International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 04 Issue: 08 | August -2020 ISSN: 2582-3930

A Review on Seismic Analysis of Unsymmetrical Building in Plan

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Abstract -A structure can be classified as irregular if it contains irregular distributions of mass, stiffness and strength or due to irregular geometrical configurations. The behaviour of any building depends on the arrangement of structural elements present in it. The important aspects on which the structural configuration depends are geometry, shape and size of the building. In reality, many existing buildings contain irregularity due to functional and aesthetic requirements. However, past earthquake records show the poor seismic performance of these structures. This proposal will try to ignorance of the irregularity aspect in formulating the seismic design methodologies by the seismic codes.

***Key Words*:**Irregularity, Geometry, Shape and Size of the building etc.

I.INTRODUCTION

The approach to seismic analysis by conventional methods make use of many random assumed values like time period, intensity of earthquake and direction of earthquake etc. These could be called the vague input data as they are mostly imagined and pseudo. Being so, seismic response of structures would be inaccurate one. Sometime the plot area is having irregular shape. In that situation there is need of construct building according to shape of plot area. Now a day there is craze of built buildings with initial letter of names Like I, L, W, V, T, O, E. This shape is challenging for earthquake study. It would be ideal if all buildings have their lateral-load resisting elements symmetrically arranged and earthquake ground motions would strike in known directions. Due to scarcity of land in big cities, architects often propose irregular buildings in order to utilize maximum available land area and to provide adequate ventilation and light in various building components. However, it is quite often that structural irregularity is the result of a combination of both types. Most buildings have some degree of irregularity in the geometric configuration or the distribution of mass, stiffness, and strength.

II. LITERATURE REVIEW

Shrivallabh S. Chavan, Amit C. Thoke, Yogesh R. Vanshe (2018) "Analysis And Design Of L-Shaped Building In Different Seismic Zones" In this Study, It is very essential to consider the effects of lateral loads induced from earthquakes in the design of reinforced concrete structures, especially for high-rise and unsymmetrical buildings. The IS Code of Practice for Calculating Loads and Forces in Structural and Building Works, IS 456-2000 and IS 1893:2002 gives simplified methods for calculating such loads in different seismic zones. This depends on some seismic parameters defined by codes. In this research the effects will be studied and compared according to the IS 1893: 2002. The codes are reviewed for earthquake analysis and discussed to show some factors affecting the design like mode shape and displacement of structure. Peak Shear in X and Z direction increases as we move from Zone II to Zone V. Displacement in X and Z direction increases as we move from Zone II to Zone V. Percentage of Steel is increasing from zone II to Zone II is 2.51 tons, zone III to Zone IV is 1.72 tons & zone IV to Zone V is 4.96 tons. And the percentile increment is 0.25% to 0.71%. Dead Load plays a very significant role to counter balance the uplifting earthquake forces.

Ashvin G. Soni, Prof. D. G. Agrawal, Dr. A. M. Pande "Effect of Irregularities in Buildings and their Consequences" In this Study, Many buildings in the present scenario has irregular configurations both in plan and elevation. This in future may subject to devastating earthquakes. In case, it is necessary to identify the performance of the structures to withstand against disaster for both new and existing one. This is due to the irregularities in plan or elevation or in both. The paper discusses the performance evaluation of RC Buildings with irregularity. Structural irregularities are important factors which decrease the seismic performance of the structures. This proves that irregularities in buildings are harmful for the structures and it is important to have simpler and regular shapes of frames as well as uniform load distribution of load around the building.

Rucha S. Banginwar, M. R. Vyawahare, P. O. Modani (2012) "Effect of Plans Configurations on the Seismic Behavior of the Structure By Response Spectrum Method" In this Study, The behaviour of building during earthquake depends critically on its overall shape, size and geometry. Building with simple geometry in plan have performed well during strong past earthquake but building with u, v, H & + shaped in plan have sustained significant damage. In this proposed work the study is carried on the effect of difference geometrical configurations on the behaviour of structure of the already constructed building located in the same area during earthquake by RSM in this paper, more emphasis is made on the plan configurations and is analysed by RSM since the RSM analysis provides a key information for real world application. The plan configuration of structure has significant impact on the seismic response in terms of displacement, story drift, and story shear.

Dj. Z. Ladjinovic and R. J. Folic (2008) "Seismic Analysis of Asymmetric in Plan Buildings" In this Study, Buildings with an asymmetric distribution of stiffness and strength in plan undergo coupled lateral and torsional motions during earthquakes. In many buildings the centre of resistance does not coincide with the centre of mass. By reducing the distance between the centre of mass and the centre of stiffness, torsional effects should be minimized. The choice of the stiffness characteristics of structures is an important step in the conceptual design phase. The good behaviour of the structure can be provided with a well distributed lateral load resisting system. The factors that determine the seismic response are the strength eccentricity, lateral and torsional capacity of the system, plan wise distribution of stiffness and excitation. Torsional stiffness and resistance are characteristics of building structures that significantly influence their response to the seismic action.

Dnyaneshkumar H. Lanjewar, Prof. Ameya Khedikar (2017) "Seismic Analysis of Unsymmetrical RCC Structures" In this Study, Seven models of G+10 storey building with one regular plan and remaining irregular plan (C, E, H, L, T, PLUS shapes) have been taken. The plan area for each structure is same only there is differ in geometry. Response spectrum analysis is used for analysis. Time period does not depend on the zone value. Frequency was Maximum for "L" shaped and minimum for plus shape done. Regular square building have minimum displacement and "L" shaped have maximum displaced compared to other Shapes since it can be avoided. Irregular shape building are severely affected undergo more deformation during earthquake especially in high seismic zones.

Gagandeep and Aditya Kumar Tiwary "Analysis of Asymmetrical Building with Shear Wall under Seismic Loading" In this Study, Earthquake in inhabited areas throughout the globe may cause intensive harm to the varied structures that lead to harmful damage of social life and massive financial harms. The change in bending moment with increasing upto 65% and decrease up to 78% in bending moment was observed. The storey drifts also shows variation up to 25% for the interior columns when soil structure interaction was incorporated in the analysis. The axial forces in the columns were reduced by 10-15%, in internal column there was a marginal reduction of 2-4%. The shear force was reduced by 10-80% for columns in the lower storeys, and then increased by 50-100% for columns in the top storeys. The bending moment reduced by 10-80% for the columns in lower storeys, but it increased from 15-50% from 6th to top storey.

Desai R.M, Khurd V.G., Patil S.P, Bavane N.U. "Behaviour of Symmetric and Asymmetric Structure in High Seismic Zone" In the present report, at present scenario many buildings are asymmetric in elevation based on the distribution of mass and stiffness along each storey throughout the height of the building. Most recent earthquakes have shown that the irregular distribution of mass, stiffness and strengths may cause serious damage in structural systems. This project performance of the torsional balanced and torsional unbalanced buildings also called as symmetric and asymmetric buildings by subjecting to response-spectrum analysis. The buildings have un-symmetrical distribution of vertical irregular in storeys. In this project the effort is made to study the effect of eccentricity between centre of mass and centre of stiffness on the performance of the buildings. Three buildings (G+3), (G+6) & (G+9) models are considered for study, which are constructed on medium soil in seismic zone II of India, one symmetric and asymmetric in vertical irregular distribution. The performance of a multi-storey framed building during sturdy earthquake motions depends on the distribution of mass, stiffness, and strength in both the horizontal and vertical planes of the

building. In some cases, these weaknesses may be produced by discontinuities in stiffness, strength or mass between adjoining storeys. Such discontinuities between storeys are often allied with sudden variations in the frame geometry along the height.

III. METHODOLOGY OF WORK

i. Extensive literature survey by referring books, papers carried out to understand basic concept of topic.
ii. Identification of need of research.
iii. Data collection.
iv. Analytical work is to be carried out.
v. Interpretation of results & conclusion.

IV. CONCLUSIONS

From the above review I have concluded that lot of research have carried on the Earthquake effect on the building with symmetrical configuration. In my analysis I purpose to study basic parameter such as shape factor, modal analysis, deflection, storey drift, twisting moment. Results will be interpreted on the bases of this parameter. Lack of research have observed on the building with unsymmetrical configuration thus in the further work I will compared the building with unsymmetrical configuration. Stiffness is increases in E, L, T, Y shape structures over Rectangular shape structure

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