Comparative Analysis of (G+11) R.C.C. Frame Structure with Flat slab and Conventional slab having different cross-sectional shape of Columns

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In

STRUCTURAL ENGINEERING
(CIVIL ENGINEERING)

By

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LUCKNOW

June, 2019

CERTIFICATE

This is to certify that the thesis entitled titled "**Comparative Analysis of (G+11) R.C.C. Frame Structure with Flat slab and Conventional slab having different cross-sectional shape of Columns"** which has being carried out by **Mr. Baqar Husain** (Roll No. 1170444002) Under the guidance of Assistant Professor **Bilal Siddiqui** to the Babu Banarasi Das University, Lucknow for the award of the degree of Master of Technology from Structural Engineering is a bonafide record of research work carried out by him under our supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

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DECLARATION

I hereby declare that the work which is being presented in the **M.Tech** Thesis Report entitled **"Comparative Analysis of (G+11) R.C.C. Frame Structure with Flat slab and Conventional slab having different cross-sectional shape of Columns",** in fulfillment of the requirement for the award of the Master of Technology in **Structural Engineering** and submitted to the Department of Civil Engineering of Babu Banarasi Das University, Lucknow (U.P.) is an authentic record of our work under the guidance of **Asst. Professor Bilal Siddiqui, Department of Civil Engineering.** The matter presented in this thesis has not been submitted by me for the award of any other degree elsewhere.

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First and foremost, I praise God, the almighty for providing me this opportunity and granting me the capability to complete my research work successfully, I would like to express my sincere appreciation and deepest gratitude to my guide, Asst. Prof. Bilal Siddiqui (Department of Civil Engineering) for his support, help and advice during my course work study. His guidance has made my learning experience a very special one and I am truly fortunate to have this opportunity to work with him. I would also like to thank Asst. Prof. Faheem Khan (Department of Civil Engineering) for his friendly guidance, valuable suggestions and constructive criticism throughout the progress of the study.

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ABSTRACT

Earthquake resistant design of structures deals with such a design which reduces or minimizes the effect of earthquake in a building. A ground motion is sometime strong enough to collapse a building, mainly in seismic zone 5 of India which is earthquake prone zone. Earthquake generate a wave of forces in the ground which may become dangerous for a building which is unable to resist the earthquake wave forces and result is failure of the structure. So, now a days each and every high-rise structure are designed to resist earthquake forces and successfully work under these condition. This paper deals with a brief comparative analyzation of (G+11) R.C.C. frame structure with different slab & cross-sectional shape of column in seismic zone 5. . The software used for this analysis is ETABS 2016. All the loadings such as dead load, live load, wall load is given as per Indian codes for dead load IS 875 (PART1), for live load IS 875 (PART 2). We will check the model for various load combination recommended by Indian code IS 875 (PART 5). The parameters on which we are going to perform our analysis are Max. & Min Storey Displacement, Storey Drift, Storey Shear, Storey Stiffness.

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CHAPTER 1

1.1 INTRODUCTION

A R.C.C. Frame structure is a combination of various parts such as Columns, Beams & Slabs, each one of them performing their own role in supporting the building. A Column is a vertical member and beam is a horizontal member of a building and slab acts as a platform. Here in this paper we are taking two types of (G+11) R.C.C. Frame building, one is having conventional slab and other one is having flat slab. In conventional slab R.C.C. Frame structure the load is transferred such as slab transfers its load to the beam and beam transfer it to the column and through column it transferred to the ground by footing. In case of flat slab R.C.C. Frame structure the slab directly transfer its load to the column because in flat slab there is no beam, that means slab is directly rested on columns. The depth of slab in both the R.C.C. Frame structure is provided in such a way that the volume of concrete in flat slab is equal to the volume of concrete in conventional slab and beam. We are using three shapes of column Circular, Rectangular & Square the size of column is selected in such a way that the volume of concrete will be equal in all of them. The types of R.C.C. Structure we are using for this comparative seismic analysis are as follows-

I. Conventional Slab with Circular column.
II. Conventional slab with Rectangular column.
III. Conventional slab with Square column.
IV. Flat slab with Circular column.
V. Flat slab with Rectangular column.
VI. Flat slab with Square column.

1.2 OBJECTIVE

I. To compare the seismic performance of all the (G+11) R.C.C. Frame structure and find out which combination of slab and column gives the better result.
II. To find out Displacement, Storey Drift, Storey Shear and Storey Stiffness in (G+11) R.C.C. Frame structure.
III. To conduct seismic analysis of Conventional slab model and flat slab model with different shapes of columns in seismic zone 5, which has been modelled in ETABS 2016 software.

1.3 NEED FOR STUDY

As we know the slab and column are the very important part of the R.C.C. Frame structure. The main aim of this study is

I. To decrease the Storey displacement of the building by using different slab and different shapes of column.
II. To decrease the Storey drift of the building by using different slab and different shapes of column.
III. To increase the Storey Shear of the building by using different slab and different shapes of column.
IV. To increase the Storey Stiffness of the building by using different slab and different shapes of column.

1.4 MODELS

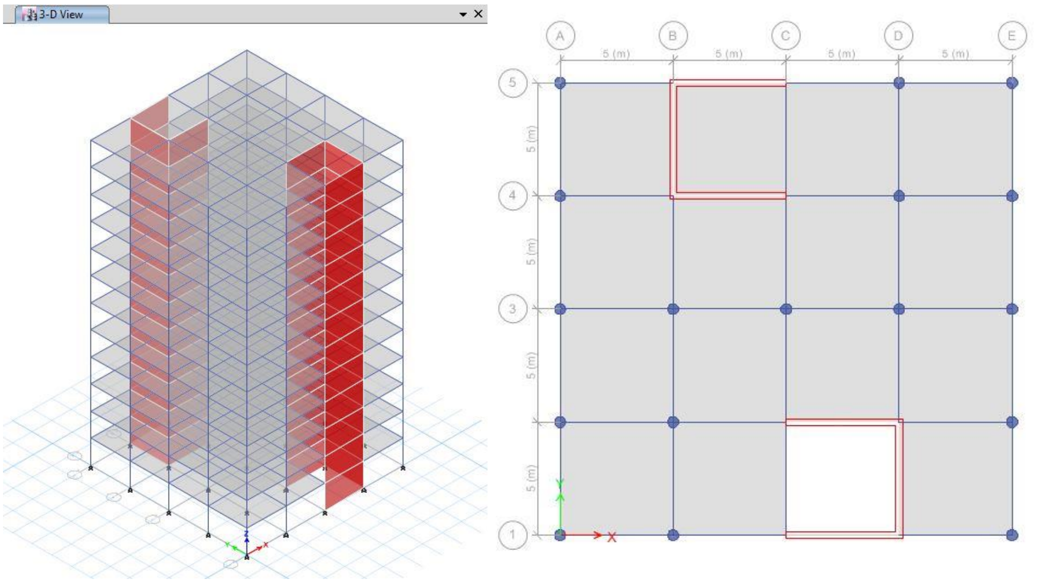

Fig. 1.4.1 (3-D VIEW OF G+11 BUILDING & PLAN OF BUILDING WITH CIRCULAR COLUMNS)

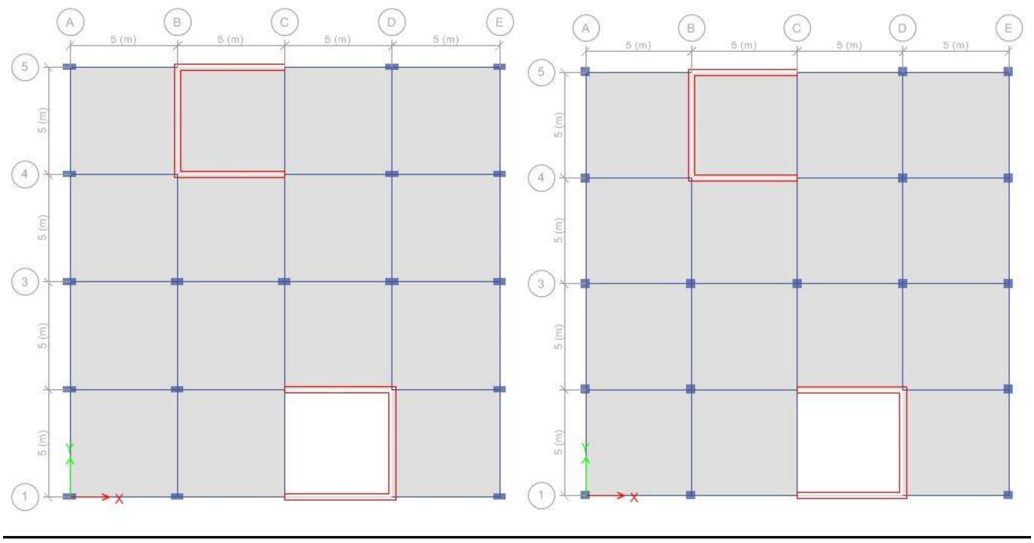

Fig. 1.4.2 (PLAN OF BUILDING WITH RECTANGULAR AND SQUARE COLUMNS)

CHAPTER 2

2. LITERATURE REVIEW

I. **Shital Arun Navghare, Prof. Amey Khedikar (*Assistant Prof.*)** carried out analysis that the RCC Columns are the major component of building which carry and transfer the loads. Generally, regular (Rectangular, square or circular) shaped RCC columns are used for the construction. In order to improve the performance of traditional shaped reinforced concrete columns under the influence of Dynamic Forces (forces generated by a given ground motion), it will be replaced by the other various RCC column cross sections (L-shaped, +-shaped, T-shaped, Z-shaped) in model. The model will be executed in FEM software. The stress behavior of different cross sections of RCC columns in G+5 RCC framed structure will be analyzed by using FEM Software. The result will indicate the comparative analysis and study of regular shaped and other various shaped column cross sections. They concluded that, various methods of analysis such as pushover analysis, time history analysis and hinge formation has been studied including the finite element software for analyzing the considered G+5 RCC framed structure. The modeling and analysis of the structure is under process and result will be displayed very soon. Pushover analysis will be executed for displacement and base shear along x-direction and y-direction. **TECH CHRONICLE (ISSN NO: 2454-1958 Volume 2: Issue 3 - May 2017)**

II. **Vidhya Purushothaman, Archana Sukumaran** carried out analysis that Due to large population and small per capita area need of tall buildings becomes more essential in the society. The limitations of the available land frequently restrict the freedom of an engineer to create a perfect structure. In such situations s the buildings will have to be designed in various shapes even with oblique corners so as to utilize the maximum benefits of available land. As earthquakes are one of the greatest damaging natural hazards to the building, the design and construction of tall structures which is capable of resisting the adverse effects of earth quake forces is the most important. Concrete-filled steel tubular columns have excellent earth-quake resistant properties such as high strength and ductility and large energy absorption capacity. The objective of this paper is to evaluate the comparison of composite columns with concrete filled steel tube and composite encased I section column. This paper mainly emphasizes on structural behavior of multi-storey building for different plan configurations like Rectangular, C, L and H shape with two different column property. It is also to compare and find which building with composite column is more effective against lateral loads. Modeling of 15- storey buildings are analyzed using ETABS 2015. The results are tabulated, compared and final conclusions are framed. From the output of ETABS, various results are obtained. And these results are evaluated by preparing various graphs.**(IJERT Vol. 6 Issue 06, June – 2017)**

III. **Harman, Dr. Hemant Sood** studied about the effect of cross-sectional change of column (i.e. rectangular, square & circular shape) on unsymmetrical R.C.C. frame structure. G+3, G+7, G+11 storey buildings were designed for this study with different cross section of column and then it was analyzed by using the software Staad.pro for gravity loads as well as seismic forces with the codal provisions provided in IS-456:2000 and IS-1893:2002. The objective of this paper mainly focuses on finding out the optimum cross-section for the column involving minimum cost of the building under same loading conditions and other parameters. After optimizing the structure in software, results were recorded and have been presented in this paper. The results of the analysis show that square is the optimum shape of column for G+3, G+7, G+11 storey buildings as the total cost of the building involving the cost of concrete and steel is minimum as compared to other two cross-sections (i.e. rectangular and circular). They concluded that with variable storeys were analyzed using different cross-sections of column (i.e. rectangular, square and circular) through Staad.Pro and inferences have been made from the post-processing results including the total cost of concrete and steel. **(IJERT Vol. 6 Issue 06, June – 2017)**

IV. **Amit A. Sathawane, R.S. Deotale** studied and determined that the FLAT slab system of construction is one in which the beam is used in the conventional methods of construction done away with the directly rests on column and the load from the slabs is directly transferred to the columns and then to the foundation. Drops or columns are generally provided with column heads or capitals. Grid floor systems consisting of beams spaced at regular intervals in perpendicular directions, monolithic with slab. They are generally employed for architectural reasons for large rooms such as auditoriums, vestibules, theatre halls, show rooms of shops where column free space is often the main requirement. The aim of the project is to determine the most economical slab between flat slab with drop, Flat slab without drop and grid slab. The proposed construction site is Nexus point apposite to Vidhan Bhavan and beside NMC office, Nagpur. The total length of slab is 31.38 m and width is 27.22 m. total area of slab is 854.16 sq. m. It is designed by using M35 Grade concrete and Fe415 steel. Analysis of the flat slab and grid slab has been done both manually by IS 456-2000 and by using software also. Flat slab and Grid slab has been analyzed by STAAD PRO. Rates have been taken according to N.M.C. C.S.R It is observed that the FLAT slab with drop is more economical than Flat slab without drop and Grid slabs. They concluded that Drops are important criteria in increasing the shear strength of the slab, Enhance resistance to punching failure at the junction of concrete slab & column, By incorporating heads in slab, we are increasing rigidity of slab, Concrete required in Grid slab is more as compared to Flat slab with Drop and Flat slab without Drop, Steel required in Flat slab without Drop is more as compared to Flat slab with Drop and Grid slab. .**(IJERA Vol. 1, Issue 03)**

V. **K. G. Patwari, L. G. Kalurkar** studied and analyzed that Tall buildings are being increasingly designed with structural system comprising of flat slab and shear wall core with or without perimeter beams. The behavior of this system under lateral loads is dependent on numerous parameters such as the height of the building, floor plate size, location of the shear wall core, flat slab spans and others. This paper studies the effect of RC flat slab with shear wall at different location for various heights of building. Shear wall with flat slab gives stability to structure as well as it improves lateral load resistance. The effectiveness of RC flat slab and shear wall building is studied with the help of three different models. Model one is a conventional building with regular slabs, beams & column framing. Model two is conventional building with various shear wall location and model three with flat slab and shear wall. Time history analysis is carried out for the structure using ETABs software. **(IJER Volume No.5 Issue: 27-28 Feb. 2016)**

VI. **Priyanka Vijaykumar Baheti , D.S.Wadje, G.R.Gandhe** studied that The main objective of this paper is to study the behavior of flat slab structure under equivalent static analysis and compare the behavior with a shear wall panel and infill wall panel provided at center and corner of building. The analysis is carried out in E-tabs software. To achieve the objective flat slab peripheral beam provided at structure and infill wall panel and shear wall panel provided different heights such asG+4, G+8, G+12 are modeled and analyzed In this paper it is proposed to carry out static analysis to study the behavior of flat slab with peripheral beam structures till collapse and identify the weaknesses under seismic loading. The natural time period increases as the height of building (No.of stories) increases, irrespective of type of wall panel provided at different stories, flat slab structure. In comparison with the shear wall panel and infill wall panel provided to flat slab with peripheral beam of building, the time period, deflection, drift and base shear considered for analysis. For analysis seismic zone IV and medium soil condition are used. **(IOSR-JMCE Volume 14, Issue 3 Ver. IV. {May. - June. 2017})**

VII. **Mohit Jain, Dr. Sudhir S. Bhadauria, Danish Khan** studied and analyzed that comparative analysis of flat slab system and wide beam system in reinforced concrete buildings . The comparison is performed with reference to conventional moment resisting frame. A G+3 building model is selected and is modelled as conventional beam column system, flat slab system and wide beam system. These models are then analyzed for gravity loads and seismic loads. For seismic analysis, two different methods- linear static and linear dynamic are used. They conclude that two configurations of reinforced concrete building- flat slab system and wide beam system are modelled and analyzed for their performance under gravity and earthquake loads. The RCC building model of G+3 i.e. 4 storey building is selected and above configurations are modelled in its. These models are then analyzed under gravity loads and seismic loads. For analysis under seismic loads, two different methods- linear static and linear dynamic response spectrum are used. Linear static analysis under gravity loads (dead load and live load)of building shows that the deformations are less in case of flat slab system compared to conventional and wide beam system. This is due to the reduced weight of the structure but same pattern is also observed in case of live loads. The wide beam system however shows same behavior to that of conventional building with less magnitude of deformation. From both seismic analyses- equivalent static analysis and response spectrum, it is observed that comparatively larger magnitude of lateral deformation has been observed in case of flat slab. This is due to decrease in lateral stiffness of flat slab system and wide beam system, The deformation is more pronounced in case of flat slab system. In this scenario, conventional beam is found better than other two configurations. **(AJER Volume-5, Issue-10)**

VIII. **J. Selwyn Babu & N. Mahendran** studied and analyzed that after the devastating Bhuj earthquake, the seismic design of structures is becoming more important.

Earthquake induced motion is one of the sources of dynamic loads, that must be considered in the design of structures. The revised code IS 1893- 2002 (Part 1) has reclassified the zonal map of India into four zones, thus bringing more than 55% of the area under seismic zones. An attempt has been made in this paper to study the behavior of interior columns of multistoried building frames in various seismic zones. In normal practice, the interior columns of a symmetric building are designed only for axial loads using IS 456:2000 with a minimum eccentricity. But during earthquakes, higher moments are generated in these interior columns and there is no provision in IS 1893-2002 for the eccentricity to be adopted in the design of columns. Several multistoried building frames were analyzed using STAAD Pro and the eccentricities of loading in the interior columns were calculated. Based on the study, suitable equations were developed for each seismic zone to calculate the eccentricity of an interior column in symmetric buildings. This eccentricity can be adopted as the design criterion for the seismic design of interior columns. They concluded that it is observed from the e/D ratios that even in mild earthquake Zone (i.e. Zone 2), the minimum eccentricity given in IS 456 – 2000 is exceeded. The e/D ratio is found to decrease when the span is increased. In addition, the e/D ratio is found to increase from bottom storey towards the top storey. It is also found out that e/D ratio increases with the Zone Number. Equations have been developed for finding the minimum eccentricity of interior columns of multistoried building frames. This minimum eccentricity can be used as the design criterion for the seismic design of interior columns of multistoried building frames. **(IJERT Vol. 2 Issue 4, April – 2013)**

IX. **Disha Sahadevan ,Megha Vijayan** studied about the behavior of G+9,G+14 Storied R.C. frame buildings subjected to earthquake located in seismic zone 3 with a different cross section of column of equivalent square, equivalent circular, and special shaped column (L, +, Z) by using ETAB Software and there result is such that the plan configuration of structures has significant impact on the seismic analysis of structures in terms of displacement, Storey drift, Storey shear. **(IRJET Volume :04 Issue: 06 June-2017)**

X. **Sachin Rajendra Ingle** studied the earthquake resistant design of structures requires that structures should sustain, safely, any ground motions of an intensity that might occur during their construction or in their normal use. However ground motions are unique in the effects they have on structural responses. In this study the seismic behavior of a frame building has been analyzed by using software called as Staad.

Pro. The seismic performance evaluation of the building has been carried out by changing the sizes of the columns and also by replacing the rectangular columns with the circular columns. The buildings are designed for the gravity and seismic loadings as per IS 456:2000 and IS 1893: 2002.The analysis of the multi-storeyed building reflected that there is not much variation of base shear between the rectangular and circular building. Almost both the buildings have same base shear. This is due to the assumption of same dimensions for both buildings. Corner Edge Displacement is found to be more in the rectangular columns than the frames having circular columns. Thus, the rectangular column building will perform better with less roof displacement as compared to circular column building with same amount of loading. Story drift is found to be more in the rectangular columns than the frames having circular columns. Thus, the behavior of rectangular column building is good as compared to circular column building. From the above points discussed we can conclude that rectangular shaped columns give good performance against earthquake as compared to circular column, hence rectangular shaped columns should be preferred as compared to circular shaped columns in areas porn to high risk of earthquake. **(IJCESR Volume :04 Issue: 10, 2017)**

XI. **Sumit Pahwa, Vivek Tiwari, Madhavi Prajapati** studied and analyzed that a traditional common practice in construction is to support slab by beam and beam supported by column this may be called as beam slab load transfer construction technique. As due to this old traditional construction net height of room is reduced. Hence to improve aesthetical and structural aspect of multi storey, shopping mall ,offices, warehouses , public community hall etc. are constructed in such a way were slab are directly on columns. This types of slab directly supported on column termed as flat slab. The present objective of this work is to compare behavior of flat slab with old traditional two way slab. The parametric studies comprise of maximum lateral displacement, storey drift and axial forces generated in the column. For these case studies we have created models for two-way slabs and flat slab without shear wall for each plan size of 16X24 m and 15X25 m, analyzed with Staad Pro. 2006 for seismic zones III, IV and V with varying height 21m, 27 m , 33 m and 39 m. This investigation also told us about seismic behavior of heavy slab without end restrained. They concluded that For all the cases considered drift values follow a parabolic path along storey height with maximum value lying somewhere near the middle storey, Use of flat slabs with drop results in increase in drift values in shorter plans and decrease in larger plans, marginally in a range of 0.5mm to 3mm. Still all drift values are within permissible limits even without shear walls, In zone III and IV use of flat slabs with drop in place of beam slab arrangements, though, alters that maximum displacement values, however, these all are well within permissible limits, even without shear walls, Provision of part shear walls in zone V is not enough to keep maximum displacements within permissible limits, whether it is a beam slab framed structure or framed structure with flat slabs with drop. **(IJLTET Vol. 4 Issue 2 July 2014)**

XII. **Rasna P, Safvana P, Jisha P** they studied and analyzed that in today's construction activity the use of flat slab is quite common which enhances the weight reduction, speed up construction, and economical. Similarly from the beginning conventional slab has got place in providing features like more stiffness, higher load carrying capacity, safe and economical also. For analysis material properties like grade of concrete steel, density, modulus of elasticity, must be defined initially and also various loads like dead load, live load, SDL. In this present work direct approach is adopted for manual design of flat slab and check for punching shear using software. Flat slabs are more vulnerable to punching shear because of absence of beam. Analysis of flat and conventional slab structures has been done using ETABS software. They concluded that the flat slab are generally adopted in commercial spaces since we need a larger grid spacing, aesthetic appearance and for facilitating the services. An RC Flat slab building with single storey was manually designed. Analysis of Flat slab and conventional slab were done using ETABS software. The punching shear value of Flat slab obtained from software analysis was compared with manual design , Punching shear value obtained from Direct Design Method was 0.538 MPa which was within the permissible limit. So the depth of slab is sufficient for punching around drop panel, Punching shear value of the middle strip of Flat slab obtained from software analysis is 0.63 MPa which is comparable with the manual design value The value of maximum displacement of Flat slab is less at middle strip portion and is equal to 3.3 mm. In comparison with conventional slab structure, displacement is greater than that of Flat slab. The value of shell stresses of Flat slab is lesser than that of conventional structure. Thus it can be concluded that Flat slab buildings are better option in construction. **(IJSRSET Volume 3)**

XIII. **Pu Yang, Hongxing Liu and Zongming Huang** studied that According to the current Chinese code and technical specification, some frame structures with rectangular columns and specially shaped columns are designed respectively based on the criterion of the same section area, moment of inertia, initial stiffness of the specially shaped frame structure. Using the program of fiber beam-column element based on flexibility method of finite element, nonlinear dynamic analysis is taken to analyze the two types of structures. The response of structures (such as story drift and torsion varying rules) is obtained under the fortification and rare grand motion. Still, the crack and yield rules of the main elements of the structures are compared by analyzing the stress and strain data of section fibers. So the change rules of the nonlinear seismic behavior of the two kinds of structures are obtained and some advices are provided for the seismic design of the specially shaped column structures and revising of the related specifications. (**The 14th World Conference on Earthquake Engineering October 12-17, 2008, Beijing, China)**

XIV. **T. Matsumoto , E. Okstad, K. Kawashima and S. A. Mahin** executed experiment that Seismic performance of RC rectangular columns was clarified in comparison with interlocking spiral columns based on a shake table experiment as a part of NEES and E-Defense collaboration on bridge project. It is found from the experiment that the interlocking spiral columns and rectangular columns with cross ties performed satisfactorily under the design and ultimate level excitations. (**The 14th World Conference on Earthquake Engineering October 12-17, 2008, Beijing, China)**

XV. **Kapil Verma (15)** studied that the earthquake resistant design of structures requires that structures should sustain, safely, any ground motions of an intensity that might occur during their construction or in their normal use. However ground motions are unique in the effects they have on structural responses. The most accurate analysis procedure for structures subjected to strong ground motions is the Push over analysis. Pushover analysis is based on the assumption that structures oscillate predominantly in the first mode or in the lower modes of vibration during a seismic event. This leads to a reduction of the multi-degree-of-freedom, MDOF system, to an equivalent single-degree-of- freedom, ESDOF system, with properties predicted by a nonlinear static analysis of the MDOF system. The ESDOF system is then subsequently subjected to a nonlinear time history analysis or to a response spectrum analysis with constant-ductility spectra, or damped spectra. The seismic demands calculated for the ESDOF system are transformed through modal relationships to the seismic demands of the MDOF system. In this study the seismic behaviour of a frame building has been analysed by using push over analysis. The seismic performance evaluation of the building has been carried out by changing the sizes of the columns and also by replacing the rectangular columns with the circular columns. Static type of pushover analysis is to be used in this research work where the loads consist of permanent gravity loads and incremental horizontal forces at each storey level. Capacity curves (base shear versus story total drift) obtained from static pushover analysis using commercially available software called Etabs (Etabs 2015) are used for the calculation of some seismic demand parameters. The dimensions of the buildings have been kept constant and only the column sizes have been changed. Three different combinations of the rectangular column dimensions are taken and the non linear response of each is evaluated by using the pushover analysis. The rectangular columns are then replaced with the circular columns of suitable dimension. The buildings are designed for the gravity and seismic loadings as per IS 456: 2000 and IS 1893: 2002. **(International Journal of Advance Research, Ideas and Innovations in Technology, Volume3, Issue3)**

CHAPTER 3

3. METHODOLOGY

All the modelling and analysis is carried out in ETABS 2016 Software. The data for which modelling is to be done are as follows-

Table 3.1 Geometry, Material and other Details of the Building Models

Building Dimension	20m x 20m
Conventional slab	150mm, M25 Grade concrete
Flat slab	200mm, M25 Grade concrete
Circular column	480mm, M30 Grade concrete
Rectangular column	600mm x 300mm, M30 Grade concrete
Square column	425mm x 425mm, M30 Grade concrete
Rebar	Fe415 Grade of reinforcement
Shear Wall	300mm, M30 Grade concrete
Floor height	3m
Type of soil	Medium soil
Importance Factor	1.0
Response Reduction Factor	5

Table 3.2 Loading Data

Below Terrace :-	
Live load on slab	2 kN/m^2
Live load on staircase	3 kN/m^2
Superdead load on slab	1.2 kN/m^2
Superdead load on staircase	1.5 kN/m^2
Wall loading on Exterior walls	14 kN/m
Wall loading on Interior walls	7 kN/m
On Terrace :-	
Live load on slab	1.5 kN/m^2
Live load on staircase	3 kN/m^2
Superdead load on slab	1.2 kN/m^2
Superdead load on staircase	2 kN/m^2
Parapet wall loading	2.5 kN/m
Brickcoba	4 kN/m^2

Table 3.3 Load Combination

1- 0.9DL + 1.43EX
2- 0.9DL – 1.43EX
3- 0.9DL + 1.43EY
4- 0.9DL – 1.43EY
5- 1.2(DL+LL+EX)
6- 1.2(DL+LL-EX)
7- 1.2(DL+LL+EY)
8- 1.2(DL+LL-EY)
9- 1.5(DL + EX)
10- 1.5(DL – EX)
11- 1.5(DL + EY)
12- 1.5(DL – EY)

CHAPTER 4

4.1 ANALYSIS

I. Max. & Min. Storey Displacement (mm)

i. Conventional slab with Circular column

- In X- Direction

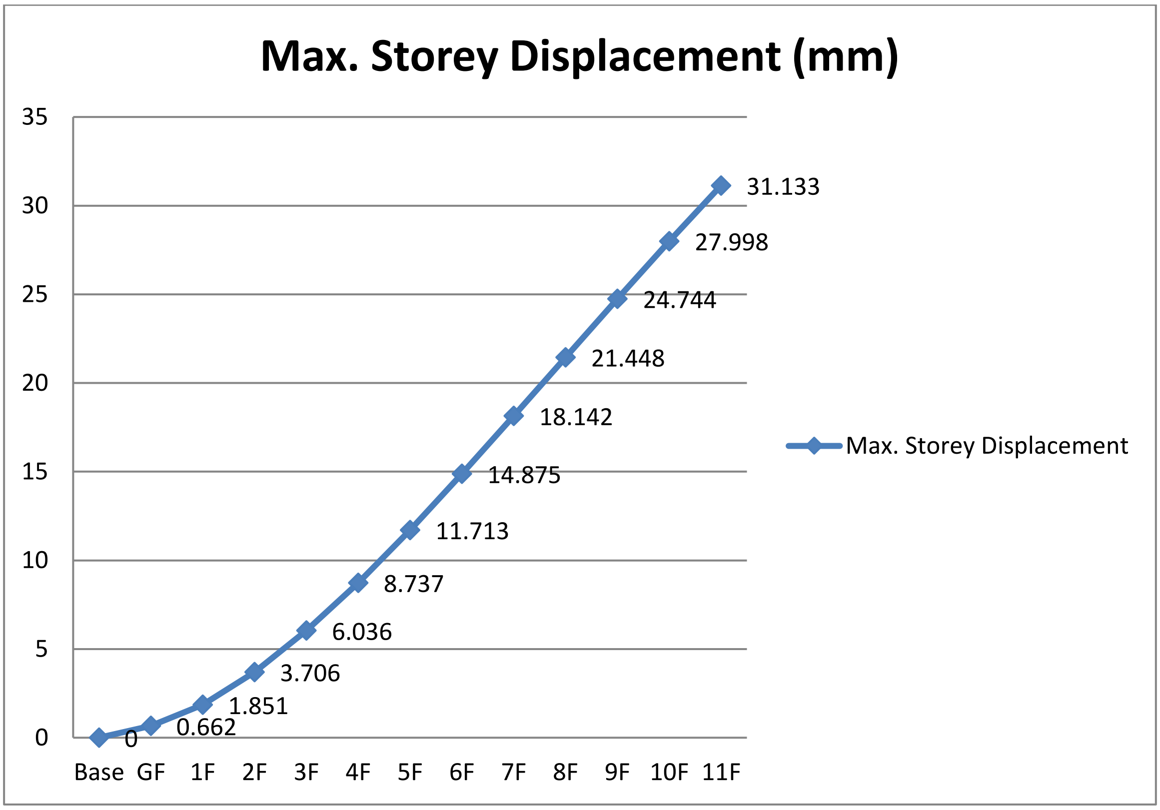

Fig. 4.1.1 Showing maximum storey displacement in X Direction

TABLE: 4.1.1 StoryResponse

Story	Elevation	Location	X-Dir	Y-Dir
	m		mm	mm
Story12	36	Top	31.133	1.04
Story11	33	Top	27.998	0.885
Story10	30	Top	24.744	0.757
Story9	27	Top	21.448	0.638
Story8	24	Top	18.142	0.518
Story7	21	Top	14.875	0.404

Story6	18	Top	11.713	0.301
Story5	15	Top	8.737	0.21
Story4	12	Top	6.036	0.135
Story3	9	Top	3.706	0.082
Story2	6	Top	1.851	0.081
Story1	3	Top	0.662	0.118
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey displacement for **1.5(DL-EX)** Load combination. The above table is storey response for maximum displacement in X-Direction that is **31.133 mm**).

- In Y- Direction

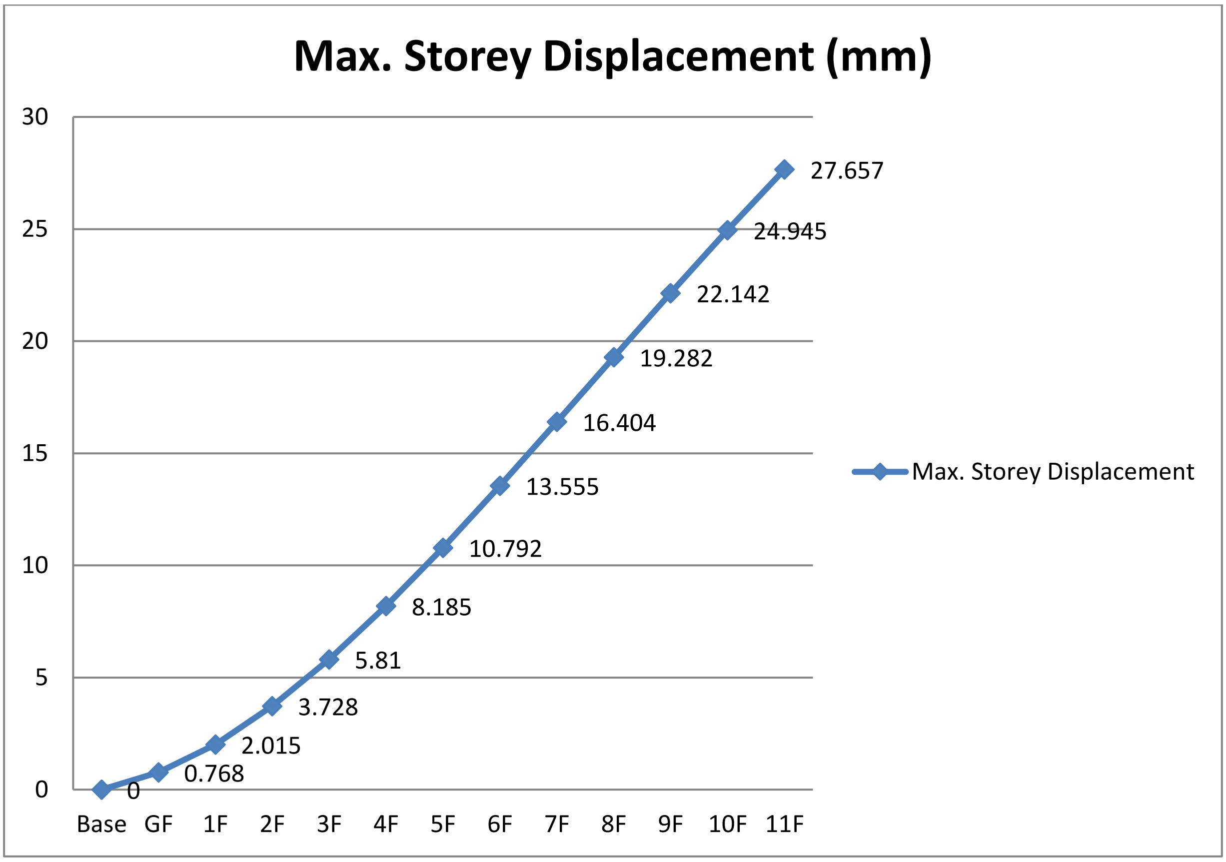

Fig. 4.1.2 Showing maximum storey displacement in Y Direction

TABLE: 4.1.2
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		mm	Mm
Story12	36	Top	0.087	27.657
Story11	33	Top	0.058	24.945
Story10	30	Top	0.063	22.142
Story9	27	Top	0.069	19.282

Story8	24	Top	0.078	16.404
Story7	21	Top	0.081	13.555
Story6	18	Top	0.083	10.792
Story5	15	Top	0.088	8.185
Story4	12	Top	0.097	5.81
Story3	9	Top	0.106	3.728
Story2	6	Top	0.118	2.015
Story1	3	Top	0.145	0.768
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey displacement for **1.5(DL+EY)** Load combination. The above table is storey response for maximum displacement in Y-Direction that is **27.657 mm**).

ii. Conventional slab with Rectangular column

- In X- Direction

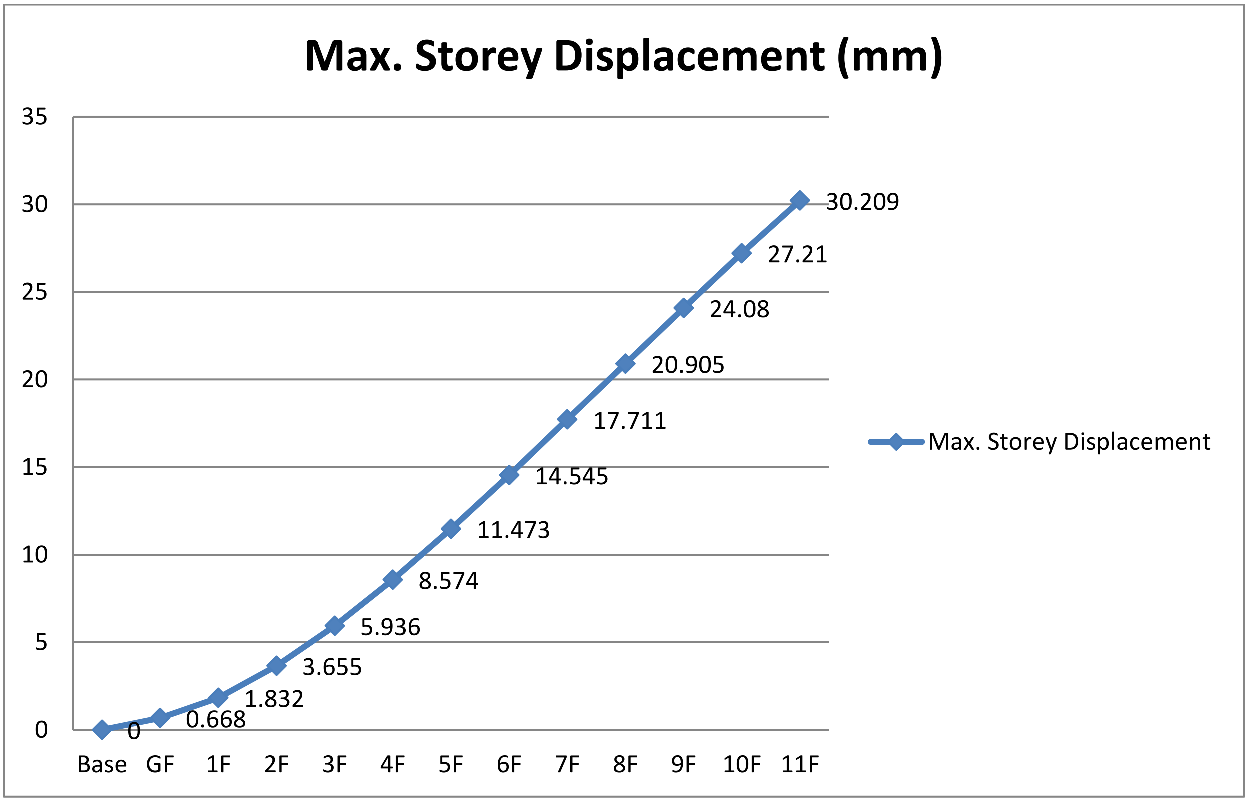

Fig. 4.1.3 Showing maximum storey displacement in X Direction

TABLE: 4.1.3 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		mm	Mm
Story12	36	Top	30.209	0.762
Story11	33	Top	27.21	0.637
Story10	30	Top	24.08	0.55
Story9	27	Top	20.905	0.464
Story8	24	Top	17.711	0.375
Story7	21	Top	14.545	0.297
Story6	18	Top	11.473	0.229
Story5	15	Top	8.574	0.167
Story4	12	Top	5.936	0.113
Story3	9	Top	3.655	0.069
Story2	6	Top	1.832	0.089
Story1	3	Top	0.668	0.119
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey displacement for **1.5(DL-EX)** Load combination. The above table is storey response for maximum displacement in X-Direction that is **30.209 mm**).

- In Y- Direction

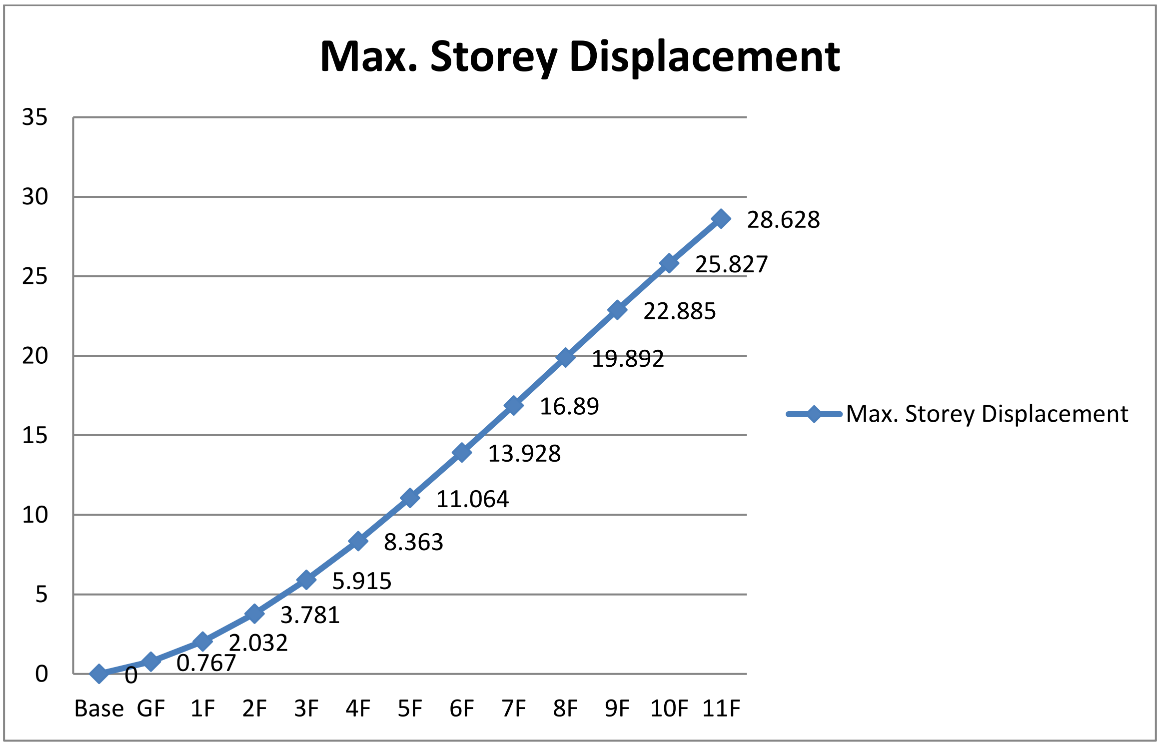

Fig. 4.1.4 Showing maximum storey displacement in Y Direction

TABLE: 4.1.4 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		mm	mm
Story12	36	Top	0.285	28.628
Story11	33	Top	0.237	25.827
Story10	30	Top	0.215	22.885
Story9	27	Top	0.195	19.892
Story8	24	Top	0.179	16.89
Story7	21	Top	0.16	13.928
Story6	18	Top	0.143	11.064
Story5	15	Top	0.121	8.363
Story4	12	Top	0.118	5.915
Story3	9	Top	0.119	3.781
Story2	6	Top	0.124	2.032
Story1	3	Top	0.148	0.767
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey displacement for **1.5(DL+EY)** Load combination. The above table is storey response for maximum displacement in Y-Direction that is **28.628 mm).**

iii. Conventional slab with Square column

- In X Direction

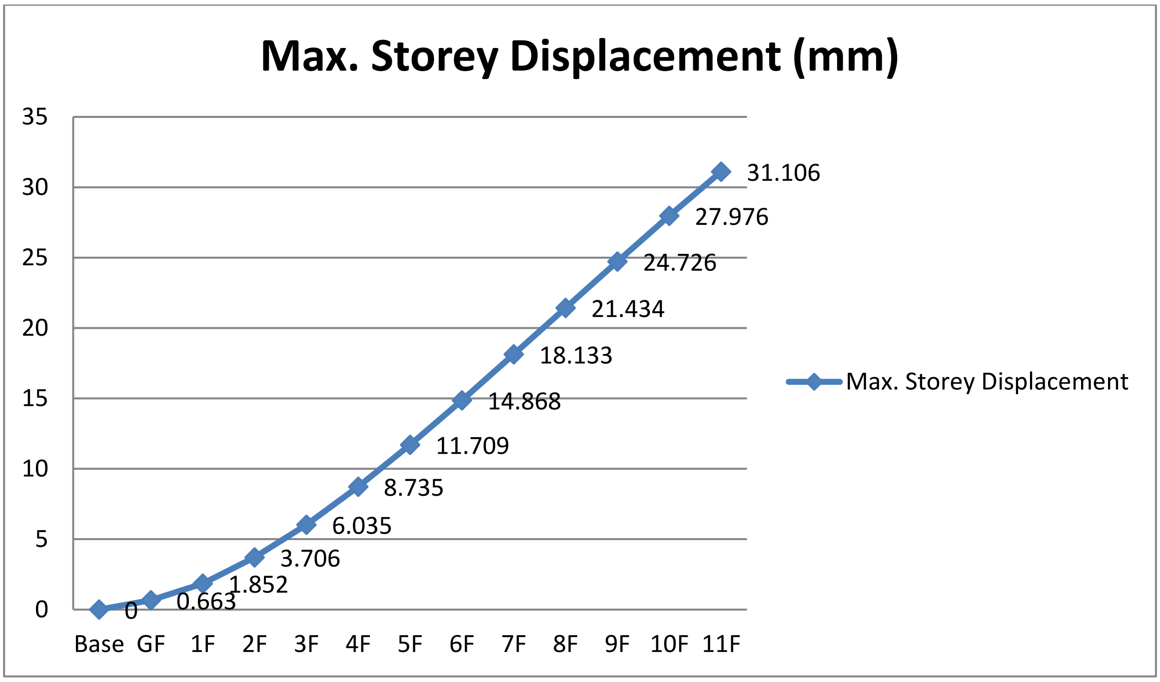

Fig. 4.1.5 Showing maximum storey displacement in X Direction

TABLE: 4.1.5 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		mm	mm
Story12	36	Top	31.106	1.052
Story11	33	Top	27.976	0.895
Story10	30	Top	24.726	0.766
Story9	27	Top	21.434	0.645
Story8	24	Top	18.133	0.524
Story7	21	Top	14.868	0.409
Story6	18	Top	11.709	0.304
Story5	15	Top	8.735	0.213
Story4	12	Top	6.035	0.137
Story3	9	Top	3.706	0.083
Story2	6	Top	1.852	0.081
Story1	3	Top	0.663	0.118
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey displacement for **1.5(DL-EX)** Load combination. The above table is storey response for maximum displacement in X-Direction that is **31.106 mm**).

- In Y Direction

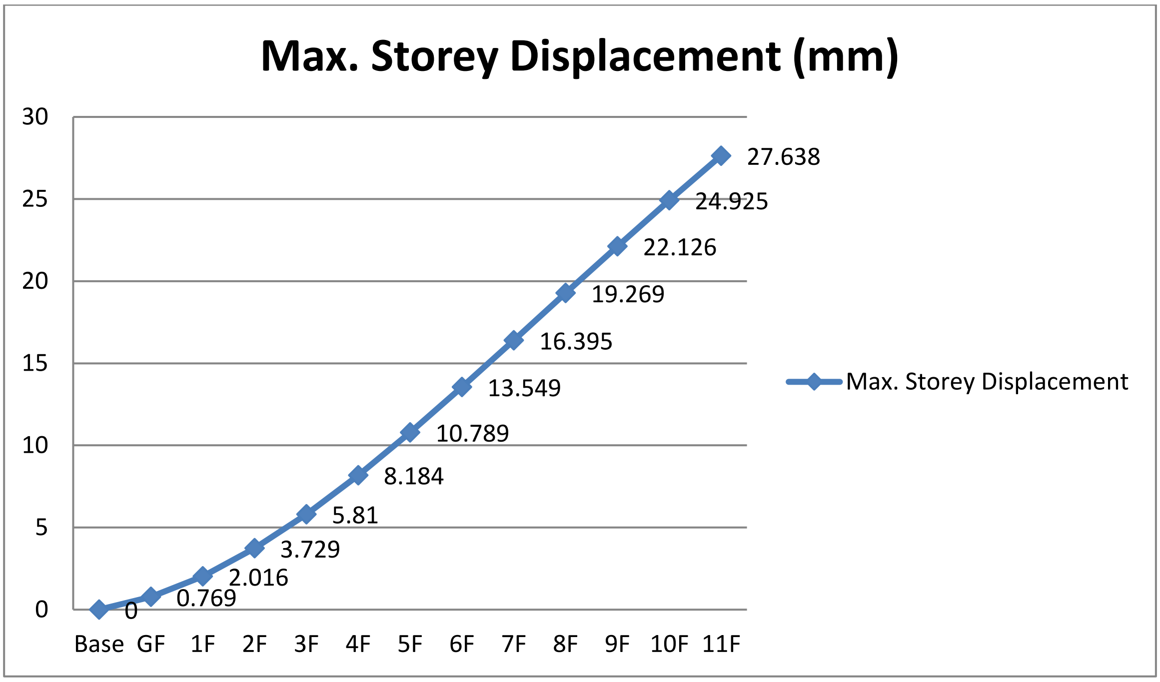

Fig. 4.1.6 Showing maximum storey displacement in Y Direction

TABLE: 4.1.6
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		Mm	mm
Story12	36	Top	0.092	27.638
Story11	33	Top	0.05	24.925
Story10	30	Top	0.054	22.126
Story9	27	Top	0.062	19.269
Story8	24	Top	0.072	16.395
Story7	21	Top	0.076	13.549
Story6	18	Top	0.08	10.789
Story5	15	Top	0.085	8.184
Story4	12	Top	0.096	5.81
Story3	9	Top	0.105	3.729
Story2	6	Top	0.118	2.016
Story1	3	Top	0.145	0.769
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey displacement for **1.5(DL+EY)** Load combination. The above table is storey response for maximum displacement in Y-Direction that is **27.638 mm**).

iv. Flat slab with Circular column

- In X Direction

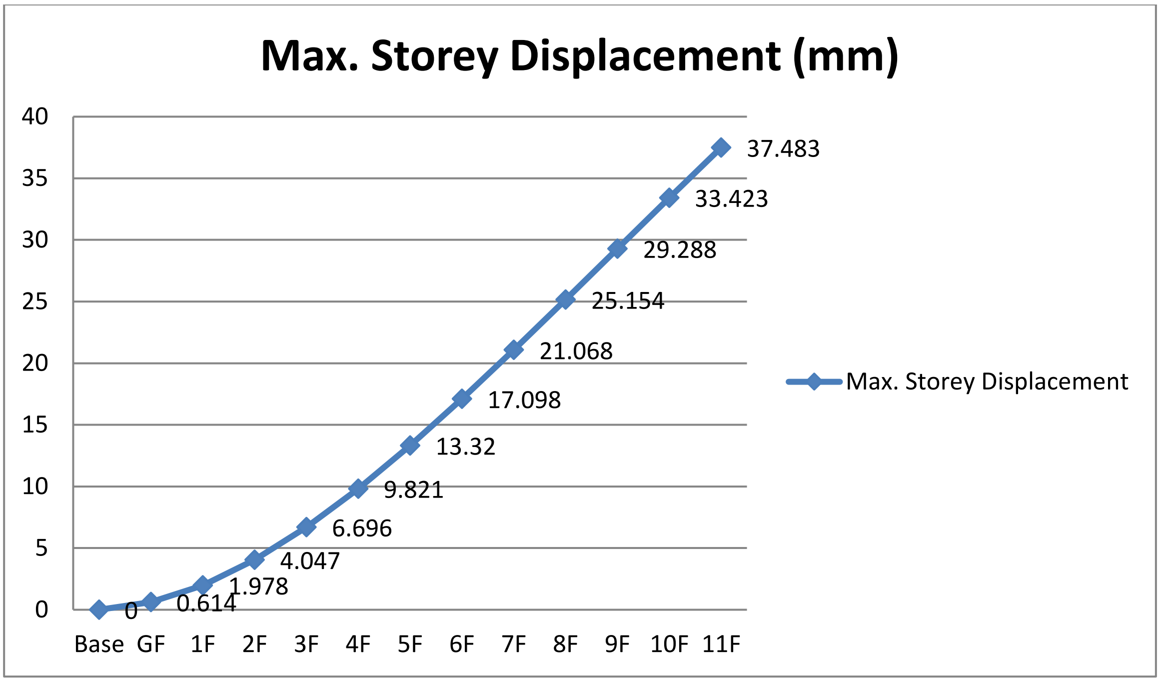

Fig. 4.1.7 Showing maximum storey displacement in X Direction

TABLE: 4.1.7 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		mm	mm
Story12	36	Top	37.483	2.967
Story11	33	Top	33.423	2.602
Story10	30	Top	29.288	2.254
Story9	27	Top	25.154	1.907
Story8	24	Top	21.068	1.572
Story7	21	Top	17.098	1.254
Story6	18	Top	13.32	0.959
Story5	15	Top	9.821	0.693
Story4	12	Top	6.696	0.464
Story3	9	Top	4.047	0.277
Story2	6	Top	1.978	0.138
Story1	3	Top	0.614	0.102
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey displacement for **1.5(DL-EX)** Load combination. The above table is storey response for maximum displacement in X-Direction that is **37.483 mm**).

- In Y Direction

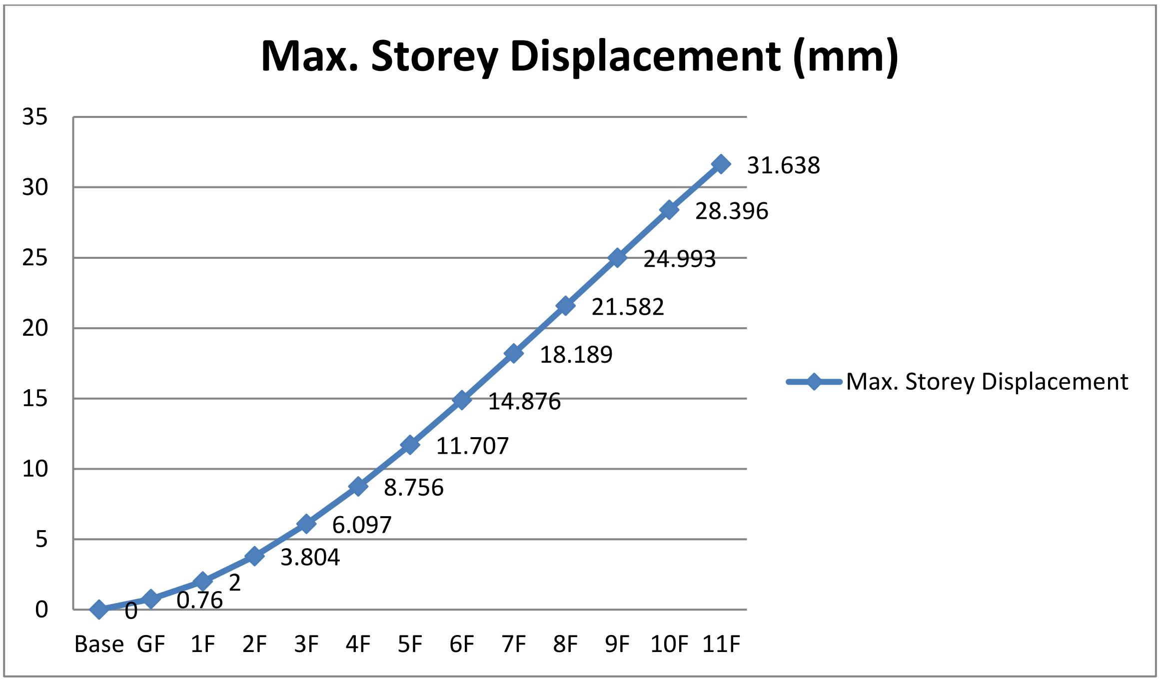

Fig. 4.1.8 Showing maximum storey displacement in Y Direction

TABLE: 4.1.8 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		Mm	mm
Story12	36	Top	2.433	31.638
Story11	33	Top	2.101	28.396
Story10	30	Top	1.799	24.993
Story9	27	Top	1.495	21.582
Story8	24	Top	1.205	18.189
Story7	21	Top	0.935	14.876
Story6	18	Top	0.695	11.707
Story5	15	Top	0.491	8.756
Story4	12	Top	0.337	6.097
Story3	9	Top	0.225	3.804
Story2	6	Top	0.148	2
Story1	3	Top	0.133	0.76
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey displacement for **1.5(DL+EY)** Load combination. The above table is storey response for maximum displacement in Y-Direction that is **31.638 mm**).

v. Flat slab with Rectangular column

- In X Direction

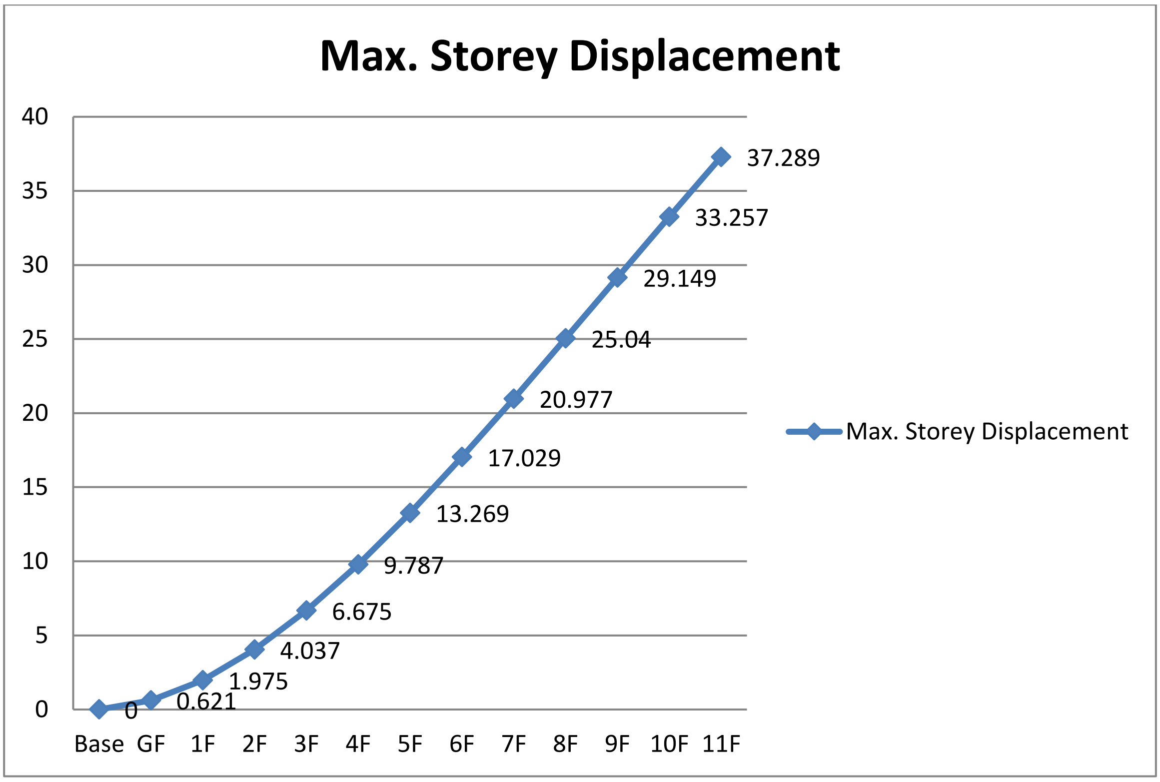

Fig. 4.1.9 Showing maximum storey displacement in X Direction

TABLE: 4.1.9 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		Mm	mm
Story12	36	Top	37.289	3.002
Story11	33	Top	33.257	2.634
Story10	30	Top	29.149	2.281
Story9	27	Top	25.04	1.93
Story8	24	Top	20.977	1.591
Story7	21	Top	17.029	1.269
Story6	18	Top	13.269	0.971
Story5	15	Top	9.787	0.702
Story4	12	Top	6.675	0.47
Story3	9	Top	4.037	0.281
Story2	6	Top	1.975	0.14
Story1	3	Top	0.621	0.103
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey displacement for **1.5(DL-EX)** Load combination. The above table is storey response for maximum displacement in X-Direction that is **37.289 mm**).

- In Y Direction

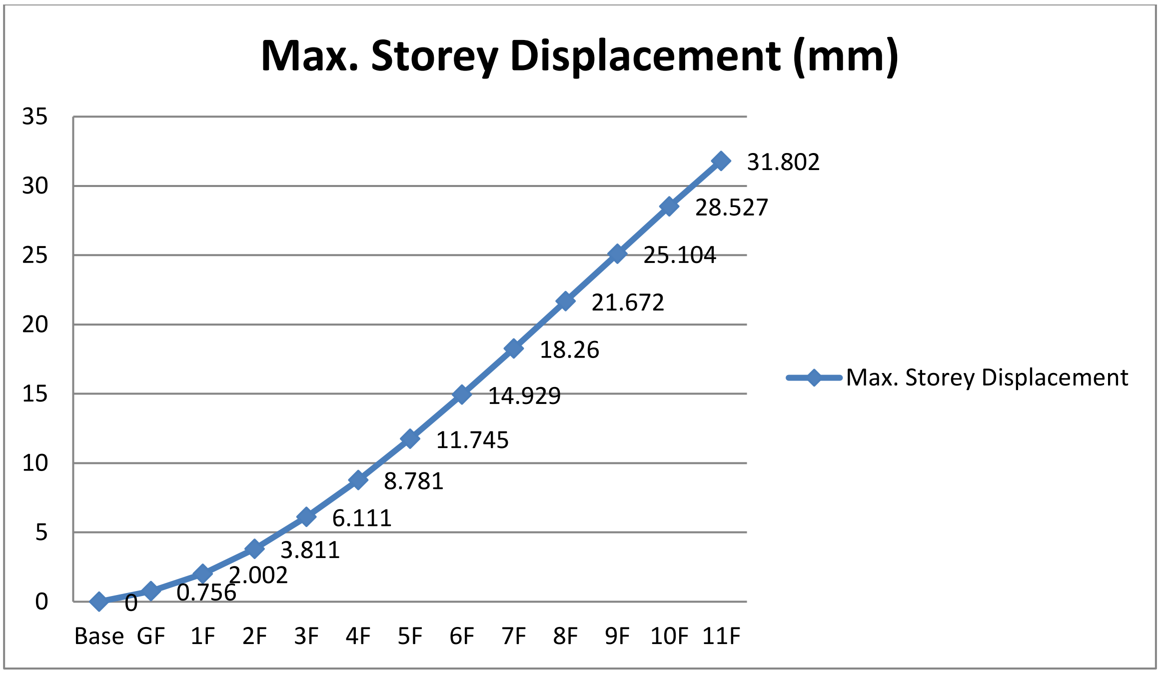

Fig. 4.1.10 Showing maximum storey displacement in Y Direction

TABLE: 4.1.10 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		Mm	mm
Story12	36	Top	2.372	31.802
Story11	33	Top	2.046	28.527
Story10	30	Top	1.752	25.104
Story9	27	Top	1.456	21.672
Story8	24	Top	1.172	18.26
Story7	21	Top	0.91	14.929
Story6	18	Top	0.676	11.745
Story5	15	Top	0.478	8.781
Story4	12	Top	0.328	6.111
Story3	9	Top	0.22	3.811
Story2	6	Top	0.146	2.002
Story1	3	Top	0.133	0.756
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey displacement for **1.5(DL+EY)** Load combination. The above table is storey response for maximum displacement in Y-Direction that is **31.802 mm**).

vi. Flat slab with Square column

- In X Direction

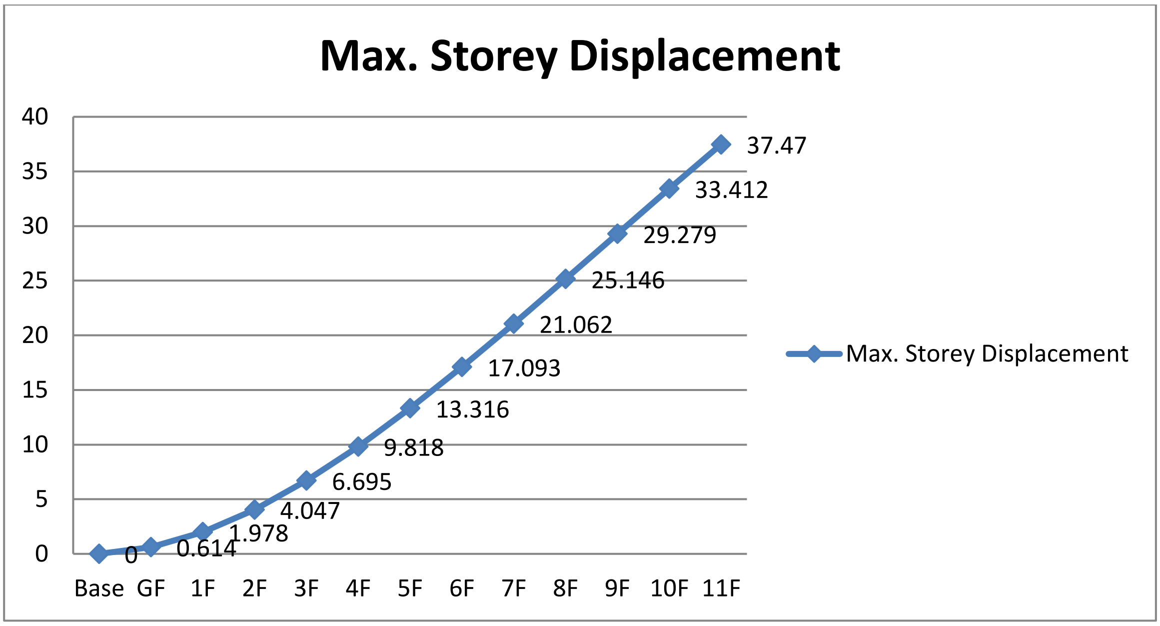

Fig. 4.1.11 Showing maximum storey displacement in X Direction

TABLE: 4.1.11 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		Mm	mm
Story12	36	Top	37.47	2.966
Story11	33	Top	33.412	2.601
Story10	30	Top	29.279	2.254
Story9	27	Top	25.146	1.906
Story8	24	Top	21.062	1.572
Story7	21	Top	17.093	1.253
Story6	18	Top	13.316	0.958
Story5	15	Top	9.818	0.693
Story4	12	Top	6.695	0.464
Story3	9	Top	4.047	0.277
Story2	6	Top	1.978	0.138
Story1	3	Top	0.614	0.102
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey displacement for **1.5(DL-EX)** Load combination. The above table is storey response for maximum displacement in X-Direction that is **37.47 mm**).

- In Y Direction

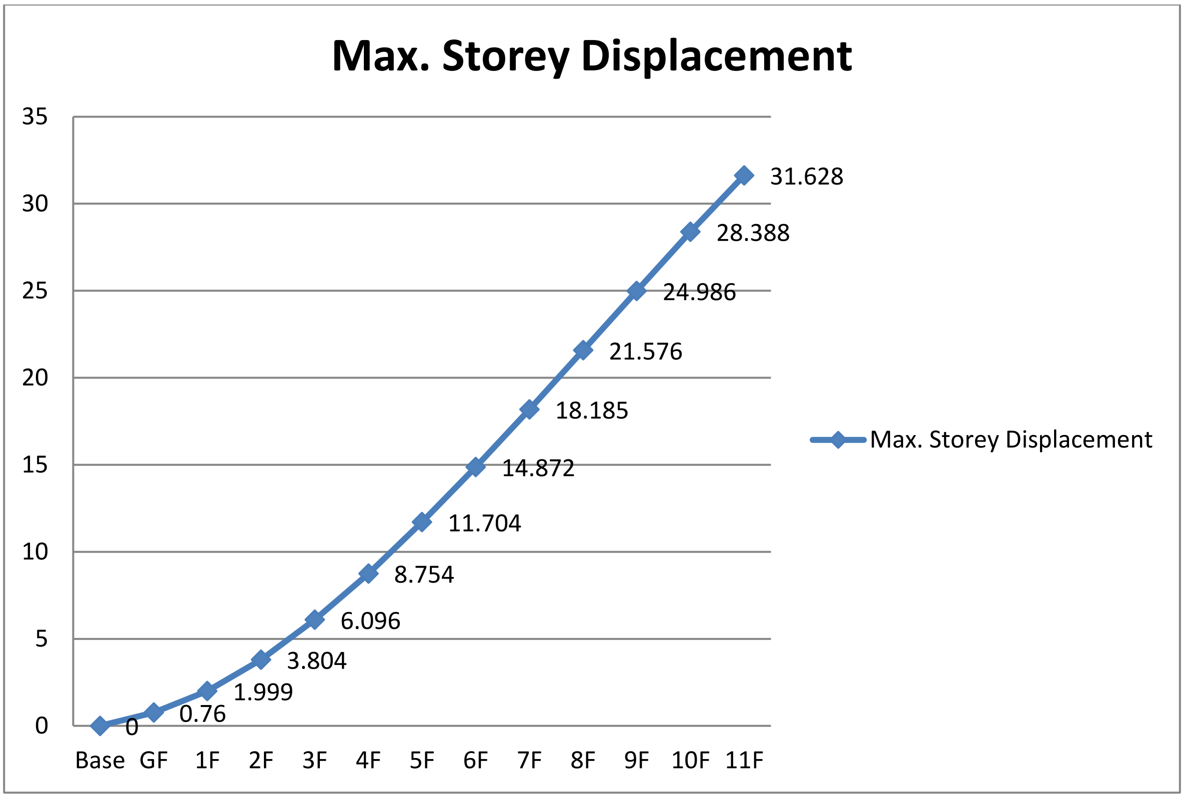

Fig. 4.1.12 Showing maximum storey displacement in Y Direction

TABLE: 4.1.12
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		mm	mm
Story12	36	Top	2.439	31.628
Story11	33	Top	2.107	28.388
Story10	30	Top	1.804	24.986
Story9	27	Top	1.499	21.576
Story8	24	Top	1.208	18.185
Story7	21	Top	0.938	14.872
Story6	18	Top	0.697	11.704
Story5	15	Top	0.492	8.754
Story4	12	Top	0.338	6.096
Story3	9	Top	0.226	3.804
Story2	6	Top	0.149	1.999
Story1	3	Top	0.133	0.76

Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey displacement for **1.5(DL+EY)** Load combination. The above table is storey response for maximum displacement in Y-Direction that is **31.628 mm**).

II. Max. & Min. Storey Drift

i. Conventional slab with Circular column

- In X Direction

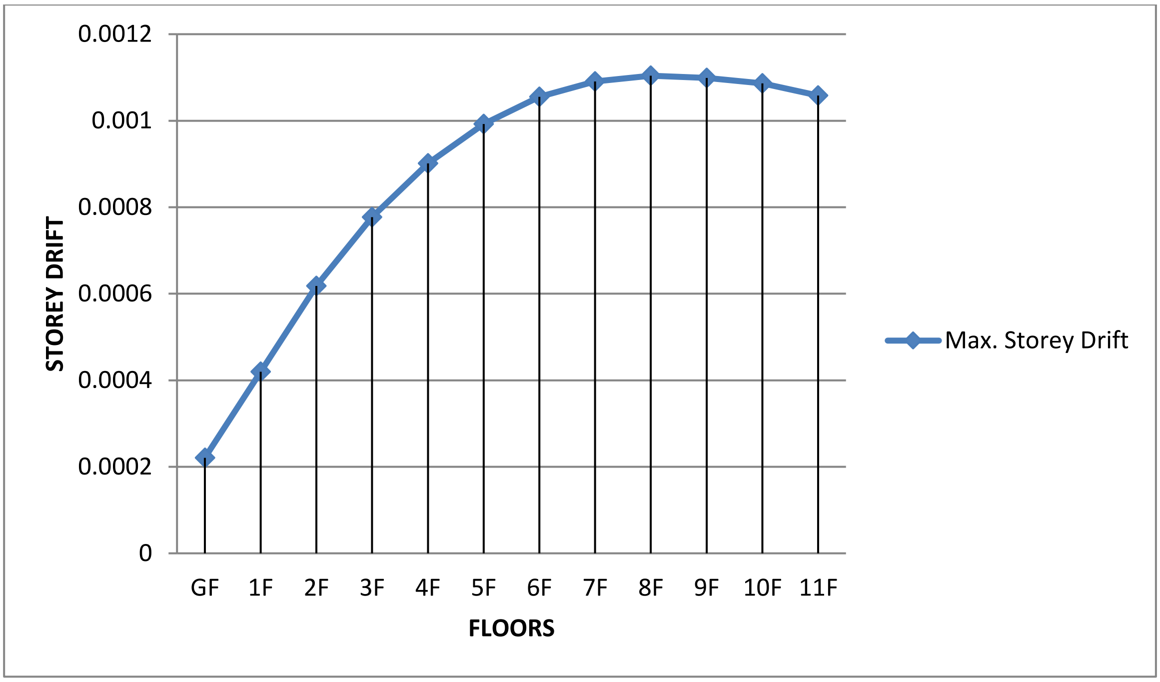

Fig. 4.1.13 Showing maximum storey drift in X Direction

TABLE: 4.1.13 Story Drifts							
Story	**Load Case/Combo**	**Direction**	**Drift**	**Label**	**X**	**Y**	**Z**
					m	m	m
Story12	1.5(DL-EX)	X	0.001058	2	5	20	36
Story11	1.5(DL-EX)	X	0.001086	4	15	20	33
Story10	1.5(DL-EX)	X	0.001099	7	20	20	30
Story9	1.5(DL-EX)	X	0.001104	7	20	20	27
Story8	1.5(DL-EX)	X	0.001091	7	20	20	24
Story7	1.5(DL-EX)	X	0.001055	7	20	20	21
Story6	1.5(DL-EX)	X	0.000992	3	10	20	18
Story5	1.5(DL-EX)	X	0.000901	2	5	20	15
Story4	1.5(DL-EX)	X	0.000777	2	5	20	12
Story3	1.5(DL-EX)	X	0.000618	2	5	20	9
Story2	1.5(DL-EX)	X	0.00042	2	5	20	6

Story1	1.5(DL-EX)	X	0.000221	16	0	0	3

(IN **X-DIRECTION** we are getting maximum storey drift for **1.5(DL-EX)** Load combination. The above table is storey response for maximum storey drift in X-Direction that is **0.001104**).

- In Y Direction

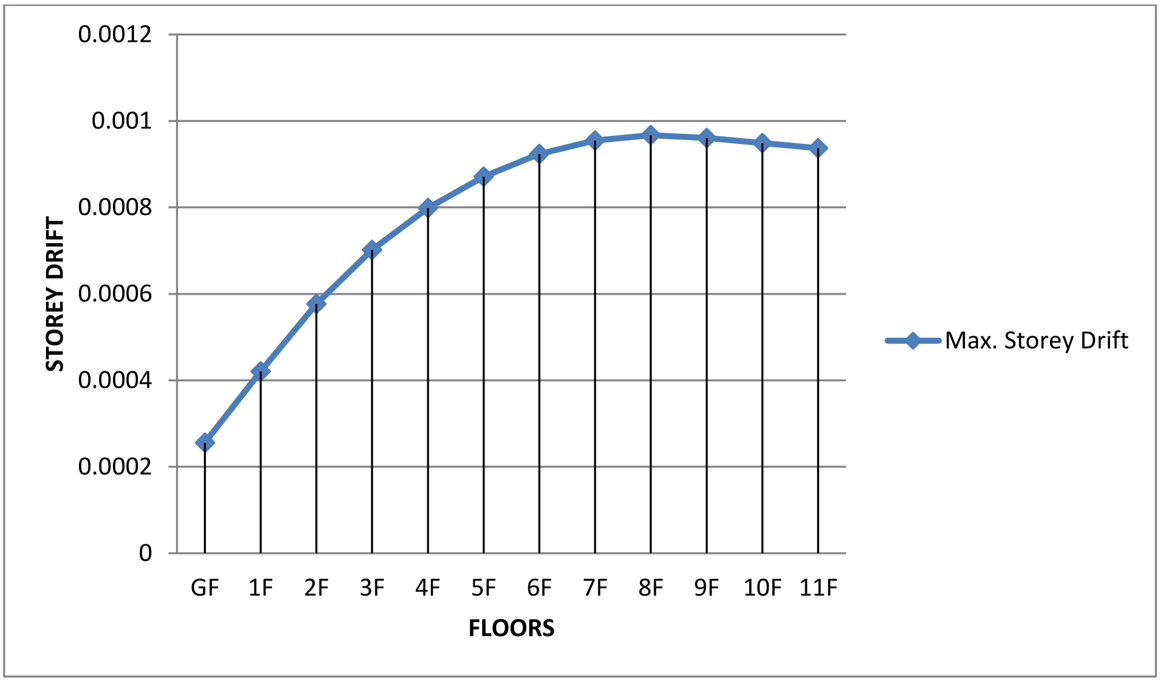

Fig. 4.1.14 Showing maximum storey drift in Y Direction

TABLE: 4.1.14
Story Drifts

Story	Load Case/Combo	Direction	Drift	Label	X	Y	Z
					m	m	m
Story12	1.5(DL+EY)	Y	0.000937	13	15	0	36
Story11	1.5(DL+EY)	Y	0.000949	7	20	20	33
Story10	1.5(DL+EY)	Y	0.000961	7	20	20	30
Story9	1.5(DL+EY)	Y	0.000967	7	20	20	27
Story8	1.5(DL+EY)	Y	0.000955	7	20	20	24
Story7	1.5(DL+EY)	Y	0.000924	7	20	20	21
Story6	1.5(DL+EY)	Y	0.000871	16	0	0	18
Story5	1.5(DL+EY)	Y	0.000799	16	0	0	15
Story4	1.5(DL+EY)	Y	0.000702	16	0	0	12
Story3	1.5(DL+EY)	Y	0.000577	16	0	0	9
Story2	1.5(DL+EY)	Y	0.000421	20	5	15	6
Story1	1.5(DL+EY)	Y	0.000256	2	5	20	3

(IN **Y-DIRECTION** we are getting maximum storey drift for **1.5(DL+EY)** Load combination. The above table is storey response for maximum storey drift in Y-Direction that is **0.000967**).

ii. Conventional slab with Rectangular column

- In X Direction

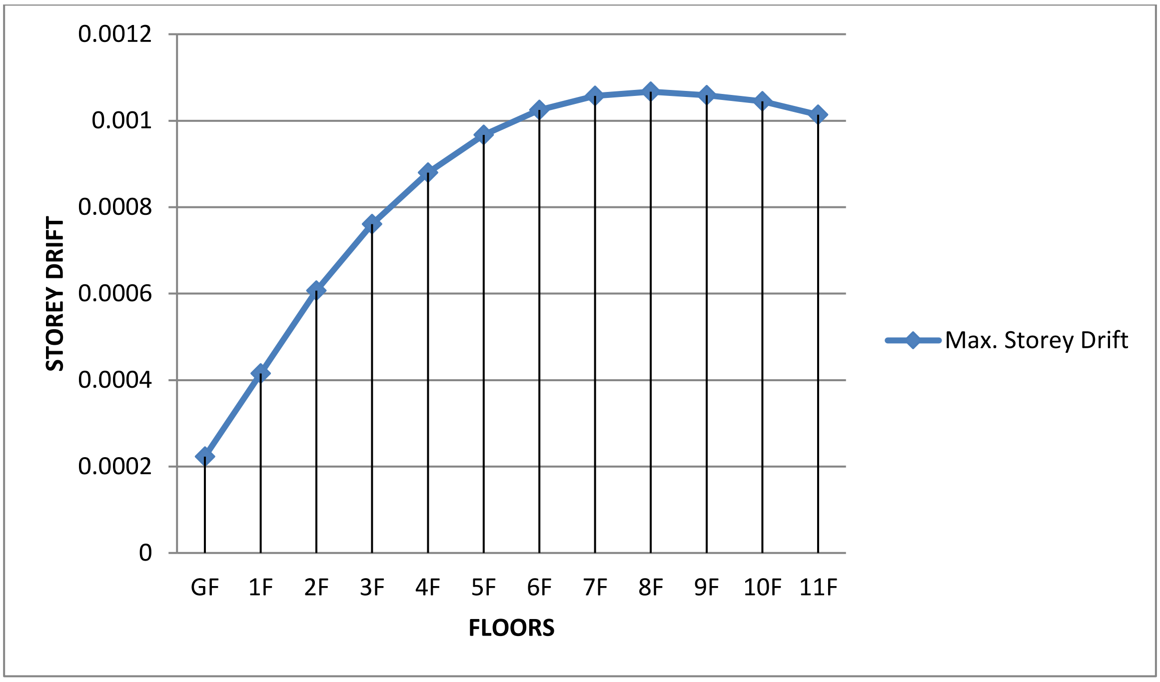

Fig. 4.1.15 Showing maximum storey drift in X Direction

TABLE: 4.1.15 Story Drifts							
Story	**Load Case/Combo**	**Direction**	**Drift**	**Label**	**X**	**Y**	**Z**
					m	m	m
Story12	1.5(DL-EX)	X	0.001014	2	5	20	36
Story11	1.5(DL-EX)	X	0.001045	4	15	20	33
Story10	1.5(DL-EX)	X	0.001059	7	20	20	30
Story9	1.5(DL-EX)	X	0.001067	7	20	20	27
Story8	1.5(DL-EX)	X	0.001057	7	20	20	24
Story7	1.5(DL-EX)	X	0.001025	7	20	20	21
Story6	1.5(DL-EX)	X	0.000967	3	10	20	18
Story5	1.5(DL-EX)	X	0.00088	2	5	20	15
Story4	1.5(DL-EX)	X	0.000761	2	5	20	12
Story3	1.5(DL-EX)	X	0.000607	2	5	20	9
Story2	1.5(DL-EX)	X	0.000415	2	5	20	6
Story1	1.5(DL-EX)	X	0.000223	16	0	0	3

(IN **X-DIRECTION** we are getting maximum storey drift for **1.5(DL-EX)** Load combination. The above table is storey response for maximum storey drift in X-Direction that is **0.001067**).

- In Y Direction

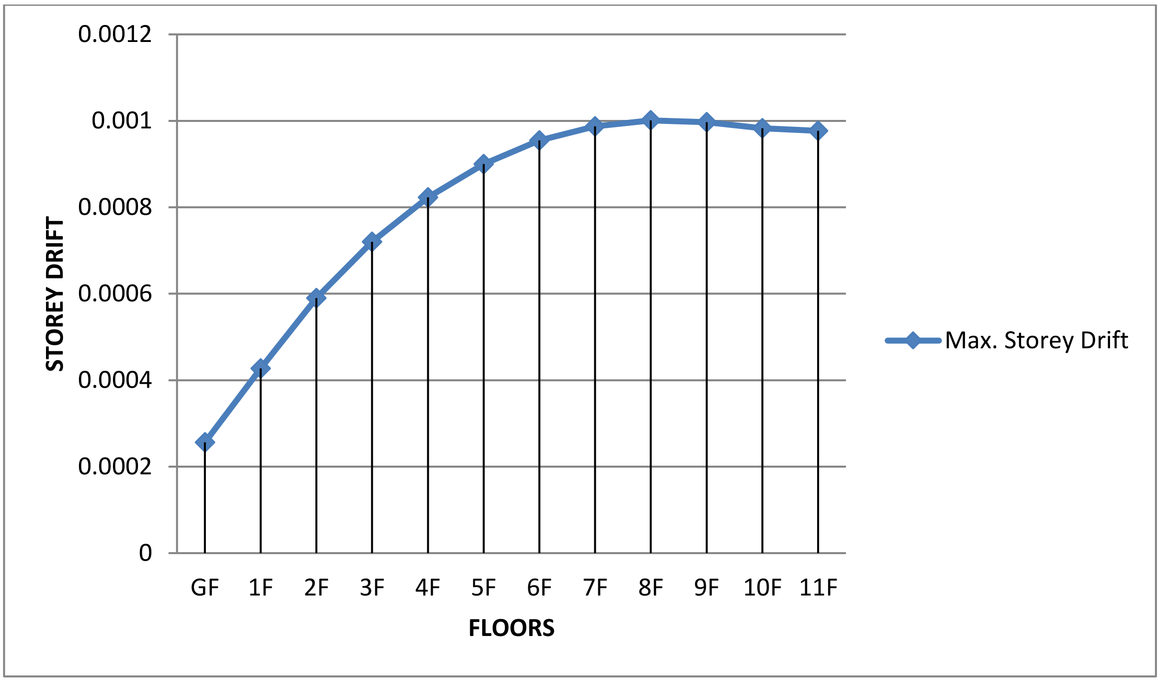

Fig. 4.1.16 Showing maximum storey drift in Y Direction

TABLE: 4.1.16 Story Drifts							
Story	**Load Case/Combo**	**Direction**	**Drift**	**Label**	**X**	**Y**	**Z**
					m	m	m
Story12	1.5(DL+EY)	Y	0.000977	13	15	0	36
Story11	1.5(DL+EY)	Y	0.000983	13	15	0	33
Story10	1.5(DL+EY)	Y	0.000997	16	0	0	30
Story9	1.5(DL+EY)	Y	0.001001	16	0	0	27
Story8	1.5(DL+EY)	Y	0.000987	16	0	0	24
Story7	1.5(DL+EY)	Y	0.000955	16	0	0	21
Story6	1.5(DL+EY)	Y	0.0009	16	0	0	18
Story5	1.5(DL+EY)	Y	0.000823	16	0	0	15
Story4	1.5(DL+EY)	Y	0.00072	16	0	0	12
Story3	1.5(DL+EY)	Y	0.00059	16	0	0	9
Story2	1.5(DL+EY)	Y	0.000427	16	0	0	6
Story1	1.5(DL+EY)	Y	0.000256	2	5	20	3

(IN **Y-DIRECTION** we are getting maximum storey drift for **1.5(DL+EY)** Load combination. The above table is storey response for maximum storey drift in Y-Direction that is **0.001001**).

iii. Conventional slab with Square column

- In X Direction

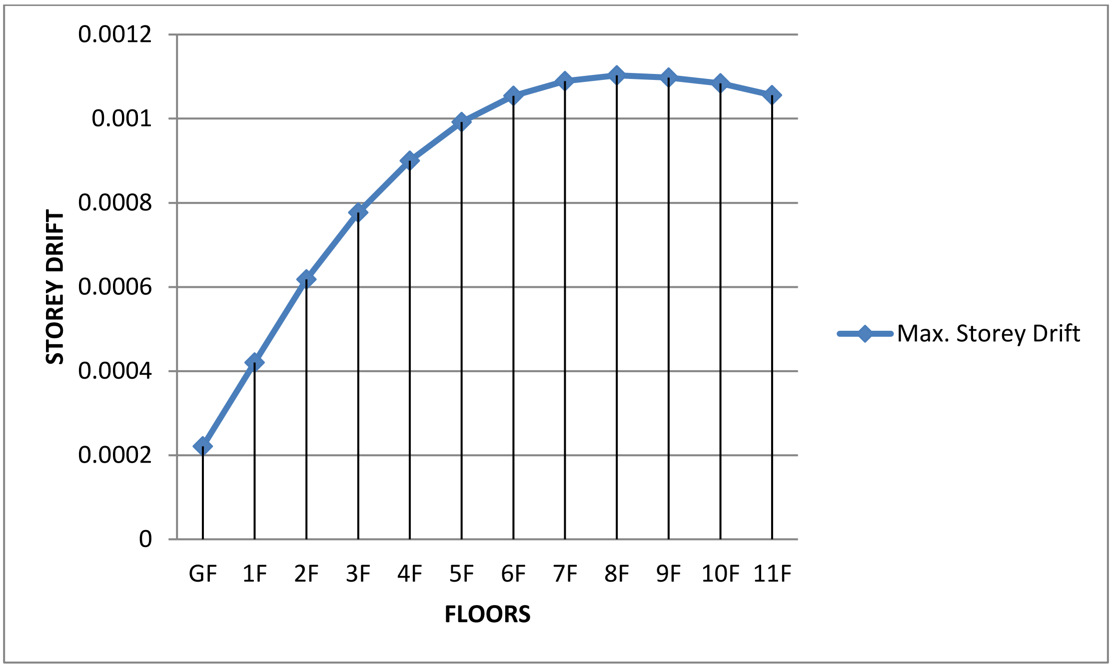

Fig. 4.1.17 Showing maximum storey drift in X Direction

TABLE: 4.1.17
Story Drifts

Story	Load Case/Combo	Direction	Drift	Label	X	Y	Z
					m	m	m
Story12	1.5(DL-EX)	X	0.001056	2	5	20	36
Story11	1.5(DL-EX)	X	0.001084	4	15	20	33
Story10	1.5(DL-EX)	X	0.001098	7	20	20	30
Story9	1.5(DL-EX)	X	0.001103	7	20	20	27
Story8	1.5(DL-EX)	X	0.001089	7	20	20	24
Story7	1.5(DL-EX)	X	0.001054	7	20	20	21
Story6	1.5(DL-EX)	X	0.000992	3	10	20	18
Story5	1.5(DL-EX)	X	0.0009	2	5	20	15
Story4	1.5(DL-EX)	X	0.000777	2	5	20	12
Story3	1.5(DL-EX)	X	0.000618	2	5	20	9
Story2	1.5(DL-EX)	X	0.00042	2	5	20	6
Story1	1.5(DL-EX)	X	0.000221	16	0	0	3

(IN **X-DIRECTION** we are getting maximum storey drift for **1.5(DL-EX)** Load combination. The above table is storey response for maximum storey drift in X-Direction that is **0.001103**).

- In Y Direction

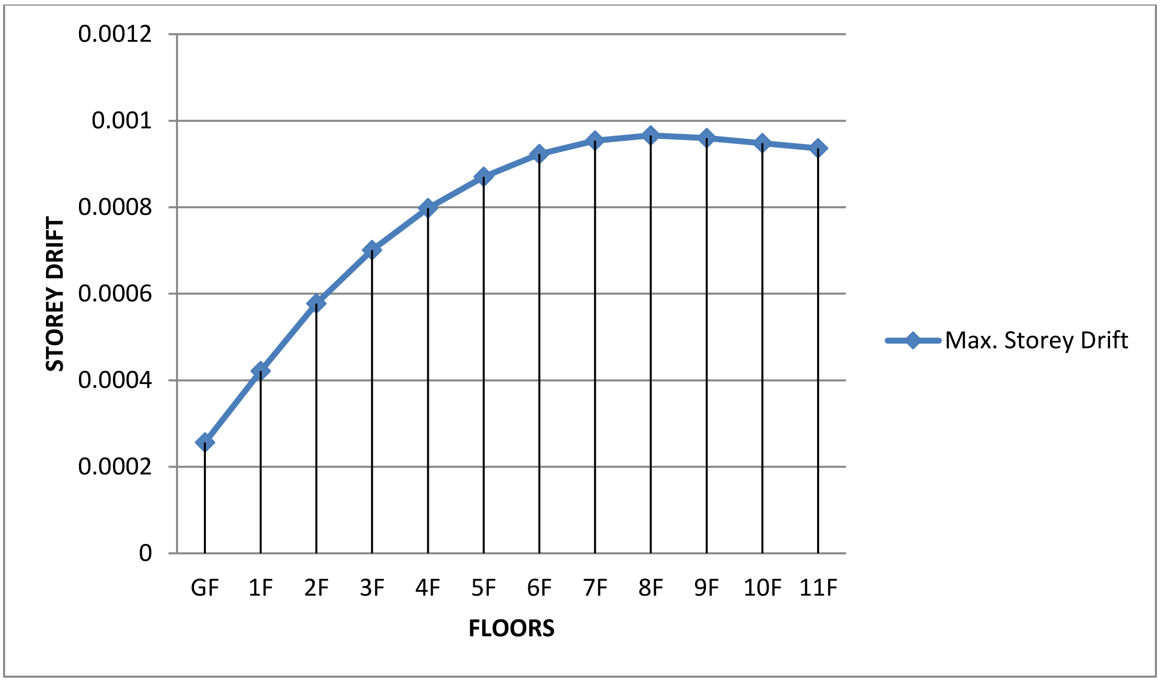

Fig. 4.1.18 Showing maximum storey drift in Y Direction

TABLE: 4.1.18 Story Drifts							
Story	**Load Case/Combo**	**Direction**	**Drift**	**Label**	**X**	**Y**	**Z**
					m	m	m
Story12	1.5(DL+EY)	Y	0.000936	13	15	0	36
Story11	1.5(DL+EY)	Y	0.000948	7	20	20	33
Story10	1.5(DL+EY)	Y	0.00096	7	20	20	30
Story9	1.5(DL+EY)	Y	0.000966	7	20	20	27
Story8	1.5(DL+EY)	Y	0.000954	7	20	20	24
Story7	1.5(DL+EY)	Y	0.000923	7	20	20	21
Story6	1.5(DL+EY)	Y	0.00087	16	0	0	18
Story5	1.5(DL+EY)	Y	0.000798	16	0	0	15
Story4	1.5(DL+EY)	Y	0.000701	16	0	0	12
Story3	1.5(DL+EY)	Y	0.000577	16	0	0	9
Story2	1.5(DL+EY)	Y	0.000421	20	5	15	6
Story1	1.5(DL+EY)	Y	0.000256	14	10	0	3

(IN **Y-DIRECTION** we are getting maximum storey drift for **1.5(DL+EY)** Load combination. The above table is storey response for maximum storey drift in Y-Direction that is **0.000966**).

iv. Flat slab with Circular column

- In X Direction

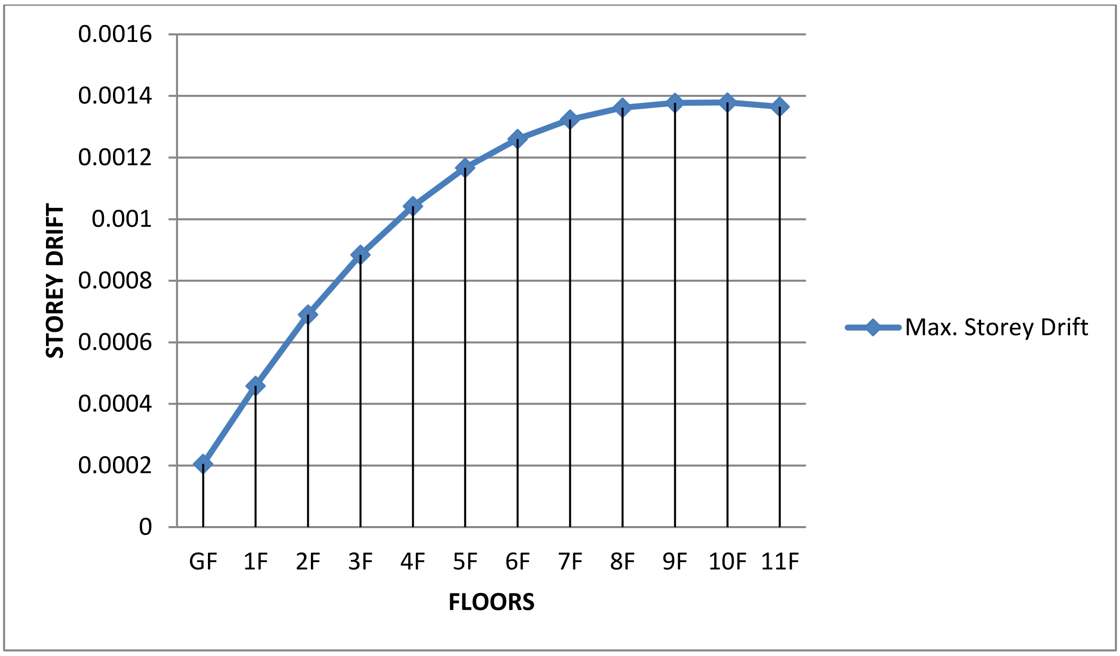

Fig. 4.1.19 Showing maximum storey drift in X Direction

TABLE: 4.1.19
Story Drifts

Story	Load Case/Combo	Direction	Drift	Label	X	Y	Z
					m	m	m
Story12	1.5(DL-EX)	X	0.001365	3	10	20	36
Story11	1.5(DL-EX)	X	0.001379	4	15	20	33
Story10	1.5(DL-EX)	X	0.001378	7	20	20	30
Story9	1.5(DL-EX)	X	0.001362	7	20	20	27
Story8	1.5(DL-EX)	X	0.001324	7	20	20	24
Story7	1.5(DL-EX)	X	0.00126	7	20	20	21
Story6	1.5(DL-EX)	X	0.001167	2	5	20	18
Story5	1.5(DL-EX)	X	0.001042	2	5	20	15
Story4	1.5(DL-EX)	X	0.000884	2	5	20	12
Story3	1.5(DL-EX)	X	0.00069	2	5	20	9
Story2	1.5(DL-EX)	X	0.000458	2	5	20	6
Story1	1.5(DL-EX)	X	0.000205	7	20	20	3

(IN **X-DIRECTION** we are getting maximum storey drift for **1.5(DL-EX)** Load combination. The above table is storey response for maximum storey drift in X-Direction that is **0.001379**).

- In Y Direction

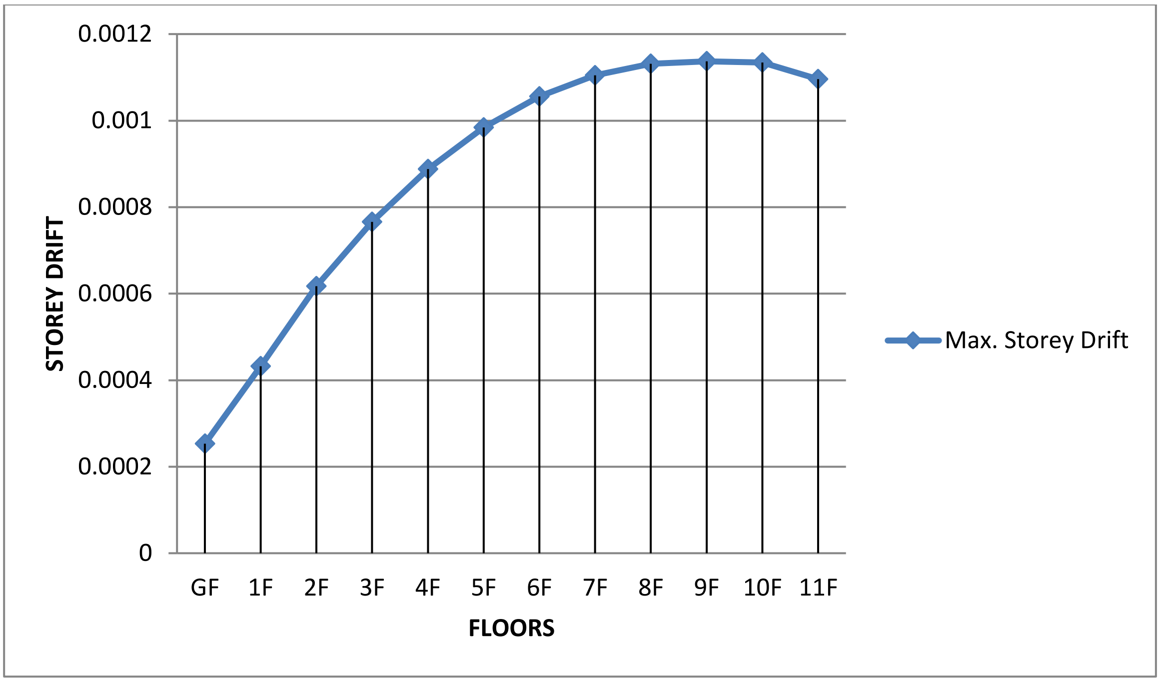

Fig. 4.1.20 Showing maximum storey drift in Y Direction

TABLE: 4.1.20 Story Drifts							
Story	**Load Case/Combo**	**Direction**	**Drift**	**Label**	**X**	**Y**	**Z**
					m	m	m
Story12	1.5(DL+EY)	Y	0.001096	11	20	0	36
Story11	1.5(DL+EY)	Y	0.001134	7	20	20	33
Story10	1.5(DL+EY)	Y	0.001137	7	20	20	30
Story9	1.5(DL+EY)	Y	0.001131	7	20	20	27
Story8	1.5(DL+EY)	Y	0.001105	7	20	20	24
Story7	1.5(DL+EY)	Y	0.001056	7	20	20	21
Story6	1.5(DL+EY)	Y	0.000984	7	20	20	18
Story5	1.5(DL+EY)	Y	0.000888	7	20	20	15
Story4	1.5(DL+EY)	Y	0.000766	7	20	20	12
Story3	1.5(DL+EY)	Y	0.000617	7	20	20	9
Story2	1.5(DL+EY)	Y	0.000432	11	20	0	6
Story1	1.5(DL+EY)	Y	0.000253	14	10	0	3

(IN **Y-DIRECTION** we are getting maximum storey drift for **1.5(DL+EY)** Load combination. The above table is storey response for maximum storey drift in Y-Direction that is **0.001137**).

v. Flat slab with Rectangle

- In X Direction

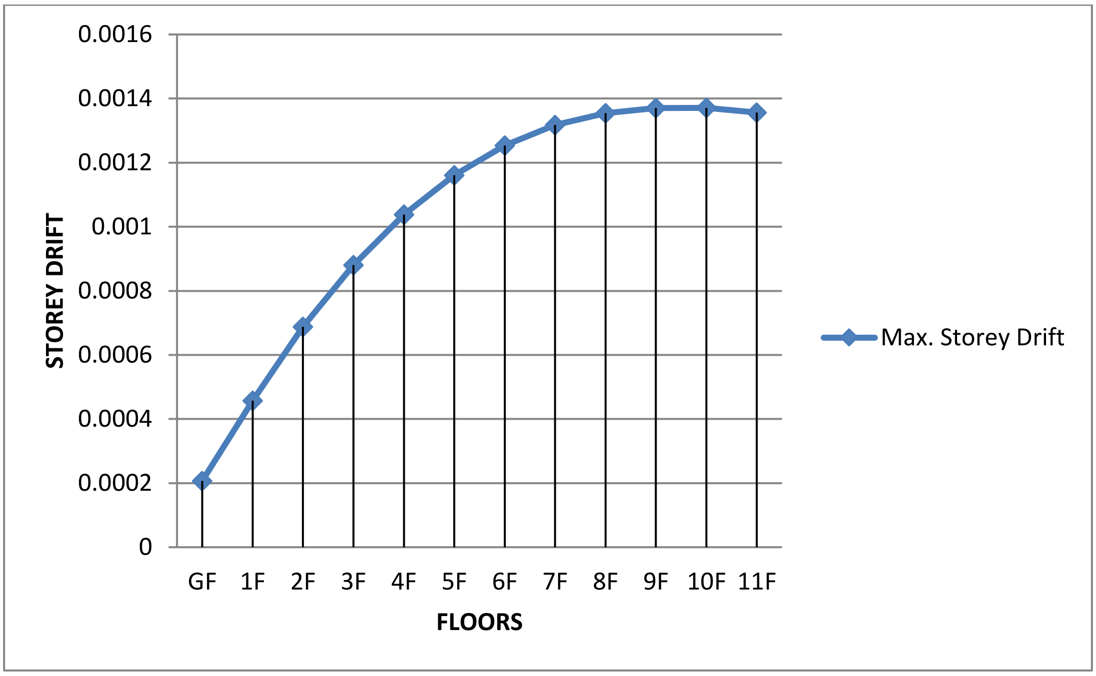

Fig. 4.1.21 Showing maximum storey drift in X Direction

TABLE: 4.1.21 Story Drifts							
Story	**Load Case/Combo**	**Direction**	**Drift**	**Label**	**X**	**Y**	**Z**
					m	m	m
Story12	1.5(DL-EX)	X	0.001356	3	10	20	36
Story11	1.5(DL-EX)	X	0.001371	4	15	20	33
Story10	1.5(DL-EX)	X	0.00137	7	20	20	30
Story9	1.5(DL-EX)	X	0.001354	7	20	20	27
Story8	1.5(DL-EX)	X	0.001317	7	20	20	24
Story7	1.5(DL-EX)	X	0.001254	7	20	20	21
Story6	1.5(DL-EX)	X	0.001161	2	5	20	18
Story5	1.5(DL-EX)	X	0.001038	2	5	20	15
Story4	1.5(DL-EX)	X	0.00088	2	5	20	12
Story3	1.5(DL-EX)	X	0.00068	2	5	20	9

			8				
Story2	1.5(DL-EX)	X	0.000457	2	5	20	6
Story1	1.5(DL-EX)	X	0.000207	7	20	20	3

(IN **X-DIRECTION** we are getting maximum storey drift for **1.5(DL-EX)** Load combination. The above table is storey response for maximum storey drift in X-Direction that is **0.001371**).

- In Y Direction

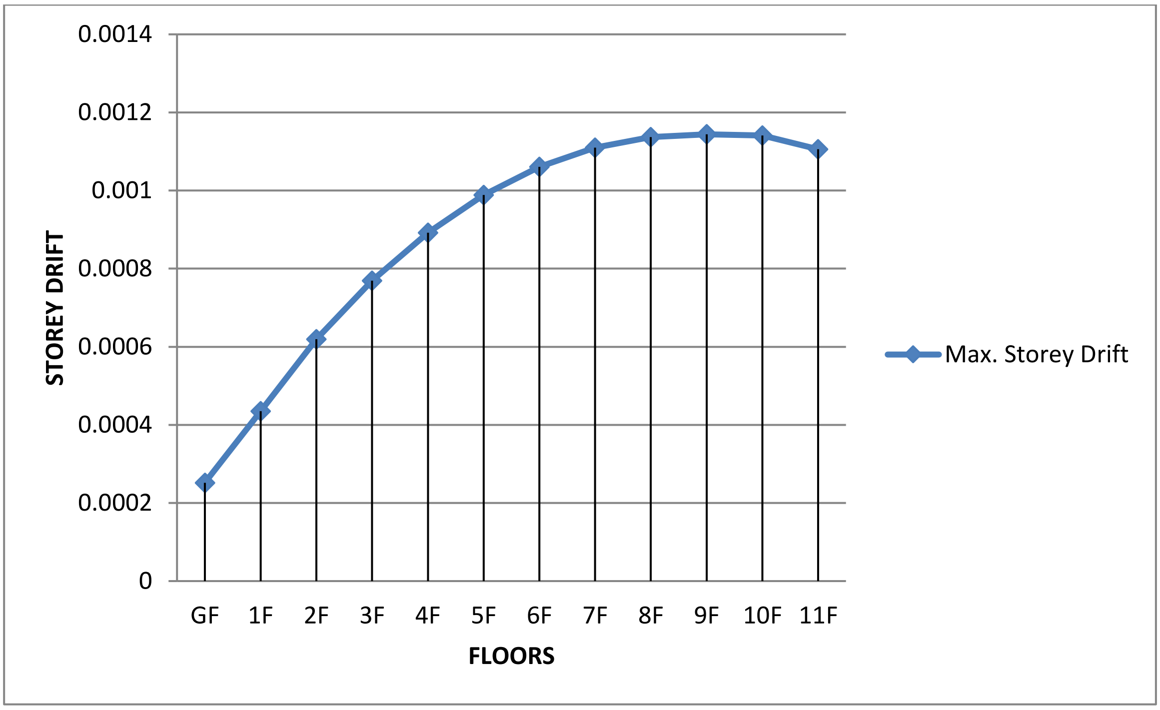

Fig. 4.1.22 Showing maximum storey drift in Y Direction

TABLE: 4.1.22 Story Drifts							
Story	**Load Case/Combo**	**Direction**	**Drift**	**Label**	**X**	**Y**	**Z**
					m	m	m
Story12	1.5(DL+EY)	Y	0.001106	11	20	0	36
Story11	1.5(DL+EY)	Y	0.001141	7	20	20	33
Story10	1.5(DL+EY)	Y	0.001144	7	20	20	30
Story9	1.5(DL+EY)	Y	0.001137	7	20	20	27

Story8	1.5(DL+EY)	Y	0.00111	7	20	20	24
Story7	1.5(DL+EY)	Y	0.001061	7	20	20	21
Story6	1.5(DL+EY)	Y	0.000989	7	20	20	18
Story5	1.5(DL+EY)	Y	0.000892	7	20	20	15
Story4	1.5(DL+EY)	Y	0.000769	7	20	20	12
Story3	1.5(DL+EY)	Y	0.000619	7	20	20	9
Story2	1.5(DL+EY)	Y	0.000435	11	20	0	6
Story1	1.5(DL+EY)	Y	0.000252	14	10	0	3

(IN **Y-DIRECTION** we are getting maximum storey drift for **1.5(DL+EY)** Load combination. The above table is storey response for maximum storey drift in Y-Direction that is **0.001144**).

vi. Flat slab with Square column

- In X Direction

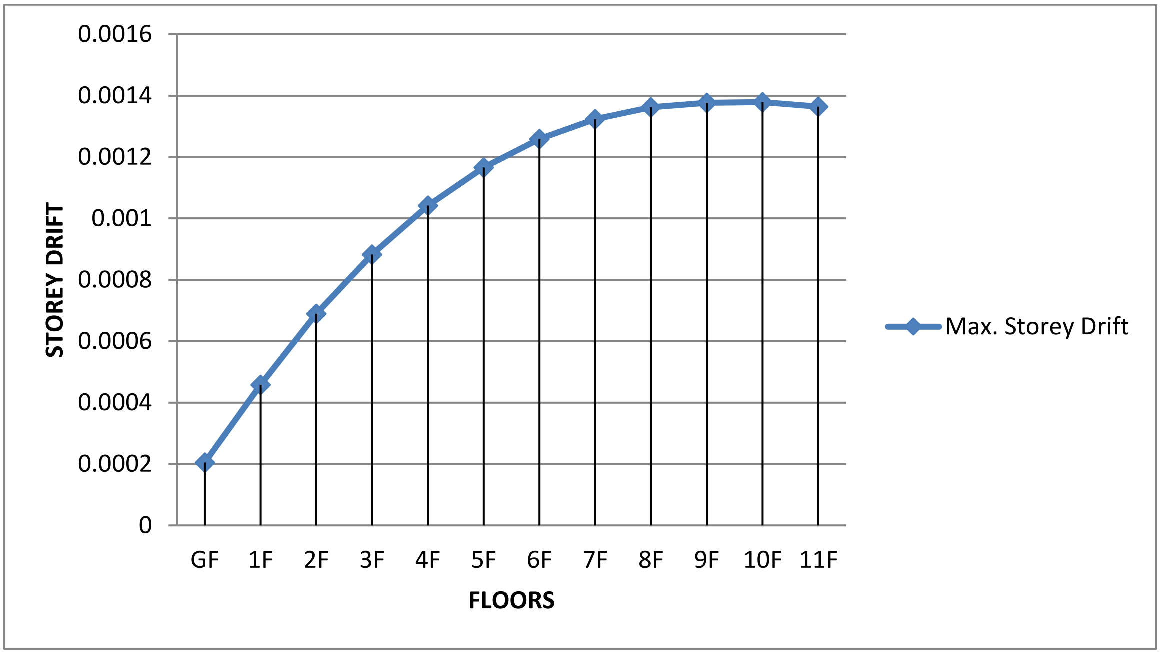

Fig. 4.1.23 Showing maximum storey drift in X Direction

TABLE: 4.1.23
Story Drifts

Story	Load Case/Combo	Direction	Drift	Label	X	Y	Z
					m	m	m
Story12	1.5(DL-EX)	X	0.001364	3	10	20	36
Story11	1.5(DL-EX)	X	0.001379	4	15	20	33
Story10	1.5(DL-EX)	X	0.001377	7	20	20	30
Story9	1.5(DL-EX)	X	0.001362	7	20	20	27
Story8	1.5(DL-EX)	X	0.001324	7	20	20	24
Story7	1.5(DL-EX)	X	0.001259	7	20	20	21
Story6	1.5(DL-EX)	X	0.001166	2	5	20	18
Story5	1.5(DL-EX)	X	0.001042	2	5	20	15
Story4	1.5(DL-EX)	X	0.000883	2	5	20	12
Story3	1.5(DL-EX)	X	0.00069	2	5	20	9
Story2	1.5(DL-EX)	X	0.000458	2	5	20	6
Story1	1.5(DL-EX)	X	0.000205	7	20	20	3

(IN **X-DIRECTION** we are getting maximum storey drift for **1.5(DL-EX)** Load combination. The above table is storey response for maximum storey drift in X-Direction that is **0.001379**).

- In Y Direction

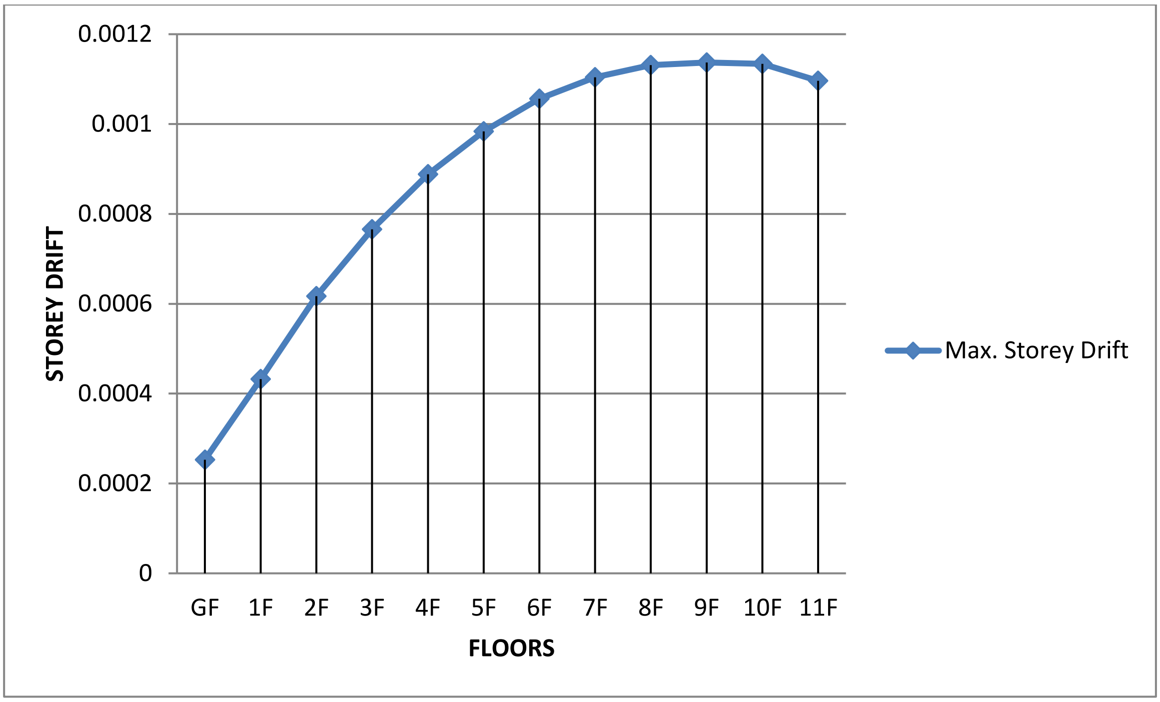

Fig. 4.1.24 Showing maximum storey drift in Y Direction

TABLE: 4.1.24 Story Drifts							
Story	**Load Case/Combo**	**Direction**	**Drift**	**Label**	**X**	**Y**	**Z**
					m	m	m
Story12	1.5(DL+EY)	Y	0.001096	11	20	0	36
Story11	1.5(DL+EY)	Y	0.001134	7	20	20	33
Story10	1.5(DL+EY)	Y	0.001137	7	20	20	30
Story9	1.5(DL+EY)	Y	0.001131	7	20	20	27
Story8	1.5(DL+EY)	Y	0.001104	7	20	20	24
Story7	1.5(DL+EY)	Y	0.001056	7	20	20	21
Story6	1.5(DL+EY)	Y	0.000984	7	20	20	18
Story5	1.5(DL+EY)	Y	0.000888	7	20	20	15
Story4	1.5(DL+EY)	Y	0.000766	7	20	20	12
Story3	1.5(DL+EY)	Y	0.000617	7	20	20	9
Story2	1.5(DL+EY)	Y	0.000432	11	20	0	6
Story1	1.5(DL+EY)	Y	0.000253	14	10	0	3

(IN **Y-DIRECTION** we are getting maximum storey drift for **1.5(DL+EY)** Load combination. The above table is storey response for maximum storey drift in Y-Direction that is **0.001137**).

III. Max. and Min. Storey Shear

i. Conventional slab with Circular column

- In X Direction

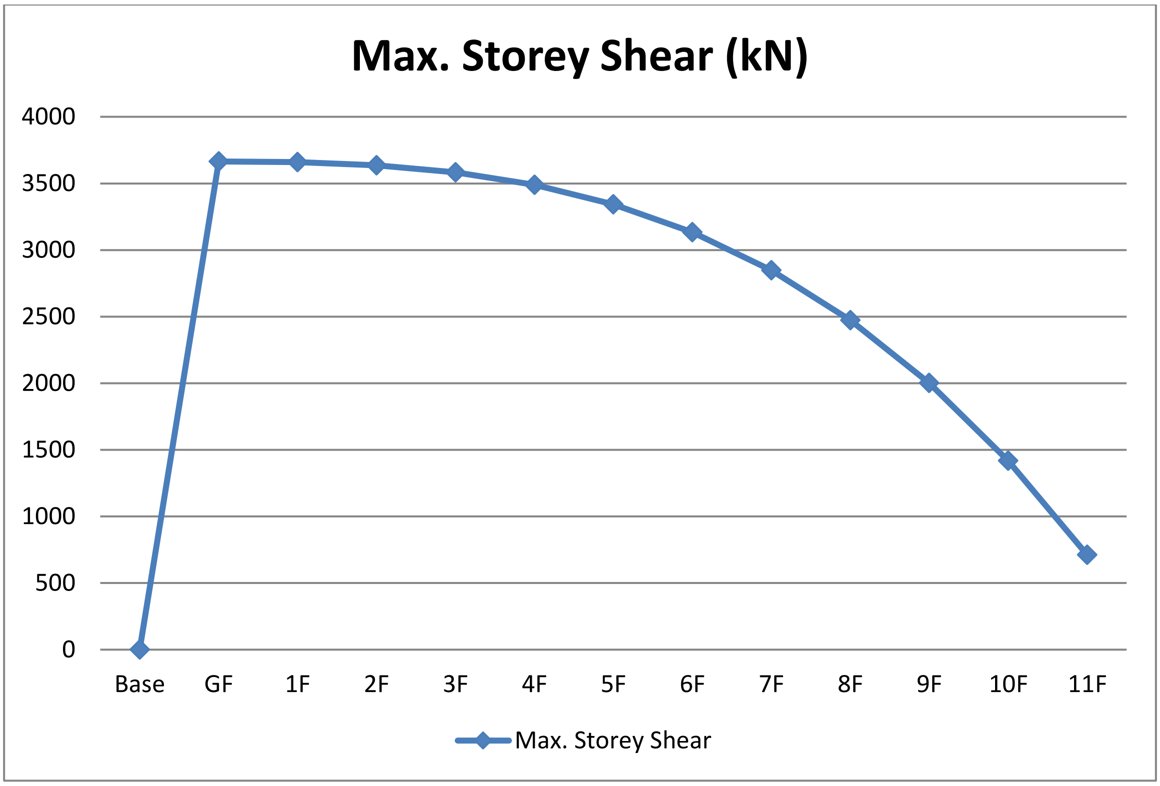

Fig. 4.1.25 Showing maximum storey shear in X Direction

TABLE: 4.1.25
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
Story12	36	Top	710.8131	0
		Bottom	710.8131	0
Story11	33	Top	1417.1885	0
		Bottom	1417.1885	0
Story10	30	Top	2000.9699	0
		Bottom	2000.9699	0
Story9	27	Top	2473.8328	0
		Bottom	2473.8328	0
Story8	24	Top	2847.4528	0
		Bottom	2847.4528	0
Story7	21	Top	3133.5057	0
		Bottom	3133.5057	0

Story6	18	Top	3343.667	0
		Bottom	3343.667	0
Story5	15	Top	3489.6123	0
		Bottom	3489.6123	0
Story4	12	Top	3583.0173	0
		Bottom	3583.0173	0
Story3	9	Top	3635.5576	0
		Bottom	3635.5576	0
Story2	6	Top	3658.9089	0
		Bottom	3658.9089	0
Story1	3	Top	3664.7407	0
		Bottom	3664.7407	0
Base	0	Top	0	0
		Bottom	0	0

(IN **X-DIRECTION** we are getting maximum storey shear for **1.5(DL-EX) & 1.5(DL+EX)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3665 KN**).

- In Y Direction

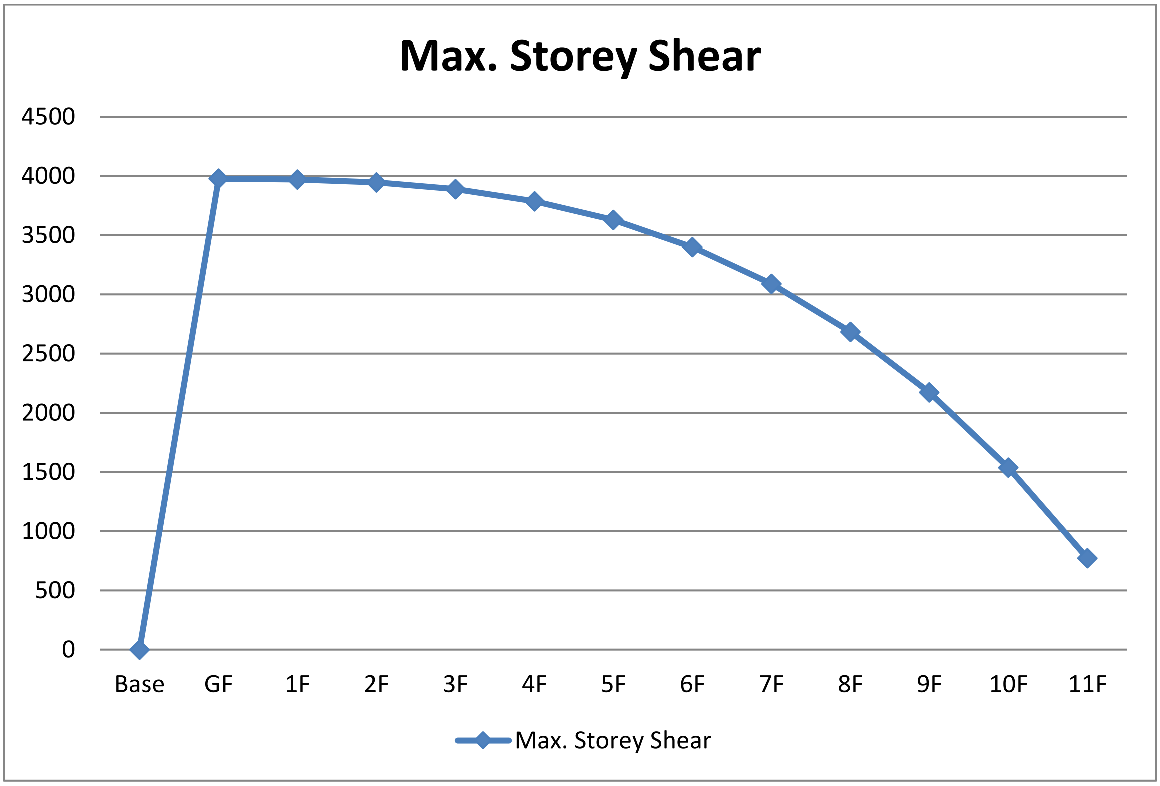

Fig. 4.1.26 Showing maximum storey shear in Y Direction

TABLE: 4.1.26 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN	kN
Story12	36	Top	0	-771.386
		Bottom	0	-771.386
Story11	33	Top	0	-1537.96
		Bottom	0	-1537.96
Story10	30	Top	0	-2171.49
		Bottom	0	-2171.49
Story9	27	Top	0	-2684.64
		Bottom	0	-2684.64
Story8	24	Top	0	-3090.1
		Bottom	0	-3090.1
Story7	21	Top	0	-3400.53
		Bottom	0	-3400.53
Story6	18	Top	0	-3628.6
		Bottom	0	-3628.6
Story5	15	Top	0	-3786.98
		Bottom	0	-3786.98
Story4	12	Top	0	-3888.35
		Bottom	0	-3888.35
Story3	9	Top	0	-3945.37
		Bottom	0	-3945.37
Story2	6	Top	0	-3970.71
		Bottom	0	-3970.71
Story1	3	Top	0	-3977.04
		Bottom	0	-3977.04
Base	0	Top	0	0

		Bottom	0	0

(IN **Y-DIRECTION** we are getting maximum storey shear for **1.5(DL-EY) & 1.5(DL+EY)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3977 KN**).

ii. Conventional slab with Rectangular column

- In X Direction

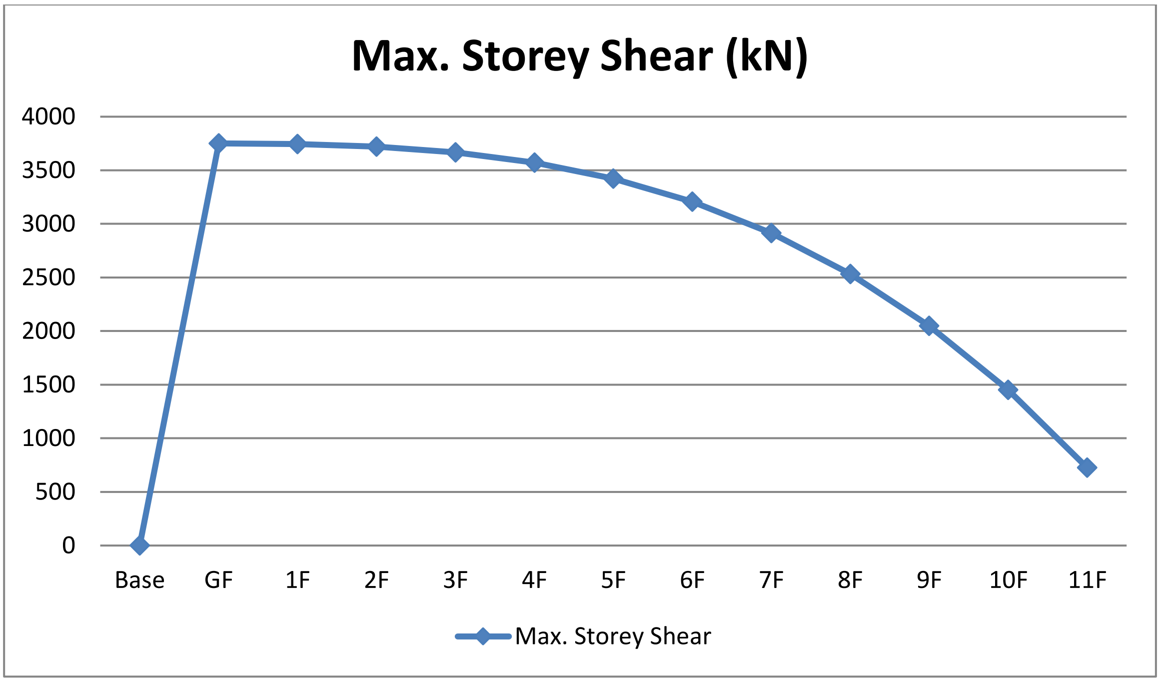

Fig. 4.1.27 Showing maximum storey shear in X Direction

TABLE: 4.1.27
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
Story12	36	Top	-727.798	0
		Bottom	-727.798	0
Story11	33	Top	-1450.7383	0
		Bottom	-1450.7383	0
Story10	30	Top	-2048.2097	0
		Bottom	-2048.2097	0

Story9	27	Top	-2532.1615	0
		Bottom	-2532.1615	0
Story8	24	Top	-2914.5432	0
		Bottom	-2914.5432	0
Story7	21	Top	-3207.3041	0
		Bottom	-3207.3041	0
Story6	18	Top	-3422.3938	0
		Bottom	-3422.3938	0
Story5	15	Top	-3571.7616	0
		Bottom	-3571.7616	0
Story4	12	Top	-3667.3571	0
		Bottom	-3667.3571	0
Story3	9	Top	-3721.1295	0
		Bottom	-3721.1295	0
Story2	6	Top	-3745.0283	0
		Bottom	-3745.0283	0
Story1	3	Top	-3750.9965	0
		Bottom	-3750.9965	0
Base	0	Top	0	0
		Bottom	0	0

(IN **X-DIRECTION** we are getting maximum storey shear for **1.5(DL-EX) & 1.5(DL+EX)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3751 KN**).

- In Y Direction

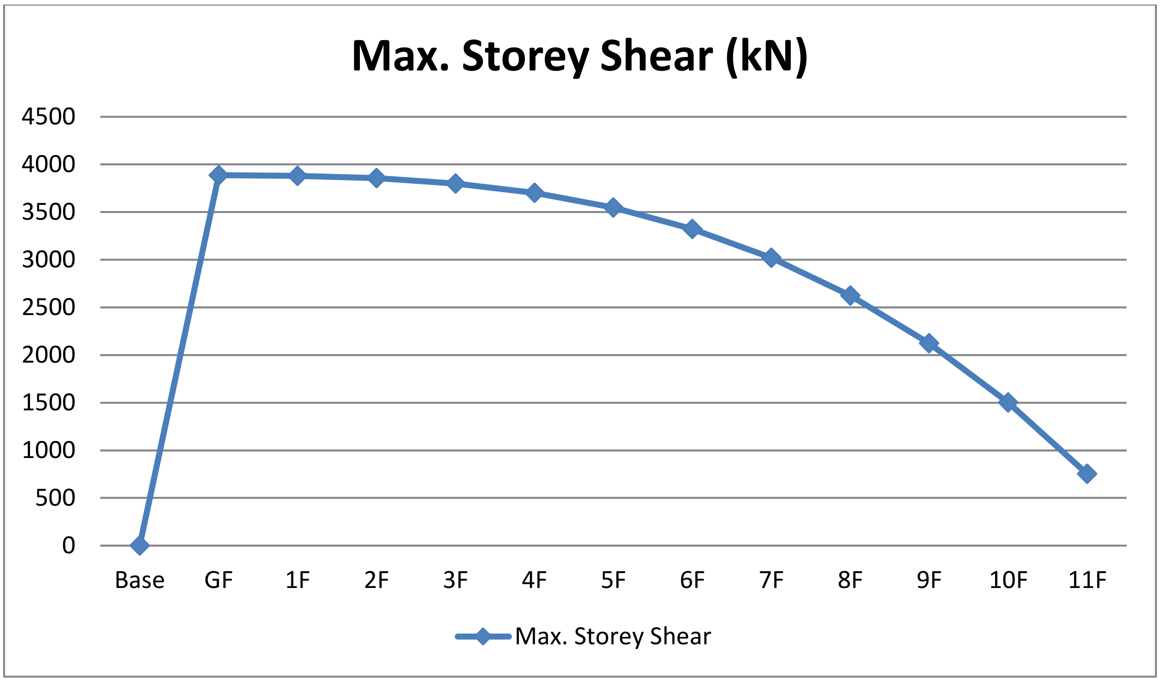

Fig. 4.1.28 Showing maximum storey shear in Y Direction

TABLE: 4.1.28 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN	kN
Story12	36	Top	0	-754.325
		Bottom	0	-754.325
Story11	33	Top	0	-1503.62
		Bottom	0	-1503.62
Story10	30	Top	0	-2122.86
		Bottom	0	-2122.86
Story9	27	Top	0	-2624.46
		Bottom	0	-2624.46
Story8	24	Top	0	-3020.77
		Bottom	0	-3020.77
Story7	21	Top	0	-3324.21

		Bottom	0	-3324.21
Story6	18	Top	0	-3547.14
		Bottom	0	-3547.14
Story5	15	Top	0	-3701.95
		Bottom	0	-3701.95
Story4	12	Top	0	-3801.03
		Bottom	0	-3801.03
Story3	9	Top	0	-3856.76
		Bottom	0	-3856.76
Story2	6	Top	0	-3881.53
		Bottom	0	-3881.53
Story1	3	Top	0	-3887.72
		Bottom	0	-3887.72
Base	0	Top	0	0
		Bottom	0	0

(IN **Y-DIRECTION** we are getting maximum storey shear for **1.5(DL-EY) & 1.5(DL+EY)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3888 KN**).

iii. Conventional slab with Square column

- In X Direction

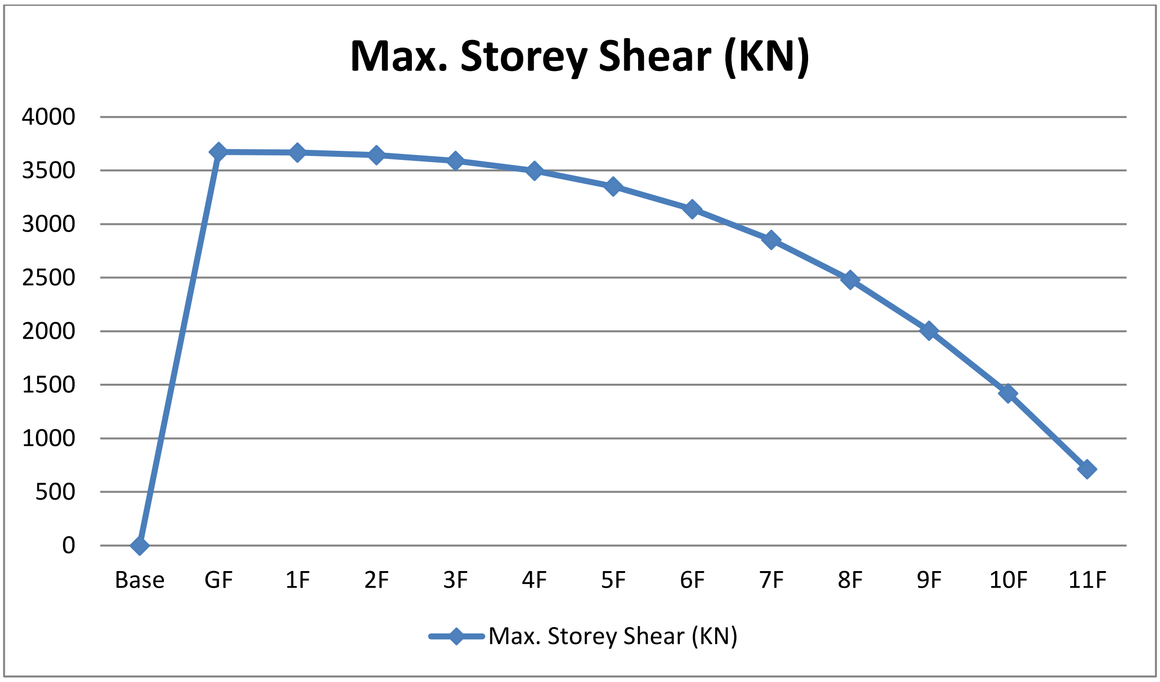

Fig. 4.1.29 Showing maximum storey shear in X Direction

TABLE: 4.1.29 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN	kN
Story12	36	Top	-712.7488	0
		Bottom	-712.7488	0
Story11	33	Top	-1420.7584	0
		Bottom	-1420.7584	0
Story10	30	Top	-2005.8902	0
		Bottom	-2005.8902	0
Story9	27	Top	-2479.8471	0
		Bottom	-2479.8471	0
Story8	24	Top	-2854.3315	0
		Bottom	-2854.3315	0
Story7	21	Top	-	0

			3141.0461	
		Bottom	-3141.0461	0
Story6	18	Top	-3351.6936	0
		Bottom	-3351.6936	0
Story5	15	Top	-3497.9766	0
		Bottom	-3497.9766	0
Story4	12	Top	-3591.5977	0
		Bottom	-3591.5977	0
Story3	9	Top	-3644.2595	0
		Bottom	-3644.2595	0
Story2	6	Top	-3667.6648	0
		Bottom	-3667.6648	0
Story1	3	Top	-3673.5093	0
		Bottom	-3673.5093	0
Base	0	Top	0	0
		Bottom	0	0

(IN **X-DIRECTION** we are getting maximum storey shear for **1.5(DL-EX) & 1.5(DL+EX)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3674 KN**).

- In Y Direction

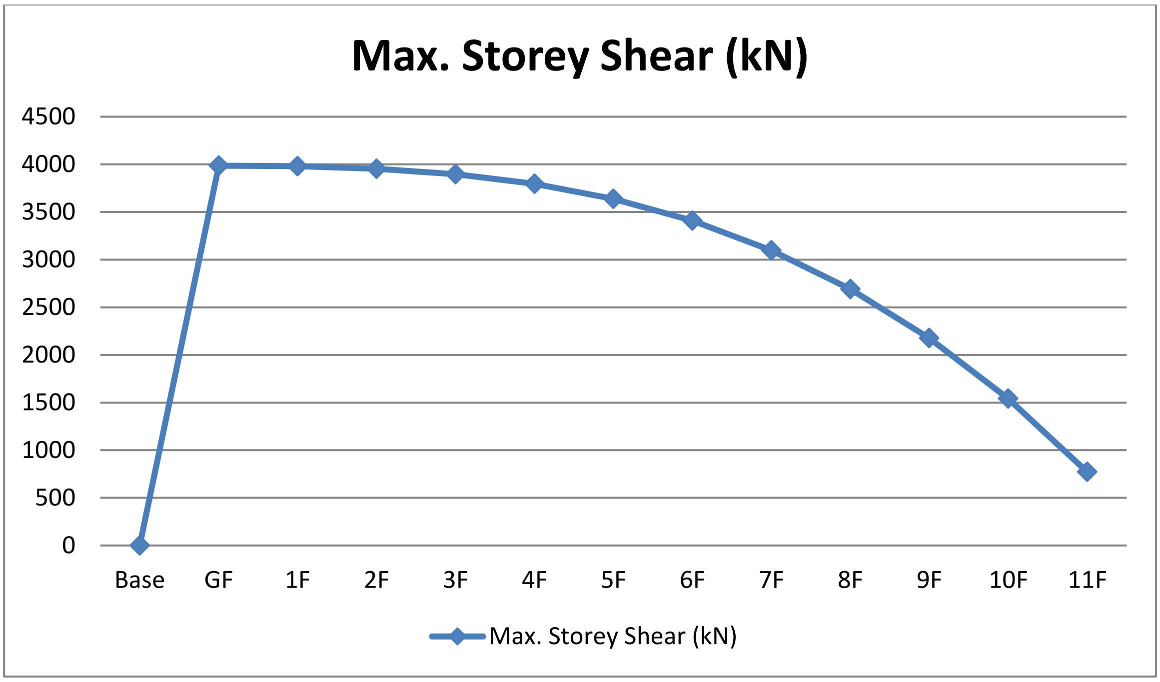

Fig. 4.1.30 Showing maximum storey shear in Y Direction

TABLE: 4.1.30 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN	kN
Story12	36	Top	0	-773.315
		Bottom	0	-773.315
Story11	33	Top	0	-1541.49
		Bottom	0	-1541.49
Story10	30	Top	0	-2176.34
		Bottom	0	-2176.34
Story9	27	Top	0	-2690.57
		Bottom	0	-2690.57
Story8	24	Top	0	-3096.88
		Bottom	0	-3096.88
Story7	21	Top	0	-3407.96

		Bottom	0	-3407.96
Story6	18	Top	0	-3636.51
		Bottom	0	-3636.51
Story5	15	Top	0	-3795.22
		Bottom	0	-3795.22
Story4	12	Top	0	-3896.8
		Bottom	0	-3896.8
Story3	9	Top	0	-3953.93
		Bottom	0	-3953.93
Story2	6	Top	0	-3979.33
		Bottom	0	-3979.33
Story1	3	Top	0	-3985.67
		Bottom	0	-3985.67
Base	0	Top	0	0
		Bottom	0	0

(IN **Y-DIRECTION** we are getting maximum storey shear for **1.5(DL-EY) & 1.5(DL+EY)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3986 KN**).

iv. Flat slab with Circular column

- In X Direction

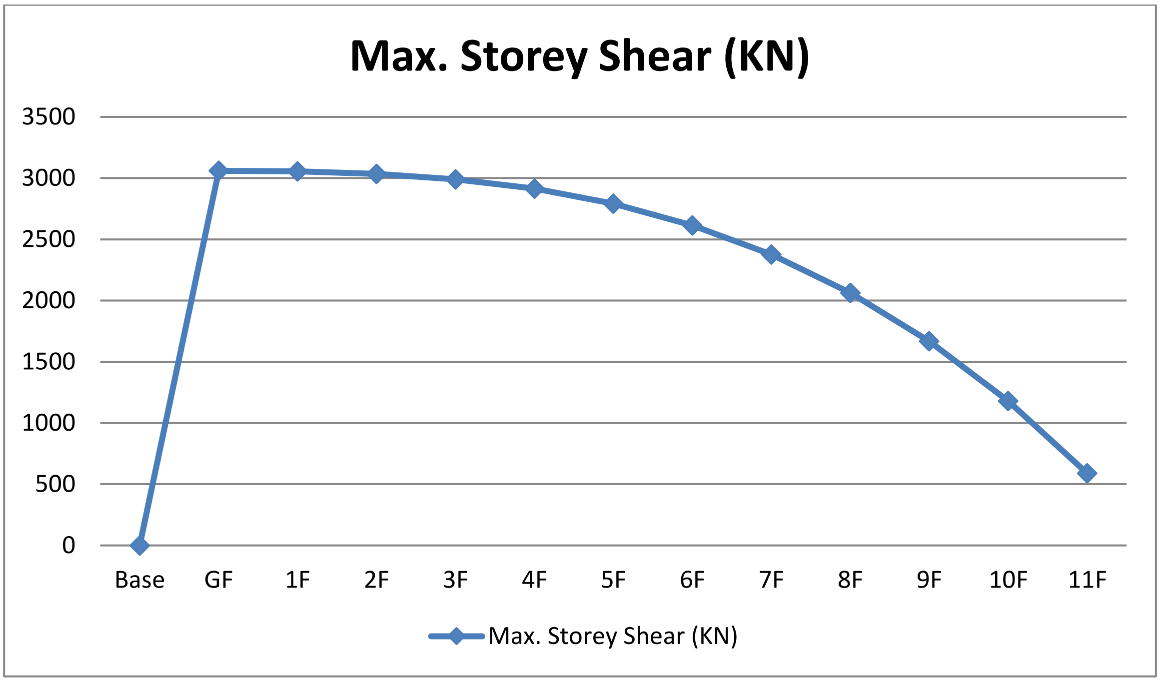

Fig. 4.1.31 Showing maximum storey shear in X Direction

TABLE: 4.1.31 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN	kN
Story12	36	Top	-588.7143	0
		Bottom	-588.7143	0
Story11	33	Top	-1179.6331	0
		Bottom	-1179.6331	0
Story10	30	Top	-1667.9957	0
		Bottom	-1667.9957	0
Story9	27	Top	-2063.5695	0
		Bottom	-2063.5695	0
Story8	24	Top	-2376.1216	0
		Bottom	-2376.1216	0
Story7	21	Top	-	0

			2615.4193	
		Bottom	-2615.4193	0
Story6	18	Top	-2791.2298	0
		Bottom	-2791.2298	0
Story5	15	Top	-2913.3205	0
		Bottom	-2913.3205	0
Story4	12	Top	-2991.4585	0
		Bottom	-2991.4585	0
Story3	9	Top	-3035.4111	0
		Bottom	-3035.4111	0
Story2	6	Top	-3054.9456	0
		Bottom	-3054.9456	0
Story1	3	Top	-3059.8173	0
		Bottom	-3059.8173	0
Base	0	Top	0	0
		Bottom	0	0

(IN **X-DIRECTION** we are getting maximum storey shear for **1.5(DL-EX) & 1.5(DL+EX)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3060 KN**).

- In Y Direction

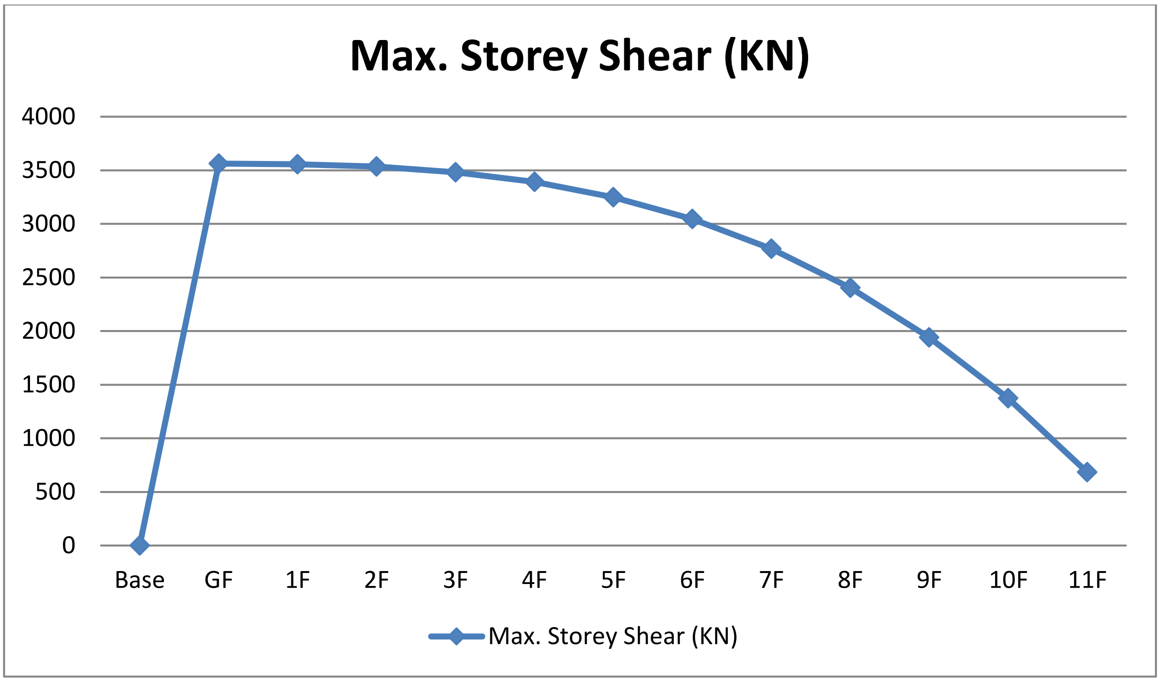

Fig. 4.1.32 Showing maximum storey shear in Y Direction

TABLE: 4.1.32
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		kN	kN
Story12	36	Top	0	-685.435
		Bottom	0	-685.435
Story11	33	Top	0	-1373.44
		Bottom	0	-1373.44
Story10	30	Top	0	-1942.03
		Bottom	0	-1942.03
Story9	27	Top	0	-2402.6
		Bottom	0	-2402.6
Story8	24	Top	0	-2766.5
		Bottom	0	-2766.5
Story7	21	Top	0	-3045.11
		Bottom	0	-3045.11
Story6	18	Top	0	-3249.8

		Bottom	0	-3249.8
Story5	15	Top	0	-3391.95
		Bottom	0	-3391.95
Story4	12	Top	0	-3482.93
		Bottom	0	-3482.93
Story3	9	Top	0	-3534.1
		Bottom	0	-3534.1
Story2	6	Top	0	-3556.85
		Bottom	0	-3556.85
Story1	3	Top	0	-3562.52
		Bottom	0	-3562.52
Base	0	Top	0	0
		Bottom	0	0

(IN **Y-DIRECTION** we are getting maximum storey shear for **1.5(DL-EY) & 1.5(DL+EY)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3563 KN**).

v. Flat slab with Rectangular slab

- In X Direction

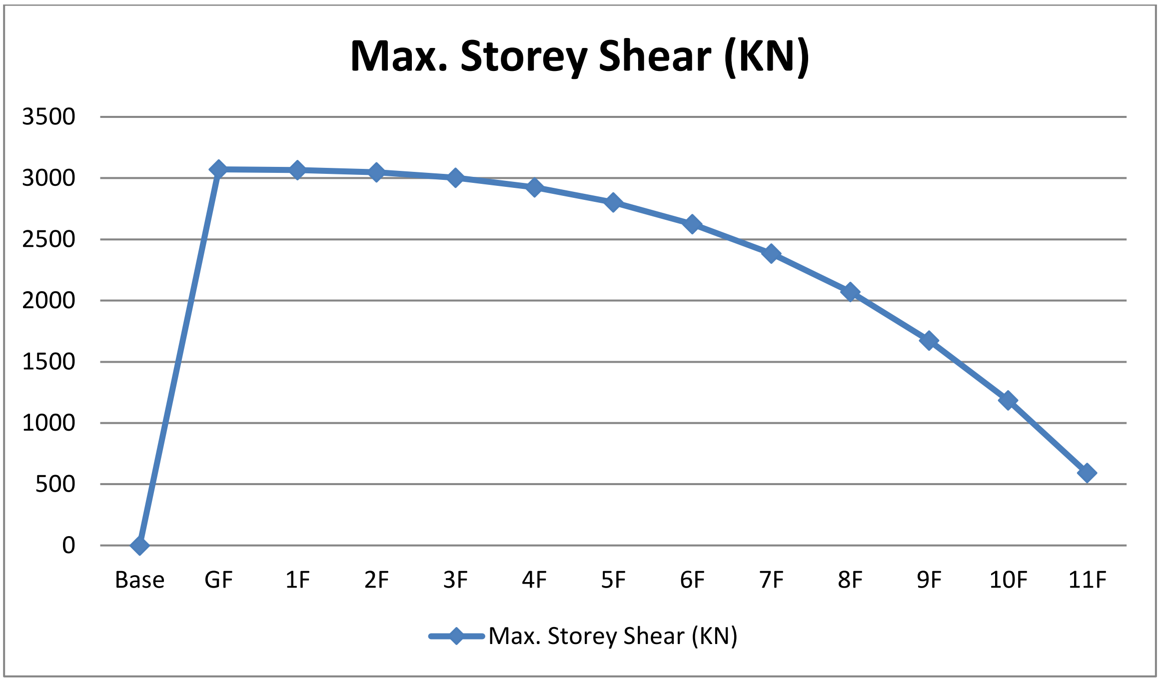

Fig. 4.1.33 Showing maximum storey shear in X Direction

TABLE: 4.1.33 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN	kN
Story12	36	Top	-591.0843	0
		Bottom	-591.0843	0
Story11	33	Top	-1184.2772	0
		Bottom	-1184.2772	0
Story10	30	Top	-1674.5192	0
		Bottom	-1674.5192	0
Story9	27	Top	-2071.6153	0
		Bottom	-2071.6153	0
Story8	24	Top	-2385.3702	0
		Bottom	-2385.3702	0
Story7	21	Top	-	0

			2625.5888	
		Bottom	-2625.5888	0
Story6	18	Top	-2802.0759	0
		Bottom	-2802.0759	0
Story5	15	Top	-2924.6364	0
		Bottom	-2924.6364	0
Story4	12	Top	-3003.0752	0
		Bottom	-3003.0752	0
Story3	9	Top	-3047.197	0
		Bottom	-3047.197	0
Story2	6	Top	-3066.8066	0
		Bottom	-3066.8066	0
Story1	3	Top	-3071.6972	0
		Bottom	-3071.6972	0
Base	0	Top	0	0
		Bottom	0	0

(IN **X-DIRECTION** we are getting maximum storey shear for **1.5(DL-EX) & 1.5(DL+EX)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3072 KN**).

- In Y Direction

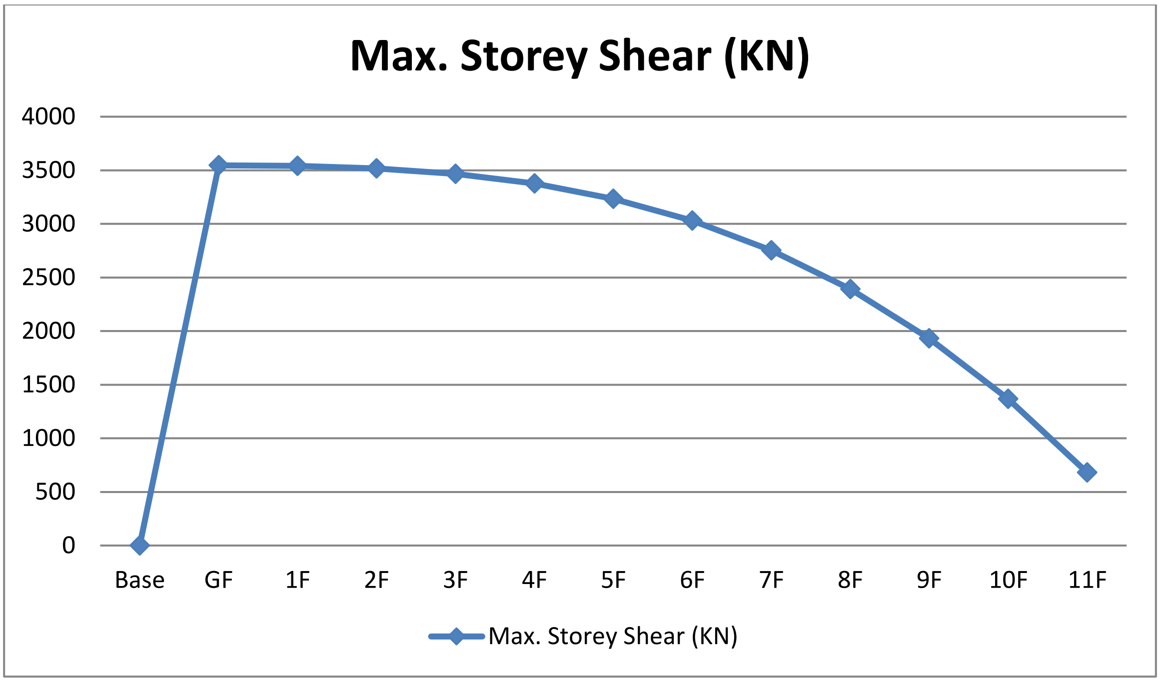

Fig. 4.1.34 Showing maximum storey shear in Y Direction

TABLE: 4.1.34 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN	kN
Story12	36	Top	0	-682.3636
		Bottom	0	-682.3636
Story11	33	Top	0	-1367.1614
		Bottom	0	-1367.1614
Story10	30	Top	0	-1933.11
		Bottom	0	-1933.11
Story9	27	Top	0	-2391.5284
		Bottom	0	-2391.5284
Story8	24	Top	0	-2753.7355
		Bottom	0	-2753.7355
Story7	21	Top	0	-3031.0503
		Bottom	0	-3031.0503
Story6	18	Top	0	-3234.7918

		Bottom	0	-3234.7918
Story5	15	Top	0	-3376.2789
		Bottom	0	-3376.2789
Story4	12	Top	0	-3466.8307
		Bottom	0	-3466.8307
Story3	9	Top	0	-3517.7661
		Bottom	0	-3517.7661
Story2	6	Top	0	-3540.404
		Bottom	0	-3540.404
Story1	3	Top	0	-3546.0497
		Bottom	0	-3546.0497
Base	0	Top	0	0
		Bottom	0	0

(IN **Y-DIRECTION** we are getting maximum storey shear for **1.5(DL-EY) & 1.5(DL+EY)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3546 KN**).

vi. Flat slab with Square column

- In X Direction

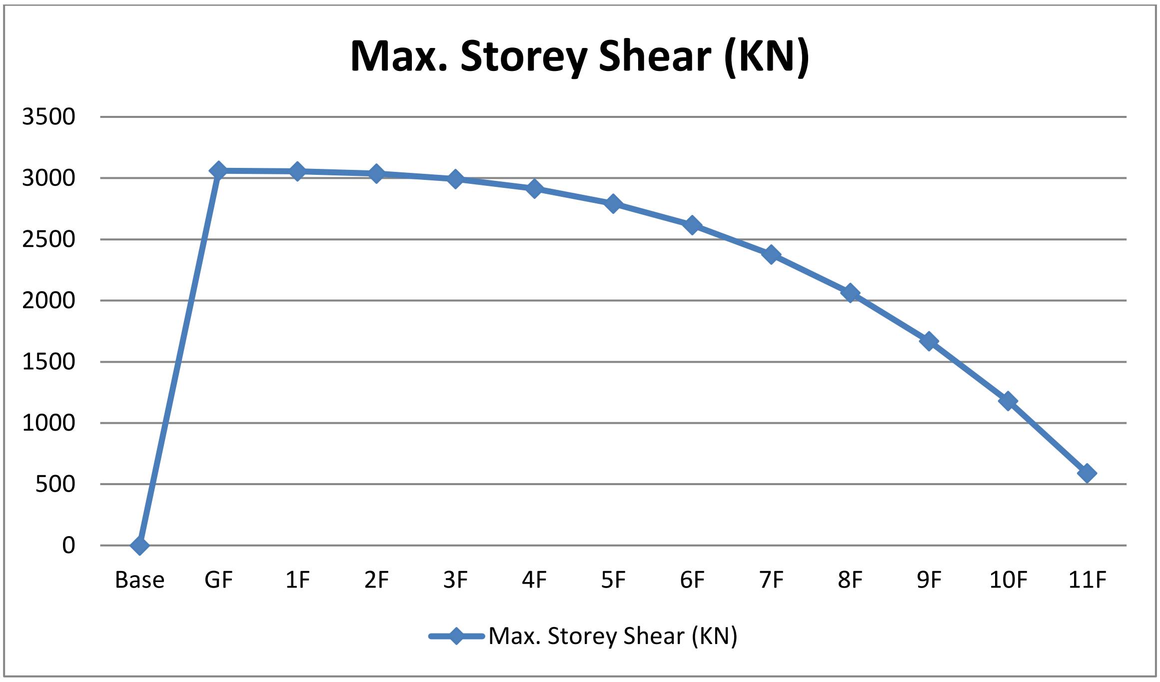

Fig. 4.1.35 Showing maximum storey shear in X Direction

TABLE: 4.1.35 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN	kN
Story12	36	Top	-588.862	0
		Bottom	-588.862	0
Story11	33	Top	-1179.89	0
		Bottom	-1179.89	0
Story10	30	Top	-1668.35	0
		Bottom	-1668.35	0
Story9	27	Top	-2064	0
		Bottom	-2064	0
Story8	24	Top	-2376.61	0
		Bottom	-2376.61	0
Story7	21	Top	-	0

			2615.95	
		Bottom	-2615.95	0
Story6	18	Top	-2791.8	0
		Bottom	-2791.8	0
Story5	15	Top	-2913.91	0
		Bottom	-2913.91	0
Story4	12	Top	-2992.06	0
		Bottom	-2992.06	0
Story3	9	Top	-3036.02	0
		Bottom	-3036.02	0
Story2	6	Top	-3055.56	0
		Bottom	-3055.56	0
Story1	3	Top	-3060.43	0
		Bottom	-3060.43	0
Base	0	Top	0	0
		Bottom	0	0

(IN **X-DIRECTION** we are getting maximum storey shear for **1.5(DL-EX) & 1.5(DL+EX)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3060 KN**).

- In Y Direction

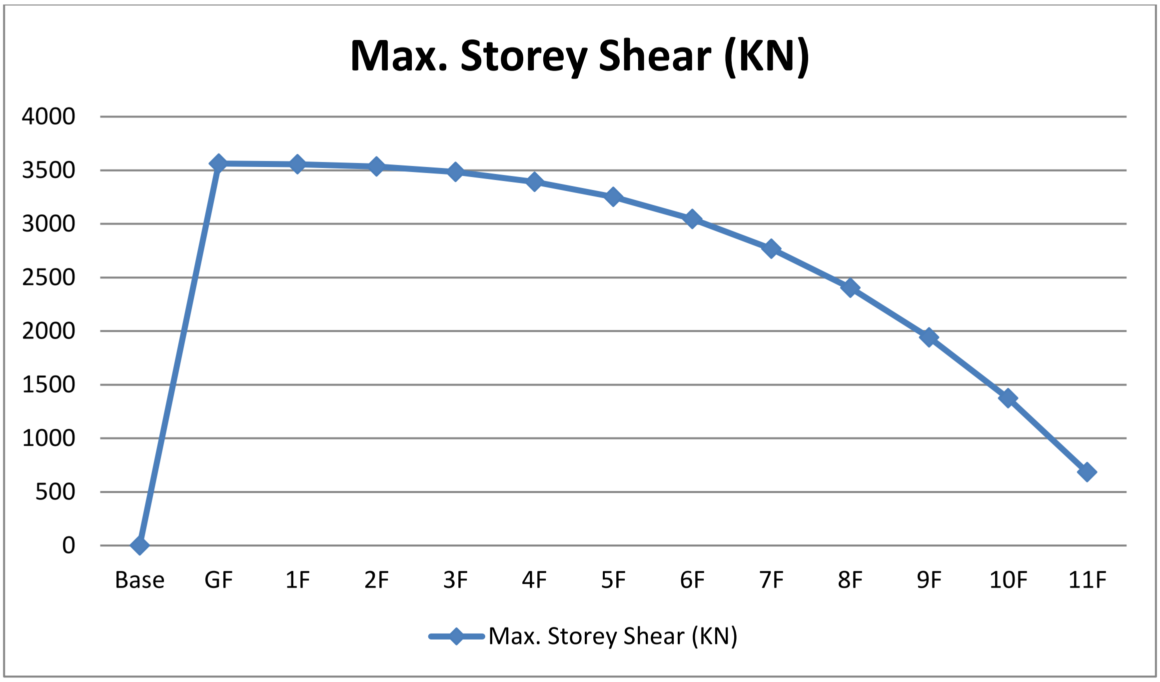

Fig. 4.1.36 Showing maximum storey shear in Y Direction

TABLE: 4.1.36 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN	kN
Story12	36	Top	0	-685.56
		Bottom	0	-685.56
Story11	33	Top	0	-1373.65
		Bottom	0	-1373.65
Story10	30	Top	0	-1942.31
		Bottom	0	-1942.31
Story9	27	Top	0	-2402.93
		Bottom	0	-2402.93
Story8	24	Top	0	-2766.88
		Bottom	0	-2766.88
Story7	21	Top	0	-3045.52
		Bottom	0	-3045.52

Story6	18	Top	0	-3250.24
		Bottom	0	-3250.24
Story5	15	Top	0	-3392.41
		Bottom	0	-3392.41
Story4	12	Top	0	-3483.4
		Bottom	0	-3483.4
Story3	9	Top	0	-3534.58
		Bottom	0	-3534.58
Story2	6	Top	0	-3557.32
		Bottom	0	-3557.32
Story1	3	Top	0	-3562.99
		Bottom	0	-3562.99
Base	0	Top	0	0
		Bottom	0	0

(IN **Y-DIRECTION** we are getting maximum storey shear for **1.5(DL-EY) & 1.5(DL+EY)** Load combination. The above table is storey response for maximum storey shear in X-Direction that is **3563 KN**).

IV. STOREY STIFFNESS

i. Conventional slab with Circular column

- In X Direction

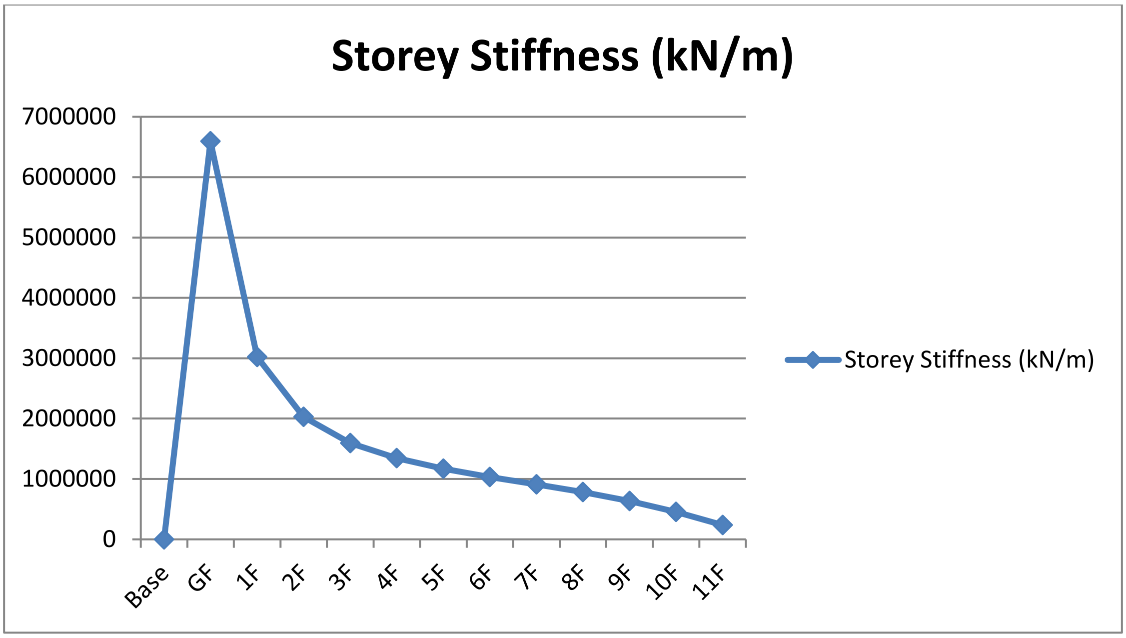

Fig. 4.1.37 Showing maximum storey stiffness in X Direction

TABLE: 4.1.37
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		kN/m	kN/m
Story12	36	Top	236311.257	0
Story11	33	Top	455573.885	0
Story10	30	Top	635845.732	0
Story9	27	Top	782829.082	0
Story8	24	Top	911009.258	0
Story7	21	Top	1034664.769	0
Story6	18	Top	1170592.176	0
Story5	15	Top	1342787.906	0
Story4	12	Top	1594883.002	0
Story3	9	Top	2029908.639	0
Story2	6	Top	3018947.224	0
Story1	3	Top	6593422.387	0
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey stiffness for Ex. The above table is storey response for maximum storey stiffness in X-Direction that is **6593422 KN/M**).

- In Y Direction

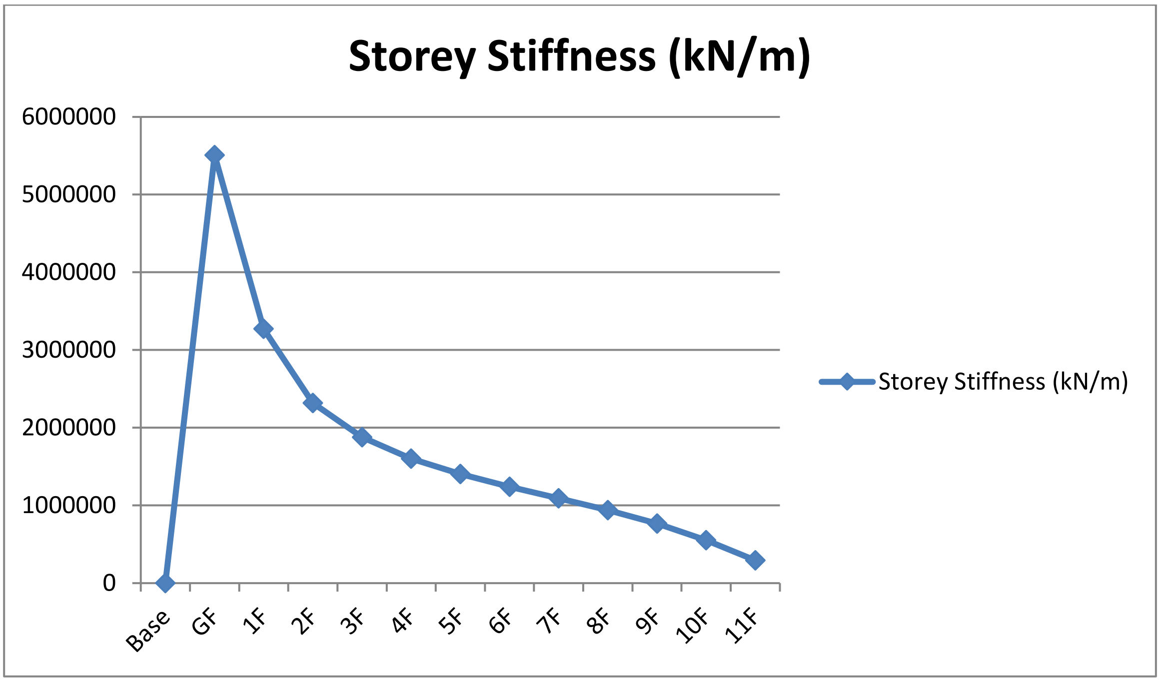

Fig. 4.1.38 Showing maximum storey stiffness in Y Direction

TABLE: 4.1.38 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN/m	kN/m
Story12	36	Top	0	293131.868
Story11	33	Top	0	551981.905
Story10	30	Top	0	764846.474
Story9	27	Top	0	939426.898
Story8	24	Top	0	1093016.129
Story7	21	Top	0	1241712.643
Story6	18	Top	0	1402889.974
Story5	15	Top	0	1600328.145
Story4	12	Top	0	1876240.218
Story3	9	Top	0	2320306.786
Story2	6	Top	0	3271749.444
Story1	3	Top	0	5509249.128
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey stiffness for EY. The above table is storey response for maximum storey stiffness in Y-Direction that is **5509249 KN/M**).

ii. Conventional slab with Rectangular column

- In X Direction

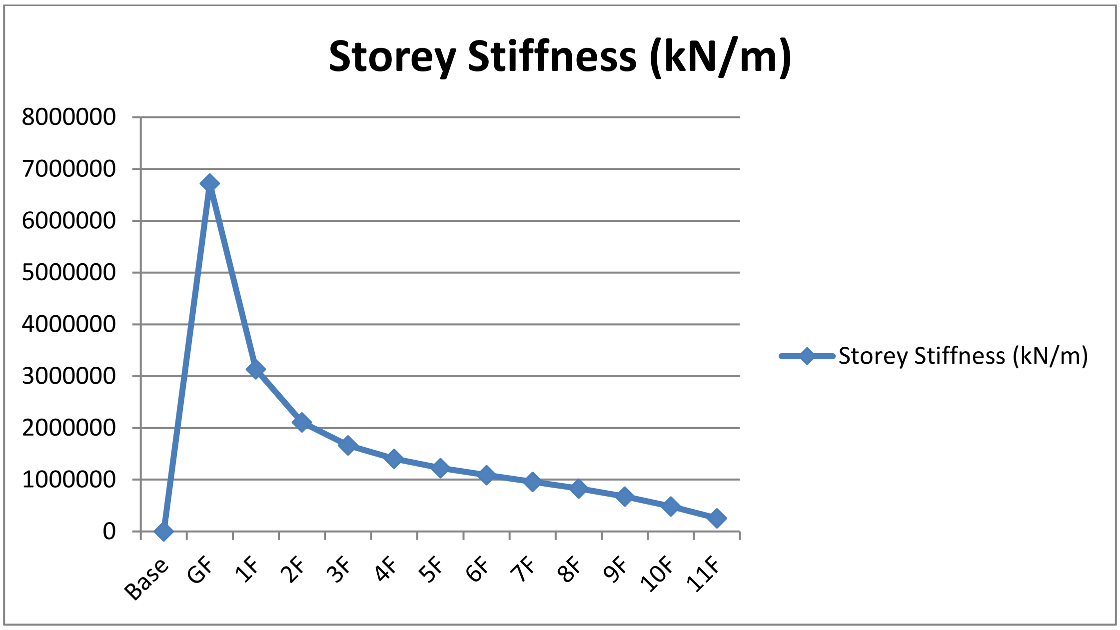

Fig. 4.1.39 Showing maximum storey stiffness in X Direction

TABLE: 4.1.39 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN/m	kN/m
Story12	36	Top	252726.763	0
Story11	33	Top	483471.842	0
Story10	30	Top	673508.552	0
Story9	27	Top	826930.647	0
Story8	24	Top	959692.877	0
Story7	21	Top	1087070.674	0
Story6	18	Top	1226703.751	0
Story5	15	Top	1403529.741	0
Story4	12	Top	1662571.862	0
Story3	9	Top	2110485.21	0
Story2	6	Top	3132360.965	0
Story1	3	Top	6719694.967	0
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey stiffness for Ex. The above table is storey response for maximum storey stiffness in X-Direction that is **6719695 KN/M**).

- In Y Direction

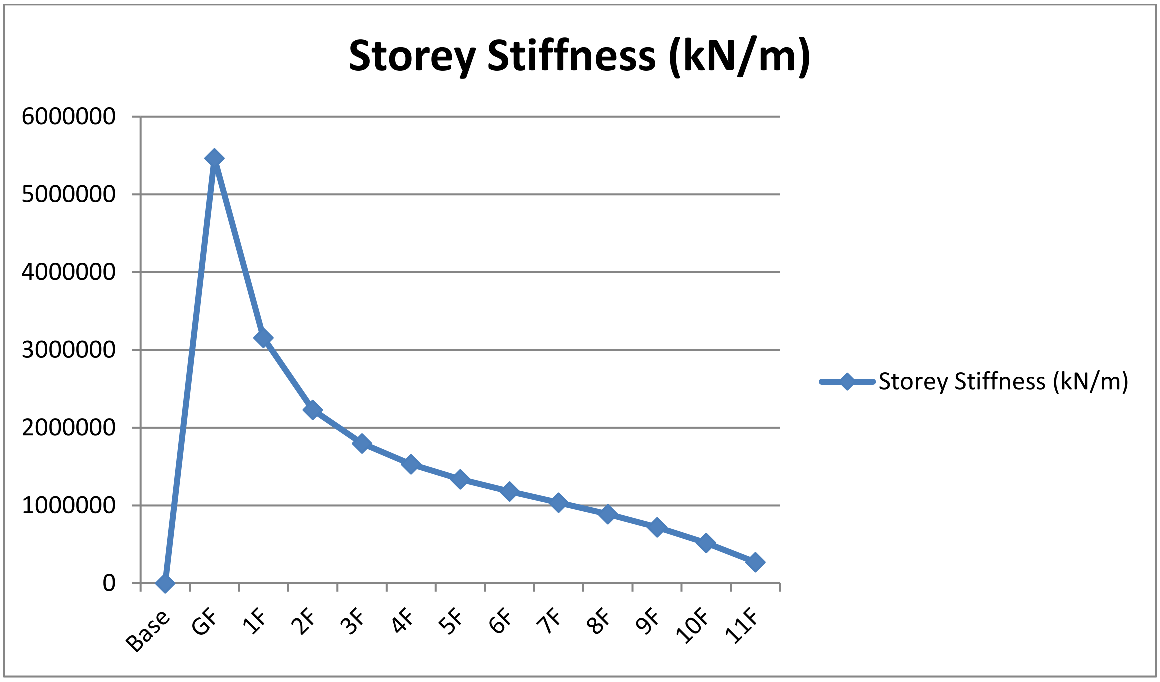

Fig. 4.1.40 Showing maximum storey stiffness in Y Direction

TABLE: 4.1.40 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN/m	kN/m
Story12	36	Top	0	272777.594
Story11	33	Top	0	519122.264
Story10	30	Top	0	720865.922
Story9	27	Top	0	887834.325
Story8	24	Top	0	1035752.217
Story7	21	Top	0	1179701.42
Story6	18	Top	0	1336319.968
Story5	15	Top	0	1528575.158
Story4	12	Top	0	1797674.197
Story3	9	Top	0	2231526.193
Story2	6	Top	0	3157800.215
Story1	3	Top	0	5464899.195
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey stiffness for EY. The above table is storey response for maximum storey stiffness in Y-Direction that is **5464899 KN/M**).

iii. Conventional slab with Circular column

- In X Direction

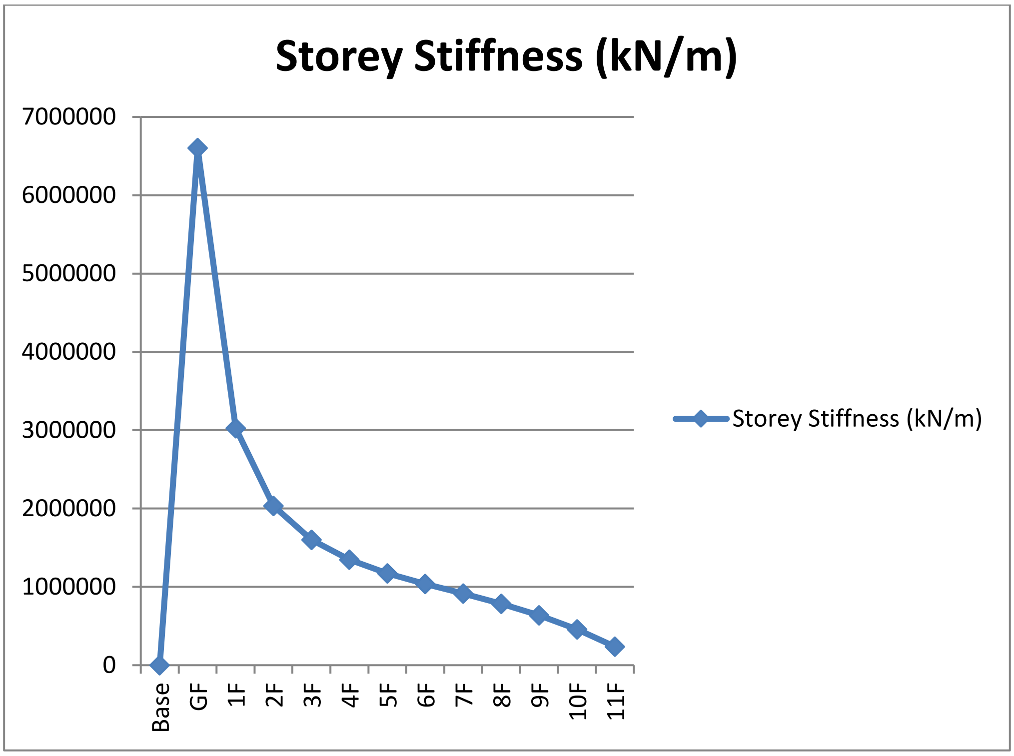

Fig. 4.1.41 Showing maximum storey stiffness in X Direction

TABLE: 4.1.41 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN/m	kN/m
Story12	36	Top	237399.406	0
Story11	33	Top	457390.637	0
Story10	30	Top	638270.437	0
Story9	27	Top	785659.047	0
Story8	24	Top	914131.291	0
Story7	21	Top	1038025.886	0
Story6	18	Top	1174193.069	0
Story5	15	Top	1346689.524	0
Story4	12	Top	1599236.894	0
Story3	9	Top	2035081.868	0
Story2	6	Top	3026168.084	0
Story1	3	Top	6602925.17	0
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey stiffness for Ex. The above table is storey response for maximum storey stiffness in X-Direction that is **6602925 KN/M**).

- In Y Direction

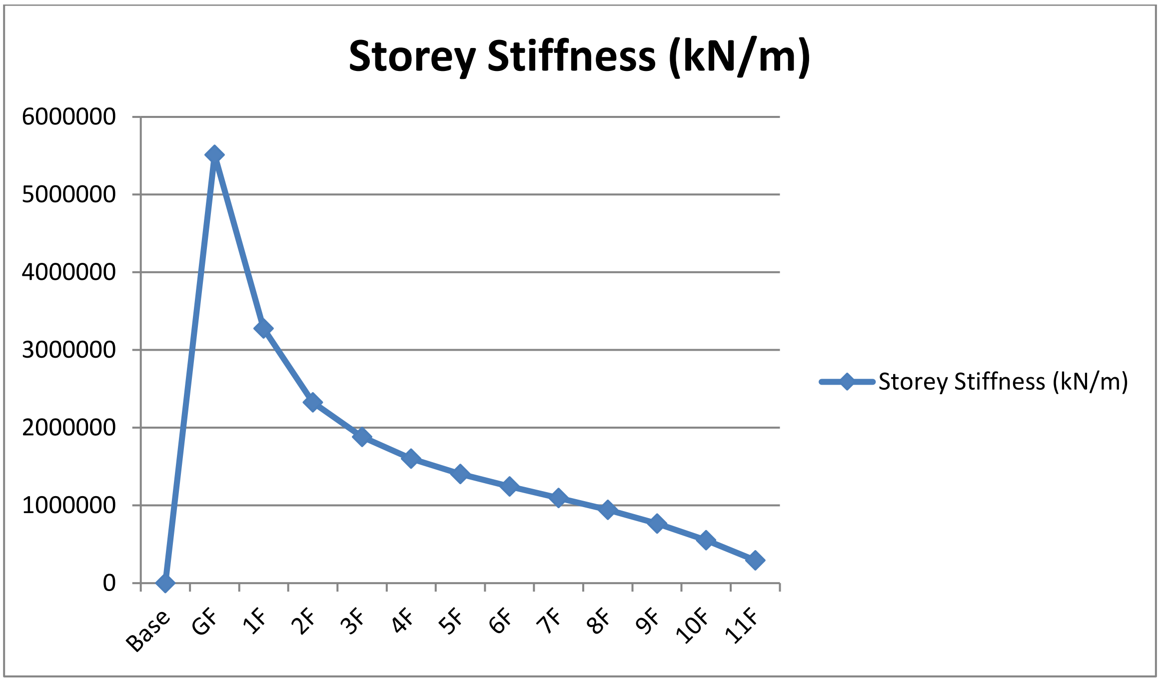

Fig. 4.1.42 Showing maximum storey stiffness in Y Direction

TABLE: 4.1.42 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN/m	kN/m
Story12	36	Top	0	294348.175
Story11	33	Top	0	553895.217
Story10	30	Top	0	767338.231
Story9	27	Top	0	942328.521
Story8	24	Top	0	1096204.903
Story7	21	Top	0	1245150.168
Story6	18	Top	0	1406567.779
Story5	15	Top	0	1604282.248
Story4	12	Top	0	1880555.98
Story3	9	Top	0	2325176.669
Story2	6	Top	0	3278013.142
Story1	3	Top	0	5511552.317
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey stiffness for EY. The above table is storey response for maximum storey stiffness in Y-Direction that is **5511552 KN/M**).

iv. Flat slab with Circular column

- In X Direction

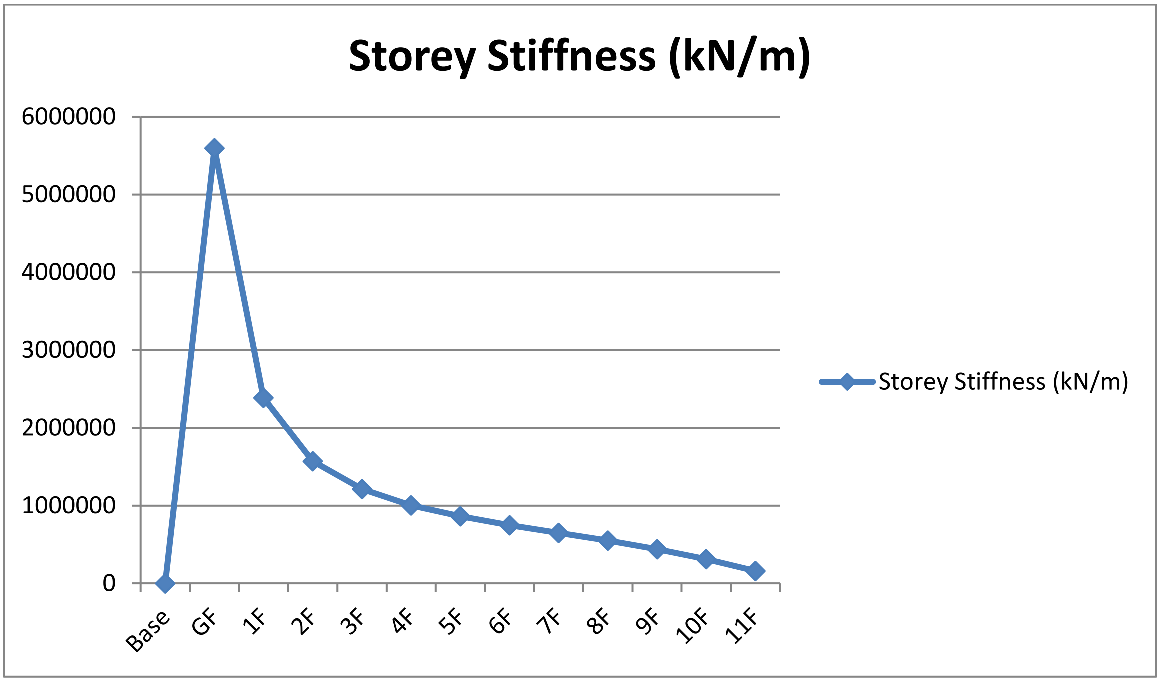

Fig. 4.1.43 Showing maximum storey stiffness in X Direction

TABLE: 4.1.43
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		kN/m	kN/m
Story12	36	Top	157155.38	0
Story11	33	Top	310078.149	0
Story10	30	Top	438955.35	0
Story9	27	Top	548961.369	0
Story8	24	Top	649058.152	0
Story7	21	Top	748974.648	0
Story6	18	Top	860924.652	0
Story5	15	Top	1003633.248	0
Story4	12	Top	1212182.386	0
Story3	9	Top	1571284.988	0
Story2	6	Top	2387481.891	0
Story1	3	Top	5594949.027	0
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey stiffness for Ex. The above table is storey response for maximum storey stiffness in X-Direction that is **5594949 KN/M**).

- In Y Direction

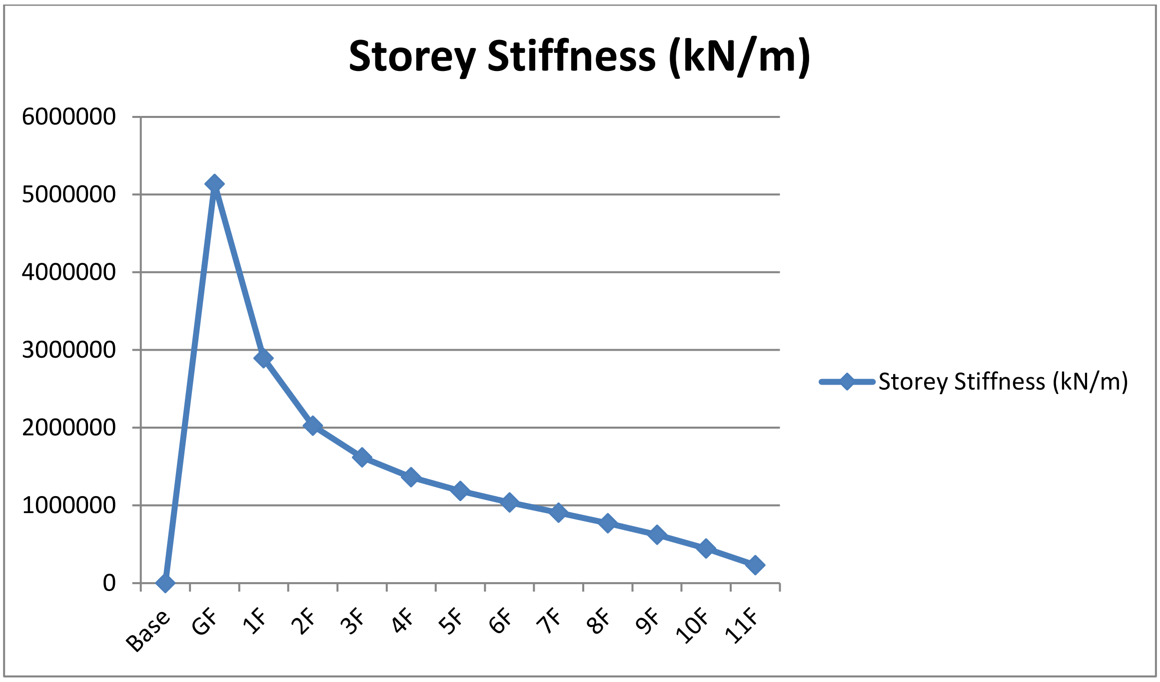

Fig. 4.1.44 Showing maximum storey stiffness in Y Direction

TABLE: 4.1.44 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN/m	kN/m
Story12	36	Top	0	230615.919
Story11	33	Top	0	444438.795
Story10	30	Top	0	623193.574
Story9	27	Top	0	772537.359
Story8	24	Top	0	907005.531
Story7	21	Top	0	1039487.29
Story6	18	Top	0	1184940.656
Story5	15	Top	0	1364558.709
Story4	12	Top	0	1617264.086
Story3	9	Top	0	2024533.74
Story2	6	Top	0	2896665.374
Story1	3	Top	0	5136914.991
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey stiffness for EY. The above table is storey response for maximum storey stiffness in Y-Direction that is **5136915 KN/M**).

v. Flat slab with Rectangle column

- In X Direction

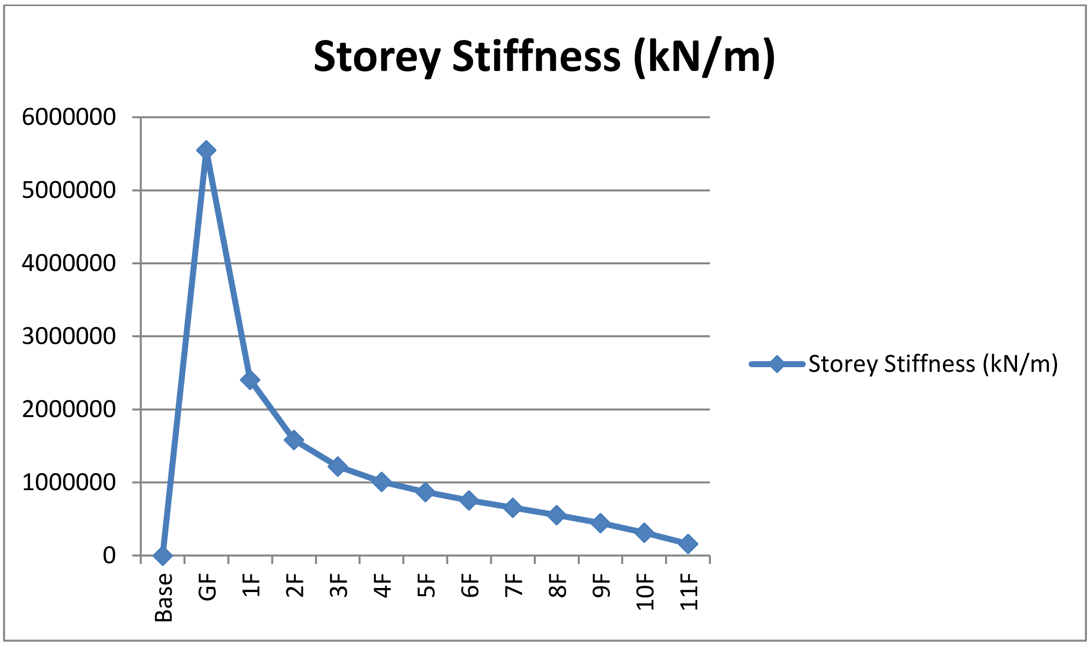

Fig. 4.1.45 Showing maximum storey stiffness in X Direction

TABLE: 4.1.45 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN/m	kN/m
Story12	36	Top	158882.387	0
Story11	33	Top	313233.437	0
Story10	30	Top	443192.298	0
Story9	27	Top	554139.907	0
Story8	24	Top	654910.09	0
Story7	21	Top	755443.248	0
Story6	18	Top	868034.976	0
Story5	15	Top	1011534.191	0
Story4	12	Top	1221211.658	0
Story3	9	Top	1582353.794	0
Story2	6	Top	2407373.998	0
Story1	3	Top	5550333.194	0
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey stiffness for Ex. The above table is storey response for maximum storey stiffness in X-Direction that is **5550333 KN/M**).

- In Y Direction

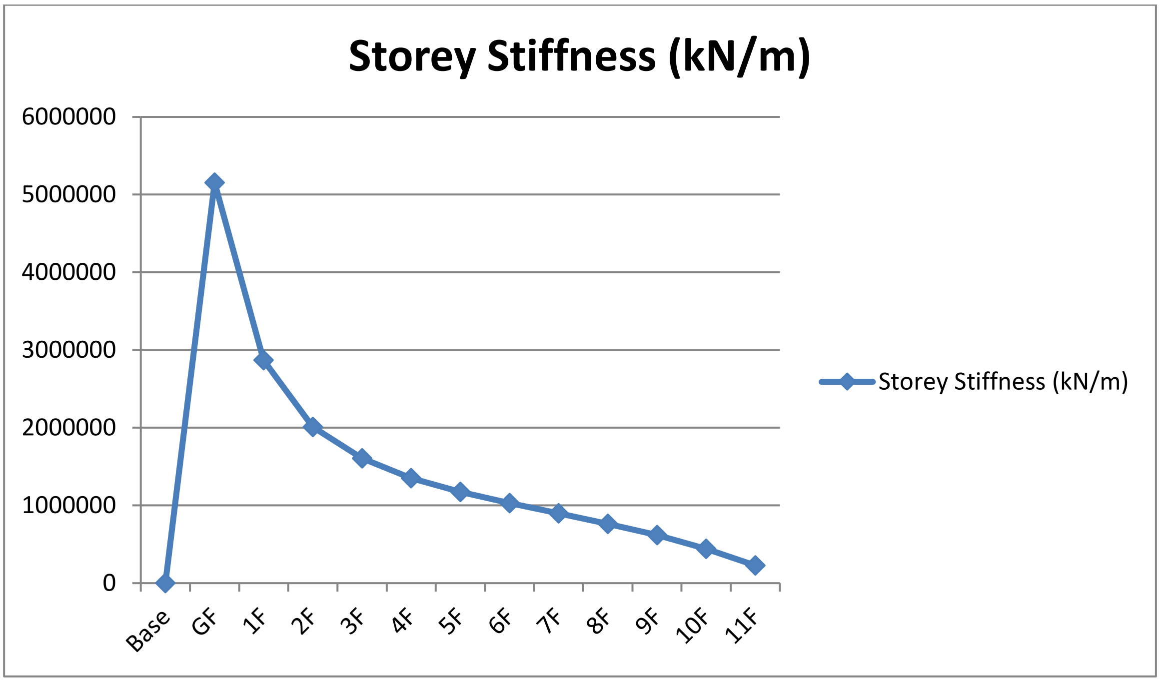

Fig. 4.1.46 Showing maximum storey stiffness in Y Direction

TABLE: 4.1.46 Story Response				
Story	**Elevation**	**Location**	**X-Dir**	**Y-Dir**
	m		kN/m	kN/m
Story12	36	Top	0	227564.276
Story11	33	Top	0	439560.455
Story10	30	Top	0	616506.288
Story9	27	Top	0	764530.464
Story8	24	Top	0	898079.643
Story7	21	Top	0	1029732.018
Story6	18	Top	0	1174379.523
Story5	15	Top	0	1353053.254
Story4	12	Top	0	1604578.021
Story3	9	Top	0	2010226.81
Story2	6	Top	0	2871227.656
Story1	3	Top	0	5154211.372
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey stiffness for EY. The above table is storey response for maximum storey stiffness in Y-Direction that is **5154211 KN/M**).

vi. Flat slab with Square column

- In X Direction

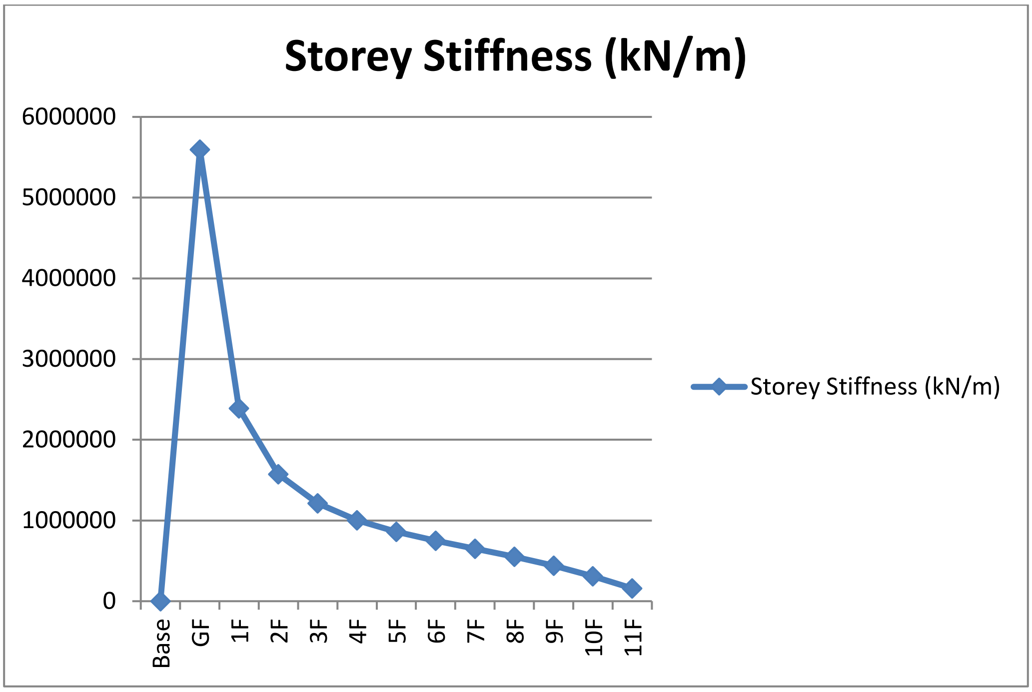

Fig. 4.1.47 Showing maximum storey stiffness in X Direction

TABLE: 4.1.47
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		kN/m	kN/m
Story12	36	Top	157280.343	0
Story11	33	Top	310297.326	0
Story10	30	Top	439249.664	0
Story9	27	Top	549317.172	0
Story8	24	Top	649458.659	0
Story7	21	Top	749415.666	0
Story6	18	Top	861407.847	0
Story5	15	Top	1004168.884	0
Story4	12	Top	1212794.112	0
Story3	9	Top	1572029.227	0
Story2	6	Top	2388715.468	0
Story1	3	Top	5593829.188	0
Base	0	Top	0	0

(IN **X-DIRECTION** we are getting maximum storey stiffness for Ex. The above table is storey response for maximum storey stiffness in X-Direction that is **5593829 KN/M**).

- In Y Direction

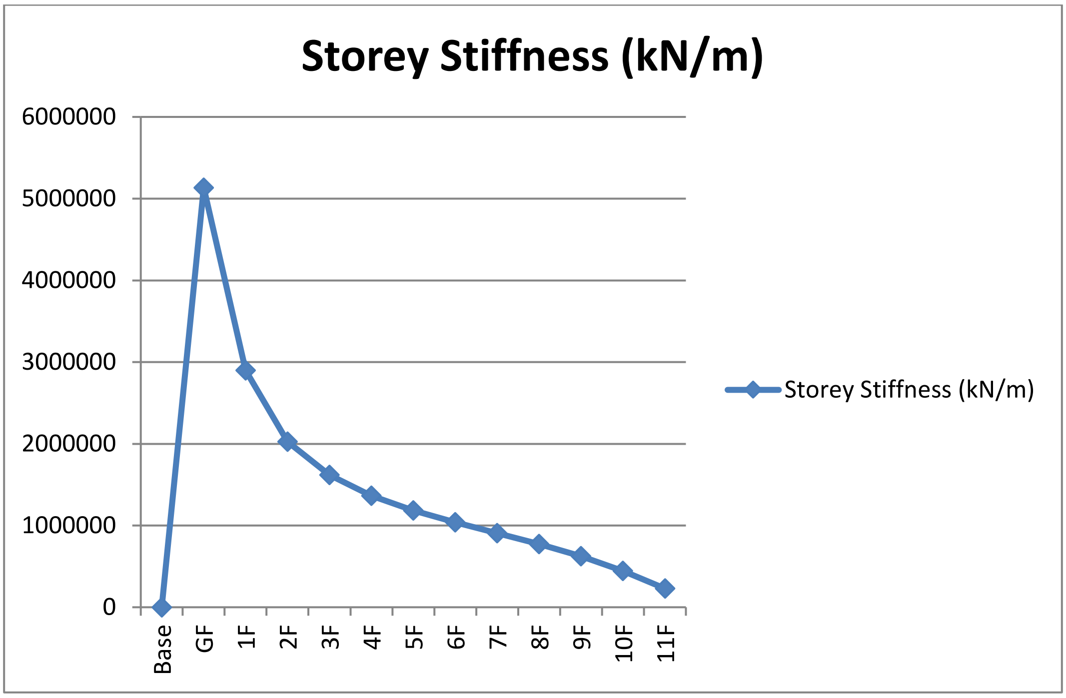

Fig. 4.1.48 Showing maximum storey stiffness in Y Direction

TABLE: 4.1.48
Story Response

Story	Elevation	Location	X-Dir	Y-Dir
	m		kN/m	kN/m
Story12	36	Top	0	230767.886
Story11	33	Top	0	444695.346
Story10	30	Top	0	623508.928
Story9	27	Top	0	772923.588
Story8	24	Top	0	907432.896
Story7	21	Top	0	1039953.629
Story6	18	Top	0	1185445.012
Story5	15	Top	0	1365111.12
Story4	12	Top	0	1617865.756
Story3	9	Top	0	2025223.968
Story2	6	Top	0	2898041.554
Story1	3	Top	0	5135010.007
Base	0	Top	0	0

(IN **Y-DIRECTION** we are getting maximum storey stiffness for EY. The above table is storey response for maximum storey stiffness in Y-Direction that is **5135010 KN/M**).

4.2 RESULT

I. DISPLACEMENT

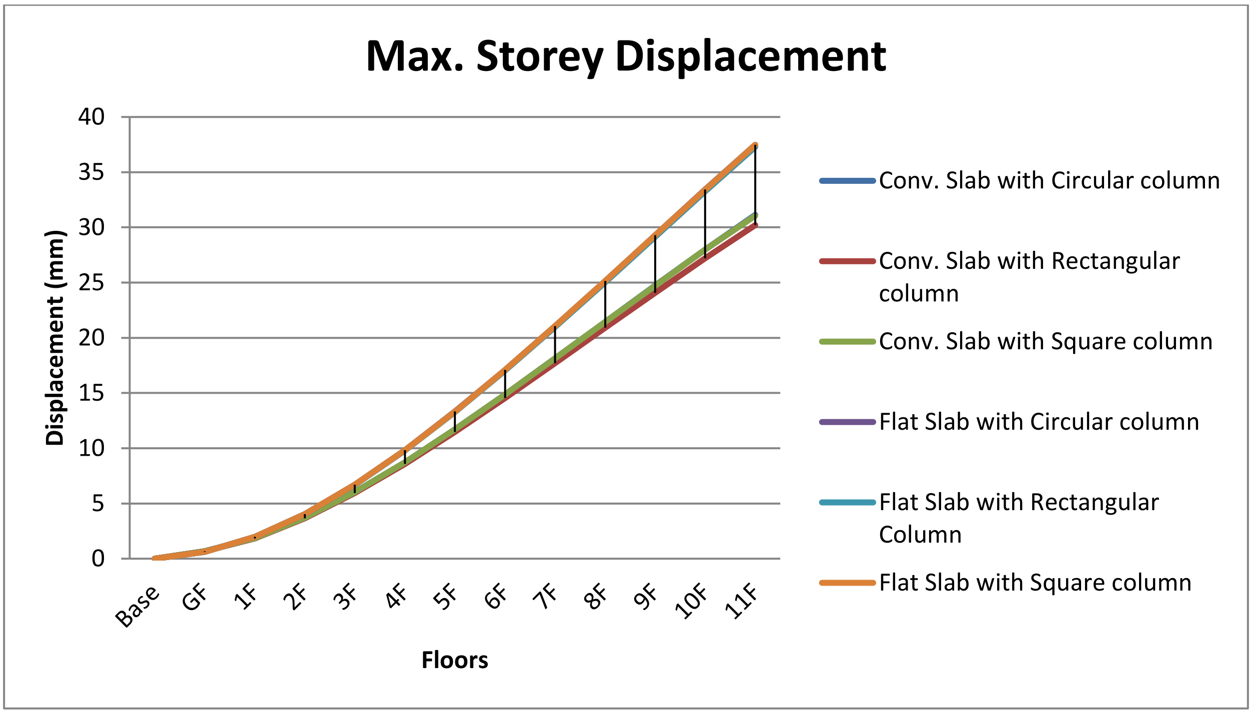

Fig 4.2.1 Displacement of (G+11) R.C.C. Frame Structure in X- Direction

II. STOREY DRIFT

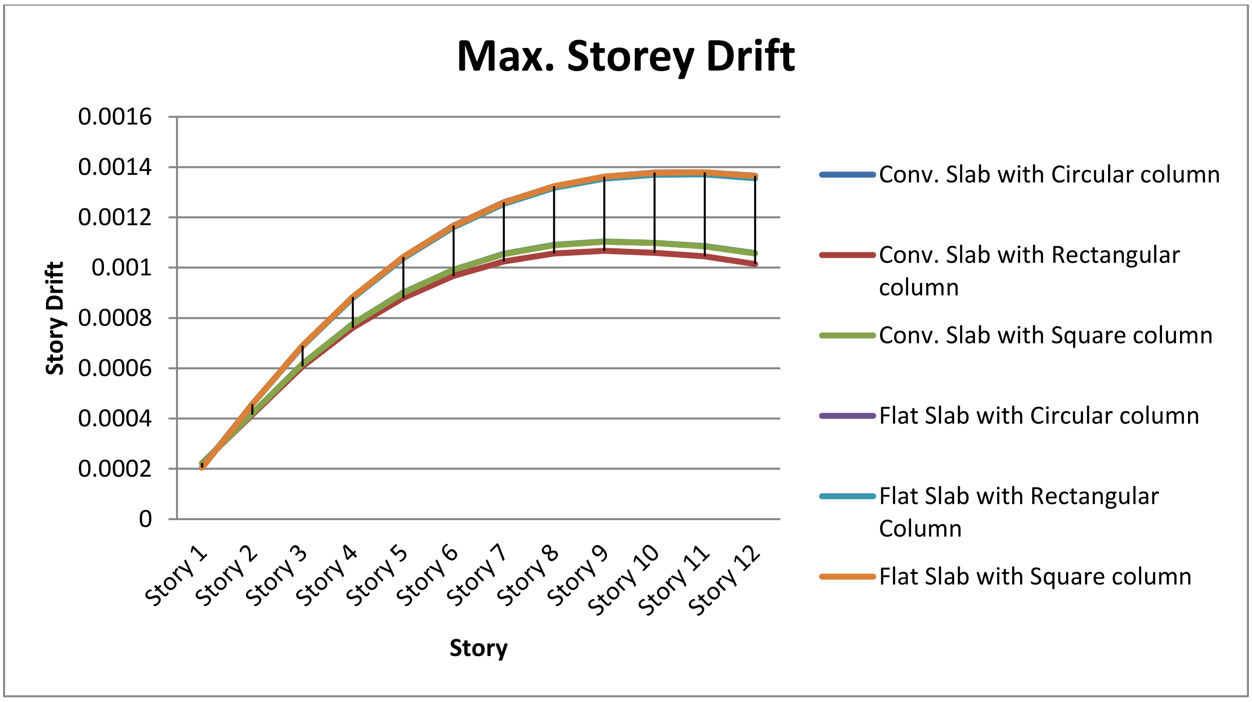

Fig 4.2.2 Storey drift of (G+11) R.C.C. Frame Structure in X- Direction

III. STOREY SHEAR

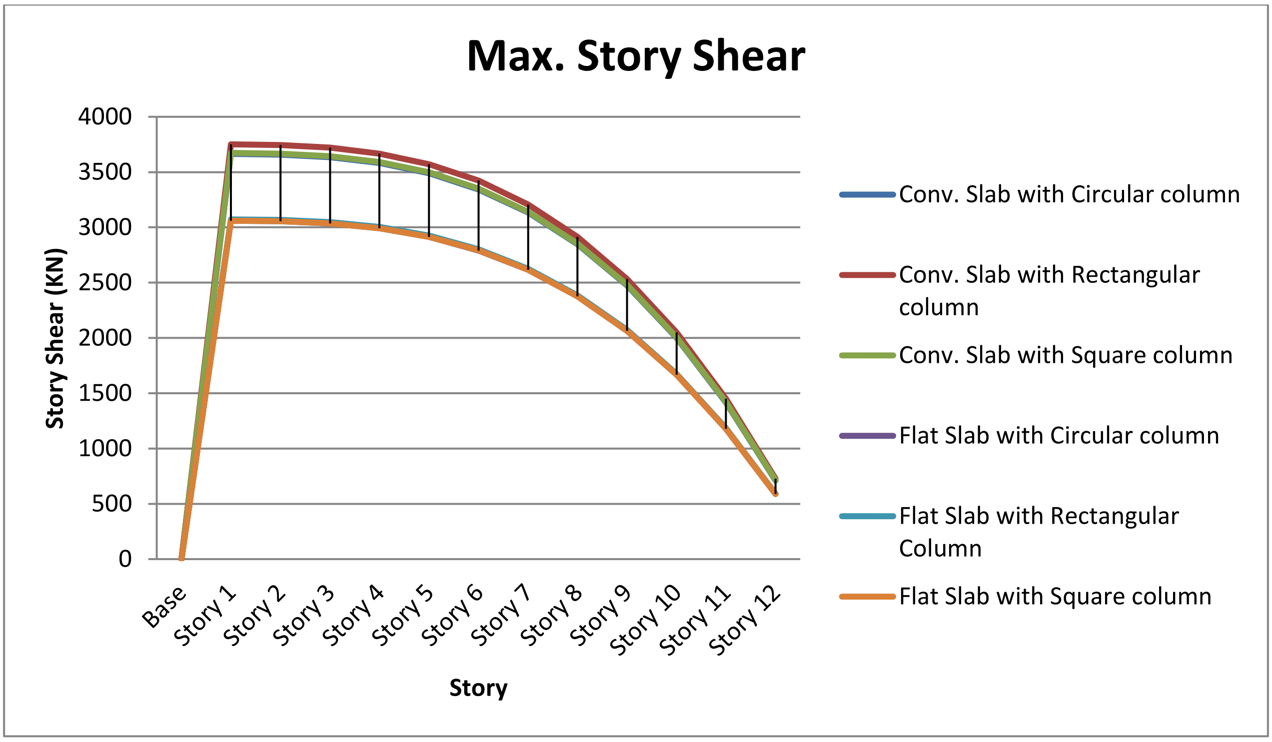

Fig 4.2.3 Storey shear of (G+11) R.C.C. Frame Structure in X- Direction

IV. STOREY STIFFNESS

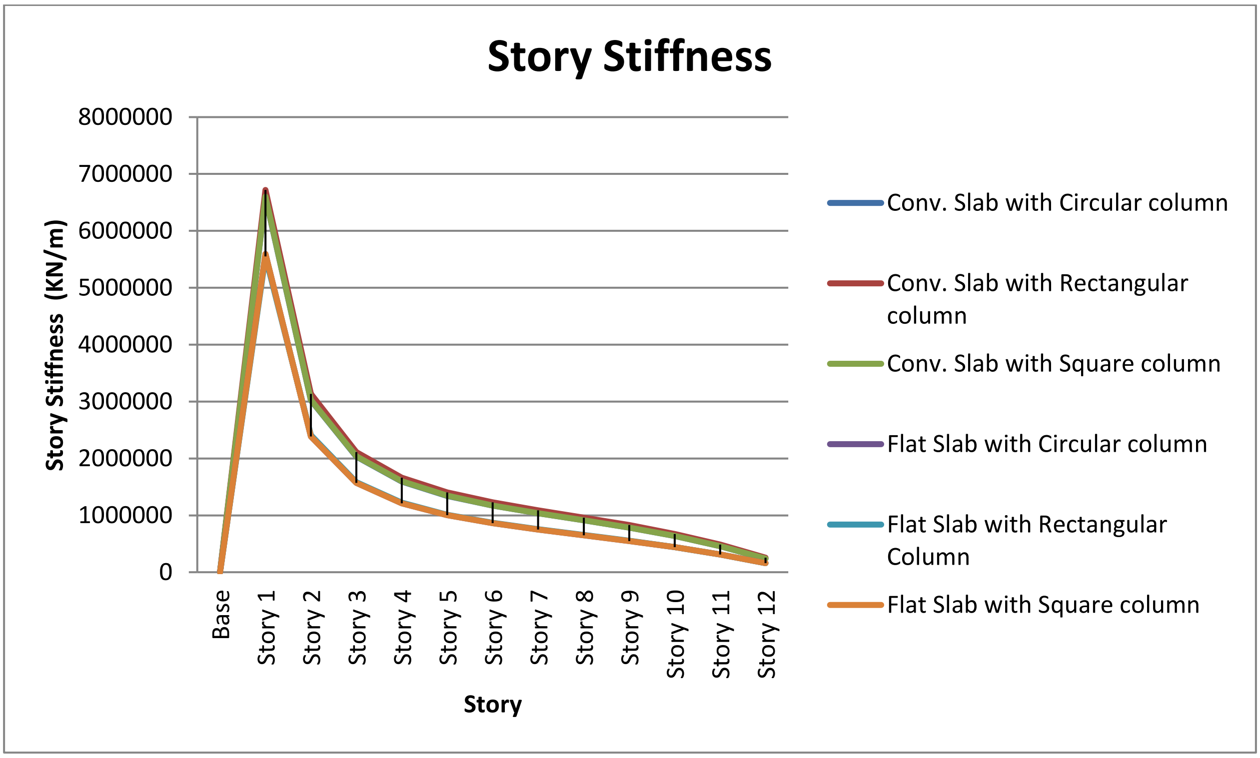

Fig 4.2.4 Storey Stiffness of (G+11) R.C.C. Frame Structure in X- Direction

4.3 DISCUSSION

I. Conventional slab with Rectangular, Circular and Square column has less displacement for (G+11) R.C.C. Frame structure while comparing to the structure having Flat slab with Rectangular, Circular and Square.

II. The displacement for conventional slab with Rectangle column i.e. 30.209 mm and 28.628 mm has decreased to 23% and 11% while comparing to the Flat slab with Rectangular column i.e. 37.289 mm and 31.802 mm.

III. Conventional slab with Rectangular, Circular and Square column has less Story Drift for (G+11) R.C.C. Frame structure while comparing to the structure having Flat slab with Rectangular, Circular and Square.

IV. The storey drift for (G+11) R.C.C. Frame structure is minimum for Conventional slab with Rectangular column i.e. 0.001067 and 0.001001 has decreased to 28% and 14% while comparing to the Flat slab with Rectangular column i.e. 0.001371 and 0.001144.

V. Conventional slab with Rectangular, Circular and Square column has more Storey shear for (G+11) R.C.C. Frame structure while comparing to the structure having Flat slab with Rectangular, Circular and Square.

VI. The storey shear for (G+11) R.C.C. Frame structure is maximum for Conventional slab with Rectangular column i.e. 3751 kN and 3888 kN has increased by 22% and 9% while comparing to the Flat slab with Rectangular column i.e. 3072 kN and 3546 kN.

VII. Conventional slab with Rectangular, Circular and Square column has more Storey stiffness for (G+11) R.C.C. Frame structure while comparing to the structure having Flat slab with Rectangular, Circular and Square.

VIII. The story stiffness for (G+11) R.C.C. Frame structure is maximum for Conventional slab with Rectangular column i.e. 6719695 kN/m and 5464899 kN/m has increased to 21% and 6% while comparing to the Flat slab with Rectangular column i.e. 5550333 kN/m and 5154211 kN/m.

5. CONCLUSION

The slab and columns of structure has significant impact on the seismic analysis of a structure in terms of displacement, storey drift, storey shear and storey stiffness

I. The displacement for (G+11) R.C.C. Frame structure is minimum for Conventional slab with Rectangular column while comparing to the Conventional slab with Circular and Square column and all the flat slab structures.

II. The maximum displacement for Conventional slab with Rectangular Column (G+11) R.C.C Frame structure has decreased by 23% and 11% while comparing the Flat slab with Rectangular column.

III. The storey drift for (G+11) R.C.C. Frame structure is minimum for Conventional slab with Rectangular column while comparing to the Conventional slab with Circular and Square column and all the flat slab models.

IV. The maximum storey drift for (G+11) R.C.C. Frame structure is minimum for Conventional slab with Rectangular column has decreased to 28% and 14% while comparing to the Flat slab with Rectangular column.

V. The storey shear for (G+11) R.C.C. Frame structure is maximum for Conventional slab with Rectangular column while comparing to the Conventional slab with Circular and Square column and all the flat slab models.

VI. The storey shear for (G+11) R.C.C. Frame structure is maximum for Conventional slab with Rectangular column has increased by 22% and 9% while comparing to the Flat slab with Rectangular column.

VII. The storey stiffness for (G+11) R.C.C. Frame structure is maximum for Conventional slab with Rectangular column while comparing to the Conventional slab with Circular and Square column and all the flat slab models.

VIII. The story stiffness for (G+11) R.C.C. Frame structure is maximum for Conventional slab with Rectangular column has increased to 21% and 6% while comparing to the Flat slab with Rectangular column.

IX. With the use of Conventional slab in R.C.C. frame building shows better performance under earthquake because it reduces the displacement and storey drift and increases the storey shear and storey stiffness.

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