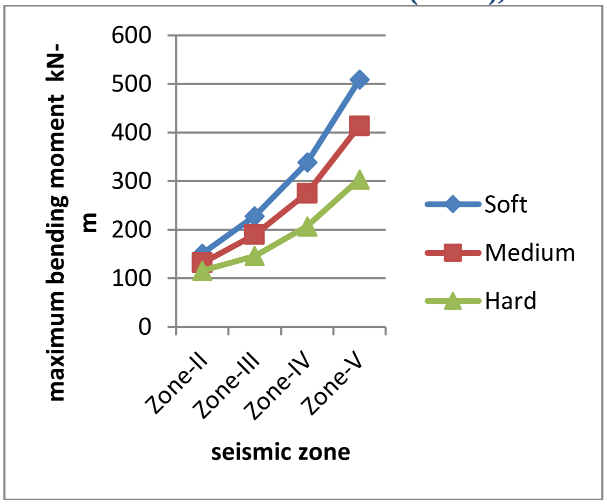

Fig.3: max. bending moment in 0°slope

Maximum bending moment in 8 degree slope

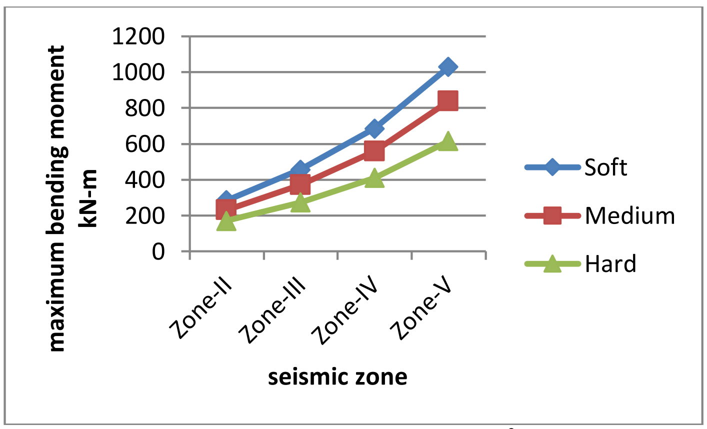

Fig:4. Max. bending moment in 8^0slope

Maximum bending moment in 12 degree slope

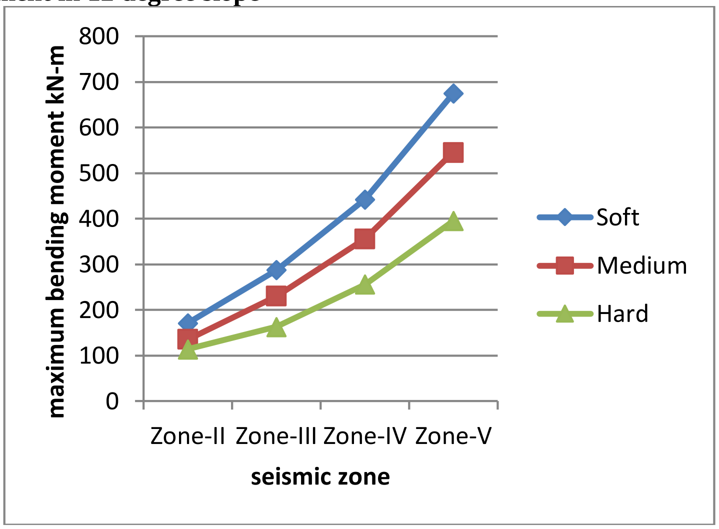

Fig.5: max. bending moment in 12ºslope

Maximum shear force

Maximum shear force in 0 degree slope

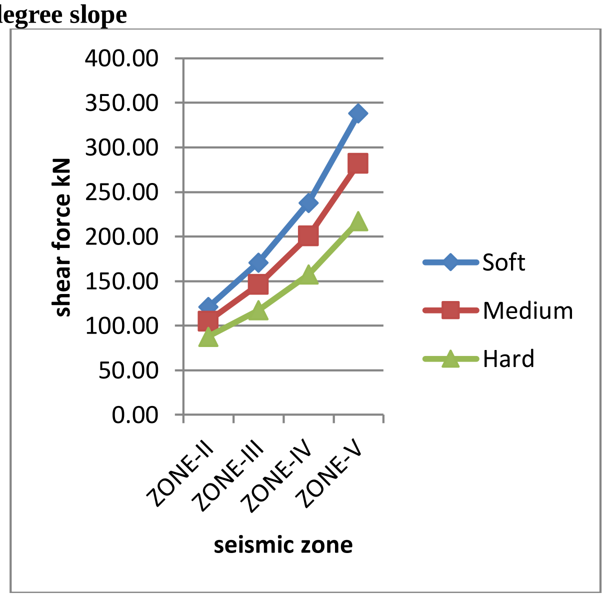

Fig.6: max. Shear force in 0ºslope

Maximum Shear Force in 8 Degree Slope

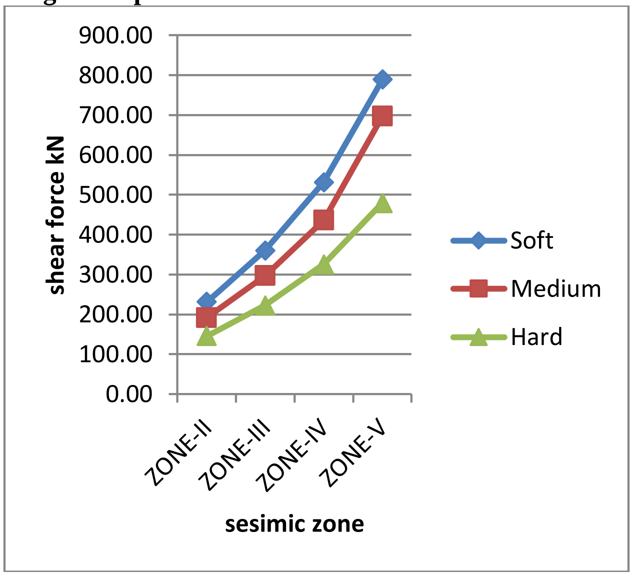

Fig.7: max. Shear force in 8ºslope

Maximum shear force in 12 degree slope

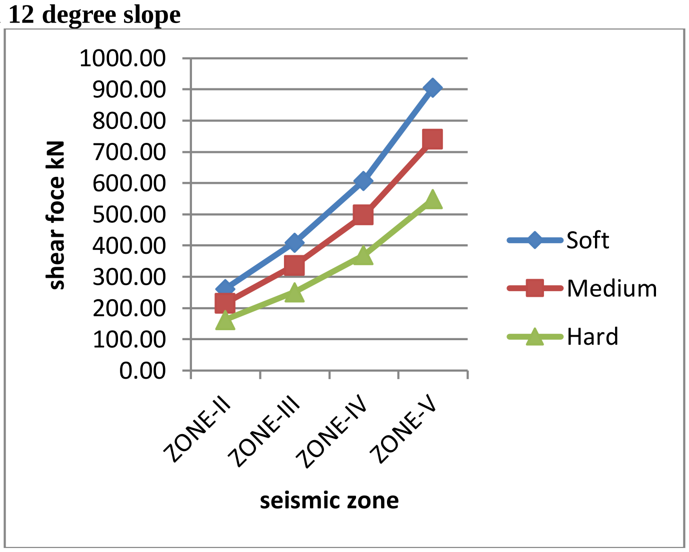

Fig.8: max. Shear force in 12ºslope

Axial force

Axial force in 0 degree slope

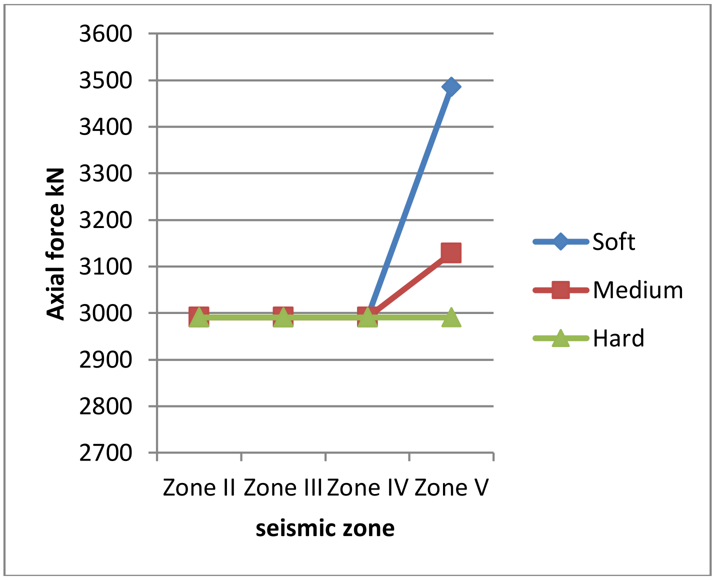

Fig.9: Axial force in 0°slope

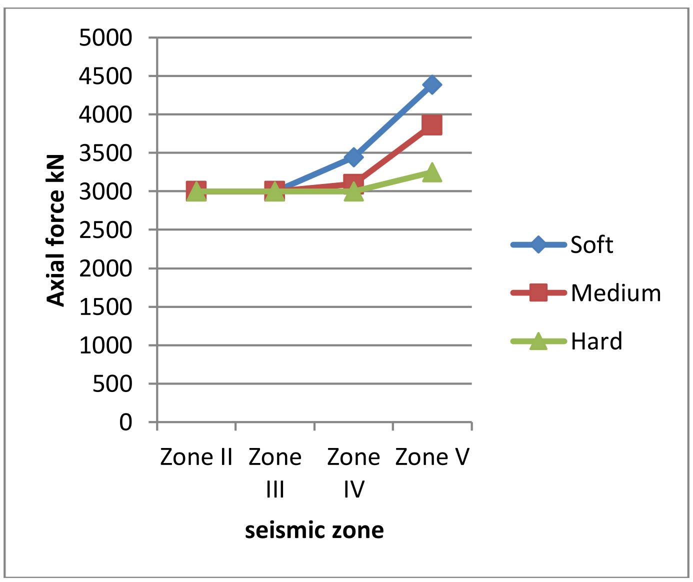

Fig.10: Axial force in 8°slope

Axial force in 12 degree slope

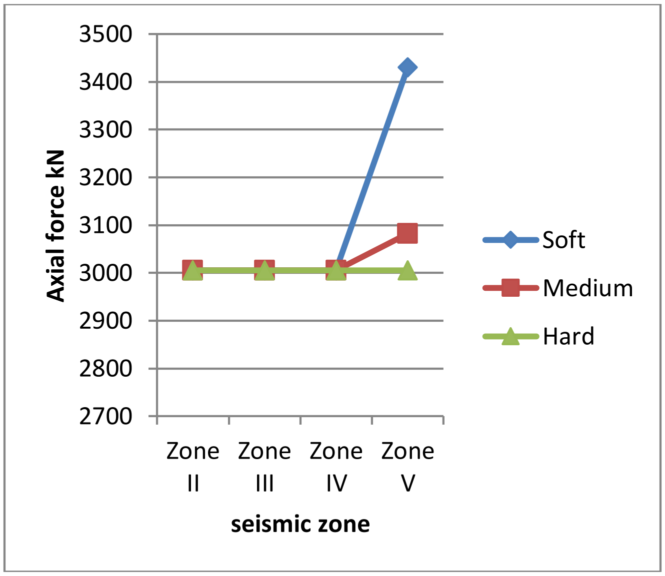

Fig.11: Axial force in 12ºslope

CONCLUSIONS

Following are the conclusions as per study-

Maximum bending moment

- Maximum bending moment is seen in soft soil and minimum in hard soil therefore hard soil is stable.
- In seismic zones, maximum bending moment is seen in zone-V and minimum in zone-II means zone-II provide better stability.
- As comparing slopes, maximum bending moment is seen in 12 degree sloping ground and minimum in 0 degree sloping ground, means as slope is increasing bending moment is also increasing.
- In this comparative study Zone-2, hard soil, o degree slope is economical as it shows less moment means less reinforcement.

Maximum shear force.

- Maximum shear force is observed in soft soil and minimum in hard soil therefore hard soil is stable whereas soft soil is critical.
- In seismic zones, maximum shear force is seen in zone-V and minimum in zone-II means zone-II provide better stability.
- As comparing slopes, maximum shear force is seen in 12 degree sloping ground and minimum in 0 degree sloping ground, means as slope is increasing shear force is also increasing.

Maximum axial force

- Maximum axial force is seen in soft soil, moderate is medium soil and minimum in hard soil therefore hard soil is stable whereas soft soil is critical.
- In seismic zones, maximum axial force is seen in zone-V and minimum in zone-II means zone-II provide better stability.
- As comparing slopes, maximum axial force is seen in 12 degree sloping ground and minimum in 0 degree sloping ground, means as slope is increasing axial force is also increasing.

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

REFERENCES

1. KUMAR SUJIT, GARG V. & SHARMA A. "Effect Of Sloping Ground On Structural Performance Of RCC Building Under Seismic Load". International Journal Of Science, Engineering And Technology, ISSN: 2348-4098 Volume 2, Issue 6. (2014)
2. **BIS (2002).** "IS 1893 (Part 1)-2002: Indian Standard Criteria for Earthquake Resistant Design of Structures", Part 1 – General Provisions and Buildings (Fifth Revision), Bureau of Indian Standards, New Delhi
3. Sarkar, P., Prasad, A. M., and Menon, D., Vertical geometric irregularity in stepped building frames, Engineering Structures 32, pp 2175–2182. (2010).
4. Paul, D.K. and Kumar, S. (1997) Stability Analysis of Slope with Building Loads. Soil Dynamics and Earthquake Engineering, **16**, 395-405.
5. A.R. Vijaya Narayanan, Rupen Goswami and C.V.R. Murty, "Performance of RC Buildings along Hill Slopes of Himalayas during 2011 Sikkim Earthquake", EERI Newsletter, EERI Special Earthquake Report, February 2012, 1-14.
6. Dr. S. A. Halkude, Mr. M. G. Kalyanshetti, Mr. V. D. Ingle "Seismic Analysis of Buildings Resting on Sloping Ground with Varying Number of Bays and Hill Slopes", International Journal of Engineering Research & Technology (IJERT), ISSN: 2278-0181, Vol. 2 Issue 12, December – 2013.
7. S.S. Nalawade., " Seismic Analysis of Buildings on Sloping Ground," M.E. Dissertation, University of Pune, Dec-2003.
8. S.M.Nagargoje and K.S.Sable," Seismic performance of multi-storeyed building on sloping ground", Elixir International Journal, 7 December 2012.
9. D.K. Paul1, Simplified seismic analysis of framed buildings on hill slopes, Bulletin of the Indian Society of Earthquake Technology, Paper No. 335, vol. 30, No. 4,Dec. 1993, pp. 113-124.
10. D.K. Paul, Simplified seismic analysis of framed buildings on hill slopes, Bulletin of the Indian Society of Earthquake Technology, Paper No. 335, vol. 30, No. 4,Dec. 1993, pp. 113-124.
11. Satish Kumar and D.K. Paul3, Hill building configurations from seismic considerations, Journal of structural engineering , vol. 26, No. 3, Oct. 1999.
12. B.G. Birajdar and S.S. Nalawade5, Seismic analysis of buildings resting on sloping ground, 13th world conference on earthquake engineering, Vancuover, B.C., Canada, August 1-6, 2004, paper No. 1472.