INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

www.ijprems.com
editor@ijprems.com

Vol. 03, Issue 08, August 2023, pp : 181-183

e-ISSN : 2583-1062

Impact Factor : 5.725

COMPARATIVE ANALYSIS OF LATERAL LOADS RESISTING SYSTEM FOR RCC STRUCTURE

Pankaj Kumar[1], Dr. Jyoti Yadav[2]

[1]M. Tech Scholar, Dept. Of Civil Engineering, Sarvepalli Radhakrishnan University, Bhopal, M.P, India.

[2]Assistant Professor, Dept. Of Civil Engineering, Sarvepalli Radhakrishnan University, Bhopal, M.P, India.

ABSTRACT

This research work focuses on comparison of seismic analysis of G+12 story buildings stiffened with shear wall at various locations. The performance of the building is analysed in Zone II, for Mumbai city. This research paper includes understanding the main zone factor that tends the structure to perform poorly during lateral moments caused by earthquake in order to achieve their appropriate behaviour under future earthquakes. The analysed structure is symmetrical, G+12, Ordinary RC moment-resting frame (OMRF). Modelling of the structure is done by using staad proV8i software. The Time period used for the seismic calculations of the structure in both the direction is achieved from the software and as per IS 1893(part I):2016 seismic analysis has conducted. The Lateral seismic forces of RC frame are carried out using equivalent static method as per IS 1893(part I): 2016. The purpose of present work is to understand that the structures need to have suitable Earthquake resisting features to safely resist large lateral forces exerted on structure during lateral movement of structure. Shear walls are efficient (model no.3), In terms of effectiveness in minimizing lateral movement and damage caused due to the earthquake in structure the conventional frame system also provides the resistance to structure but it is unable to minimise the damage caused by the earthquake in structure. A comparative analysis is done in terms of Base shear, Displacement, Axial load, Moments in Z direction in columns and maximum bending moments in beams.

Keywords: - Staad-pro, seismic excitation, ordinary RC frame structure

1. INTRODUCTION

India is the fast-growing economy in the world and it does require infrastructure facility along with the rapid growth of population in our country. These types of structures help to increase life of structure, stiffness of structure and strength of structure. We have been studying this project since 5 to 6 month and we gain the knowledge of different IS code and different Software. There are fluctuations in axial force, Absolute displacement, Torsion and moment in Z direction. This demands changes in the current structural system which needs to be implemented to resist these forces. Many research has been carried which describes the suitability of various lateral load resisting system against deformation and shear exerted due to the earthquake and wind force. It is necessary to consider the seismic load for the design of high-rise structure. The different

lateral load resisting system are used in medium-rise building as the lateral load due to earthquake are a matter of concerned whereas building height increase the importance of lateral load action rise in an accelerating rate.

2. ANALYSIS BY USING STAAD SOFTWARE

Staad-Pro is structural analysis design program software. It includes a state-of-the-art user interface, visualization tools and international design codes. It is used for 3D model generation, analysis and multi-material design. Analyse gravity and lateral loads: Design and analyse simple or complex structures for a wide range of loading conditions, including those induced by gravity such as dead and live loads, including skip conditions, in combination with lateral loads including wind and seismic. Design and analysis structural models: quickly model your entire structure, including decks, slabs, slab edges and openings, beams, columns, walls, braces, spread and continuous footings, and pile caps. Effectively automate many of your time-consuming design and analysis tasks and produce practical system and components designs that are document ready.

- **Design beams, columns and walls:** Optimize or analysis beams, columns, and walls for gravity and lateral loads to quickly obtain safe and economical designs. Confidently produce design in compliance with global design specifications and building codes.
- **Design lateral resisting frames:** perform extinctive building code checks for seismic and wind forces on braced frames and moment frames. Quickly obtain safe and reliable designs for all of your structural projects.
- **Design cold-formed steel members:** design light gauge steel members using a comprehensive cold formed section library without needing to use a separate special purpose application.

3. RESULT AND CALCULATIONS

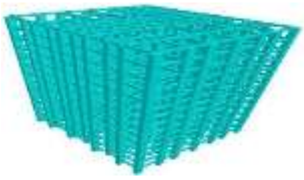

Figure 1: Model 1 of Ordinary Moment Resisting Frame

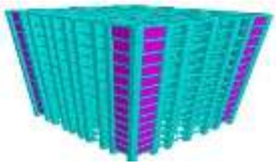

Figure 2: Model 2 of Corner SW Dead Load

Table 1: Dead load & Live load calculations

Calculation of floor load		
Density of slab γ	25	kn/m^3
Slab thickness t	0.15	m
Self-weight of slab	3.75	kn/m
Floor Finish F.F	1	kn/m
Total floor load	4.75	kn/m

Table 2

Calculation of internal wall load		
Density of brick wall	20	kn/m^3
Height of wall	2.6	m
Width of wall	0.15	m
Internal wall load	7.80	kn
Calculation of external wall load		
Density of brick wall	20	kn/m^3
Height of wall	2.6	m
Width of wall	0.23	m
External wall load	11.96	kn
Calculation parapet wall load		
Density of brick wall	20	kn/m^3
Height of wall	1.5	m
Width of wall	0.23	m
Paraphet wall load	6.90	kn

- **Design Of Wind Load Calculation**

  Design Wind Speed (Vz)

  The basic wind speed (V,) for any site shall be obtained from Fig. 1 and shall be modified to include the following effects to get design wind velocity at any height (V), j for the chosen structure:

- Risk level;
- Terrain roughness, height and size of structure; and
- Local topography. It can be mathematically expressed as follows: Vz= Vb kl k2 k3

  where

Vz= design wind speed at any height z in m/s; kl = probability factor (risk coefficient)

k2 = terrain, height and structure size factor k3 = topography factor

- **Design Of Earthquake Load**

  When the lateral load resisting elements are oriented along orthogonal horizontal direction, the structure shall be designed for the effects due to till design earthquake load in one horizontal direction at time. When the lateral load resisting elements are not oriented along the orthogonal horizontal directions, the structure shall be designed for the effects due to full design earthquake load in one horizontal direction plus 30 percent of the design earthquake load in the other direction.

Design Spectrum- Provided that for any structure with T <0.1 s, the value of Ah will not be taken less than Z/2 whatever be the value of I/R, Where,

Z= Zone factor given, is for the Maximum Considered Earthquake (MCE) and service life of structure in a zone. The factor 2 in the denominator of Z is used so as to reduce the Maximum Considered Earthquake (MCE) zone factor to the factor for Design Basis Earthquake (DBE).

I= Importance factor, depending upon the functional use of the structures, characterized by hazardous consequences of its failure, post-earthquake functional needs, historical value, or economic importance.

R= Response reduction factor, depending on the perceived seismic damage performance of the structure, characterized by ductile or brittle deformations. However, the ratio (I/R) shall not be greater than 1.0. The values of R for buildings are given

Sa/g =Average response acceleration coefficient

4. CONCLUSIONS

From the study of Comparative Analysis of Lateral Load Resisting System in G+ 12 storied building subjected to Earthquake and Wind, following conclusions can be made.

- The Absolute displacement, axial force, moment and storey shear in moment frame (Model-I) is the greatest among all lateral load resisting systems investigated. Amongst in dual frames, Model III (Shear wall provided at intermediate side) is the least while other frames have higher values in earthquake.
- When shear wall provided at corner side and each side at middle, no significant variation in Absolute displacement, axial force and moment.
- When shear wall provided at middle portion, absolute displacement, axial force and moment is greatest as compared to other dual system model.
- When shear wall provided at intermediate side, all parameter like absolute displacement, axial force and moment is less as compared to other dual system model.
- Absolute displacement, axial force and moments in conventional frame system are lesser than earthquake load and wind load case. So, it is considered that in comparison wind load case is better than earthquake load case.
- Hence wind load is less predominant than earthquake load case.
- The model no. 2 is the economically best as compare to another model.

5. REFERENCES

[1] Shruti Badami, M. R. Suresh, “A study on behaviour of structural system for tall building subjected to lateral loads.” International journal of Engineering Research &Technology (IJERT).

[2] Ajinkya P. Gadkari, “Review on behavior of outrigger structural system in high rise building.” International journal of Engineering Development of Research.

[3] Venkta S. Kumar, Surendra Babu,Usha Kranti, “Shear wall-A review.” International journal of innovative research in science.

[4] M. D. Kevadkar,P. B. Kodag, “Lateral load analysis of RCC building.” International journal of Modern Engineering Research (IJMER), Vol.3, Issue3, May- June2013, pg no.1428-1434.

[5] TanhaB.Shah, “literature Survey on Analysis of Multi-storey building considering hybrid structure.” International journal of innovative research and development.

[6] Tejaswini R. M. Rashmi A. R, “Analysis and comparison of different lateral load resisting structural forms.” International journal of engineering research and technology.

[7] Kiranparmar, Mazhardhankot, “Comparative study between dual system for lateral Load resistance in buildings of variable heights.” International Engineering Research Journal of & Technology, page no. 303.