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Base Shear Reduction Using Diverse Dimension of Columns with Identical Concrete Grade In High Rise Structure Under Earthquake Loading

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ABSTRACT

At the present days the structure are ready with lots of current traditions like tall structure etc and there necessity is satisfied by fresh modernization and latest thoughts. A multiplicity of innovators bounded by them used to build the structure with their own alternative and also the insist of market. The parameter of assessment of consequence such as displacement and storey drift are obtained in fundamentals of the any multistoried structure situated in earthquake Zone-III, earthquake effects are acting on the building under 7 diverse best sizes of column for decrease of base shear. For base shear decrease using the best dimension of column columns with same concrete grade in multistoried building under seismic loading, to study the decrease of base shear and inspect with the alliance of E-Tabs design software.

Keywords— concrete grade, Base Shear, Efficient size, Lateral Loading, Response spectrum analysis, Seismic Effects, ETabs

INTRODUCTION

In this learning we identify the concerning of the essential of base shear in any structure and as well the decreasing of base shear through the varying of dimension of column on various floors. for the improvement of tall structure lowest base shear is requisite. With the help of tall structure we can work out the difficulty of housing properties. current time tall structure are very much in demand due to its architectural design and structural design, in seismic zone. For that, we should be on known terms with the resourceful parameters when these type of structures are in the make get in touch with of earthquake loads.

MODELLING APPROCH

Every seven cases are prepared in civil design software ETabs. The model of building detail of the multi storey structure are shown in Table A and Table B. Plan view and elevation view of diverse model of G+19 building shown by the help of figures. In this research paper up to 19 floor with 7 dissimilar models. After than proficient model for every parameter along with its comments has drawn below every parameters.

Building configuration	G+19
No. of bays in X direction	7
No. of bays in Z direction	4
Height of building	73.74 M
Dimensions of building	28M X 28M
Size of column	0.50M X 0.65M and 50M X 50M(various level)
Size of Beam	0.50 X 0.35
Concrete and Steel Grade	M 35 & FE500

Table A Details of building

Earthquake parameters	Zone III with RF 4 & 5% damping ratio
Period in X & Z direction	1.37598 & 1.37598 for both direction
Dead load for floor and waterproofing	$2KN/m^2$ & 0.55 KN/m^2
Live load for floor and roof	$3KN/M^2$ & 1 KN/M^2 & 2 KN/M^2

Table B Detail of loading

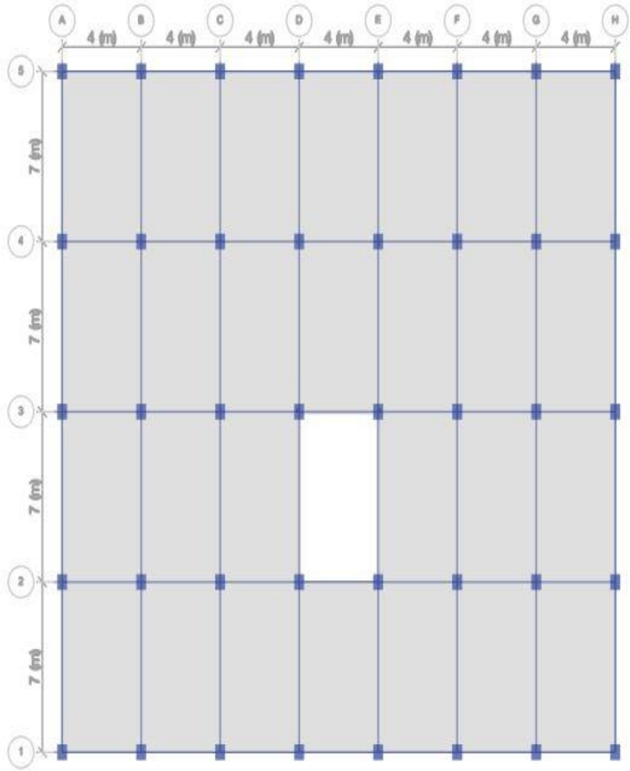

Fig: A Plan of model

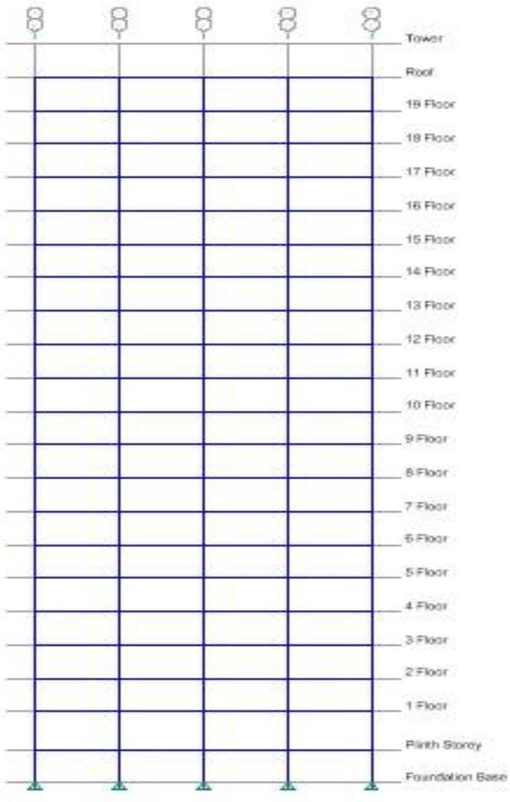

Fig: B Plan of model

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RESULT AND DISCUSSION

These results are observed by the following cases-

Table.1: Maximum Displacement in X and Z direction Zone III

Model	Maximum Displacement (mm)	
	For X Direction	For Z Direction
A	218.735	181.012
B	218.211	180.926
C	217.761	180.398
D	217.486	180.418
E	217.486	180.418
F	217.323	180.342
G	217.410	180.411

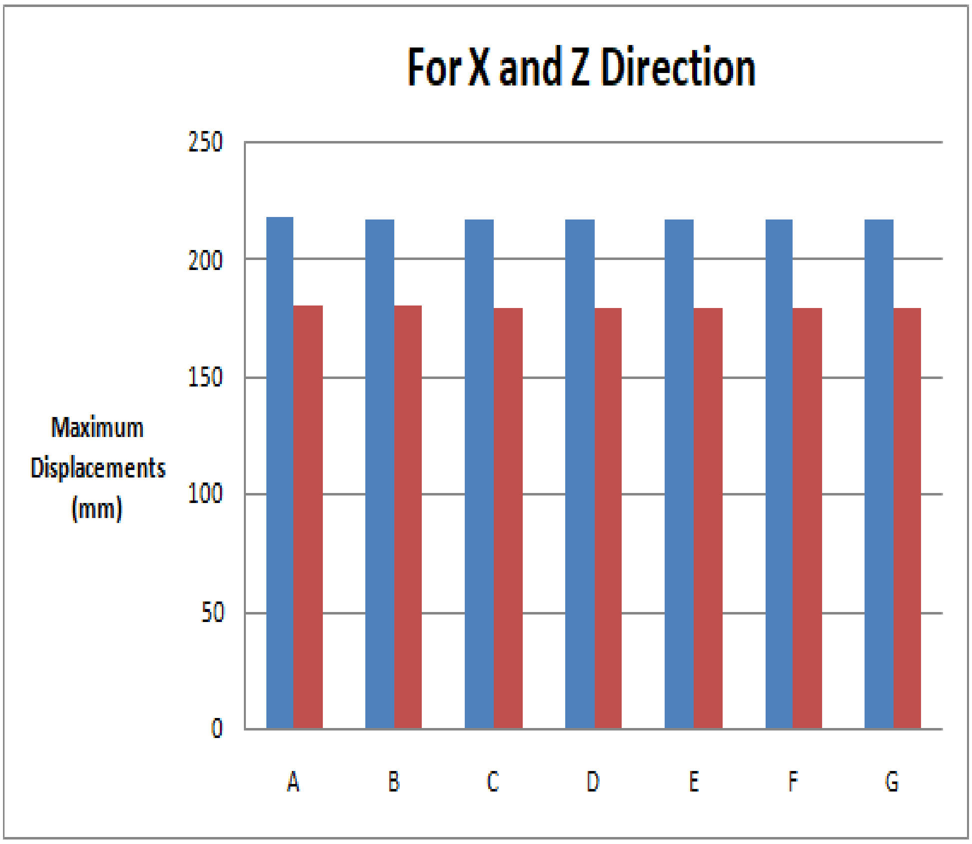

Fig. 1: Maximum Displacement shown in X and Z direction Zone III

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Table 2: Base Shear for all Building cases

Model	BASE SHEAR (KN)	
	X Direction	Z Direction
A	4283.3468	4283.3467
B	4272.9582	4272.9581
C	4263.9408	4263.9407
D	4254.9235	4254.9234
E	4245.9061	4245.9061
F	4236.8888	4236.8887
G	4227.8714	4227.8714

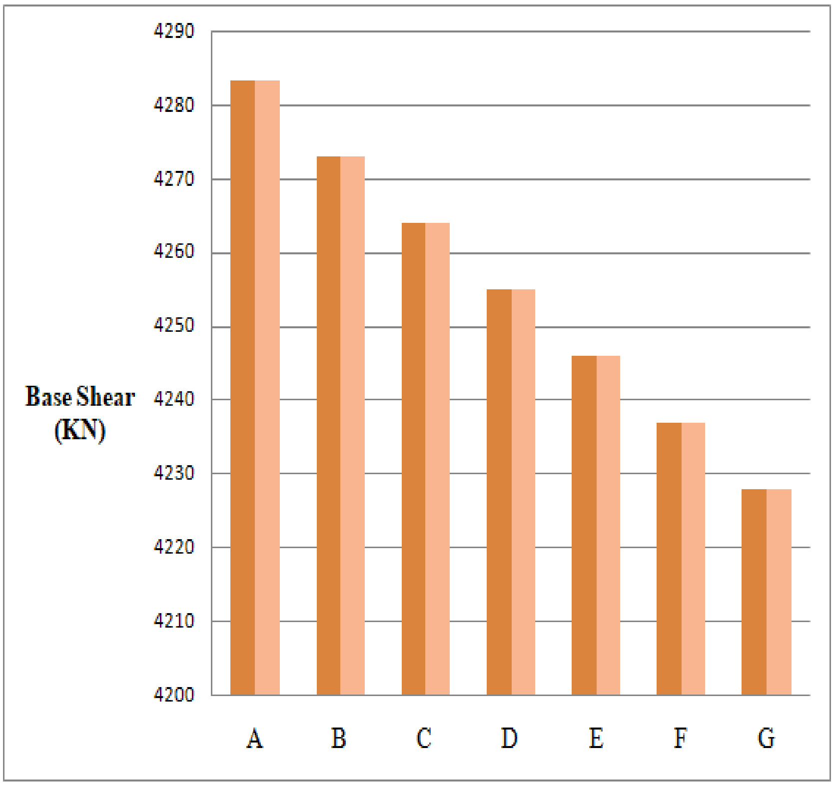

Fig. 2: Base Shear shown for all Building SHAPEs

Table 3: Maximum Axial Forces shown in Column at ground level for all Building cases

Model	Column Axial Force (KN)
A	3458.9382
B	3451.7879
C	3442.602
D	3435.5432
E	3429.5834
F	3424.6801
G	3420.5723

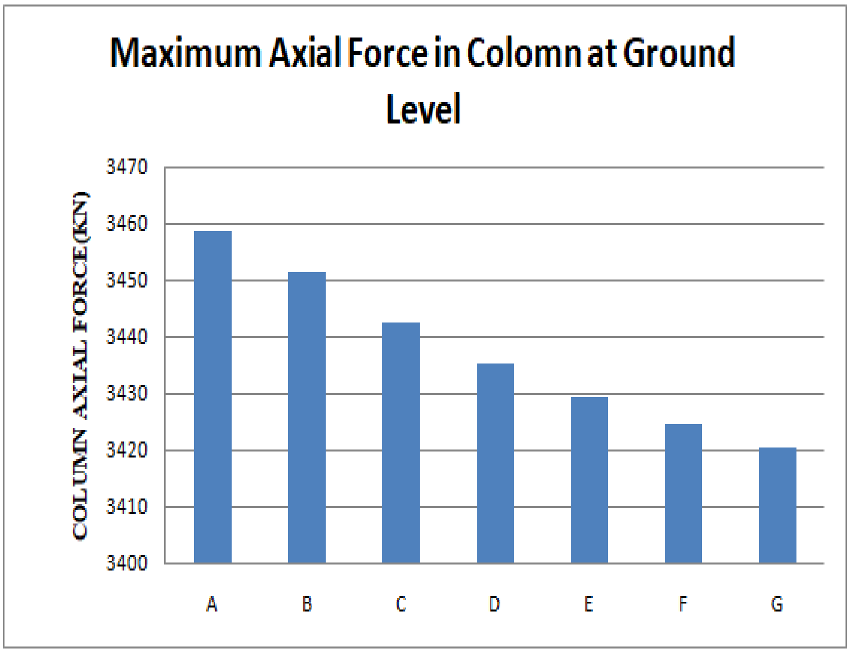

Fig. 3: Maximum Axial Forces shown in Column at ground level for all Building cases

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Table 4: Maximum Shear Forces shown in Columns for all Building cases

Model	Column Shear Force (KN)	
	Shear along Y	Shear along Z
A	164.927	99.7143
B	150.6612	88.4173
C	155.0008	95.5808
D	154.3137	93.6486
E	154.8435	94.2091
F	155.342	94.2602
G	156.0088	94.4551

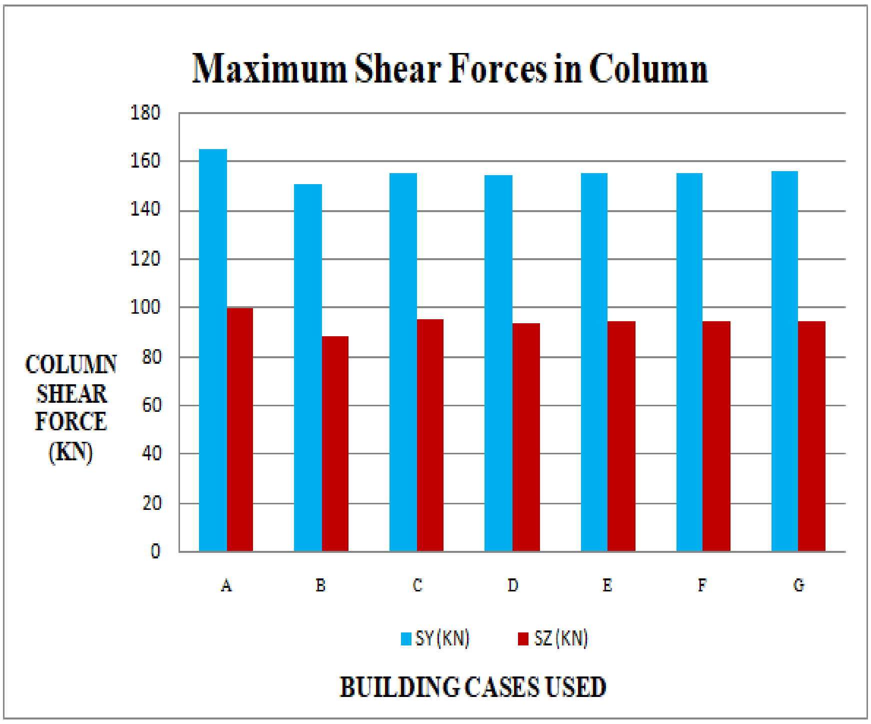

Fig. 4: Maximum Shear Forces shown in Columns for all Building cases

Table 5: Maximum Bending Moment shown in Columns for all Building cases

Model	Column Bending Moment (KNm)	
	Moment along Y	Moment along Z
A	166.8143	267.2669
B	152.4106	250.637
C	151.4038	250.0972
D	151.8497	249.6946
E	151.9353	249.4004
F	152.1432	249.175
G	152.355	250.2103

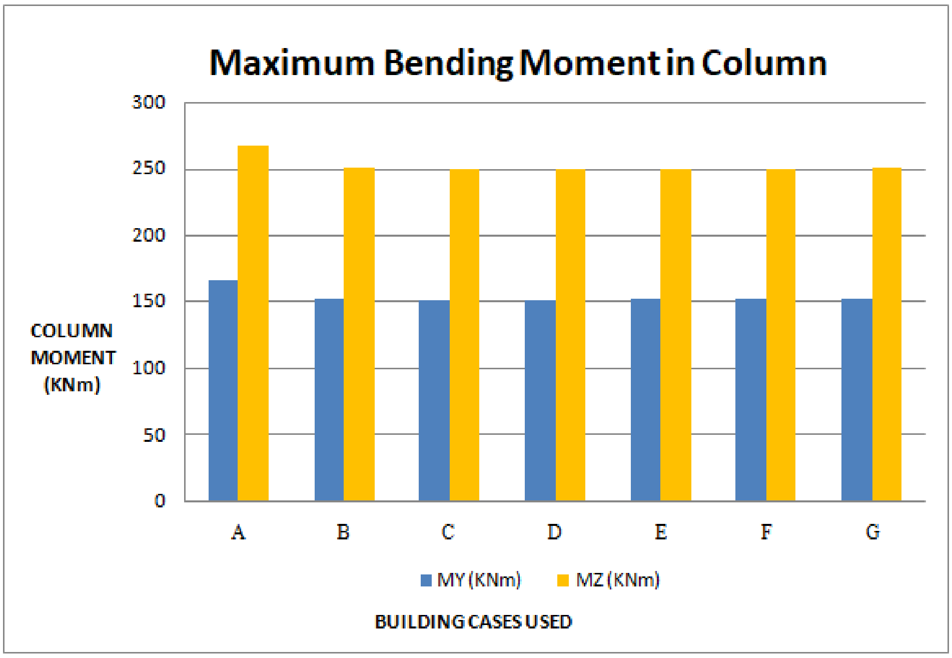

Fig. 5: Maximum Bending Moment shown in Columns for all Building cases

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Table 6: Maximum Shear Forces shown in beams all Building cases

Model	Beam Shear Force (KN)
A	229.0601
B	228.6986
C	228.2859
D	227.9475
E	227.6569
F	227.4318
G	227.3477

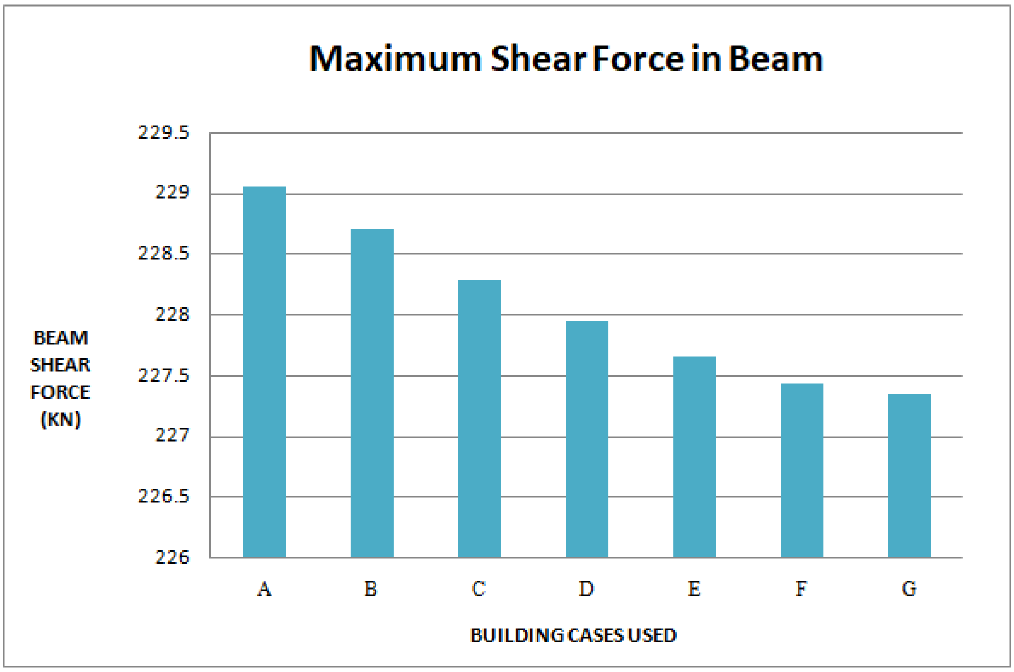

Fig. 6: Maximum Shear Force shown in beam all Building cases

Table 7: Maximum Bending Moment shown in beams all Building cases

Model	Beam Bending Moment (KNm)
A	287.4057
B	286.7865
C	286.083
D	285.5033
E	285.0004
F	284.6166
G	284.6184

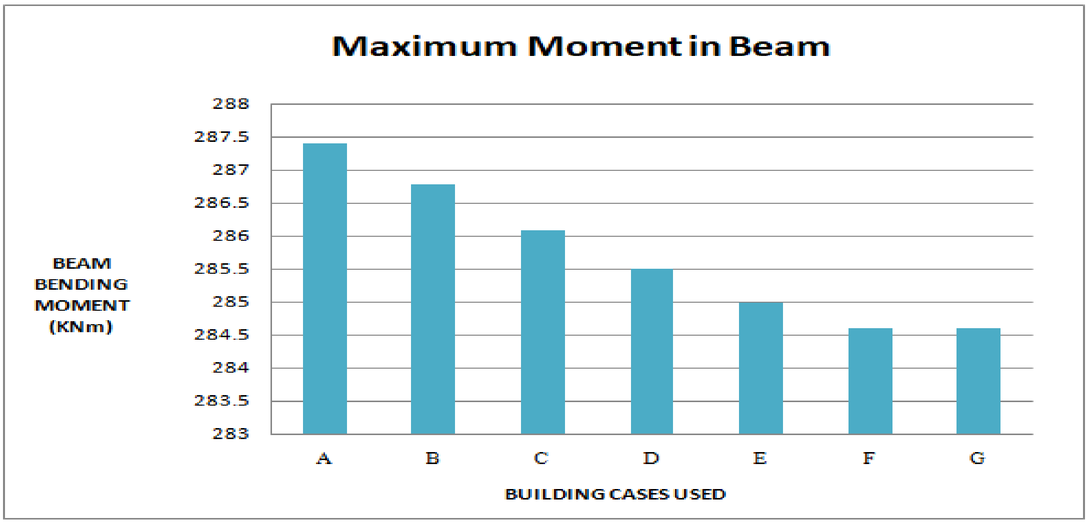

Fig. 7: Maximum Bending Moment shown in beams Building cases

Table 8: Maximum Torsional Moment shown in beams Building cases

Model	Beam Torsional Moment (along X direction) (KNm)	Beam Torsional Moment (along Z direction) (KNm)
A	8.8836	9.2328
B	8.864	11.596
C	8.8472	11.0964
D	8.8287	11.198
E	8.8089	11.1968
F	8.7878	11.218
G	8.4656	11.2412

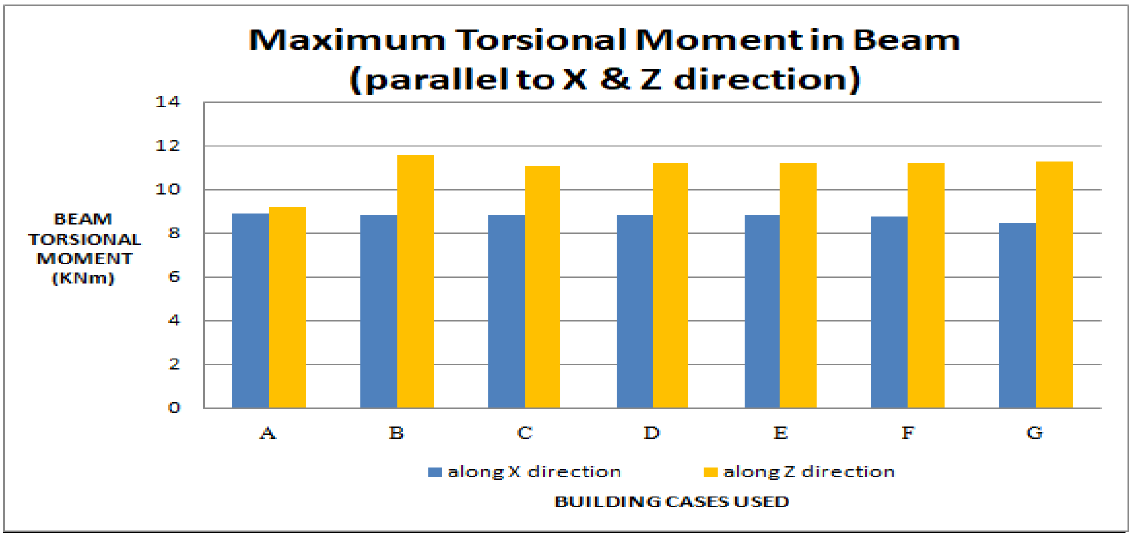

Fig. 8: Maximum Torsional Moment in beams Building cases

CONCLUSION

On comparing all seven models it has been concluded that the maximum displacement in model F in X and Z direction. As per comparative results in Base Shear, Model G is very effective than other models in both X and Z.As per comparative outcome in axial force, Model G is very effective than other models. Comparing the column shear force for all models, Model B is the optimum than other models respectively in X and Z direction. As per comparative results in column bending moment, Model C and Model F is the optimum than other models respectively in X and Z direction. Comparing the beam shear force in all models, model F is the effective than other models. Comparing the beam bending moment in all models, model F is the effective than other models. On analyzing the Torsional Moment in beams along X direction and Z direction model G and model C is efficient respectively. As per proportional outcomes in all parameters model F and Model G is very efficient in all Models respectively.

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