International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 05 | May 2022 www.irjet.net p-ISSN: 2395-0072

COMPARATIVE STUDY ON THE SEISMIC ANALYSIS OF MULTISTOREY RC STRUCTURE WITH VARIOUS PERCENTAGE OF DIAPHGRAM DISCONTINUITY.

Momin Mohmmed Iliyas[1], Aakash suthar[2]

[1]Post Graduate Scholar, Post Graduate Department L.J Institute of Engineering and Technology L.J University, Ahmedabad, India.
[2]Aakash Rajesh Kumar Suthar, Assistance Professor, L.J Institute of Engineering and Technology L.J University, Ahmedabad, India.

Abstract - *For the present study, 36 types of buildings have been selected to determine the effects of diaphragm discontinuity. Model I is taken as a regular building without opening in the slab as shown in figure 5.1 Model II has a central opening of 6.25% as shown in figure 5.4, and Model III is having 9.35 % opening, model 4 has 12% opening, model 5 has 14% opening, model 6 has 18.7% opening, model 7 has 23.4% opening, model 8 has 25% opening model 9 has 31% opening respectively. The prototype buildings are G+12 storied reinforced concrete buildings consisting of eight bays in both the directions. The spacing along X and Y directions is 5m and the storey height is kept as 3m throughout. Hence, the overall plan dimensions are 40m x 40m. Initially, the beam sizes are kept as 300mm x750mm and column dimensions as 800mm x 800mm. Slab thickness is kept as 100,125,150,175mm.*

Key Words: Diaphgram discontinuity, slab thickness, storey displacement, base shear, storey drift

1. INTRODUCTION

Slabs in building are the horizontal member which distribute the horizontal seismic force to vertical member of the structural system .In addition to the gravity loads, they also transfer the inertia forces generated by their own self weight masses, to the vertical elements that is columns and walls on which they rest. Today due to architectural aspect requirement it is inevitable to prevent openings in the slabs. Due to this openings it affects the rigidity of a diaphragm. Large openings or cut-outs in slab break the load paths and prevents the smooth and direct transfer of forces to the vertical elements. This results in stress concentration near the edges of opening in slab which cause brittle failure in structure.

2. OBJECTIVE

The main objectives of the present study are as follows:

- To study the seismic behaviour of R.C.C Multi-storey building with various percentage of Diaphgram opening in slab using response spectrum method of analysis.
- To study the behaviour of slab thickness in building on seismic response of the structure.
- To compare base shear, time period, storey displacement, storey drift in building with and without opening.

3. Methodology

For the present study the g+12 building located in Ahmedabad seismic zone 3 with medium type soil was taken.

For the design m-25 grade concrete and hysd 500 steel was used. The basic parameter like base shear, storey displacement, storey drift were studied.

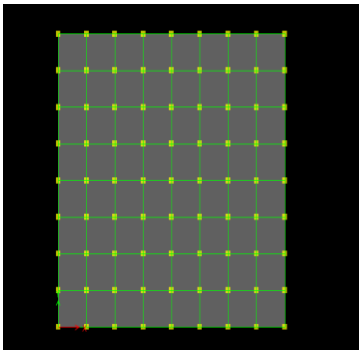
Table -1: Data taken for analysis

Live load	2kn/m2 on typical floor 1.5kn/m2 on terrace
Dead load	1.5kn/m2 on typical floor 2kn/m2 on terrace
Location	Ahmedabad
Zone	3
Type of soil	Medium
Sbc	200kn/m2
Storey height	3m
Number of storey	12 storey
Beam size	300*750 mm
Column size	800*800mm
Slab thickness	100,125,150,175mm
wall	230 MM
R value	5
Density of brick	20 kn/m2

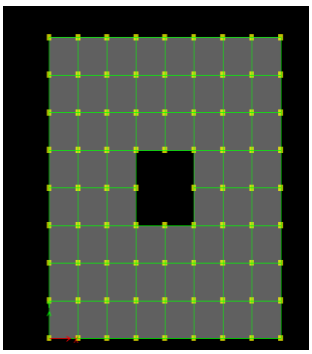
Table 2 list of model

Model number	Opening in slab (%)	Slab thickness(mm)
Model 1 A	0	100
Model 1B	0	125
Model 1C	0	150
Model 1D	0	175
Model 2 A	6.25	100
Model 2 B	6.25	125
Model 2 C	6.25	150
Model 2 D	6.25	175
Model 3 A	9.3	100
Model 3B	9.3	125
Model 3C	9.3	150
Model 3D	9.3	175
Model 4A	12.5	100
Model 4B	12.5	125
Model 4C	12.5	150
Model 4D	12.5	175
Model 5A	14	100
Model 5B	14	125
Model 5C	14	150
Model 5D	14	175
Model 6A	18.7	100
Model 6B	18.7	125
Model 6C	18.7	150
Model 6D	18.7	175
MODEL 7A	23.43	100
MODEL 7B	23.43	125
Model 7C	23.43	150
Model 7D	23.43	175
Model 8A	25	100
Model 8B	25	125
Model 8C	25	150
Model 8D	25	175
Model 9A	31.25	100
Model 9B	31.25	125
Model 9C	31.25	150
Model 9D	31.25	175

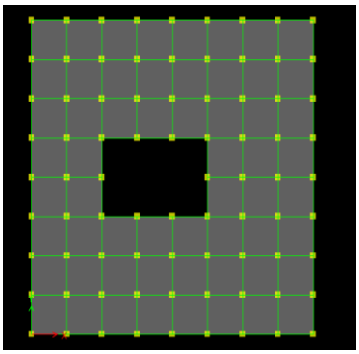
MODEL 1:0%OPENING



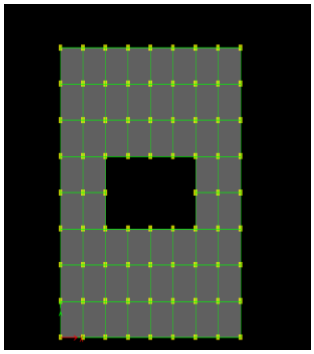
MODEL2:6.25%OPENING



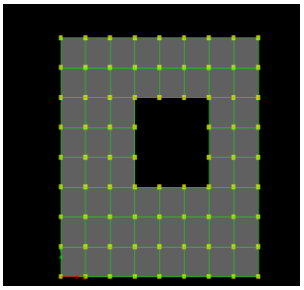
MODEL3:9.3%OPENING



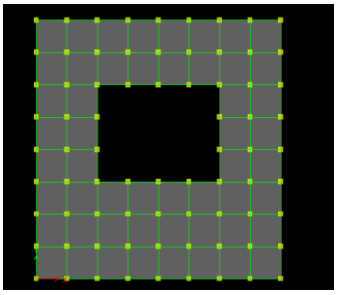
MODEL4:12.5%OPENING



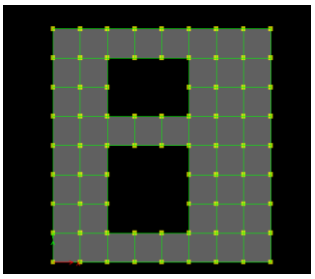
MODEL5:14%OPENING

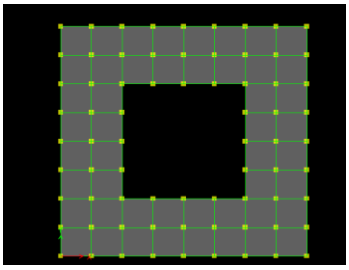


MODEL6:18.7%OPENIN

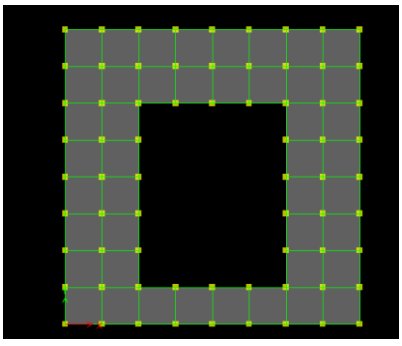


MODEL7:23.43%OPENING





MODEL9:31%%OPENING



3. RESULT

Table -2: BASE SHEAR IN KN COMPARISION

	A		B	C	D
MODEL1	13473		14097	14953	15344
MODEL2	12942		13527	14112	14697
MODEL3	12648		13213	13779	14344
MODEL4	12354		12900	13445	13991
MODEL5	12188		12725	13261	13797
MODEL6	11725		12232	12739	13246
MODEL7	11364		11841	12319	12796
MODEL8	11093		11561	12029	12497
MODEL9	13247		13856	14465	15074

Table 3 -: DISPLACEMENT (MM) IN X DIRECTION COMPARISION

	A	B	C	D
MODEL1	81.12	81.82	85.68	89.56
MODEL2	77.041	80.72	84.45	88.18
MODEL3	76.32	79.96	83.61	87.27
MODEL4	75.61	79.17	82.74	86.33
MODEL 5	77.08	80.73	84.39	88.06
MODEL 6	76.53	80.09	83.67	87.26
MODEL 7	75.56	78.94	82.33	85.37
MODEL 8	77.13	80.6	84.08	87.58
MODEL 9	78.41	82.26	86.12	90

Table 4-: DISPLACEMENT (MM) IN Y DIRECTION COMPARISION

	A	B	C	D
MODEL1	81.12	81.82	85.68	89.56
MODEL2	77.041	80.72	84.45	88.18
MODEL3	77.59	81.31	34.94	88.78
MODEL4	78.12	81.8	85.5	89.2
MODEL 5	77.08	80.73	84.39	88.06
MODEL 6	77.66	81.24	84.83	88.45
MODEL 7	76.58	80.07	83.57	87.08
MODEL 8	77.13	80.6	84.08	87.58
MODEL 9	78.14	81.97	85.32	89.68

Table 5-: STOREY DRIFT IN X DIRECTION COMPARISION

	A	B	C	D
MODEL1	0.002854	0.00295	0.00327	0.00321
MODEL2	0.00278	0.002913	0.003046	0.00318
MODEL3	0.00275	0.002932	0.00315	0.003147
MODEL4	0.002729	0.002856	0.002984	0.0031
MODEL5	0.002781	0.002911	0.003042	0.00129
MODEL6	0.002761	0.002888	0.003016	0.003144
MODEL7	0.00273	0.002843	0.002964	0.003086
MODEL8	0.002779	0.002903	0.003027	0.003152
MODEL9	0.002799	0.002935	0.003072	0.003209

Table 6-: STOREY DRIFT IN Y DIRECTION COMPARISION

	A	B	C	D
MODEL1	0.002854	0.00295	0.00327	0.00321
MODEL2	0.00278	0.002913	0.003046	0.00318
MODEL3	0.002799	0.00285	0.003066	0.0032
MODEL4	0.002816	0.002948	0.00308	0.003212
MODEL5	0.002781	0.002911	0.003042	0.00129
MODEL6	0.002799	0.002927	0.003055	0.003184
MODEL7	0.00276	0.002884	0.003009	0.003134
MODEL8	0.002779	0.002903	0.003027	0.003152
MODEL9	0.002793	0.002929	0.003065	0.003203

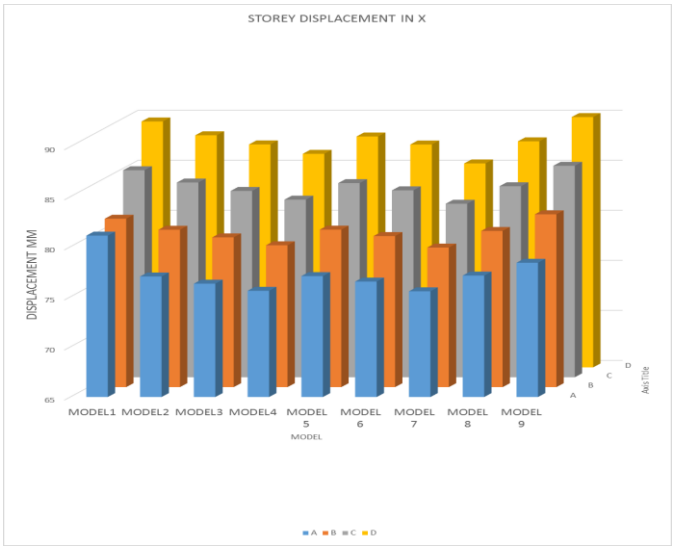


CHART-1 STOREY DISPLACEMENT IN X DIRECTION

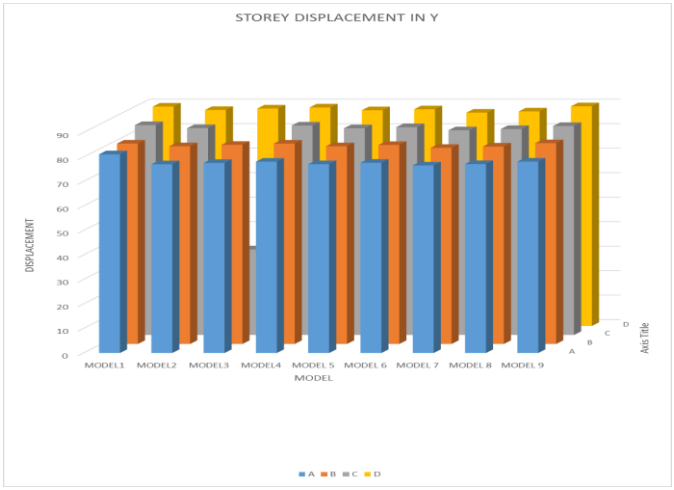


CHART-2 STOREY DISPLACEMENT IN Y DIRECTION

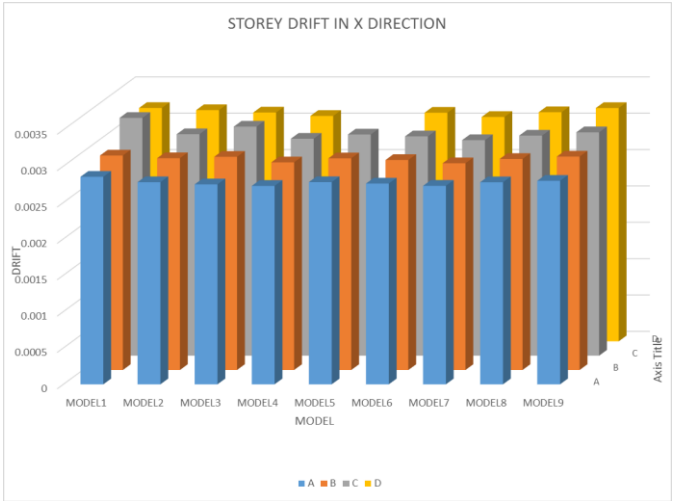


CHART-3 STOREY DRIFT IN X DIRECTION

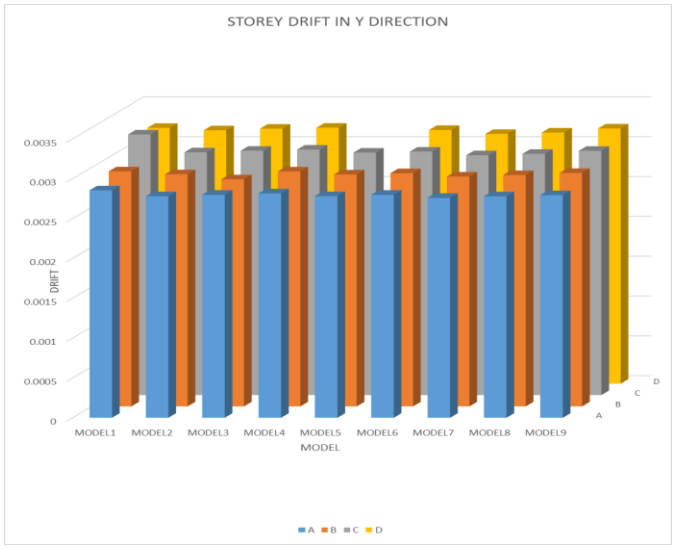


CHART-4 STOREY DRIFT IN Y DIRECTION

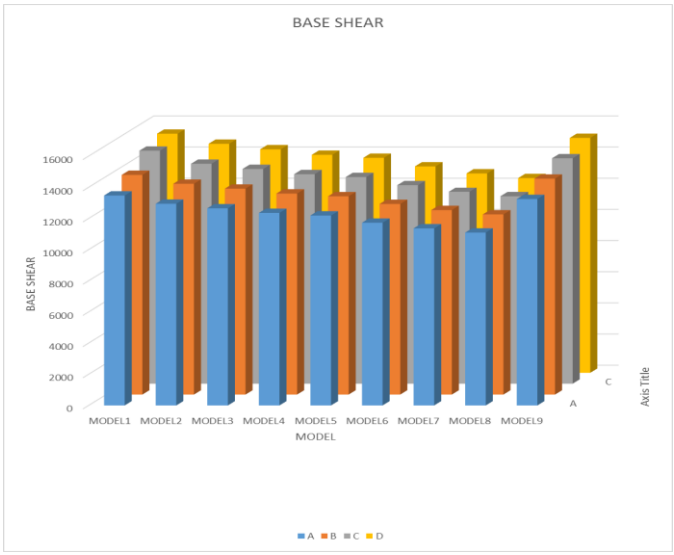


CHART-5 BASE SHEAR

4. CONCLUSION

- Model of same slab thickness but with various percentage when compared with regular model which was without any opening it was found that as percentage of opening increases the displacement Decreases for X Direction.
- For model with percentage of opening greater than 30% storey displacement increases in X direction.
- Model of same slab thickness but with various percentage when compared with regular model which was without any opening it was found that as percentage of opening increases the displacement Decreases for Y Direction.

- For storey drift when model with slab thickness and various percentage of opening when compared without any opening it was found that storey displacement decreases as percentage of opening increases.
- The value of base shear decreases as percentage of opening increases.
- For opening greater than 30% Value Of Base Shear Increases.
- Time period decreases up to 30% of Opening. For percentage of opening greater than 30% Time Period Increases Suddenly.
- The Value of Base Shear, Storey Displacement, Storey Drift, Time Period Increases as the Thickness of Slab Increases.

REFERENCES

[1] R. D. Reena sahu, seismic analysis of rc frame with diaphragm discontinuity, vol. 14, Indore, Madhya pradesh: iosr journal of mechanical and civil engineering, 2017, pp. 36-41.

[2] P. K. H. V. Vinod v, "influence of stiffness discontinuous diaphragm characteristics on the seismic behavior of rc structure," International Journal of Scientific Development and Research (IJSDR), vol. Volume 2, no. 6, June 2017.

[3] P. S. P. Amaranth Dodamani, "Seismic Analysis Of Multistoried Building With Diaphargms Discontinuity," International Research Journal of Engineering and Technology (IRJET), vol. 7, no. 9, 09 SEPTEMBER 2020.

[4] Pooja P. Dhanani, Krutarth Patel, Bijal chaudhari, "Behavioural Study For Seismic Response Of High Rise Building Having Different Diaphragm Discontinuity In Plan," Journal of Emerging Technologies and Innovative Research (JETIR), vol. Volume 5, no. 5, 5 MAY 2018.

[5] S. K. S Monish, "A Study On Seismic Performance Of High Rise Irregular Rc Framed Building," IJRET: International Journal of Research in Engineering and Technology, vol. 4, no. 5, 05 MAY 2015.

[6] 2. IS 1893 PART 1, Criteria for Earthquake resistant design of structures, General provisions and building, NEW DELHI: Bureau of Indian Standards, 2016.