International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 9 Sep. 2022, pp: 425-428 www.ijaem.net ISSN: 2395-5252

Seismic behaviour of Symmetricand Asymmetrical Multi StoriedBuilding:A Review

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Date of Submission: 05-09-2022 Date of Acceptance: 13-09-2022

ABSTRACT : Due to fast urbanization there is construction of large number of multistoried buildings. In order to fulfill the requirements of this increased population in the limited land the height of building becomes medium to high-rise. many buildings located in seismic zones are deficient to withstand earthquakes.From past earthquakes it is proved that many of structures are totally or partially damaged due to earthquakes,So it is necessary to determine seismic response of multistory buildings.in this project work analysis of G+12 story building is considered.this paper highlights the effect of seismic response of building by using Time history analysis and Response spectrum analysis.The analysis is carried out by using F.E based software SAP2000.Various parameters such as base shear ,story displacements ,story drifts can be determined .

Key Words: ETABS, Earthquake Load, Torsion, Response Spectrum, Push Over Modal Mass Participation.

I. INTRODUCTION

General Introduction

Most recent earthquakes have shown that the irregular distribution of mass, stiffness and strengths may cause serious damage in structural systems Due to several reasons structures acquire asymmetry. Asymmetry in structures makes analysis of the seismic behavior very complicated. Seismic demand in peripheral elements is enhanced. Uniformity in load distribution gets disturbed. Torsional behavior of asymmetric building is one of the most frequent causes of structural damage and failure during strong ground motions Torsion responses in structures arise from two sources: Eccentricity in the mass and stiffness distributions, causing a torsion response coupled with translation response; and torsion arising from accidental causes, including uncertainties in the masses and stiffness, the differences in coupling of the structural foundation with the supporting earth or rock beneath and wave propagation effects in the earthquake motions that give a torsion input to the ground, as well as torsion motions in the earth itself during the earthquake.

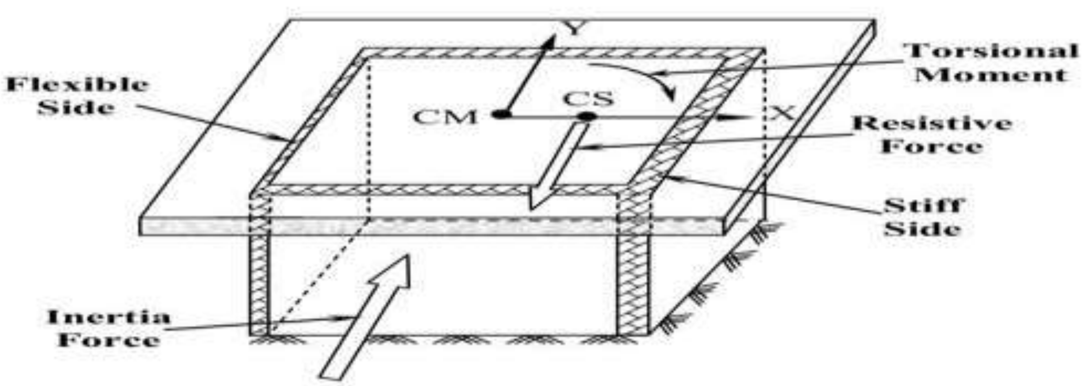

Figure 1. Forces in structure

Seismic damage surveys and analyses conducted on modes of failure of building structures during past severe earthquakes concluded that most vulnerable building structures are those, which are symmetrical and asymmetric in nature. Asymmetric-plan buildings, namely buildings with in-plan asymmetric mass and strength distributions, are systems characterized by a coupled torsional-translational seismic response.

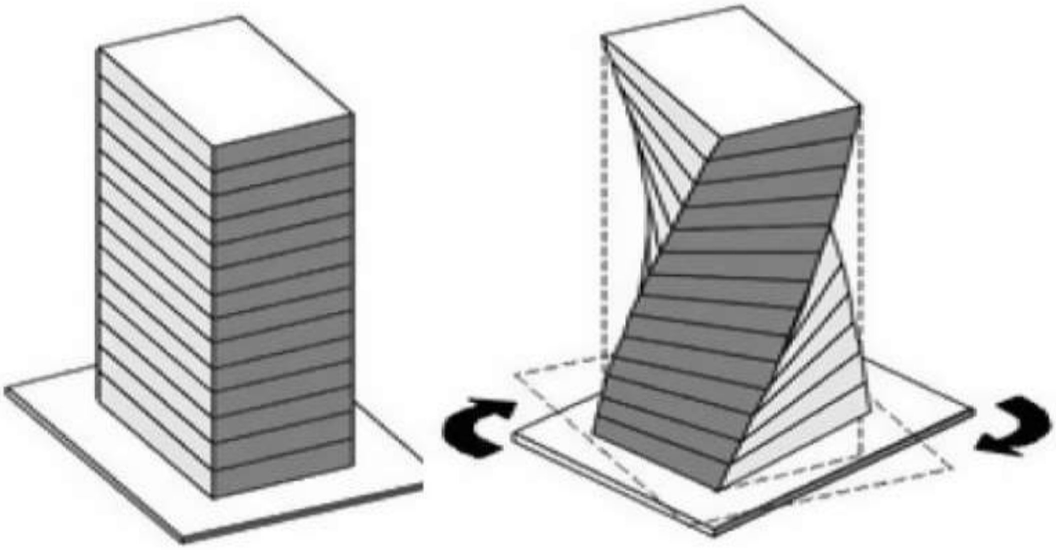

Fig- 2Torsional Moment in Structure.

Torsion in buildings during earthquake shaking may be caused from a variety of reasons, the most common of which are non-symmetric distributions of mass and stiffness.

Earthquake load acts at the center of mass of the structure. However, resisting force acts at a point called center of rigidity on the structure, which is the center of lateral resistance. Torsional problems take place when the mass center and center of rigidity are not located at the same place. By increasing distance between center of mass and center of rigidity, building is forced to twist around the rigid structural section (rigid core) and subjected to great torsional moments. The lateral-torsional coupling due to eccentricity between center of mass (CM) and center of rigidity (CR) in asymmetric building structures generates torsional vibration even under purely translational ground shaking. During seismic shaking of the structural systems, inertia force acts through the Centre of mass while the resistive force acts through the Centre of rigidity.

Figure 3. Failure of irregular structures

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II. PROJECT STATEMENT

The study will give more knowledge which result into benefits for future implementation with the help of RCC building actual design. To study the effect of shape and position of shear wall on structural behavior.

i) Response Spectrum Method

A response spectrum is simply a plot or steady-state response (displacement, velocity or acceleration) of a series of oscillators of varying natural frequency that are forced into motion by same base vibration. The resulting plot can then be used to pick off the response of any linear system, given its natural frequency of oscillation. One such use is in assessing the peak response of building to earthquake. The science of strong ground motion may use some values from the ground response spectrum for correlation with seismic damage.

In technical terms it can be said that it is the representation of the maximum response of idealized single degree of freedom having certain period and damping during earthquake ground motion. The maximum response is plotted against the undammed natural period and for various damping values can be expressed in terms of maximum relative velocity or maximum relative displacement. The characteristics of seismic ground vibrations expected at any location depends upon the magnitude of earthquake, its depth of focus, distance from the epicenter, characteristics of the path through which the seismic waves travel, and soil strata on which the structure stands. The random earthquake ground motions, which cause the structure to vibrate, can be resolved in any three mutually perpendicular directions.

ii) Non-Linear Static Push-over Analysis

The pushover analysis of a structure is a static nonlinear analysis under permanent vertical loads and gradually increasing lateral loads. The equivalent static lateral loads approximately represent earthquake induced forces. A plot of the total base shear versus top displacement in a structure is obtained by this analysis that would indicate any premature failure or weakness. The analysis is carried out up to failure, thus it enables determination of collapse load and ductility capacity. On a building frame, plastic rotation is monitored, and lateral inelastic forces versus displacement response for the complete structure are analytically computed. This type of analysis enables weakness in the structure to be identified.

The decision to retrofit can be taken in such studies. Two key elements of a performance-based design procedure are demand and capacity. Demand is a representation of the earthquake ground motion. Capacity is a representation of the structures ability to resist the seismic demand. The performance is dependent on the manner that the capacity is able to handle the demand. In other words, the structure must have the capacity to resist the demands of the earthquake such that the performance of the structure is compatible with the objectives of the design. Once the capacity curve and demand displacement are defined, a performance check can be done. A performance check verifies that structural and non-structural components are not damaged beyond the acceptable limit of the performance objective for the forces and displacements implied by the displacement demand. In this study, nonlinear static pushover analysis was used to evaluate the seismic performance of the structures.

III. PROBLEMFORMULATION

Multi-storied ferroconcrete, moment defying space frame are ana tomized using professional software ETABS2016. Model G+24of erecting frame withth ree kudos in vertical andthree kudos in side directio n is anatomized by Response spectrum method.The plan confines of structures are shown in table belo w.

The plan view of structure, elevation of colorful fra mes is shown in numbers below.

CONCLUSION

Based on the literature review presented in Chapter 2, the salient objectives of the Present study have been identified as follows:

1) To study the effect torsional analysis of symmetrical and asymmetrical building, study on the influence of the torsional moment effects on the behaviour of structure is done by using Response spectrum method.
2) Then simplified nonlinear pushover analysis has been used to find structural descriptors required in seismic vulnerability assessment.
3) And how we can avoid torsion by doing structural changes has been carried out.

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