Review on Seismic Response of A High Rise Building With & Without Floating Column

Shubham Barod[1], Prof. Sumit Pahwa[2]
[1]Dept of Civil Engineering
[2]Associate Professor, Dept of Civil Engineering
[1, 2] ALPINE INSTITUTE OF TECHNOLOGY, UJJAIN (M.P.)

Abstract- *Different parts of the world has seen adverse effects in high rise multi-storey buildings due to earthquakes because of different irregularities present and inadequately designed structures. A structure is regarded as vertically irregular if it has irregular distribution of stiffness, strength and mass along the building height. Irregular building provided with floating column makes it much more irregular with discontinuous load path and are probable to collapse during earthquake. Floating column due to discontinuity in load path makes the performance of building weak. In the present study high rise G+10 building with regular structure and with irregularity are studied and analyzed with and without floating column. The critical position of floating column has been studied for different locations around the periphery columns for both regular and irregular structures for zone V. The study highlights the response of G+10 high rise regular and vertically irregular building with and without presence of floating columns subjected to earthquake forces. The various response parameters such as base shear, storey drift, node displacement, shear forces and bending moments are studied in the various models. The results are compared to determine the effects of presence of floating column in a building.*

Keywords- Floating Column, Base Shear, Storey Drift, Node Displacement, Shear Force, Bending Moment

I. INTRODUCTION

High rise building frames with floating columns at one or more positions have a major risk to collapse during strong earthquakes. In recent times, buildings are required with free space with lesser number of columns due to functional and aesthetical requirement. The structural Response to seismic forces critically depends on the overall size, shape and geometry and also the way in which the forces are carried to the ground. During the earthquake, the forces developed at different floor levels in a structure must be transferred through the shortest path to the base or footing. Floating column present in a structure makes a discontinuous load transfer path which effect the performance of the structure and make it weak. Building which have floating column does not rest on foundation directly but rest on beams that transfer the load through the beams and adjacent columns. Buildings with vertical irregularity and floating column have discontinuity so the earthquake forces transfers abruptly with jump at the level of discontinuity. The floating column is a vertical member of a structure which at its lower ends rest on a beam and doesn't rest on a foundation. The seismic inertia forces that get generated at the floor levels in a structure must be brought down along the height of the structure as we move downwards towards the ground. In seismic active areas the floating column are highly undesirable. A building should be simple and regular in configuration with good strength and stiffness. Buildings with regular and simple geometric configuration in its plan and elevation go through lesser damage than irregular structures

II. REVIEW OF PAPERS SEISMIC RESPONSE OF A HIGH RISE BUILDING WITH & WITHOUT FLOATING COLUMN

2.1 Overview: It's been observed from the literature survey that various researches have been done on floating column in the structure, but most of them are the comparative studies of building with and without floating column. However very little research is available on the structure which are irregular in shape and have floating column in them and also comparing them with the normal structure.

2.2 Review:

2.2.1 Amit Joshi in 2018 studied the P+3 & P+20 storey building with and without floating column and analysed the same for zone III and zone V and for soil type I, II and III by using Staad Pro. On the basis of the study it was concluded that the storey drift increases in building with floating column and the storey drift and base shear is more in soft soil than medium soil and hard soil in all the cases.

2.2.2 Shivam Tyagiin 2018 analyzed the high rise building with and without floating column using SAP 2000 to find out the effects on different design parameters under seismic effects due to the presence of floating column and comparing the results and the benefit of providing them in the structure

2.2.3 Kapil Dev Mishra in 2018 made a comparative study of floating and non-floating column of plaza building subjected to seismic loading using Staad-Pro. The plaza building is G+5 in plan having different position of floating column at different height of building at two different zones (zone 3 & zone 4) are considered.

2.2.4 Murtaza A. Rangwala in 2018 carried a study to evaluate the presence and absence of floating column in high rise building with and without infill walls using static analysis. Total four models having a G+9 framing structure with and without floating column and infill walls are analyzed to acquire the values of storey drift, Maximum storey displacement.

2.2.5 Amarnath D. Burdein 2017 studied the analysis of multistoried building with and without floating column under seismic loading in different zones. Different cases of building are studied using equivalent static method by varying the location of floating columns floor wise, setback column and within the floor in seismic zone 2 & zone 5 to determine the structural response of building with respect to shear force, bending moment, base shear, storey displacement and storey drift.

2.2.6 Pradeep D.in 2017, studied the seismic analysis of multi-storey building with and without floating column using E-tabs to study the structural response of the models with reference to storey drifts, storey displacement and base shear for different cases by varying location of floating column at different floors and on hard and medium soil strata.

2.2.7 Akhil R in 2017 carried out the seismic analysis of regular and irregular buildings with vertical irregularities using Staad-Pro by response spectrum analysis to compare the behavior of regular and plan irregular buildings (H-Shape) and also compare the base shear, node displacements, time period, frequency of different types of vertically irregular H shaped buildings to obtain best building configuration. The model considered is G+10 in zone V.

2.2.8 Imranullah Khan in 2017 studied the seismic analysis of irregular L-shape building in different zones using response spectrum analysis by E-tabs. In the analysis a G+9 storey building 32 M in height under earthquake load is evaluated to determine displacement and storey drift in different zones.

2.2.9 Abrar Ahmed in 2017 studied the structural behaviour to understand the horizontal and vertical irregularity in a building with irregular shapes and plan using E-tabs. Total 10 models with different shapes such as T, E, F, S and irregularities has been modelled in the analysis.

2.2.10 Deekshita R in 2017 made a comparative research on the analysis of multi-storey building with and without floating column and studied the structural parameters such as base shear, storey drift, and displacement under earthquake excitations .Four models of G+5 frame having floating columns at different positions has been analysed in the study.

2.2.11 PriyaPrasannanin 2017, studied the seismic performance of RC floating column considering different configurations, the effect of varying the location of floating columns floor wise and within the floor of multi-stories RC frame on various structural response quantities of structure.

2.2.12 KandukuriSunitha in 2017, made a seismic analysis of G+4, G+9, G+14 multi-storey building with and without floating column located in zone III using E-Tabs.

2.2.13 PodiliJyothiin 2017, carried out the design and analysis of High rise building with floating columns with the aim to observe and analyse the seismic performance of Reinforced Concrete building with floating column and the building having floating column with bracings**.**

III. CONCLUSIONS

From the above discussion following conclusions can be made.

1. It was observed that in building with floating column has more time period as compared to building without floating columns.
2. It was observed that in building with floating column has less base shear as compared to building without floating column
3. It was observed that displacement floating column building is more as compared to without floating column building.
4. It was observed that building with floating column has more storey drift as compared to building without floating column.
5. From dynamic analysis it was observed that floating column at different location results into variation in dynamic response.

REFERENCES

[1] Amit Joshi (2018), “Seismic analysis of multistorey building having floating columns”, IJESRT, pp.144-158.
[2] ShivamTyagi (2018), “Seismic analysis of multistorey building with floating column”, IRJET, volume 5, issue 5, pp.3479-3483.

[3] Kapil Dev Mishra (2018), "Comparitive study of floating and non floating column of plaza building subjected to seismic loading by using Staad-Pro software", IJEDR, volume 6, issue 3, pp.110-115.
[4] Murtaza A Rangwala (2018), "Seismic analysis of multistorey frame with and without floating columns", IJIRSET, volume 7, issue 5, pp.5262-5272.
[5] Amarnath D. Burde, (2017) "An analysis of multi-storey building with floating column and non-floating column under seismic loading in different zones", IRJET, volume 4, issue 2, pp.998-1002.
[6] Pradeep D. (2017), "Seismic analysis of multi-storey building with floating columns using ETABS", IJSDR, volume 2, issue 9, pp.110-116.
[7] Akhil R (2017), "Seismic analysis of regular and irregular buildings with vertical irregularity using Staad.Pro", IRJET, volume 4, issue 6, pp.1863-1866.
[8] Imranullah Khan (2017), "seismic analysis of irregular L-shape buildings in various zones", IJIRSET, volume 6, issue 8, pp.16529-16536.
[9] Abrarahmed (2017), "Seismic analysis on building with horizontal and vertical irregularities", IJAERD, volume 4, issue 9, pp.545-556.
[10] Deekshitha R (2017), "Analysis of multi-storey building with and without floating column", IJERT, volume 6, issue 6, pp.1002-1006.
[11] PriyaPrasannan (2017), "Seismic performance of RC floating column considering different configurations", IJERT, volume 6, issue 5, pp.100-107.
[12] KandukuriSunitha (2017), "Seismic analysis of multistorey building with floating column by using tabs", IJETSR, volume 4, issue 8, pp.933-943.
[13] PodiliJyothi (2017), "Design and analysis of high-rise building with floating columns", IJITR, volume 5, issue 4, pp.6959-6961.