Determination of Base Shear Reduction by Using Optimum Size of Beam in Top Floors in Multistoried Building at Different Levels

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Abstract

Now a days the structure are prepared with lots of modern ways and there requirement is fulfilled by new innovation and new ideas. A diversity of innovators surrounded by them used to make the construction with their own option and also insist of marketplace. The parameter of evaluation of result such as displacement and storey drift are obtained in requisites of the any multistoried structure located in earthquake Zone-III, earthquake effects are performing on the construction under 6 different optimum sizes of beam for reduction of base shear. For base shear reduction using the optimum size of beam in top floors of six multistory building to analysis the reduction of base shear and examine with the association of design software.

Keywords – *Base Shear, Efficient size, Lateral Loading, Response spectrum analysis, Seismic Effects*

Introduction

In this study we know about the basic of base shear and also the reduction of base shear through the changing of size of beam on top floors. for the betterment of high rise structure minimum base shear is requirement. With the help of high rise structure we can solve the problem of residential properties. Recent days high rise are vastly in demand due to its architectural and structural design, in earthquake zone. For that, we should be on familiar terms with the resourceful parameters when these type of structures are in the make contact with of seismic loads.

Objectives

This research analyze the different beam size on top floors may reduce the base shear of the structure. The most efficient size of beam will be analyzed after all parameters are taken. There are total 6 different size of beam cases structure are prepared at medium soil under seismic loading for earthquake zone III. The cases the design in ETabs design software.

Structure Modeling

All six cases are modeled in design software ETabs. The case building detail of the multi storey structure are shown in Table A and Table B. Top view and front view of various cases of G+17 building shown by the help of figures. In this paper up to 17 floors with 6 different cases. After than efficient case for each parameter along with its remarks has drawn below each parameters.

Table 1. Description of parameters taken for analysis

Building configuration	G+17
No. of bays in X direction	6
No. of bays in Z direction	6
Height of building	55 M
Dimensions of building	24M X 24M
Case B1(Size of beam)	0.50M X 0.35M

Case B2(Size of beam)	0.50M X 30M
Case B3(Size of beam)	0.50M X 30M
Case B4(Size of beam)	0.50M X 30M
Case B5(Size of beam)	0.50M X 30M
Case B5(Size of beam)	0.50M X 30M
Size of column	0.50 X 0.60
Concrete and Steel Grade	M 35 & FE415

Table 2. Detail of loading

Earthquake parameters	Zone III with RF 4 & 5% damping ratio
Period in X & Z direction	1.12064 & 1.12064 for both direction
Dead load for floor and waterproofing	2KN/m^2 & 0.55 KN/m^2
Live load for floor and roof	3.2KN/M^2 & 1.2 KN/M^2

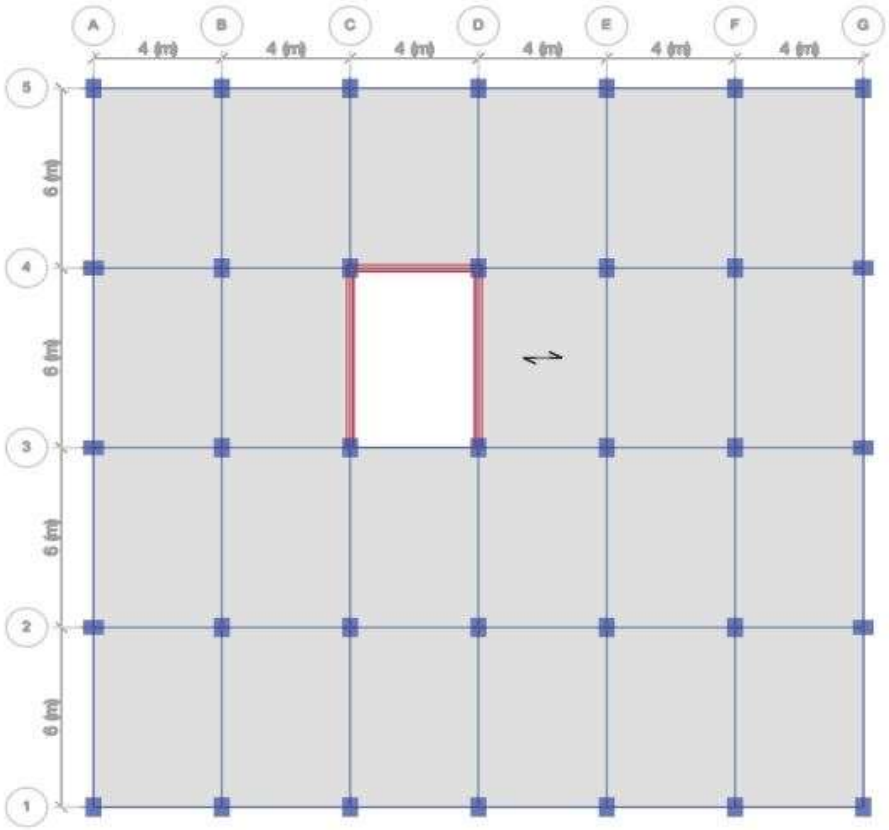

Figure 1. Typical floor plan of the Structure

Results Analysis

These results are observed by comparing all the cases-

Table 3: Maximum Displacement in X direction Zone III

Cases	Maximum Displacement (mm)
	For X Direction
B1	409.707
B2	408.794
B3	408.665
B4	409.093
B5	410.035
B6	411.445

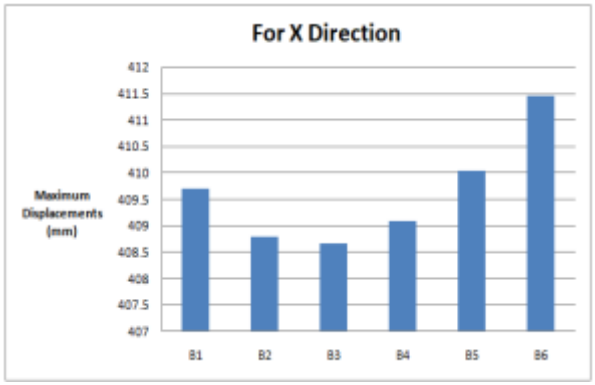

Figure 2. Maximum Displacement shown in X direction Zone III

Table 4. Maximum Displacement shown in Z direction Zone III

Cases	Maximum Displacement (mm)
	For Z Direction
B1	230.542
B2	230.017
B3	229.956
B4	230.135
B5	230.526
B6	231.093

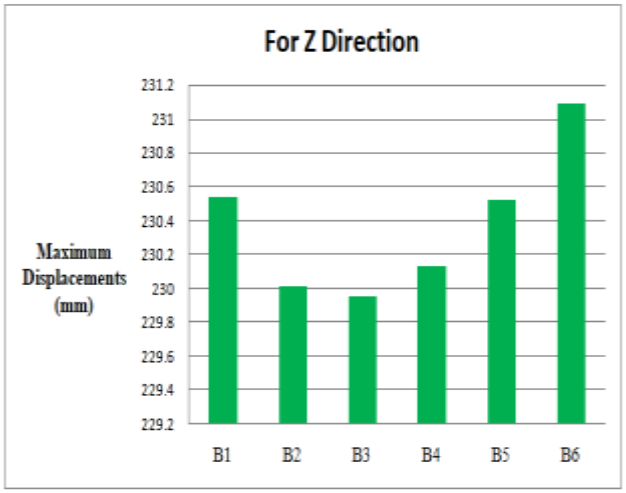

Figure 3. Maximum Displacement shown in Z direction Zone III

Table 5. Base Shear for all Building cases

Cases	BASE SHEAR (KN)
B1	3531.4269
B2	3523.6115
B3	3516.6301
B4	3509.6487
B5	3502.6673
B6	3495.6859

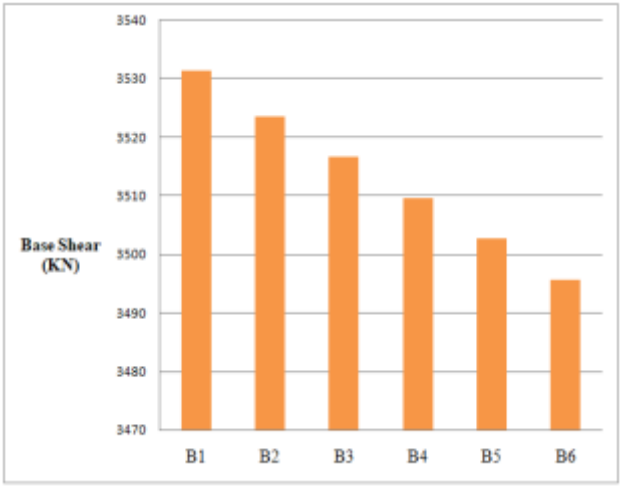

Figure 4. Base Shear shown for all Building SHAPEs

Table 6. Maximum Axial Forces shown in Column at ground level for all Building cases

Cases	Column Axial Force (KN)
B1	4214.3358
B2	4205.4412
B3	4199.9082
B4	4195.4272
B5	4192.0204
B6	4182.5885

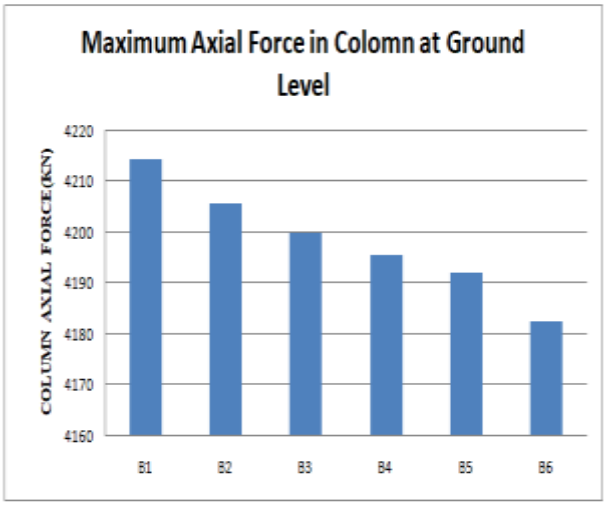

Figure 5. Maximum Axial Forces shown in Column at ground level for all Building cases

Table 7. Maximum Shear Forces shown in Columns for all Building cases

Cases	Column Shear Force (KN)	
	Shear along Y	Shear along Z
B1	99.9753	73.9753
B2	99.7349	73.3914
B3	99.5126	73.3138
B4	99.3008	73.2368
B5	99.1032	73.1605
B6	99.9258	73.0849

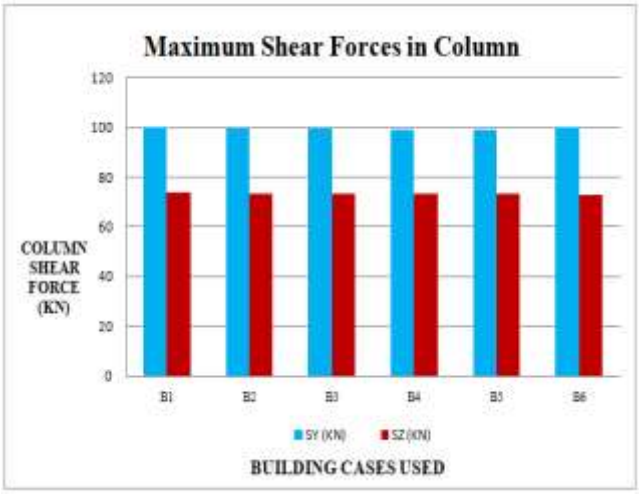

Figure 6. Maximum Shear Forces shown in Columns for all Building cases

Table 8. Maximum Bending Moment shown in Columns for all Building cases

Cases	Column Bending Moment (KNm)	
	Moment along Y	Moment along Z
B1	246.1573	204.0814
B2	245.6590	203.6728
B3	245.1744	203.2702
B4	244.6976	203.8732
B5	244.229	202.4818
B6	243.7696	202.6968

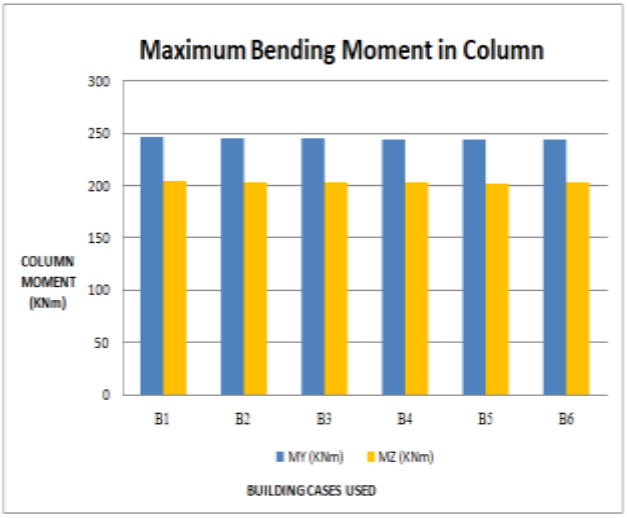

Figure 7. Maximum Bending Moment shown in Columns for all Building cases

Table 9. Maximum Shear Forces shown in beams all Building cases

Cases	Beam Shear Force
B1	152.9846
B2	152.9577
B3	152.8586
B4	152.8197
B5	152.6704
B6	152.3948

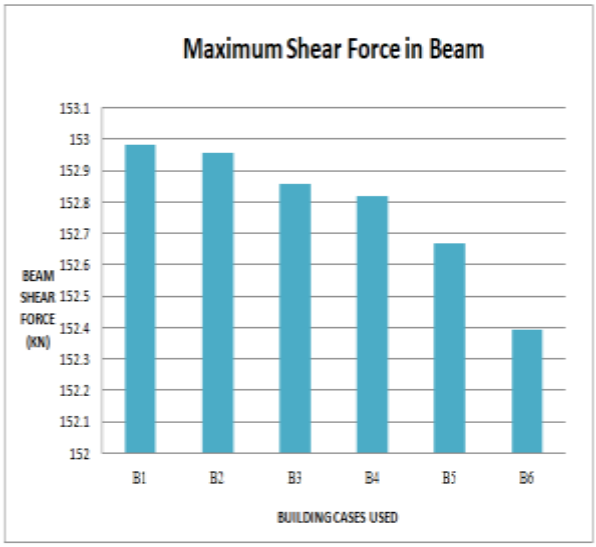

Figure 8. Maximum Shear Force shown in beam all Building cases

Table 10. Maximum Bending Moment shown in beams all Building cases

Cases	Beam Bending Moment (KNm)
B1	118.3793
B2	113.5626
B3	113.5403
B4	113.6148
B5	113.7869
B6	114.2023

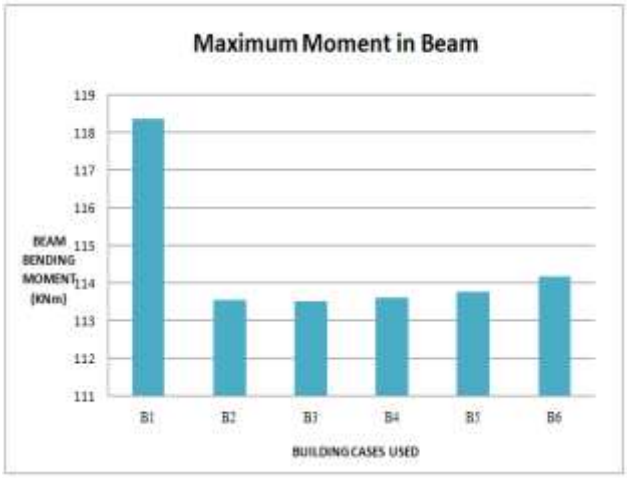

Figure 9. Maximum Bending Moment shown in beams Building cases

Table 11. Maximum Torsional Moment shown in beams Building cases

LOCATION No.	Beam Torsional Moment (along X direction) (KNm)	Beam Torsional Moment (along Z direction) (KNm)
B1	48.3758	14.2209
B2	48.3758	14.1824
B3	48.1208	14.1437
B4	47.9866	14.1052
B5	47.8546	14.2673
B6	47.7284	14.0310

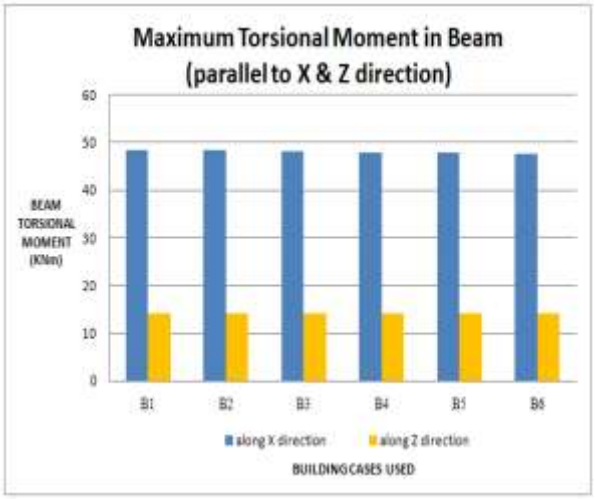

Figure 10. Maximum Torsional Moment in beams Building cases

Conclusions and Recommendations

On comparing all six cases it has been concluded that the maximum displacement in B3 case in X direction, maximum displacement in B3 cases in Z direction, Case B6 is very effective than other cases in Base Shear. Case B6 is very effective than other case in axial case. Case B5 and Case B6 is the optimum than other cases respectively in X and Z direction in column shear force, , Case B6 and Case B5 is the optimum than other cases respectively in X and Z direction in column bending moment. In Beam shear force and Beam bending moment is efficient respectively B6 and B3. In torsional moment case B6 is efficient.

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