International Research Journal of Education and Technology
Peer Reviewed Journal
ISSN 2581-7795

Analysis of Altitude in Twin Tower Under Seismic Loading

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ABSTRACT

The design of multi-storey buildings and the architectural vision now require a new innovation. A number of competitors closed by them used to create a structure with their individual capabilities as well as market demands and multi-storey building as extremely critical work in pioneering and fresh areas. It should shed light on the complexity of the field of production along with the architectural and design aspects. Combined and diverse floor arrangements on similar terrain require consistency in design approach. These types of structures are the Twin Tower structures used in this modern world. In this investigation, the result evaluation parameters, such as floor displacement and drift, in the particulars of a multi-story twin-tower structure located in earthquake zone III, the effects of earthquakes on the structure under 11 different height combinations are obtained and analyzed with Staad pro design software assistant.

Keywords— Twins Tower, Efficient, Height, Lateral Loading, Response spectrum analysis, Seismic Effects, Staad pro software,

INTRODUCTION

With the help of multistory structure guide the structural engineer to analyze and design as per harmful earthquake effects. current days, Twin towers are very much in demand due to its good architectural and structural design, individual plan along with additional space with similar base support. For that, we should know the well-organized point parameters when these types of structures are in the get in touch with of earthquake loads

MODELLING APPROCH

The twins tower modeling done in Staad pro software. The twin tower building detail of the multi storey construction are shown in Table A and Table B and shown graphically with the help of graphs. Top view and front view of various SHAPEs of G+12 building shown by the help of figures. various height combination used in this paper up to 12 floor twin with 11 different height combination. After than efficient height combination for each parameter along with its remarks has drawn below each parameters..

Building configuration	G+12
No. of bays in X direction	9
No. of bays in Z direction	9
Height of building	51.580m
Dimensions of building	45M X 45M
Size of beam	750mmX650mm
Size of column	550mmX450mm
Concrete and Steel Grade	M 30 & FE415

Table A Details of building

Earthquake parameters	Zone III with RF 4 & 5% damping ratio
Period in X & Z direction	0.692 & 0.692 for both direction
Dead load for floor and waterproofing	2KN/m^2 & 0.5 KN/m^2
Live load for floor and roof	3.8KN/M^2 & 1.2KN/M^2

Table B Detail of loading

RESULT AND DISCUSSION

These result is observed by the following cases-

Table.3: Maximum Displacement in X direction in Zone III

HEIGHT CASE	Maximum Displacement (mm)
	For X Direction
A	131.980
B	122.788
C	130.483
D	137.960
E	144.911
F	151.011
G	155.951
H	159.481
I	161.450
J	161.825
K	160.701

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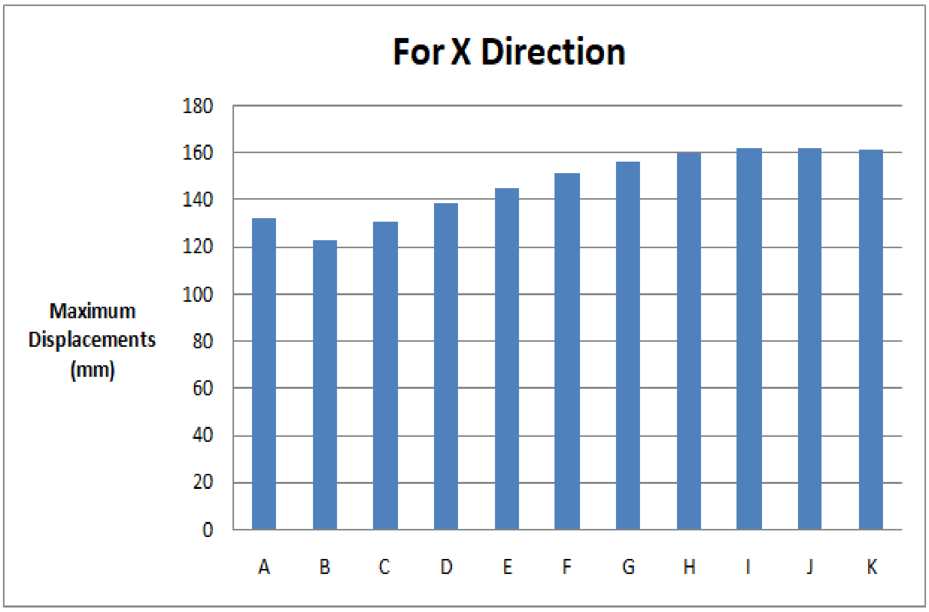

Fig. 1: Maximum Displacement shown in X direction Zone III

Table.4: Maximum Displacement shown in Z direction in Zone III

HEIGHT CASE	Maximum Displacement (mm)
	For Z Direction
A	168.458
B	178.957
C	191.855
D	204.35
E	215.912
F	226.077
G	234.347
H	240.337
I	243.814
J	244.738
K	243.263

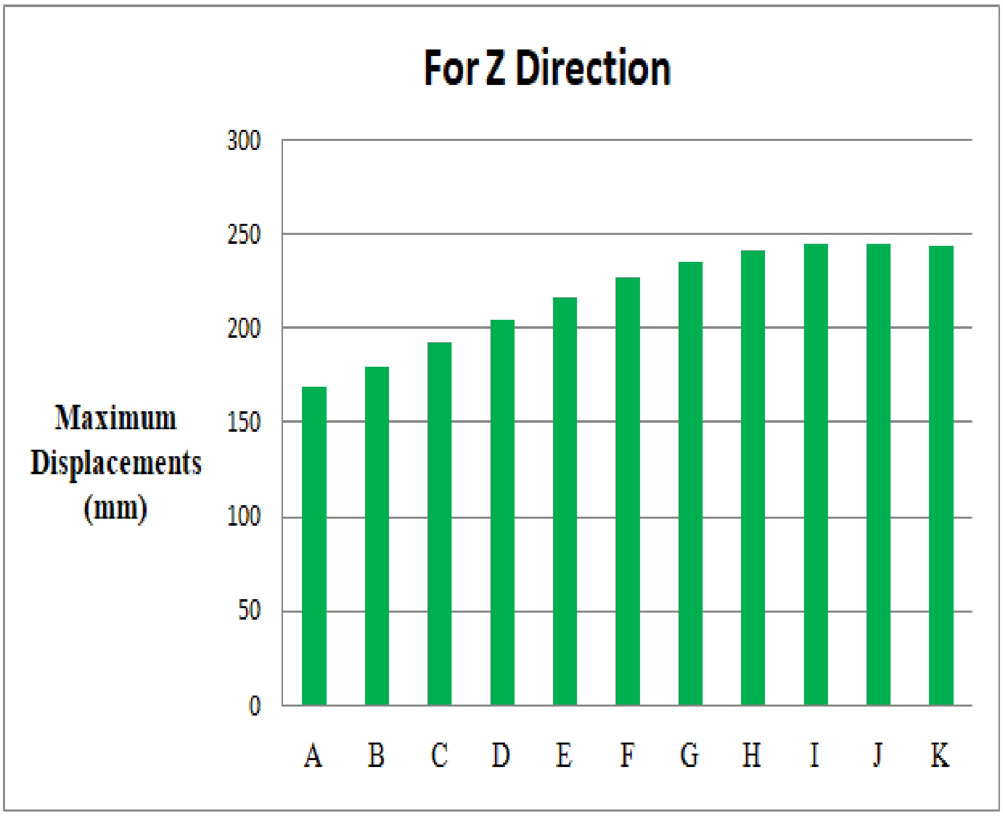

Fig. 2: Maximum Displacement shown in Z direction in Zone III

Table 5: Base Shear shown in X and Z direction in zone III

HEIGHT CASE	Base Shear (KN)	
	X direction	Z direction
A	18079.26	14962.41
B	16797.29	13996.19
C	15203.78	13193.95
D	15102.46	14176.83
E	16083.18	14067.64
F	18463.25	14410.82
G	23552.23	15221.03
H	10012.44	14707.36
I	9804.96	14383.24
J	30472.28	8112.48
K	26285.39	8015.43

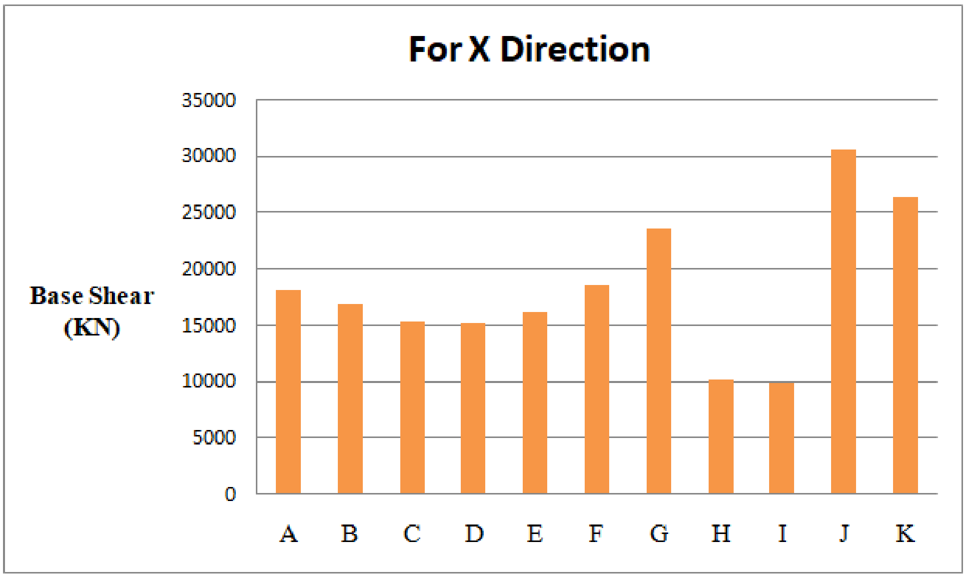

Fig. 3: Base Shear shown in X direction in zone III

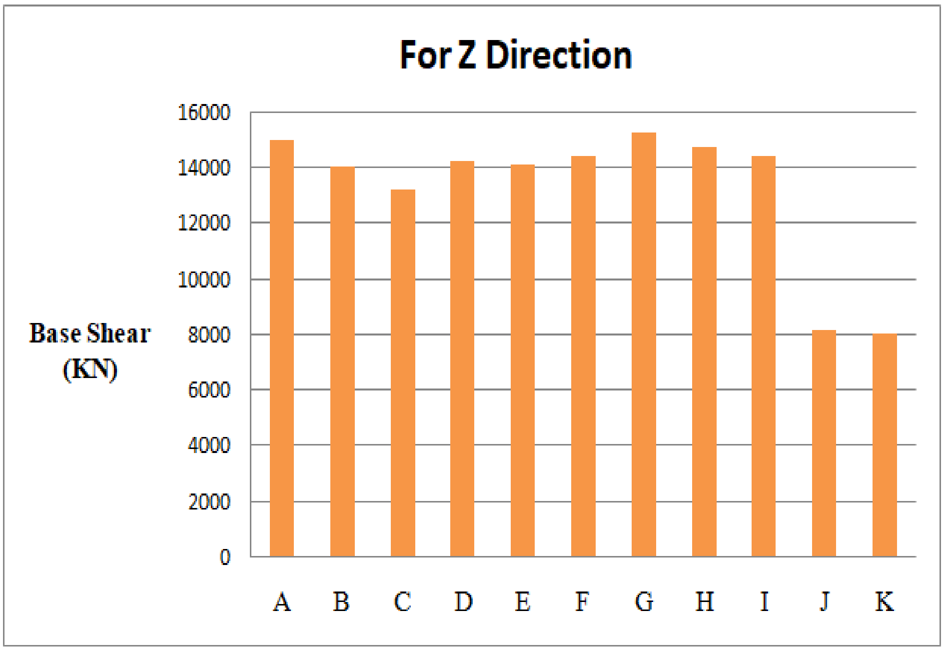

Fig. 4: Base Shear shown in Z direction in zone III

Table 6: Maximum Axial Forces shown in Column at ground level in zone III

HEIGHT CASE	Column Axial Force (KN)
A	8502.388
B	8698.226
C	8938.696
D	9171.270
E	9387.021
F	9576.525
G	9730.927

H	9843.141
I	9908.945
J	9927.641
K	9902.112

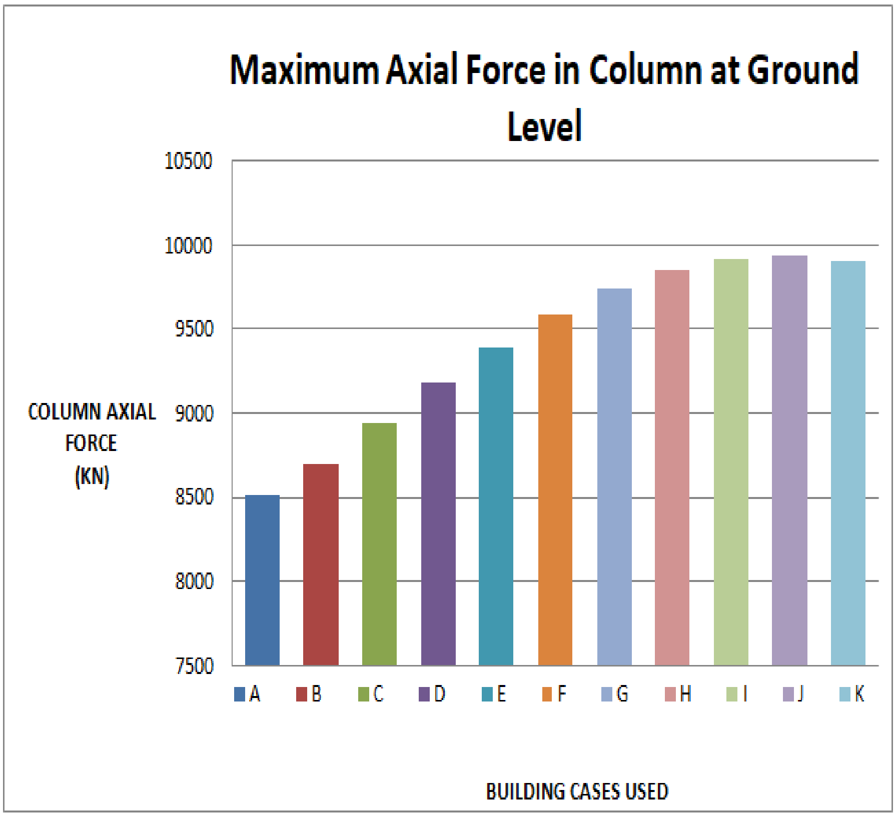

Fig. 5: Maximum Axial Forces shown in Column at ground level in zone III

Table 7: Maximum Shear Forces shown in Columns in zone III

HEIGHT CASE	**Column Shear Force (KN)**	
	Shear along Y	**Shear along Z**
A	294.635	374.260
B	306.869	397.620
C	321.973	426.315
D	336.671	454.078
E	350.341	479.839
F	362.323	502.463
G	371.990	520.886
H	378.839	534.253
I	382.566	542.051
J	383.115	544.191
K	380.689	541.011

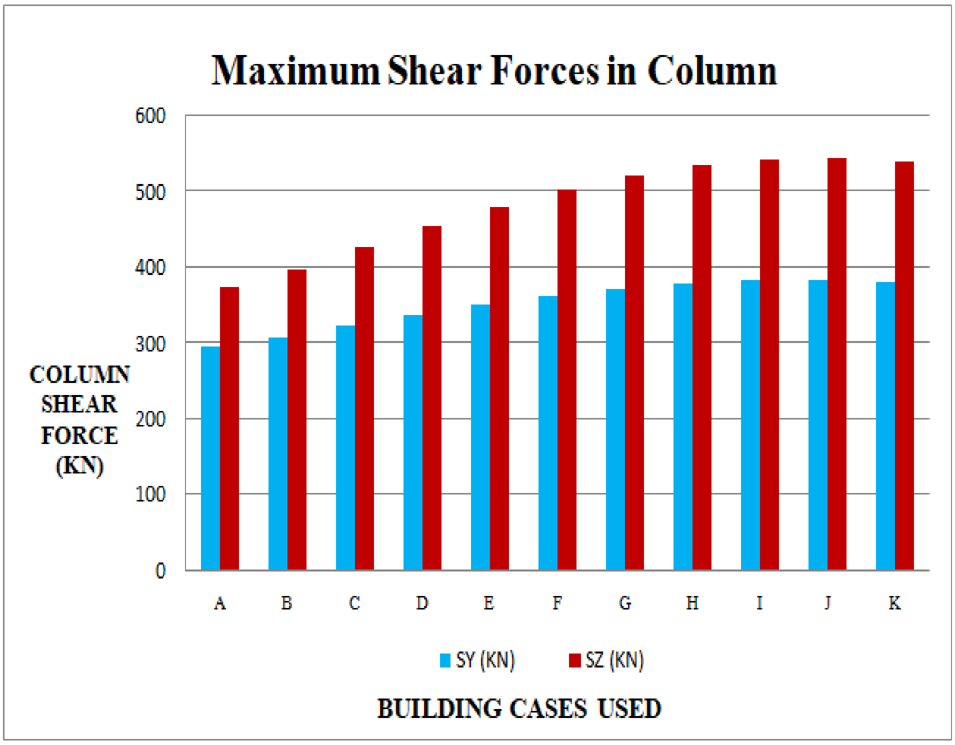

Fig. 6: Maximum Shear Forces shown in Columns in zone III

Table 8: Maximum Bending Moment shown in Columns in zone III

HEIGHT CASE	Column Bending Moment (KNm)	
	Moment along Y	**Moment along Z**
A	737.827	668.461
B	783.494	695.994
C	839.973	729.958
D	898.882	762.978
E	944.257	793.672
F	988.496	820.573
G	1024.505	842.288
H	1056.606	857.702
I	1065.789	866.142
J	1069.873	867.488
K	1063.524	862.186

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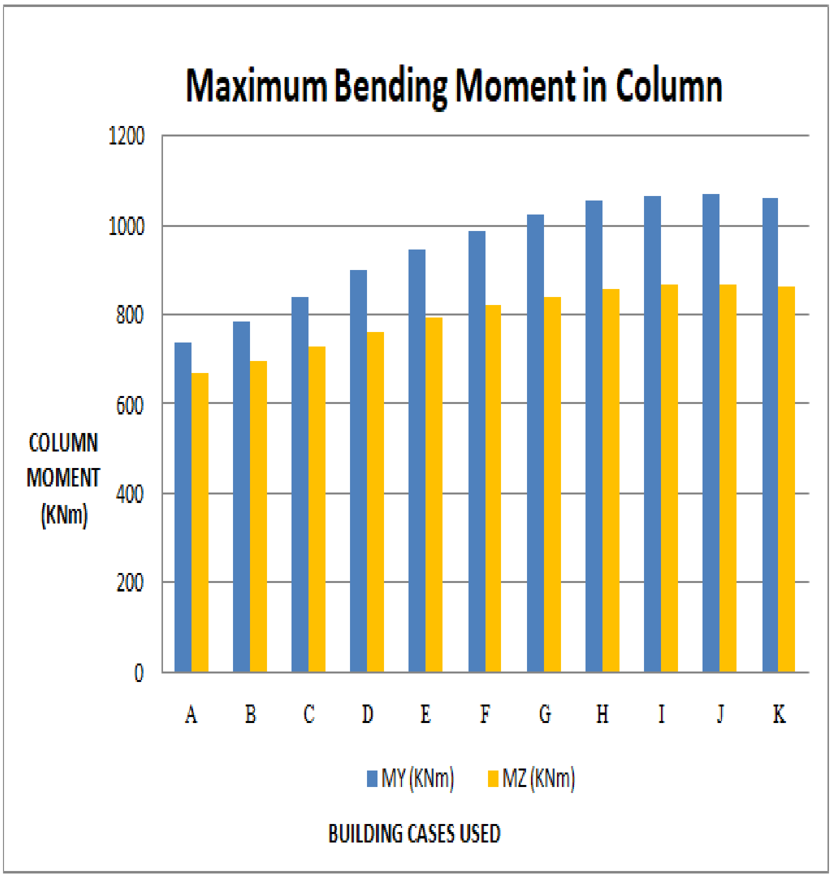

Fig. 7: Maximum Bending Moment shown in Columns in zone III

Table 9: Maximum Shear Forces shown in beams parallel to X direction in zone III

HEIGHT CASE	Beam Shear Force (parallel to X direction) (KN)
A	158.162
B	162.153
C	167.055
D	171.798
E	176.199
F	180.066
G	183.232
H	185.529
I	189.871
J	187.242
K	186.701

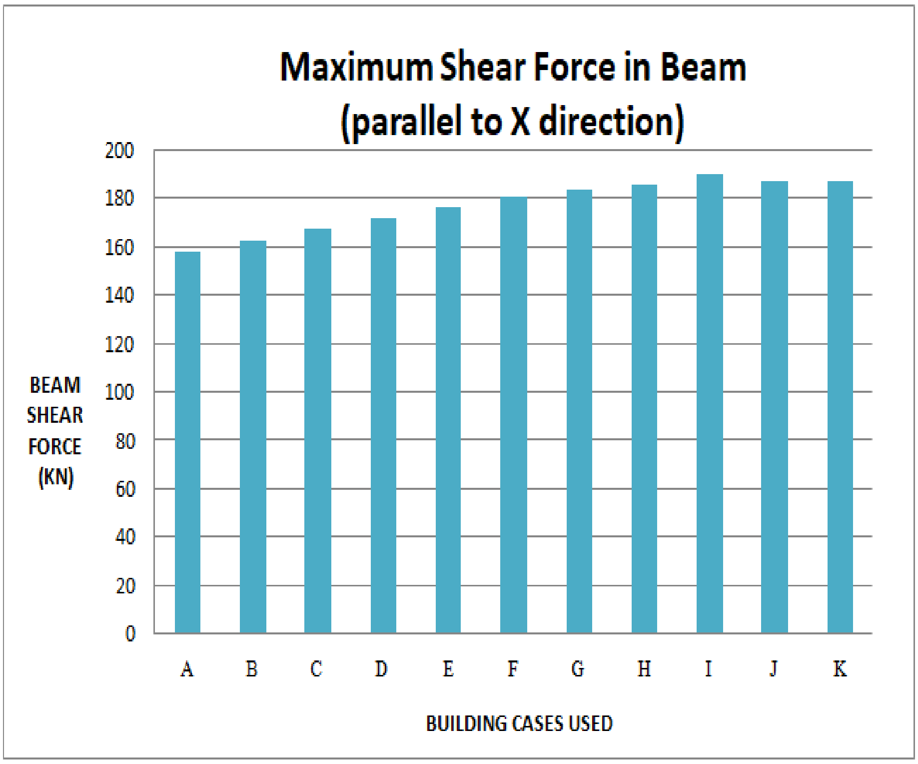

Fig. 8: Maximum Shear Force shown in Beam for X in zone III

Table 10 : Maximum Shear Forces shown in beams parallel to Z direction in zone III

HEIGHT CASE	Beam Shear Force (parallel to Z direction) (KN)
A	2.681
B	3.124
C	3.271
D	3.590
E	3.738
F	4.064
G	4.552
H	4.879
I	4.237
J	3.998
K	3.881

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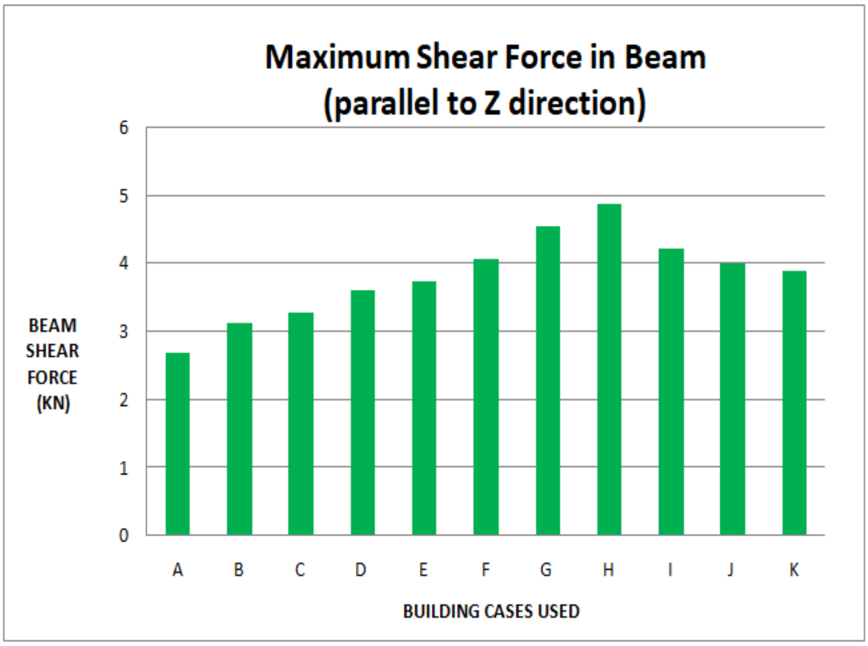

Fig. 9: Maximum Shear Force shown in Beam for Z direction in zone III

Table 11: Maximum Bending Moment shown in beams parallel to X direction in zone III

HEIGHT CASE	Beam Bending Moment (along X direction) (KNm)
A	6.701
B	7.810
C	8.336
D	8.975
E	9.347
F	10.161
G	11.381
H	12.199
I	10.673
J	9.995
K	9.838

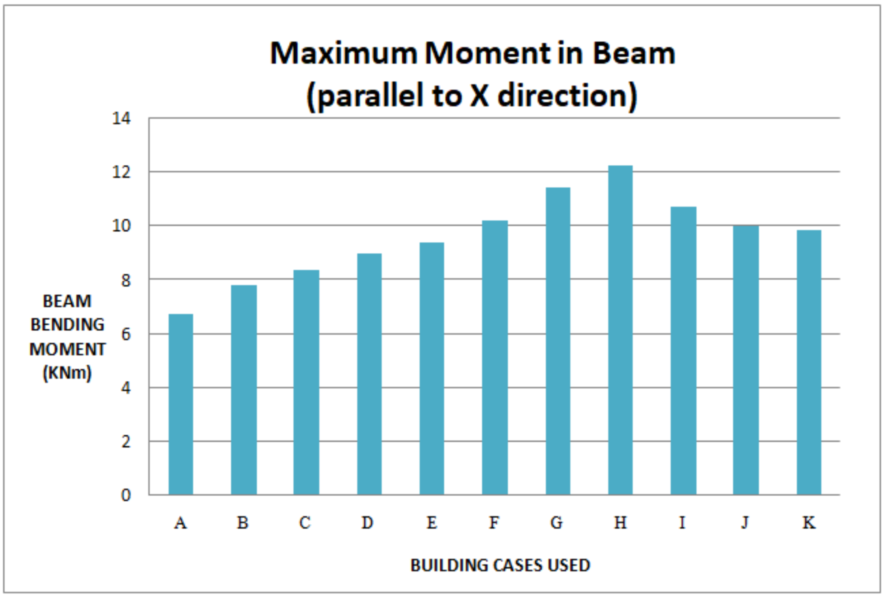

Fig. 10: Maximum Bending Moment shown in beams parallel to X direction in zone III

Table 12: Maximum Bending Moment shown in beams parallel to Z direction in zone III

HEIGHT CASE	**Beam Bending Moment (along Z direction) (KNm)**
A	253.577
B	264.028
C	276.940
D	289.433
E	301.023
F	311.203
G	319.493
H	325.510
I	329.024
J	329.994
K	328.574

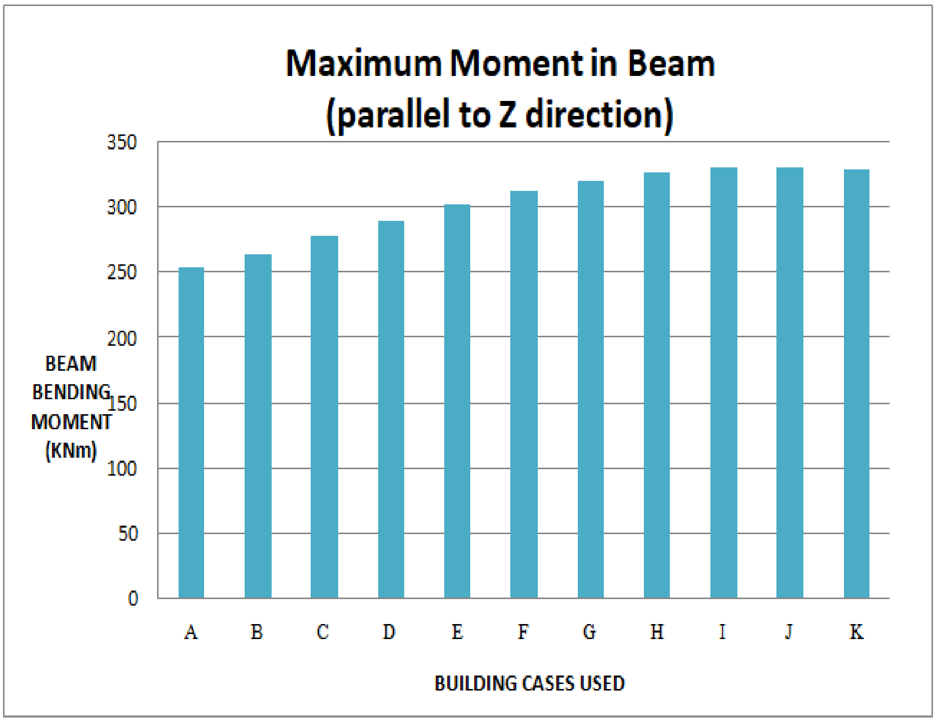

Fig. 11: Maximum Bending Moment shown in beams parallel to Z direction in zone III

Table 13: Maximum Torsional Moment shown in beams parallel to X and Z direction in zone III

HEIGHT CASE	Beam Torsional Moment (along X direction) (KNm)	Beam Torsional Moment (along Z direction) (KNm)
A	29.201	28.670
B	29.266	28.428
C	29.291	28.869
D	30.821	28.880
E	32.392	28.499
F	33.772	29.262
G	34.895	30.961
H	35.711	32.736
I	36.184	31.091
J	36.762	35.148
K	36.119	34.342

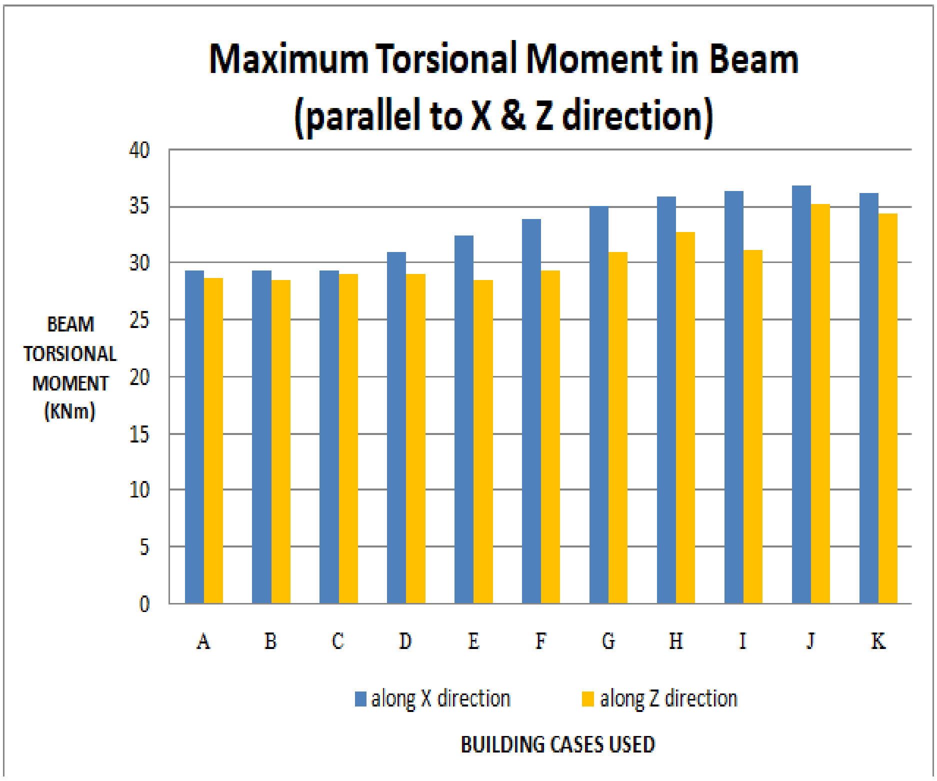

Fig. 12: Maximum Torsional Moment in beams parallel to X and Z direction in zone III

CONCLUSION

The design of twin towers height combination of building subjected to seismic effects the analytical results obtained from 11 combination of twins tower multistoried structure. As seen in results the minimum displacement in X direction height case B and Z direction height case B, minimum base shear in height case I and K in respectively X and Z direction, minimum axial force in height case B , minimum column shear force in height case B in both direction , minimum column bending moment height case B in both direction, beam shear force height case B is optimum as well result same for torsional force. That means height case B is very efficient cases for twins tower in height case.

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