To Study Effect of Irregularity of Multistoried Building For All Zones

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Abstract- *Among categorizations of seismic behaviour that have been adopted in modern codes is extreme vertical Irregularity. Vertical irregularity is not an unfamiliar concept, having been expressed in codes in various forms for decades. It is an issue that engineers have learned to deal with, particularly in seismically active areas. Extreme vertical irregularity, however, is a somewhat newer concept and subset within the larger issue of vertical behaviour. It is something that can greatly limit and restrict flexibility in choosing seismic force-resisting systems and configurations.*

In this paper vertical irregular frames are analysed for Pushover analysis and time history analysis for different frames and different zones using ETABS. For time history analysis Bhuj and Koyana data is used.

Keywords- Vertical irregularity, Push over analysis, Time History analysis, ETABS

I. INTRODUCTION

1.1 General:

During an earthquake, failure of structure starts at points of weakness. This weakness arises due to discontinuity in mass, stiffness and geometry of structure. The structures having this discontinuity are termed as Irregular structures. Irregular structures contribute a large portion of urban infrastructure. Vertical irregularities are one of the major reasons of failures of structures during earthquakes. For example structures with soft storey were the most notable structures which collapsed. So, the effect of vertically irregularities in the seismic performance of structures becomes really important. Height-wise changes in stiffness and mass render the dynamic characteristics of these buildings different from the regular building

A building is said to be a regular when the building configurations are almost symmetrical about the axis and it is said to be the irregular when it lacks symmetry and discontinuity in geometry, mass or load resisting elements. Asymmetrical arrangements cause a large torsion force. IS 1893: 2002 (part1) has explained building configuration system for better performance of RC buildings during earthquakes. The building configuration has been described as regular or irregular in terms of the size and shape of the building, arrangement of structural the elements and mass. There are two types of irregularities 1) Horizontal irregularities refers to asymmetrical plan shapes (L, T, U and F) or discontinuities in horizontal resisting elements such as re-entrant corners, large openings, cut outs and other changes like torsion, deformations and other stress concentrations, 2) Vertical irregularities referring to sudden change of strength, stiffness, geometry and mass of a structure in vertical direction. The main objective of the present work is to study the response of the irregular structures under dynamic loads. In this present study it is proposed to consider the building frames that are irregular in elevation and analyse the response and behaviour of the structures under earthquake and wind loads. For this purpose, Three RC building frames are selected and it is proposed to analyse all the frames that are considered and are modelled. STAAD PRO analysis package is proposed for the analysis of all structures, to get the all nodal displacements. Frames considered in this study are 15,20,25-Storied 3-D frames with symmetrical elevation configuration throughout its height and three other frames with unsymmetrical vertical configuration starting from tenth floor, placed at corner of the plan respectively. It is proposed that the responses of all the above frames are to be determined for all the load combinations. Lateral loads and Storey shears of all the three frames due to earthquake loads is proposed to determine using Time history analysis method, the IS 1893(Part 1) : 2002 has recommended dynamic analysis (linear dynamic analysis).

1. Plan Irregularities
2. Vertical Irregularities.
3. Stiffness Irregularity
4. Mass Irregularity
5. Vertical Geometric Irregularity
6. In-Plane Discontinuity in Vertical Elements Resisting Lateral Force
7. Discontinuity in Capacity

1.2 Need for Research

Irregular buildings constitute a large portion of the modern urban infrastructure. Structures are never perfectly regular and hence the designers routinely need to evaluate the likely degree of irregularity and the effect of this irregularity on a structure during an earthquake. Need for research is required to get economical & efficient lateral stiffness system for high seismic prone areas. For optimization & design of high rise building with different structural. framing systems subjected to seismic loads. To improve the understanding of the seismic behaviour of building structures with vertical irregularities

1.3 Scope:

From the above literature survey it is observed that there is very less research work carried out for seismic performance of irregular structure. Response of base isolated and fix base structure for torsional irregularity is modified by consideration of soil strata. Therefore, this work deals with comparative parametric study of irregular structure with effect of torsion irregularity.

1.4 AIM:

To study effect of irregularity of multi-storeyed building for all zones

1.5 OBJECTIVES:

To study effects of irregularities o building as per is 1893

To perform time history analysis and push over analysis for various irregularities with different a/l ratio

To validate results experimentally with horizontal shake table

To compare results such as storey drift, base shear, point drift for time history and push over analysis.

II. LITERATURE REVIEW

H. Yoshioka; J. C. Ramallo; and B. F. Spencer Jr.9 (2002) states in this paper that one of the most successful means of protecting structures against severe seismic events is base isolation. However, optimal design of base isolation systems depends on the magnitude of the design level earthquake that is considered. The features of isolation system designed for an El Centro-type earthquake typically will not be optimal for a Northridge-type earthquake and vice versa. To be effective during a wide range of seismic events, an isolation system must be adaptable. To demonstrate the efficacy of recently proposed ‘‘smart’’ base isolation paradigms, this paper presents the results of an experimental study of a particular adaptable, or smart, base isolation system that employs magneto rheological ~MR! Dampers. The experimental structure, constructed and tested at the Structural Dynamics and Control/Earthquake Engineering Laboratory at the Univ. of Notre Dame, is a base-isolated two-degree-of-freedom building model subjected to simulated ground motion. A sponge-type MR damper is installed between the base and the ground to provide controllable damping for the system. The effectiveness of the proposed smart base isolation system is demonstrated for both far-field and near-field earthquake excitations.

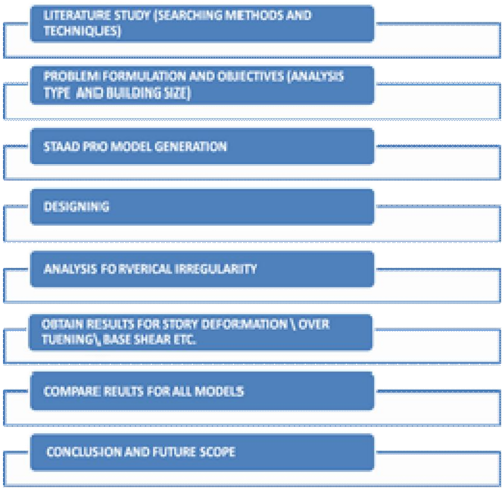
Ahmad Naderzadeh8 (2009)

states in this study that application of base isolation techniques in Iran goes back to hundreds of years ago and even to ancient times. Installing pieces of wood between the foundation and the walls of buildings is among the earthquake resistant construction techniques that have been applied in some areas of Iran in the past. However, contrary to other technologies which are generally adapted soon after their development, modern seismic base isolation technology took almost a quarter of a century to be adapted and utilized in Iran. This paper presents the historical as wells as the modern application of seismic base isolation technology in Iran.

Sajal Kanti Deb10 (2004)

discusses 3D nonlinear analysis procedure of base isolated building in this paper. Important issues related to design of base isolated building are presented. Shear test for obtaining force-displacement hysteresis loop of isolation bearings is outlined. Other important issues, e.g. (i) effects of soft soil on performance of base isolated building, (ii) effects of near fault motion, and (iii) soil-base isolated building interaction, as reported in the literature have also been discussed.

III. METHODOLOGY OF WORK



3.1 Description of Method

- Among categorizations of seismic behaviour that have been adopted in modern codes is extreme vertical Irregularity. Vertical irregularity is not an unfamiliar concept, having been expressed in codes in various forms for decades. It is an issue that engineers have learned to deal with, particularly in seismically active areas. Extreme vertical irregularity, however, is a somewhat newer concept and subset within the larger issue of vertical behaviour. It is something that can greatly limit and restrict flexibility in choosing seismic force-resisting systems and configurations.

- In this paper vertical irregular frames are analysed for Pushover analysis and time history analysis for different frames and different zones using ETABS. For time history analysis Bhuj and Koyana data is used.

- Among categorizations of seismic behaviour that have been adopted in modern codes is extreme torsional irregularity. Torsional irregularity is not an unfamiliar concept, having been expressed in codes in various forms for decades. It is an issue that engineers have learned to deal with, particularly in seismically active areas. Extreme torsional irregularity, however, is a somewhat newer concept and subset within the larger issue of torsional behaviour. It is something that can greatly limit and restrict flexibility in choosing seismic force-resisting systems and configurations.

IV. PROBLEM STATEMENT

Consider a 13 storye reinforced concrete office building shown in Fig. 1.1. The building is located in Shillong (seismic zone III, IV,V). The soil conditions are medium stiff and the entire building is supported on a raft foundation. The R. C. frames are in filled with brick-masonry. The lumped weight due to dead loads is 12 kN/m2 on floors and 10 kN/m2 on the roof. The floors are to cater for a live load of 4 kN/m2 on floors and 1.5 kN/m2 on the roof. Determine design seismic load on the structure as per new code Thickness of slab: 130mm

- Beam size: 250mm X 350 mm
- Column size at G.L.:250mm X 400 mm
- Thickness of outer wall including plaster: 250 mm
- Thickness of partition wall including plaster: 175 mm
- Load due to roof finish: 2kN/m2
- Load due to floor finish: 1kN/m2
- Imposed load: 4kN/m2
- Type of foundation: Isolated footing
- Soil Condition: Hard Murum available at depth of 1.5m below G.L.
- Zone-III

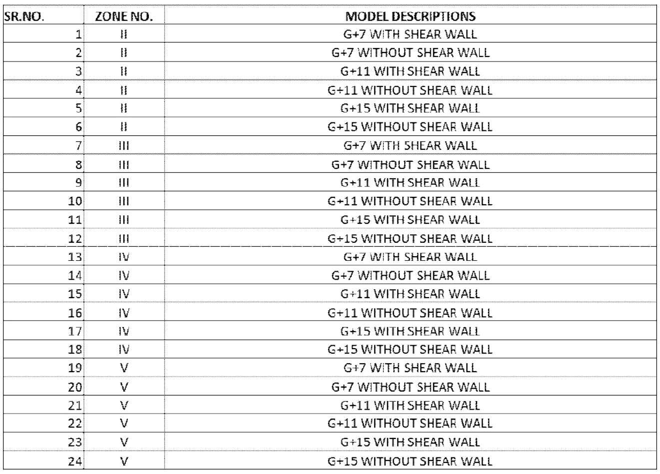
Description of loading

Density of various materials considered for design,
- Concrete – 25kN/m3
- Insulation – 1kN/m3
- Structural steel – 78.5kN/m3
- Live load – 5kN/m3

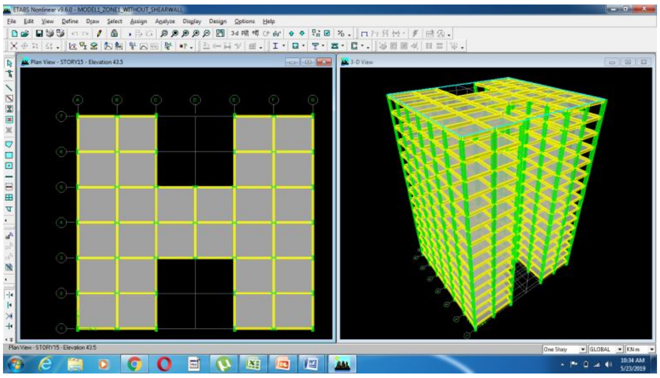
The following wind parameters are followed in accessing the wind loads on the structure

- Basic wind speed – 55m/s
- Terrain category -2
- Class of structure – c
- Risk coefficient k1 – 1
- Topography factor k3– 1
- K2 factor taken from Draft Code CED 38(7892):2013 (third revision of IS 4998(part 1):1992)
- Earthquake force data:
- Earthquake load for the chimney has been calculated as per IS 1893(par 4) : 2005
- Zone factor – 0.16
- Seismic zone – III
- Importance factor (I) – 1.5
- Reduction factor (R) – 3

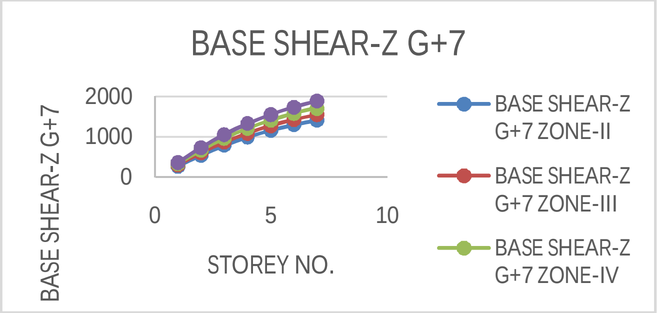
V. PROPOSED MODELS



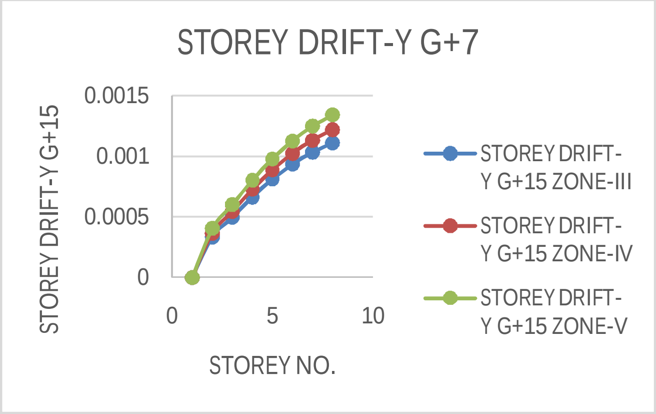
SR.NO.	ZONE NO.	MODEL DESCRIPTIONS
1	II	G+7 WITH SHEAR WALL
2	II	G+7 WITHOUT SHEAR WALL
3	II	G+11 WITH SHEAR WALL
4	II	G+11 WITHOUT SHEAR WALL
5	II	G+15 WITH SHEAR WALL
6	II	G+15 WITHOUT SHEAR WALL
7	III	G+7 WITH SHEAR WALL
8	III	G+7 WITHOUT SHEAR WALL
9	III	G+11 WITH SHEAR WALL
10	III	G+11 WITHOUT SHEAR WALL
11	III	G+15 WITH SHEAR WALL
12	III	G+15 WITHOUT SHEAR WALL
13	IV	G+7 WITH SHEAR WALL
14	IV	G+7 WITHOUT SHEAR WALL
15	IV	G+11 WITH SHEAR WALL
16	IV	G+11 WITHOUT SHEAR WALL
17	IV	G+15 WITH SHEAR WALL
18	IV	G+15 WITHOUT SHEAR WALL
19	V	G+7 WITH SHEAR WALL
20	V	G+7 WITHOUT SHEAR WALL
21	V	G+11 WITH SHEAR WALL
22	V	G+11 WITHOUT SHEAR WALL
23	V	G+15 WITH SHEAR WALL
24	V	G+15 WITHOUT SHEAR WALL



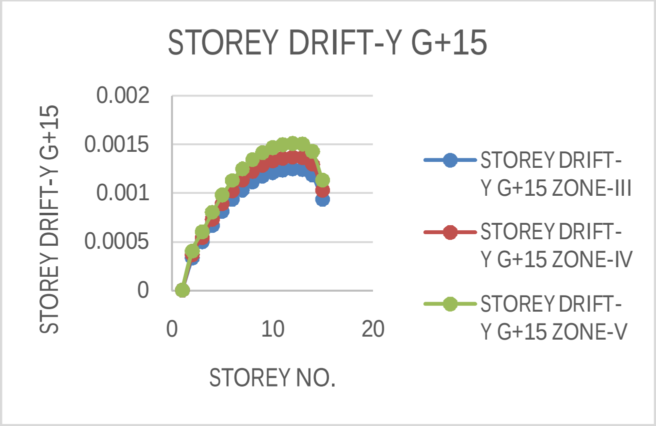
VI.RESULT AND DISCUSSION



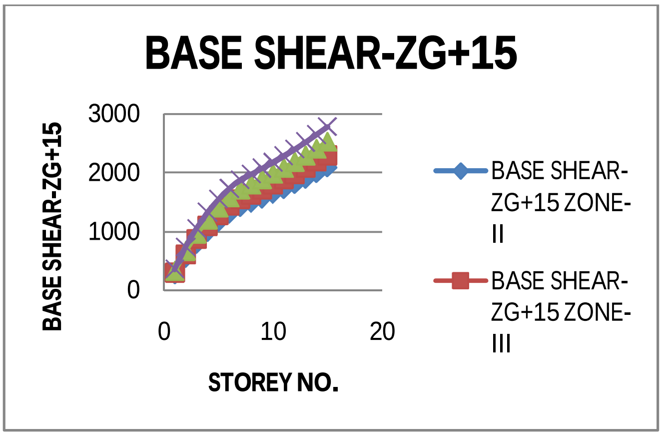
Graph no 6.1 in this graph it shows that base shear in G+7 is Zone 5 is more as Compared to other zones.



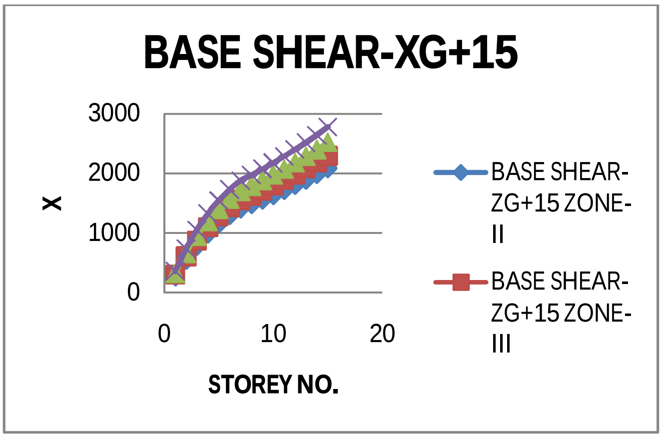
Graph no 6.2 In this graph it shows that storey drift in Y G+15 is Zone 5 is more as Compared to other zones.



Graph no 6.3 In this graph it shows that storey drift in Y G+15 is Zone 5 is more as Compared to other zones.



Graph no 6.4 In this graph it shows that base shear in Z G+15 is Zone 5 is more as Compared to other zones.



Graph no 6.4 In this graph it shows that base shear in Z G+15 is Zone 5 is more as Compared to other zones.

VI.CONCLUSION

In this project modelling of multi-storeyed building with plan irregularity is done. In accordance with IS1893-2002 for simulation purpose finite element analysis Staad-Pro is used following conclusions are formed after studying H Shape Building with variation of height.

REFERENCES

[1] By storey drift graph it is concluded that increase in height of L-shape building directly increase in relative displacement & stress at re-entrant corners

[2] Shear wall is given for H shape buildingrelatively considerable decrease in displacementand also decrease in stresses at re-entrant corners.

[3] Increase in height of H Shapebuilding directly increase in relative displacement and stress will be developed at re-entrant corner.

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