

CHAPTER 1

INTRODUCTION

1.1 Introduction

Earthquakes are natural hazards under which disasters are mainly caused by damage because of collapse of buildings and other man-made structures. Experience has shown that for new constructions, establishing earthquake resistant regulations and their implementation is the critical safeguard against earthquake-induced damage. To perform well in an earthquake, a building should possess four main attributes, namely simple and regular configuration, and adequate lateral strength, stiffness and ductility. Buildings having simple regular geometry and uniformly distributed mass and stiffness in plan as well as in elevation, suffer much less damage than buildings with irregular configurations. A building shall be considered as irregular for the purposes of this standard which is discussed as under.

As regards existing structures, it is necessary to evaluate and strengthen them based on evaluation criteria before an earthquake. The poor performance level, and hence the high level of structural damage in the stock of building structures during the frequent earthquakes happened in our country by the last decade, increased the need to the determination and evaluation of the damages in the building type of structures, so much more than ever before. The commercial and parking areas with higher story heights and less infill walls reduce the strength of the lateral load resisting system at that story and progressive collapse becomes unavoidable in a severe earthquake for such buildings. This situation has been verified for all of the building structures with weak stories, independently from good quality of construction and design. Structures are designed with vertical irregularities due to functional, aesthetic, or economical reasons. Vertical irregularities are due to sudden changes in stiffness, strength and/or mass between adjacent stories. Sudden changes in stiffness and strength between adjacent stories are associated with changes in structural system along the height, changes in storey height

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setbacks, changes in materials and unanticipated participation of non-structural components (Das, 2000). Many structures have suffered unexpected damage or collapse due to these types of discontinuities. When such buildings are located in a high seismic zone, the structural engineer's role becomes more challenging. Therefore, the structural

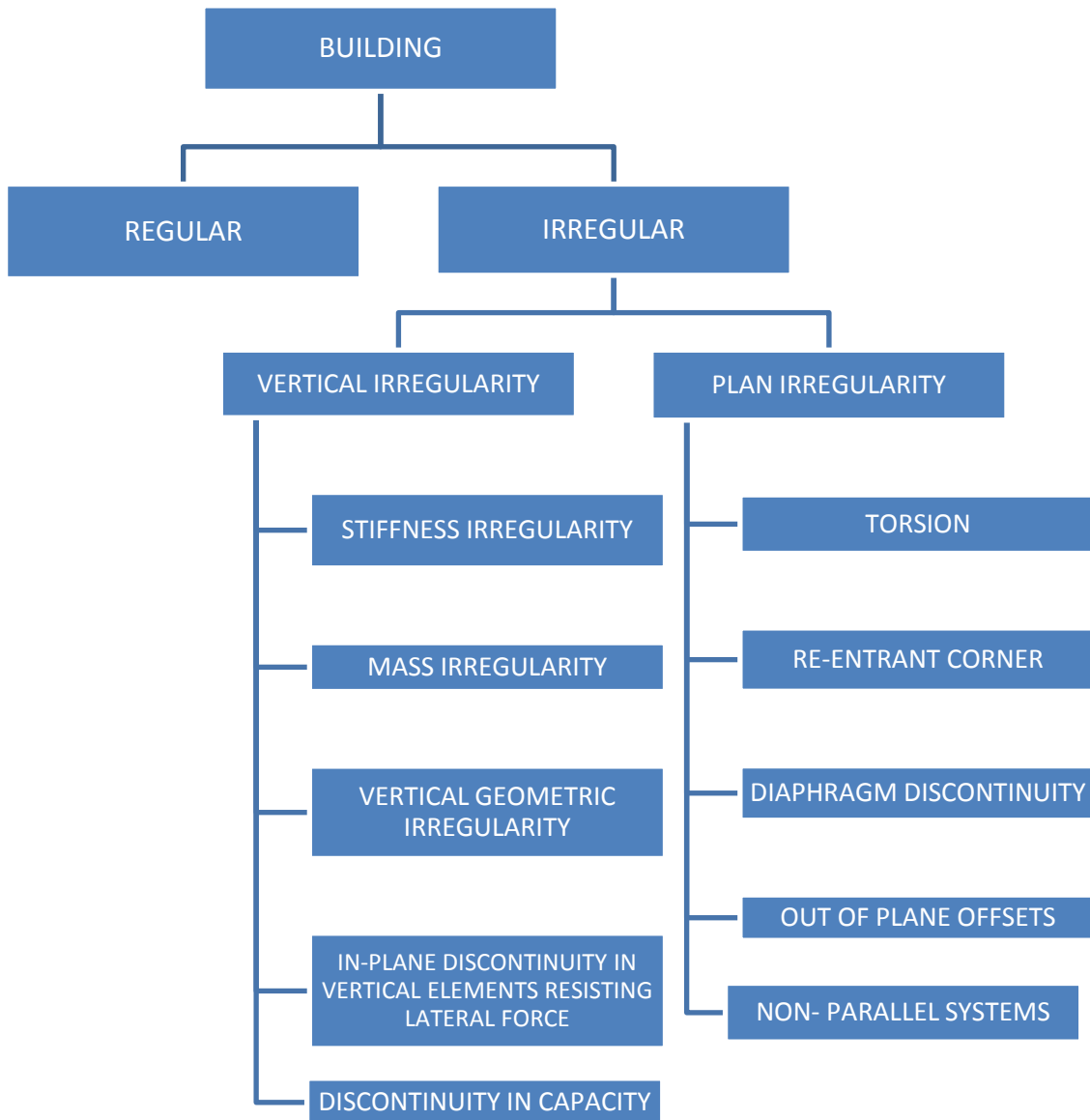


FIGURE 1- BLOCK DIAGRAM OF TYPE OF BUILDING

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engineer needs to have a thorough understanding of the seismic response of irregular structures. In recent past, several studies have been carried out to evaluate the response of irregular buildings. In the present investigation the author studied the seismic behaviour of building due to discontinuity in capacity-weak storey.

Weak-storey is simply formed by the neighbor floors which have redundant columns, concrete walls and brick-wall areas. Several types of architectural and structural plans lead to the formation of so called “weak” stories which are more vulnerable to ground excitations than others due to the fact that they are less stiff, less resistant, or both, now a days the base floors are generally used for shopping stores, for car parking or for other commercial purposes. These buildings can be encountered especially in on both sides of the main city streets. The sides facing the main street are with glass partitioning walls for presentation purposes. The weak-storey occurs by the brick walls. Despite the developing technology in earthquake engineering, buildings which have weak-storey irregularities are still being constructed. This makes the base weak-storey much softer and weaker than the adjacent stories, in which masonry infill walls are provided. Most of these buildings were constructed without engineering supervision and lack of proper seismic design and ductile detailing. Several such buildings suffered severe damage or collapsed due to ground excitation.

Following factors or parameters affect the weak-storey irregularity formation in structures;

1. Height of the weak-storey.
2. Existence of mezzanine floor.
3. Rigidity and distribution of columns in weak-storey.
4. Overhang and cantilever projection existence in weak-storey.
5. Infill wall material properties.
6. Soil class and properties.
7. Floor number.
8. Seismic conditions

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1.2 Codal Provisions

1.2.1 Euro code 8:

Euro code 8 (CEN, 1998) design guidelines contain criteria for classification of vertically regular and irregular structures, where a structure is defined as being “irregular” when the ratio of one of the quantities (such as masses or strength) between adjacent stories exceeds a minimum prescribed value. For a building to be categorized as being regular in elevation, it shall satisfy the following:-

All lateral load resisting systems, such as cores, structural walls, or frames, shall run without interruption from their foundations to the top of the building or, if setbacks at different heights are present, to the top of the relevant zone of the building. Both the lateral stiffness and the mass of the individual story shall remain constant or reduce gradually, without abrupt changes, from the base to the top of a particular building. In framed buildings the ratio of the actual storey resistance to the resistance required by the analysis should not vary disproportionately between adjacent storey.

1.2.2 International Building Code (IBC):

The international Building Code (IBC) (ICC, 2003) lists various types of vertical irregularities follows:

1a) Stiffness Irregularity—Soft Story: is defined to exist when there is a story in which the lateral stiffness is less than 70% of that in the story above or less than 80% of the average stiffness of the three stories above.

1b) Stiffness Irregularity -Extreme Soft Story is defined to exist where there is a story in which the lateral stiffness is less than 60% of that in the story above or less than 70% of the average stiffness of the three stories above.

2) Weight (Mass) Irregularity is defined to exist where the effective mass of any story is more than 150% of the effective mass of an adjacent story. A roof that is lighter than the floor below need not be considered.

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3) Vertical geometric irregularity shall be considered to exist where the horizontal dimension of the lateral force-resisting system in any story is more than 130% of that in an adjacent story.

4) Discontinuity in Capacity-Weak Story where the weak story is one in which the story lateral strength is less than 80% of that in the story above. The story lateral strength is the total lateral systems, limitations on height and irregularity, those components of the structure that must be designed for seismic resistance and the types of analysis that must be performed. In the IBC (ICC, 2003), Buildings having one or more of the features of the 5 points listed above shall be designated as having vertical irregularity except for types 1a, 1b and 2 when no story drift ratio under design lateral load is greater than 130% of the story drift ratio of the next story above, also irregularities of these types are not required to be considered for onestory buildings in any seismic design category or for two-story buildings in Seismic Design Category A, B, C or D. In these 2 exceptions the structure is deemed to not have the structural irregularity.

1.2.3 Vertical Irregularities in IS Code 1893 Part 1

Most building codes propose a simplified method called the equivalent lateral force (ELF) procedure or the multi-mode response spectrum method to compute design forces. These methods assume that the dynamic forces developed in a structure during an earthquake are proportional to the maximum ground acceleration and the modal characteristics of the structure. These forces are approximated as a set of equivalent lateral forces which are distributed over the height of the structure. However, the ELF method is based on a number of assumptions which are true for regular structures “structures with uniform distribution of stiffness, strength, and mass over the height”. So the current building codes define criteria in order to categorize building structures as either regular or irregular as explained in the following paragraphs.

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1.3 Specific point of study

Irregularity arises in building when there is non uniformity in distribution of mass, stiffness, and/or strength along height i.e. along vertical direction of building. Thus as mentioned earlier these irregularities are referred to as mass irregularity, stiffness irregularity and strength irregularity respectively.

When one or more of these properties is non-uniformly distributed, either individually or in combination with other properties in any direction, the structure is referred to as being irregular. In the present investigation seismic behavior of building due to discontinuity in strength – weak storey irregularity has been carefully studied. The sixteen storey building model is programmed on STAAD PRO v8i, following the guidelines of Indian codes. The strength of each storey is changed in STAAD file for each concerned case of strength ratio and behavior of building is studied by findings of the various effective parameters such as drift, all type of shears, storey shear distribution vertically, frequency, time period etc.

1.4 ORGANIZATION OF DISSERTATION

For presentation purposes, the dissertation is structured in six chapters. Summaries of the contents of these chapters are given hereafter.

Chapter 1 introduces the background, codal provision and specific point of study.

Chapter 2 present detailed objective of study.

Chapter3 present literature review

Chapter4 discusses programme of study that include building details, input parameters and output parameters.

Chapter 5 present results and discussion.

Chapter6 conclude the dissertation by drawing conclusion from different chapter and suggesting future research requirement

CHAPTER 2

OBJECTIVES

The following are objectives of study-

1. To develop a model of a real building actually constructed / to be constructed.
This building may or may not be perfectly regular as per guidelines of IS 1893.
2. To study the guidelines of IS 1893 PART 1 2002 & IS 875 with respect to general and design criteria.
3. To study the strength irregularity –weak storey criterion as per IS 1893 and that of relevant characteristics in the ground storey of the real building model.
4. To consider appropriate changes in physical parameters in the real building model and to study the effects of these changes on the discontinuity in capacity –weak storey characteristic of building model and on the seismic performance of the building.
5. To study the effect of the application of changes (as mentioned in previous objective) in the other storey of the real building model and to study changes in the seismic performance of the building.
6. To study the changes in seismic performance effect because of changes in strength capacity in the ground floor storey (as per objective no 6 above).
7. To draw graph for changes in building performance indices vs. changes in storey strength and to attempt at developing characteristic equations for relationships among various parameters.

CHAPTER 3

LITRATURE REVIEW

1. **Elnashai & Mwafy** investigated the issue of horizontal overstrength in modern code-designed reinforced-concrete (RC) buildings. The relationship between the lateral capacity, the design force reduction factor, the ductility level and the overstrength factor are investigated. The lateral capacity and the over strength factor are estimated by means of inelastic static pushover as well as time-history collapse analysis for 12 buildings of various characteristics representing a wide range of contemporary RC buildings. The importance of employing the elongated periods of structures to obtain the design forces is emphasized. Predicting this period from free vibration analysis by employing ‘effective’ flexural stiffness is investigated. A direct relationship between the force reduction factor used in design and the lateral capacity of structures is confirmed in this study. Moreover, conservative over strength of medium and low period RC buildings designed according to Euro code 8 is proposed. Finally, the implication of the force reduction factor on the commonly utilized over strength dentition is highlighted.

Advantages of using an additional measure of response alongside the over strength factor are emphasized. This is the ratio between the over strength factor and the force reduction factor and is termed the inherent over strength. The suggested measure provides more meaningful results of reserve strength and structural response than overstrength and force reduction factors. Copyright Δ 2002 John Wiley & Sons, Ltd.

2. **Bariola** (1988), concluded that the period of the structure increases during the earthquake, with larger period elongation for weaker structure.

3. **Moehle and Alarcon** (1986) carried out an experimental response study on two small scale models of reinforced concrete frame-wall structures subjected to strong base motions by using shake table & they made two test structures and analyses those structures using elastic and inelastic methods. For each analysis, different modeling

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assumptions were tried in an effort to establish a “best-fit” model. They compared maximum top-floor displacements obtained by the experiments and by different inelastic dynamic and elastic analysis method and concluded that the main advantage of dynamic methods is that those are capable of estimating the maximum displacement response, whereas the static methods cannot be used for this purpose. Further, they inferred that the inelastic static and dynamic methods are superior to the elastic methods in interpreting the structural discontinuities.

4. **Ruiz and Diederich** (1989) studied the seismic performance of buildings with weak first story in case of single ground motion. They studied the influence of the lateral strength discontinuity on ductility demand at the first story under the action of the acceleration record with largest peak ground acceleration, as obtained on soft soil in Mexico City during the Mexico earthquake of September 19, 1985. A parametric study was carried out for 5- and 12-story buildings with weak first story, and with brittle infill wall in upper stories in some cases and ductile in others. The fundamental periods of these buildings were 0.67 and 1.4 s respectively. They noted that the behavior of weak first story buildings greatly depends on the ratio of the dominant periods of excitation and response, the resistances of upper and first stories, and on the seismic coefficient used for design. The ratio of dominant periods of response and excitation was found to be closely related to the formation of plastic hinges, yielding or failure of infill walls, and to the times of their occurrences.

5. **Nassar and Krawinkler** (1991) evaluated seismic demand parameters for bilinear and stiffness degrading single-degree-of-freedom (SDOF) systems and three types of multi-degree-of-freedom (MDOF) structures of 3-, 5-, 10-, 20-, 30-, and 40-story heights and 0.217, 0.431, 0.725, 1.220, 1.653 and 2.051 s fundamental periods, respectively. The three MDOF models studied were: (a) BH (beam hinge) model, in which plastic hinges form in beams only (as well as in supports), (b) CH (column hinge) model, in which plastic hinges form in columns only, and (c) WS (weak story) model, in which plastic hinges form in columns of the first story only. They used 36 strong ground motions, recorded during single earthquake, namely, the Whittier Narrows earthquake of October 1, 1987, in and around Los Angeles, California, and 15 strong ground motions from different Western U.S.

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earthquakes, recorded on firm soil. In the study on SDOF models, the inelastic strength and cumulative damage demands were evaluated statistically for specified target ductility ratios. Strength demands were represented in terms of inelastic strength demand spectra or spectra of strength reduction factors. Expressions were developed that relate the strength reduction factor to period and target ductility ratio. In the study on MDOF models, they found that the required strengths for specified target ductility ratios depend strongly on the type of failure mechanisms that develop during severe earthquakes. They observed that weak first story leads to large amplifications in ductility and overturning moment demands. This has been confirmed later by the study of **Seneviratna and Krawinkler** (1997).

6. **Valmudsson and Nau** (1997) focused on evaluating building code requirements for vertically irregular frames. The earthquake response of 5-, 10-, and 20-story framed structures with uniform mass, stiffness, and strength distributions was evaluated. The structures were modeled as two-dimensional shear buildings. The response calculated from the time-history analysis was compared with that predicted by the ELF procedure as embodied in UBC (1994). Based on this comparison, they evaluated the requirements under which a structure can be considered regular and the ELF provisions are applicable. They concluded reducing the strength of the first story by 20% increases the ductility demand by 100-200%, depending on design ductility. And strength criterion results in large increases in response quantities and is not consistent with the mass and stiffness requirements.

7. **Al-Ali and Krawinkler** (1998) carried out evaluation of the effects of vertical irregularities by considering height-wise variations of seismic demands. They used a 10-story building model designed according to the strong-beam-weak-column (column hinge model) philosophy and an ensemble of 15 strong ground motions, recorded on rock or firm soil during Western U.S. earthquakes after 1983, for the parametric study. The effects of vertical irregularities in the distributions of mass, stiffness and strength were considered separately and in combinations, and the seismic response of irregular structures was assessed by means of the elastic and inelastic dynamic analyses. They found that the effect of mass irregularity is the smallest, the effect of strength

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irregularity is larger than the effect of stiffness irregularity, and the effect of combined-stiffness-and-strength irregularity is the largest. Roof displacement is not affected by the vertical irregularity.

Chintanapakdee and Chopra (2004) studied the effects of stiffness and strength irregularities on story drift demand and floor displacement responses. They considered 48 frames, all 12-stories high and designed according to the strong-column-weak-beam (beam hinge model) philosophy. Three types of irregularities in the height-wise distributions of frame properties were considered: stiffness irregularity (KM), strength irregularity (SM), and combined-stiffness-and-strength irregularity (KS). They studied the influence of vertical irregularities in the stiffness and strength distributions, separately and in combination, on the seismic demands of strong-column-weak-beam frames. For this, they compared the median seismic demands of irregular and regular frames computed by nonlinear time history analyses for an ensemble of 20 large-magnitude-small-distance records (LMSR). The ground motion records were obtained for earthquakes from California, with magnitudes ranging from 6.6 to 6.9, and for firm ground sites at epicentral distances of 13 to 30 km. They found that introducing a soft and/or weak story increases the story drift demands in the modified and neighboring stories and decreases the drift demands in other stories,. On the other hand, a stiff and/or strong story decreases the drift demands in the modified and neighboring stories and increases the drift demands in other stories, Irregularity in upper stories has very little influence on the floor displacements, In contrast, irregularity in lower stories has significant influence on the height-wise distribution of floor displacements. These results are found to be significantly different from those reported using less realistic column hinge models by Al-Ali and Krawinkler (1998).

From the above discussion, it can be concluded that a large number of research studies and building codes have addressed the issue of effects of vertical irregularities. Building codes provide criteria to classify the vertically irregular structures and suggest elastic time history analysis or elastic response spectrum analysis to obtain the design lateral force distribution. A majority of studies have evaluated the elastic response only. Most of the studies have focused on investigating two types of irregularities: those in set-back and

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soft and/or weak first story structures. Conflicting conclusions have been found for the strength (independently or in combination), the effect of strength irregularity has been found to be larger than the effect of stiffness irregularity, and the effect of combined-stiffness-and strength irregularity has been found to be the largest. It has been found that the seismic behavior is set-back structures; most of the studies, however, agree on the increase in drift demand for the tower portion of the set-back structures. For the soft and weak first story structures, increase in seismic demand has been observed as compared to the regular structures. For buildings with discontinuous distributions in mass, stiffness, and influenced the type of model (i.e., beam hinge model or column hinge model) used in the study. Finally, buildings with a wide range of vertical irregularities that were designed specifically for code based limits on drift, strength and ductility, have exhibited reasonable performances, even though the design forces were obtained from the ELF (seismic coefficient) procedures.

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CHAPTER 4

PROGRAMME OF STUDY

4.1. INTRODUCTION

Generally it is observed that to give a building aesthetically appealing look , architects try some different design which may be irregular in shape, the irregularity may be in plan or it may be irregular vertically like irregularity in strength , or in stiffness or mass irregularity may be there. Since the demand for such architecturally sound building are more, it is the job of a structural engineer to design such a building and make the design in such a way that performance of the structure is acceptable under all the code provisions of the concerned region..

As it is already mentioned that irregularity may be of different types , here in the present investigation , mainly the irregularity in strength –weak storey is investigated..

A 16 storey building is selected as shown in figure below:

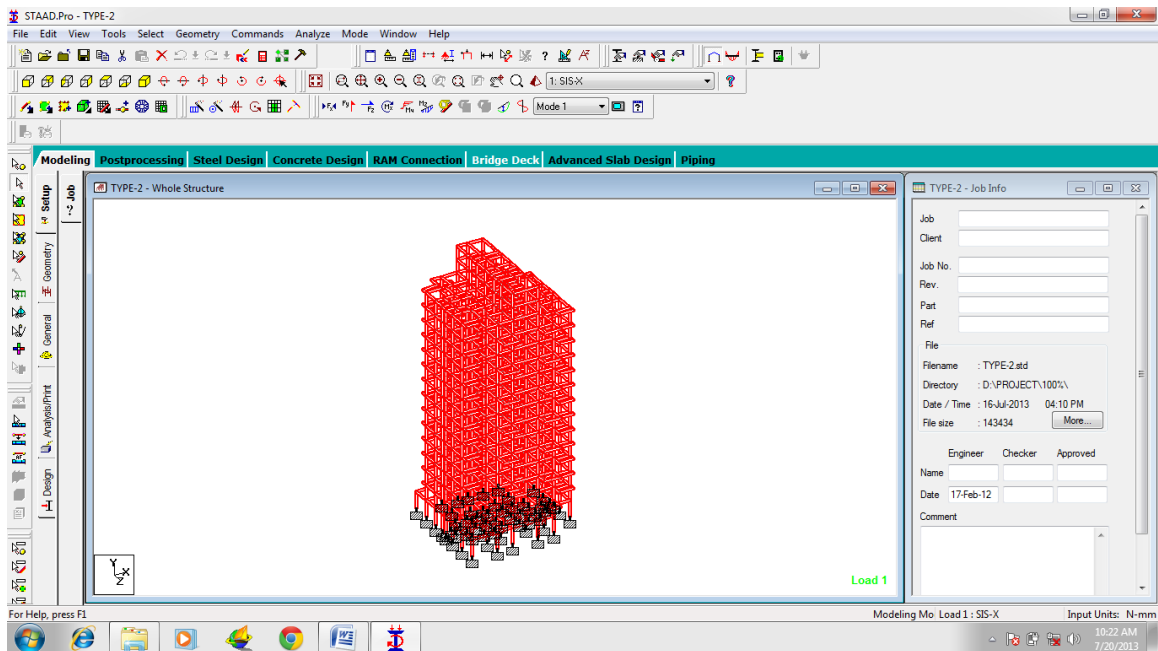


FIGURE 2 -3 D VIEW OF BUILDING (DESIGNED IN STAAD PRO)

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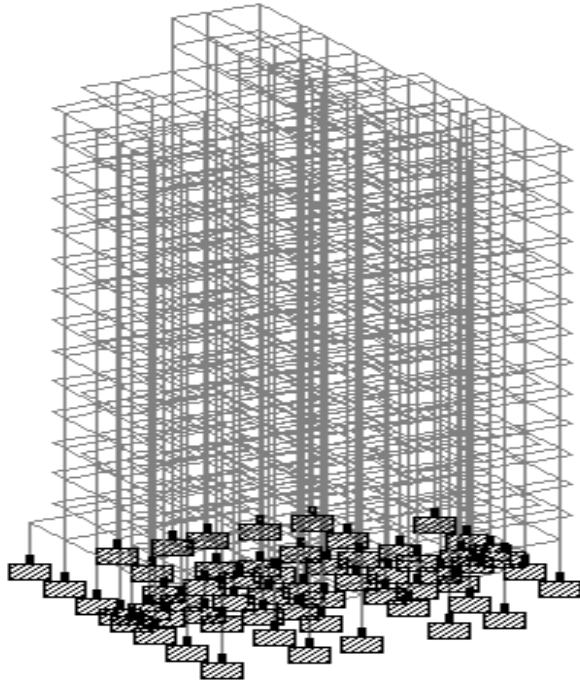
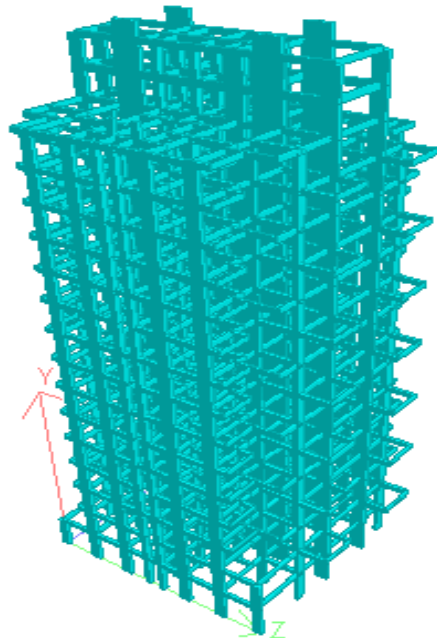
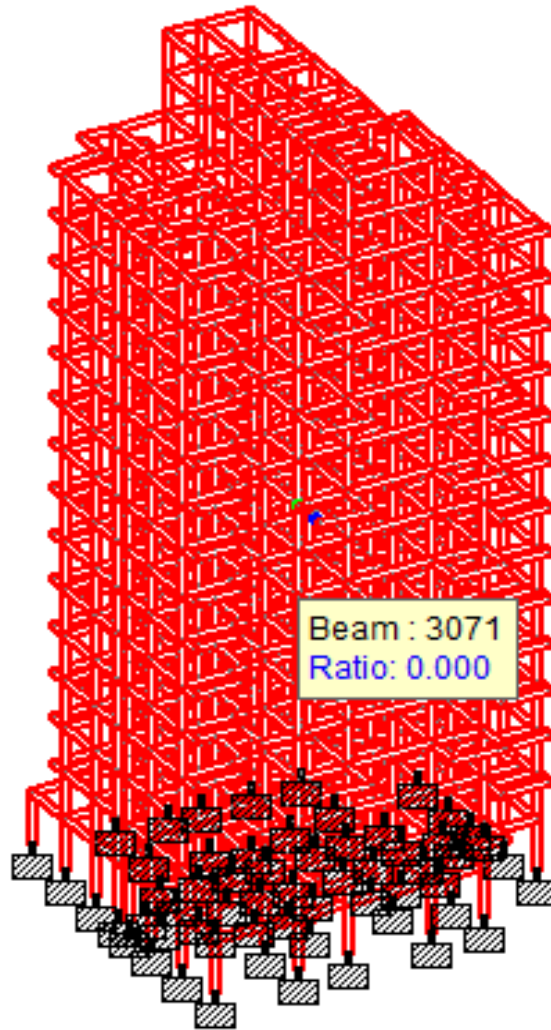


FIGURE 3- DIFFERENT VIEW OF THE BUILDING



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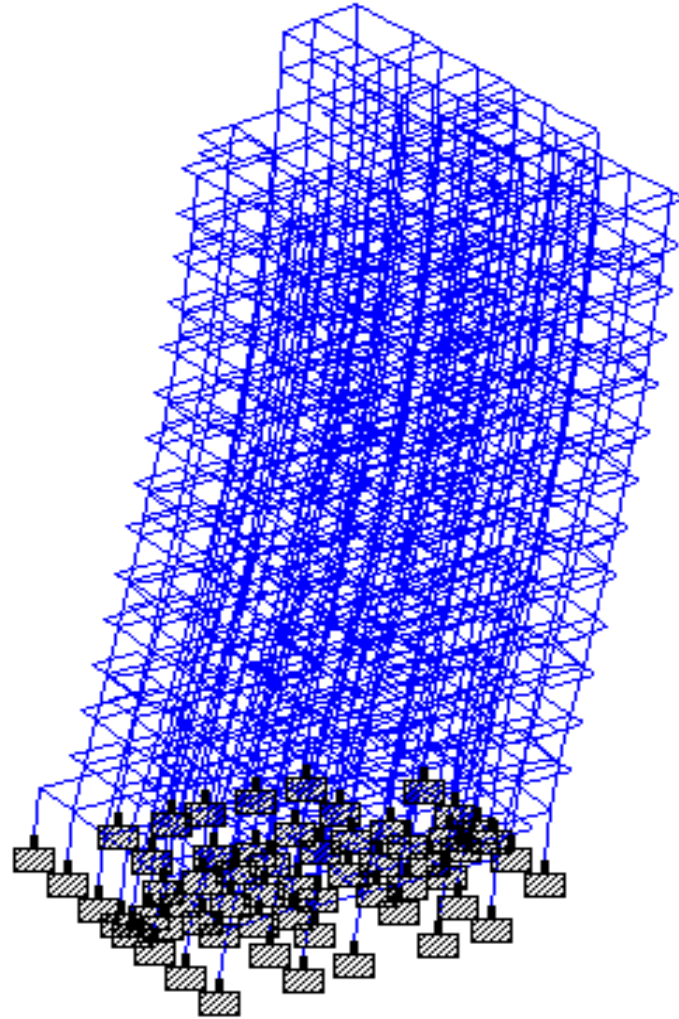


FIGURE 4- SCHEMATIC VIEW OF BUILDING SHOWING THE SELECTION OF ALL COMPONENTS OF BUILDING AND DIAGRAM ON RIGTH SHOWS THE MODE SHAPE OF BUILDING FOR MODE 1

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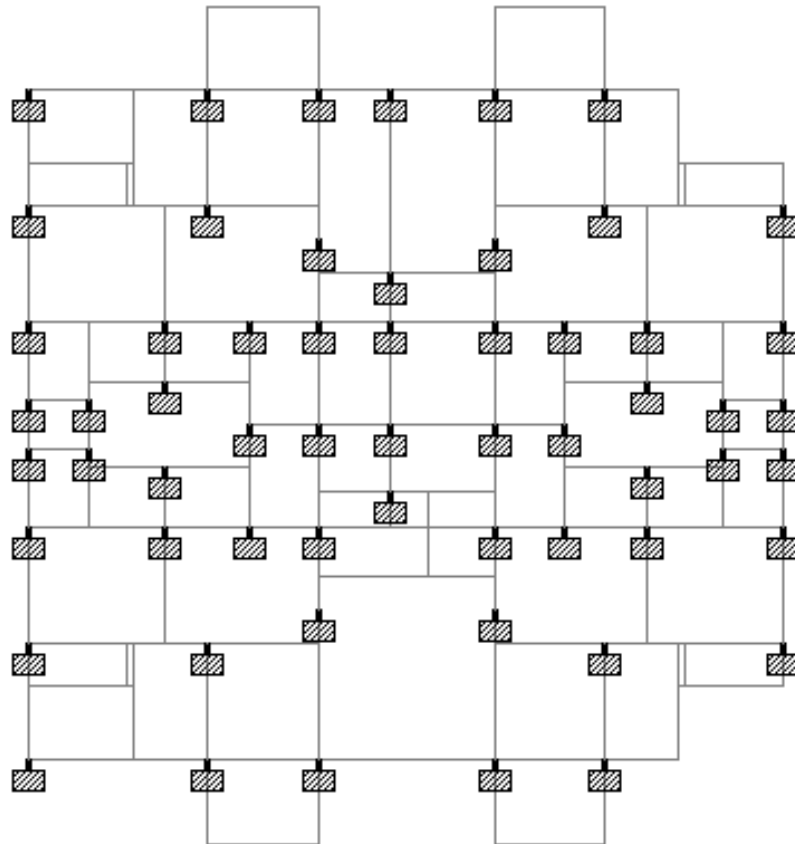


FIG 5- PLAN VIEW OF BUILDING

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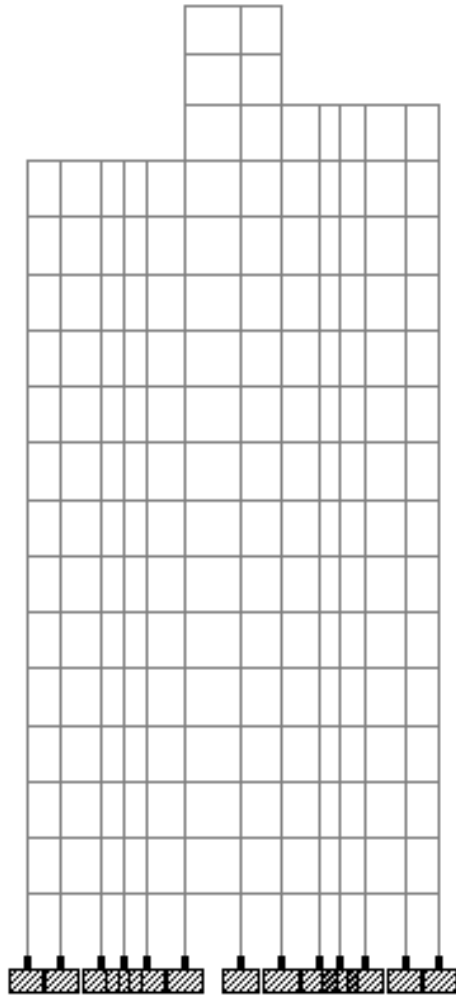


FIG 6(A) - ELEVATION VIEW OF BUILDING

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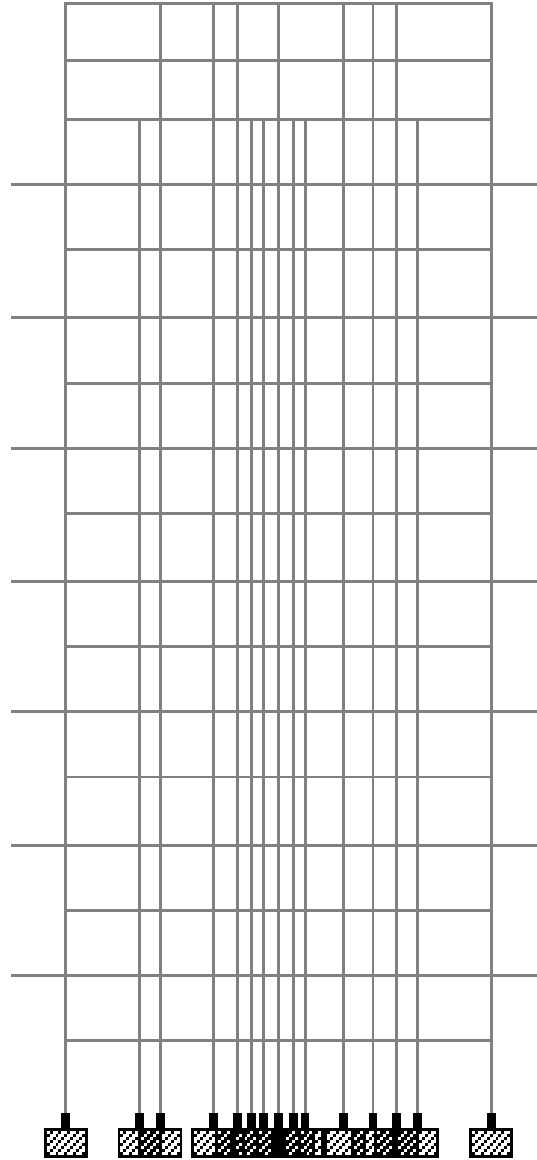


FIGURE 6(B) - SIDE VIEW OF BUILDING (VIEW FROM- X)

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TABLE 1-STRUCTURAL DATA

STRUCTURAL DATA	
HEIGHT	51.26 m
WIDTH	19.620 m
LENGTH	22.05 m
NO. OF STOREY	18
STOREY HEIGHT	3.04 m
TOTAL NO. OF COLUMN	877
TOTAL NO. OF BEAM	2359
CONCRETE GRADE	M25
STEEL GRADE	Fe 500
DENSITY OF CONCRETE	2500 kN/m ³
POISION RATIO	0.17
YOUNG'S MODULUS OF ELASTICITY	21.7185 kN/mm ²

TABLE 2- EARTHQUAKE DATA

EARTHQUAKE DATA	
ZONE VALUE	0.24
IMPORTANCE FACTOR	1
RESPONSE REDUCTION FACTOR	3
TYPE OF SOIL	2
DAMPING RATIO	0.05
CUT OFF MODE	20

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TABLE 3 – DIMENSIONS OF BEAM AND COLUMN

BEAM NO	SIZE (m x m)	COLUMN NO	SIZE(m x m)
878 TO 1006	.45 x .15	1 TO 102	.90 x 0.30
1007 TO 1062	.55 x .23	103 TO 310	0.75 x 0.30
1063 TO 1066	.55 x .15	311 TO 395	1.095 x 0.30
1067 TO 1103	.60 x .23	396 TO 463	2.18 x 0.30
1104 TO 1297	.45 X .23	464 TO 521	0.829 x 0.685
1298 TO 2365	.45 x .23	522 TO 606	0.48 x 0.48
2366 TO 2384	.45 x .23	606 TO 686	0.60 x 0.30
2385 TO 2729	.45 x .23	687 TO 807	0.45 x 0.45
2730 TO 2972	.45 x .23	803 TO 860	0.995 x 0.30
2973 TO 3236	.45 x .23	861 TO 877	1.285 x 0.30

TABLE 4-(A) DEAD LOAD CALCULATIONS

DEAD LOAD	
STILT FLOOR	82.885
BASEMENT EXTN	9
1 ST FLOOR	112.164
BALCONY ALT 1	19.73
BALCONY ALT 2	18.7425
2 ND TO 15 TH FLOOR	75.24
TOP FLOOR	75.24
TERRACE FLOOR	70.784
MACHINE ROOM & WATER TANK	103.5
STAIRCASE	6.6

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TABLE 4-(B) DEAD LOAD CALCULATIONS

LIVE LOAD	
STILT FLOOR	83.6
BASEMENT EXTN	9
1 ST FLOOR	36.215
BALCONY ALT 1	11.748
BALCONY ALT 2	12.495
2 ND TO 15 TH FLOOR	33.44
TOP FLOOR	33.44
TERRACE FLOOR	15.4005
MACHINE ROOM & WATER TANK	34.7

4.2 INPUT PARAMETER:

Input parameter are weight on each floor, seismic weight on each floor, dimension of building, beam and column, soil type & site condition of building, purpose of building, type of materials used.

For all the floor, strength of storey was varied to check and investigate the results for furthering of the research of project.

Following paragraphs describe each input parameter briefly:

Design Acceleration Spectrum: For a specified damping ratio, Design acceleration spectrum refers to an average smoothed plot of maximum acceleration as a function of frequency or time period of vibration for earthquake excitations at the base of a single degree of freedom system (SDOF).

Importance Factor: A factor used to obtain the design seismic force depending on the functional use of the structure, characterized by hazardous aftermaths of its failure, i.e.its post-earthquake functional need, historic or economic importance of the structure.

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Response Reduction Factor: It is the factor by which the actual base shear force, that would be generated if the structure were to remain elastic during its response to the Design Basis Earthquake (DBE) shaking, shall be reduced to obtain the design lateral force.

Zone Factor (Z): It is a factor to obtain the design spectrum depending on the perceived maximum seismic risk characterized by Maximum Considered Earthquake (MCE) in the zone in which the structure is located.

Structural Response Factor ($\frac{S_a}{g}$): It is a factor denoting the acceleration response spectrum of the structure subjected to earthquake ground vibrations, and depends on natural period of vibration and damping of the structure.

Damping: The effect of internal friction, imperfect elasticity of material, slipping, sliding, etc in reducing the amplitude of vibration and is expressed as a percentage of critical damping.

Modal Mass: Modal mass of a structure subjected to horizontal or vertical, as the case maybe, ground motion is apart of the total seismic mass of the structure that is effective in mode k of vibration. The modal mass for a given mode has a unique value irrespective of scaling of the mode shape.

Normal Mode: A system is said to be vibrating in a normal mode when all its masses attain maximum values of displacements and rotations simultaneously, and pass through equilibrium positions simultaneously.

Seismic Weight: It is the total dead load plus appropriate amounts of specified imposed load.

Partial safety factors for limit state design of reinforced concrete structure

In the limit state design of reinforced concrete structures, the following load combinations shall be accounted for:

- 1) 1.5 (DL+LL)

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2) 1.2 (DL+ZL+EL)

3) 1.5 (DL+EL)

4) 0.9DL+1.5EL

4.3 Earthquake Lateral Force Analysis

The design lateral force shall first be computed for the building as a whole. Then design lateral force calculated shall be distributed to the various floor levels. The overall design seismic force thus obtained at each floor level shall then be distributed to individual lateral load resisting elements depending on the floor diaphragm action. There are two commonly used procedures for specifying seismic design lateral forces:

1. Equivalent static force analysis
2. Dynamic analysis

Equivalent static force analysis

The equivalent lateral force analysis for an earthquake converts a dynamic analysis into partly dynamic and partly static analyses for finding the maximum displacement (or stresses) induced in the structure due to earthquake excitation. The equivalent lateral force for an earthquake is defined as a set of lateral static forces which will produce the same peak response of the structure as that obtained by the dynamic analysis of the structure under the same earthquake. This equivalence is restricted only to a single mode of vibration of the structure. Inherently, equivalent static lateral force analysis is based on the following assumptions:

1. Structure is rigid.
2. Perfect fixity between structure and foundation.
3. Same acceleration is induced in each point of structure during ground motion.
4. Dominant effect of earthquake is equivalent to horizontal force of varying magnitude over the height.
5. Base shear on the structure is determined approximately.

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However, during an earthquake structure does not remain rigid, it deflects, and thus base shear is disturbed along the height.

The limitation of equivalent static lateral force analysis is that empirical relationships are used to specify dynamic inertial forces as static forces which do not explicitly account for the dynamic characteristics of the particular structure being designed or analyzed. These formulas were developed to approximately represent the dynamic behavior of regular structures. For such structures, the equivalent static force procedure is most often adequate. Structures that are classified as irregular violate the assumptions on which the empirical formulas, used in the equivalent static force procedure, are developed.

Step by step procedure for Equivalent static force analysis according to code

Step-1: Depending on the location of the building site, identify the seismic zone and assign Zone factor (Z).

Step-2: Compute the seismic weight of the building (W)

Step-3: Compute the natural period of the building (T_a).

Step-4: Obtain the data pertaining to type of soil conditions of foundation of the building

Step-5: Using T_a and soil type, compute the average spectral acceleration as per code..

Step-6: Assign the value of importance factor (I) depending on occupancy and/or functionality of structure.

Step-7: Assign the values of response reduction factor (R) depending on type of structure

Step-8: Knowing $Z, \frac{s_a}{g}, R$ and I compute design horizontal acceleration coefficient (A_h).

Step-9: Using A_h and W compute design seismic base shear (V_B), from $V_B = A_h W$ as per code.

Dynamic Analysis

- 1.) Dynamic analysis is classified into two types,
 - a.) Response spectrum method
 - b.) Time history method

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- 2.) Dynamic analysis shall be performed to obtain the design seismic force and its distribution along the height of the building and to the various lateral load resisting elements, for the following buildings:
 - a.) Regular buildings Those greater than 40 m in height in Zones IV and V and those greater than 90 m in height in Zones II and III.
 - b.) Irregular buildings — All framed buildings higher than 12 m in Zones IV and V, and those greater than 40 m in height in Zones II and III.
- 3.) Time History Method: Time history method of analysis, when used, shall be based on an appropriate ground motion and shall be performed using accepted principles of dynamics.
- 4.) Response Spectrum Method: Response spectrum method of analysis shall be performed using the design spectrum
- 5.) Modes to be considered: The number of modes to be used in the analysis should be such that the sum total of modal masses of all modes considered is at least 90%.

Step by step procedure for Response spectrum method

Step-1: Depending on the location of the building site, identify the seismic zone and assign Zone factor (Z)

Step-2: Compute the seismic weight of the building (W) as per code

Step-3: Establish mass [M] and stiffness [K] matrices of the building using system of masses lumped at the floor levels with each mass having one degree of freedom, that of lateral displacement in the direction under consideration. Accordingly, to develop stiffness matrix effective stiffness of each floor is computed using the lateral stiffness coefficients of columns and infill walls. Usually floor slab is assumed to be infinitely stiff.

Step-4: Using [M] and [K] of previous step and employing the principles of dynamics compute the modal frequencies, $\{w\}$ and corresponding mode shapes, $\{j\}$.

Step-5: Compute modal mass M_k of mode k as per code

Step-6: Compute modal participation factors P_k of mode k as per code

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Step-7: Compute design lateral force (Q_{ik}) at each floor in each mode as per code

Step-8: Compute storey shear forces in each mode (V_{ik}) acting in storey i in mode k as per code

Step-9: Compute storey shear forces due to all modes considered, V_I in storey i, by combining shear forces due to each mode as per code.

4.4 OUTPUT PARAMETERS:

Parameter in which changes is noted after modifying the structure are frequency, time period, spectral acceleration, base shear, SRSS shear, CQC shear, SHEAR 10 pt shear, ABS shear, storey shear, storey drift and mass participation factor.

Modal Participation Factor: Modal participation factor of mode k of vibration is the amount by which mode k contributes to the overall vibration of the structure under horizontal and vertical earthquake ground motions. Since the amplitudes of 95 percent mode shapes can be scaled arbitrarily, the value of this factor depends on the scaling used for mode shapes.

Natural Period: Natural period of a structure is its time period of undamped free vibration.

Storey Drift: It is the displacement of one level relative to the other level above or below.

Storey Shear: It is the sum of design lateral forces at all levels above the storey under consideration.

Storey drift Limitation: The storey drift in any due to minimum specified design lateral load with partial factor of safety 1.0 shall not be increased by 0.004 times the storey height.

SRSS METHOD: It is approximate for combining modal response. In this method, the squares of a specific response are summed. The square root of this sum is taken to be

[Type text]

combines effect. It is important to note that the quantities combined are those for each individual mode.

$$r_o = (\sum_{n=1}^N r_{no}^2)^{0.5}$$

This method gives excellent response estimates for structure with well separated natural frequencies.

CQC METHOD: It is modal combination method based on the use of cross modal coefficient. The cross modal coefficient reflects the duration and frequency content of seismic event as well as the modal frequencies and damping ratio of the structure.

$$r_o = (\sum_{i=1}^N \sum_{n=1}^N \rho_{in} r_{io} r_{no})^{0.5}$$

This method gives acceptable response estimates for types of structure having well separated natural frequencies as well as to those having closely spaced natural frequencies like in multistory building with unsymmetrical plan.

ABS METHOD: It is modal combination method based on assumption that all modal peaks occurs at the same time and algebraic sign is ignored to get an upper bound to the peak value of the total response. This upper bound value (ABS VALUE) is too conservative.

$$r_o \leq \sum_{n=0}^N r_{no}$$

:

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4.5 DETAILS OF STEPS PERFORMED:

1. The building, whose isometric view is already shown in previous chapter, is designed in STAAD PRO V8i with dimension and specification as discussed above.
2. For calculating seismic force, every joint in structure is pinned and static analysis is performed to calculate resulting reaction on each joint. Reaction in global Y direction is taken as seismic force in all direction and then it is applied on each joint.
3. In order to study the effect of discontinuity in strength- weak storey, the value of modulus of elasticity (E) of the concrete for the concerned storey is varied for the 5 cases viz. 100% , 90%, 80%, 70%, 60%.
4. For each case, different strength values were assigned to the columns of the concerned storey.
5. Model of building is analyzed and value of output parameter is noted.
6. Steps 2 to 5 were repeated for each floor of the model of the building nad results were noted.

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CHAPTER 5

RESULTS & DISCUSSION

TABLE 5-DATA OF FREQUENCY FOR VARIOUS CASES

%STRENGTH	100%	90%	80%	70%	60%
FREQUENCY	0.427	0.428	0.428	0.428	0.428

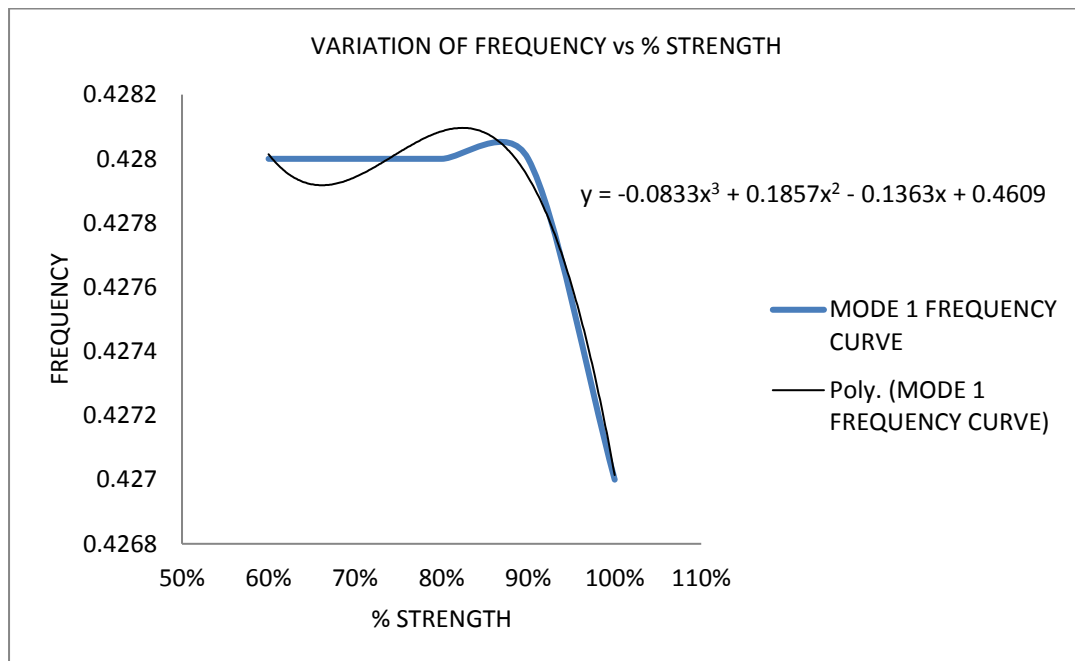


FIGURE 7- FREQUENCY vs. % STRENGTH

It is observed from the table of frequency & % strength ratio that frequency corresponding to 100% strength is 0.427 and for all the case there after it is 0.427, the

[Type text]

value is constant. Thus for the above case, it can be said the variation in frequency with decrease in strength is very low for the case concerned.

TABLE 6 – TIME PERIOD DATA

%STRENGTH	100%	90%	80%	70%	60%
TIME PERIOD	2.34231	2.33745	2.33745	2.33774	2.33794

The above data is collected after analyzing the 16 storey building for determination of all the required parameters to be checked. Then all the values are written in tabular fashion, graph is plotted, which is on next page, then variation of time period with respect to variation in strength is observed.

It can be observed that it follows the inverse proportion of frequency variation.

The trend line of this variation is $y = 1.745x^4 - 5.174x^3 + 5.711x^2 - 2.784x + 2.843$
Observed.

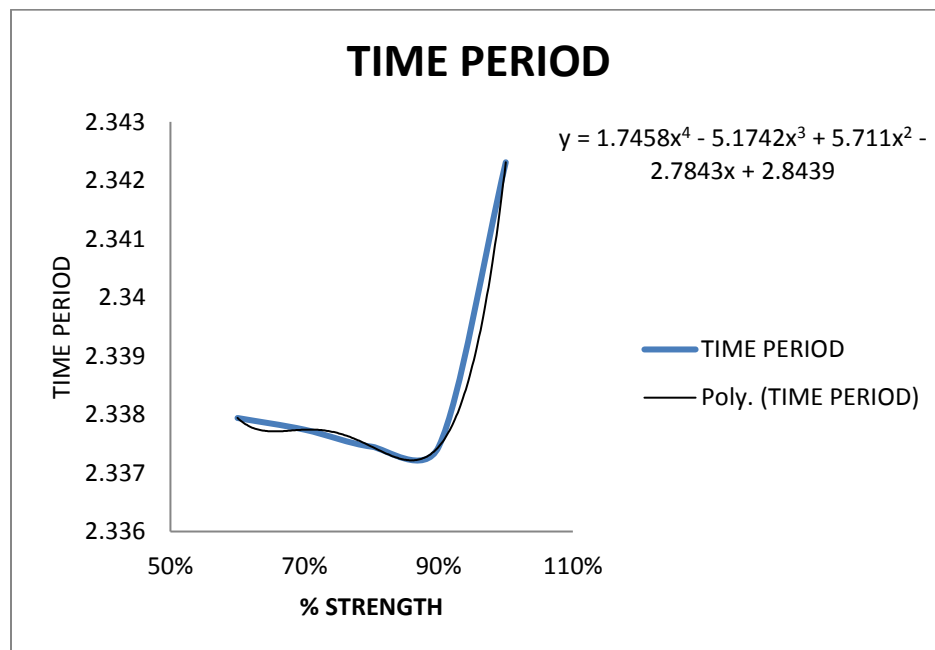


FIGURE 8- TIME PERIOD vs. % STRENGTH

[Type text]

**TABLE 7- DATA FOR SPECTRAL ACCELERATION FOR ALL CASES
UNDER CONSIDERATION**

% STRENGTH	100	90	80	70	60
1ST FLOOR	0.58062	0.58183	0.5818	0.58176	0.58174
2ND FLOOR	0.58062	0.58378	0.58181	0.58177	0.58173
3RD FLOOR	0.58062	0.58181	0.58175	0.58169	0.58161
4TH FLOOR	0.58062	0.58179	0.58176	0.5817	0.58162
5TH FLOOR	0.58062	0.58178	0.58177	0.58171	0.58164
6TH FLOOR	0.58062	0.58177	0.58178	0.58172	0.58166
7TH FLOOR	0.58062	0.58176	0.58178	0.58173	0.58167
8TH FLOOR	0.58062	0.58176	0.58179	0.58174	0.58168
9TH FLOOR	0.58062	0.58176	0.58179	0.58174	0.58166
10TH FLOOR	0.58062	0.58175	0.58179	0.58175	0.58167
11TH FLOOR	0.58062	0.58175	0.58179	0.58175	0.58167
12TH FLOOR	0.58062	0.58175	0.5818	0.58176	0.58167
13TH FLOOR	0.58062	0.58175	0.5818	0.58176	0.58168
14TH FLOOR	0.58062	0.58186	0.5818	0.58176	0.58171
15TH FLOOR	0.58062	0.58185	0.58185	0.58185	0.58184
TOP FLOOR	0.58062	0.58185	0.58185	0.58185	0.58184

It can be concluded that variation of spectral acceleration with respect to % strength is approximately the same as the variation of frequency with respect to % strength. The plot of spectral acceleration and % strength is shown in graph below-

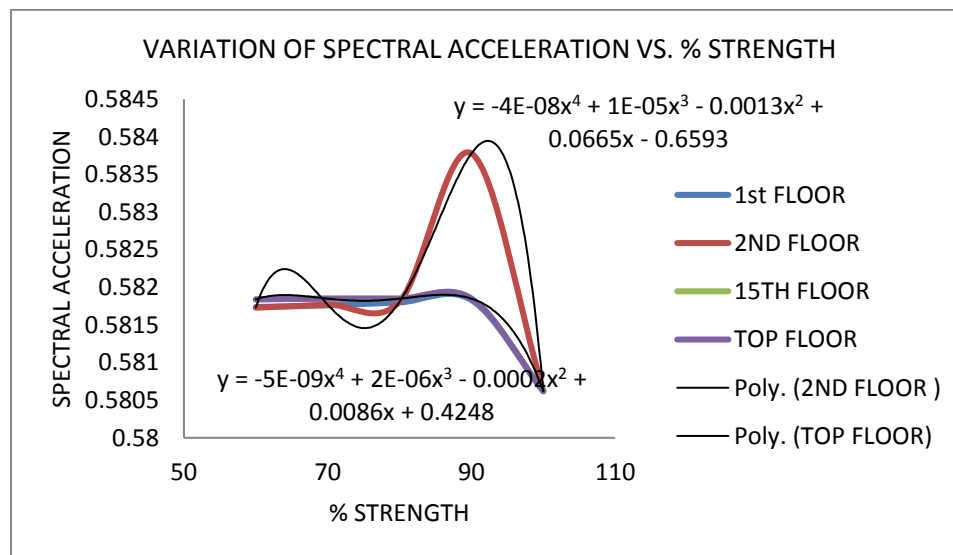


FIGURE 9- SPECTRAL ACCELERATION vs. % STRENGTH

[Type text]

TABLE 8 -DATA OF BASE SHEAR (MTON) vs. % STRENGTH

%STRENGHT	100	90	80	70	60
1 ST FLOOR	106.9	105.57	105.55	105.52	105.49
2 ND FLOOR	106.9	105.35	105.56	105.54	105.51
3 RD FLOOR	106.9	105.56	105.52	105.48	105.43
4 TH FLOOR	106.9	105.55	105.53	105.49	105.44
5 TH FLOOR	106.9	105.55	105.53	105.5	105.45
6 TH FLOOR	106.9	105.54	105.54	105.5	105.46
7 TH FLOOR	106.9	105.54	105.541	105.51	105.47
8 TH FLOOR	106.9	105.54	105.54	105.51	105.48
9 TH FLOOR	106.9	105.54	105.54	105.52	105.47
10 TH FLOOR	106.9	105.54	105.55	105.52	105.47
11 TH FLOOR	106.9	105.54	105.55	105.52	105.47
12 TH FLOOR	106.9	105.54	105.55	105.52	105.47
13 TH FLOOR	106.9	105.54	105.55	105.52	105.47
14 TH FLOOR	106.9	105.59	105.55	105.52	105.49
15 TH FLOOR	106.9	105.59	105.59	105.59	105.59
TOP FLOOR	106.9	105.59	105.59	105.59	105.59

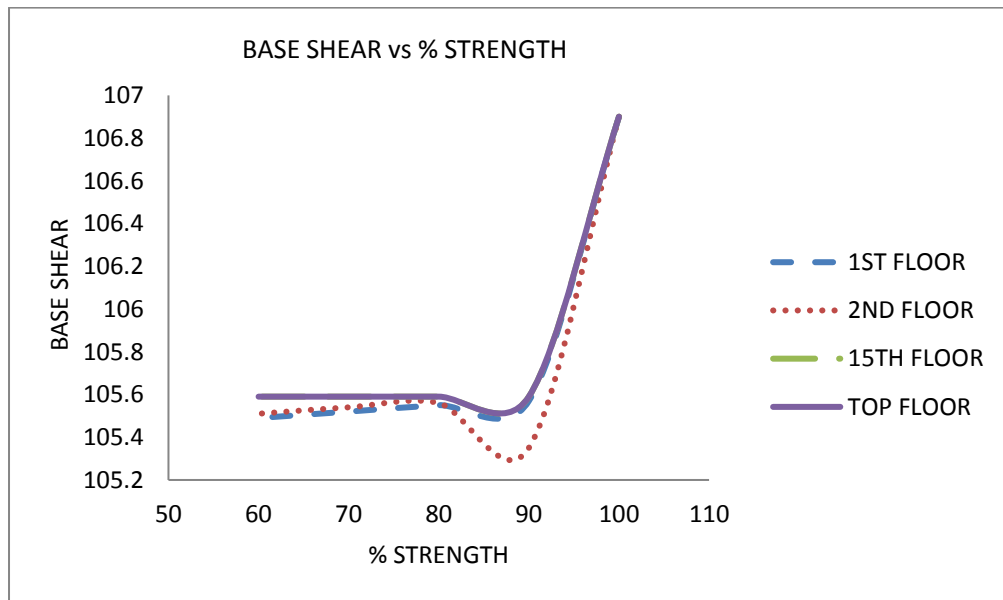


FIGURE 10- VARIATION OF BASE SHEAR vs. % STRENGTH

[Type text]

From the above set of values of base shear and % strength it can be concluded that as the strength ratio of building is being decreased the base shear is decreasing for the base of the building.

By thoroughly studying the graph it can also be concluded that the effect of change in shear is more pronounced for 1st storey and top storey. For the 2nd floor of the building approximately for 90% strength of 2nd floor , the max decrease in base shear is observed.

The above graph is plotted for 1st, 2nd , 15th and top storey. The graph on the next page gives the similar variation for all remaining floors of the building.

If the strength of building falls below 80 % of the original strength of the building, base shear remains more or less constant. The effect of which are necessarily be discussed.

VARIATION OF BASE SHEAR vs. % STRENGTH

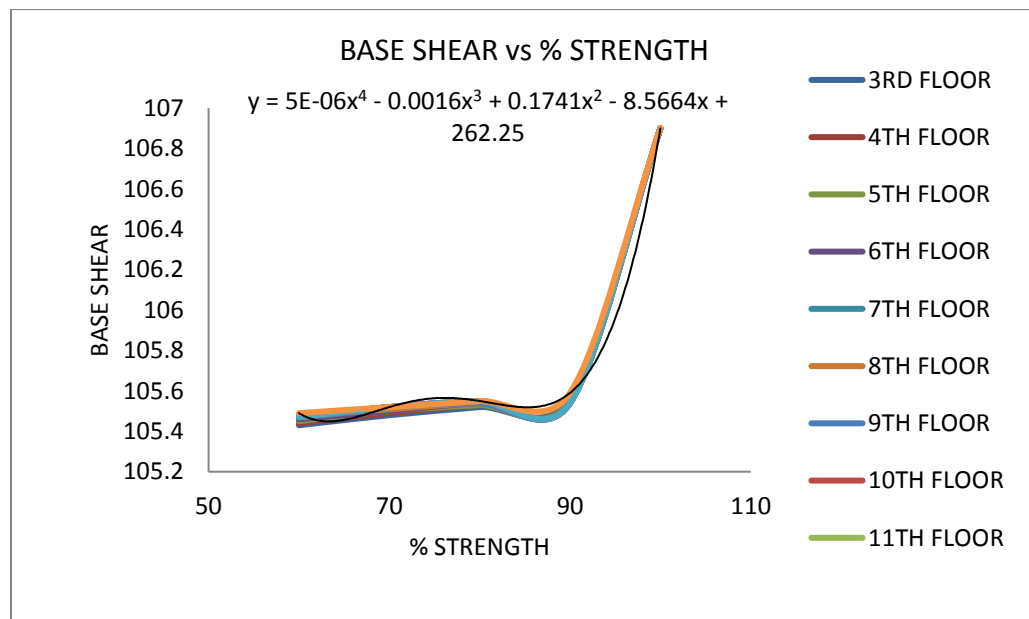


FIGURE 11 VARIATION OF BASE SHEAR vs. % STRENGTH

[Type text]

TABLE 9-SQUARE ROOT OF SUM OF SQUARE SHEAR DATA

%STRENGHT	100	90	80	70	60
1 ST FLOOR	117.99	116.84	116.82	116.79	116.76
2 ND FLOOR	117.99	116.99	116.82	116.81	116.78
3 RD FLOOR	117.99	116.83	116.79	116.76	116.71
4 TH FLOOR	117.99	116.82	116.8	116.77	116.72
5 TH FLOOR	117.99	116.81	116.8	116.77	116.73
6 TH FLOOR	117.99	116.81	116.81	116.78	116.74
7 TH FLOOR	117.99	116.81	116.81	116.78	116.75
8 TH FLOOR	117.99	116.81	116.81	116.79	116.75
9 TH FLOOR	117.99	116.81	116.81	116.79	116.75
10 TH FLOOR	117.99	116.8	116.82	116.79	116.75
11 TH FLOOR	117.99	116.8	116.82	116.79	116.75
12 TH FLOOR	117.99	116.81	116.82	116.79	116.75
13 TH FLOOR	117.99	116.81	116.82	116.79	116.75
14 TH FLOOR	117.99	116.85	116.82	116.8	116.77
15 TH FLOOR	117.99	116.85	116.86	116.86	116.87
TOP FLOOR	117.99	116.85	116.86	116.86	116.87

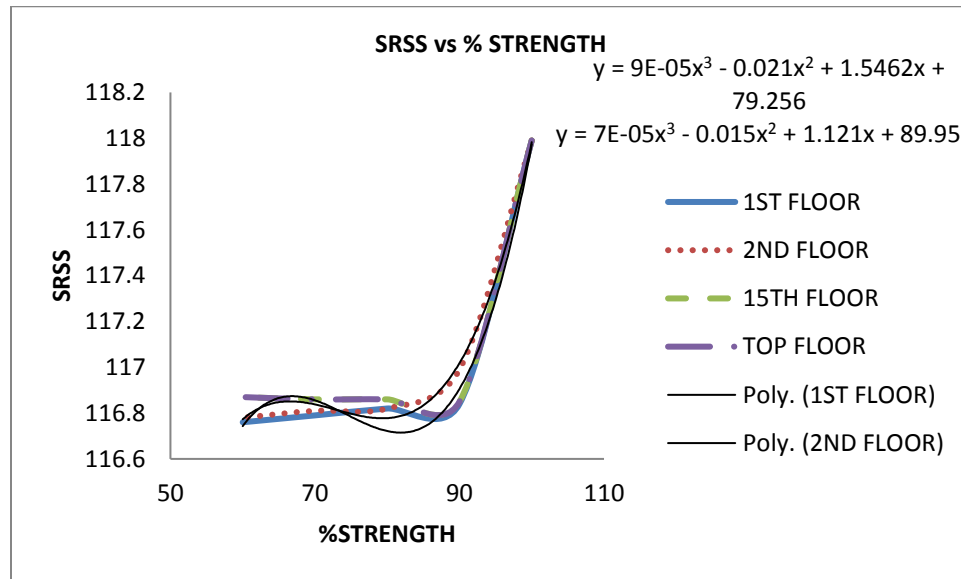


FIGURE 12(A)-VARIATION OF SQUARE ROOT OF SUM OF SQUARE SHEAR vs. % STRENGTH

[Type text]

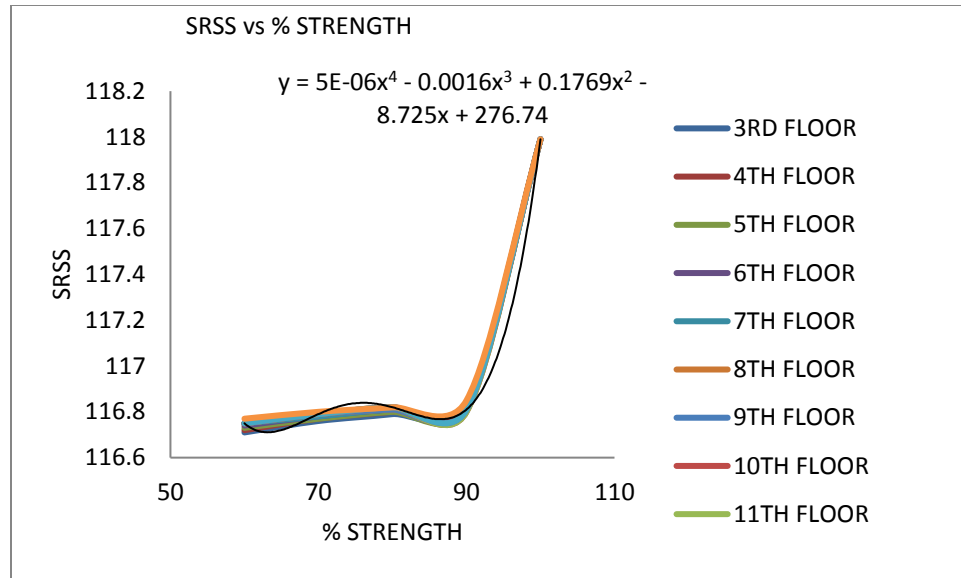


FIGURE 12(B)-VARIATION OF SQUARE ROOT OF SUM OF SQUARE SHEAR vs. % STRENGTH

The above set of graphs and values in table are for square root of sum of square shear values.

The following trend lines are observed,

$$y = 9E-05x^3 - 0.021x^2 + 1.546x + 79.25 \dots \text{for } 1^{\text{st}} \text{ and } 2^{\text{nd}} \text{ floor}$$

$$y = 7E-05x^3 - 0.015x^2 + 1.121x + 89.95 \dots \text{for } 15^{\text{th}} \text{ and top floor}$$

$$y = 5E-06x^4 - 0.001x^3 + 0.176x^2 - 8.725x + 276.7 \dots \text{for all other remaining floor}$$

The values obtained using SRSS method are greater than those obtained from simple method of calculating base shear. The SRSS shear is constant for each case of different % strength. i.e. if for the 1st floor, if the strength is reduced by 10 % , if this is done for any storey, even then the shear remains the same, since the mass is not changed, the shear is constant.

[Type text]

But if the variation for different % strength ratio of each floor is observed, it may be noted that that SRSS shear decreases as the % strength of the building is decreased.

**TABLE 10 - VARIATION OF COMPLETE QUADRATIC COMBINATION
SHEAR vs.% STRENGTH**

% STRENGTH	100	90	80	70	60
1 ST FLOOR	119.53	118.96	118.95	118.93	118.91
2 ND FLOOR	119.53	119.34	118.95	118.94	118.92
3 RD FLOOR	119.53	118.95	118.93	118.91	118.87
4 TH FLOOR	119.53	118.95	118.94	118.91	118.88
5 TH FLOOR	119.53	118.95	118.94	118.92	118.89
6 TH FLOOR	119.53	118.94	118.94	118.92	118.9
7 TH FLOOR	119.53	118.94	118.94	118.83	118.9
8 TH FLOOR	119.53	118.94	118.95	118.93	118.9
9 TH FLOOR	119.53	118.94	118.95	118.93	118.9
10 TH FLOOR	119.53	118.94	118.95	118.93	118.9
11 TH FLOOR	119.53	118.94	118.95	118.93	118.9
12 TH FLOOR	119.53	118.94	118.95	118.93	118.9
13 TH FLOOR	119.53	118.94	118.95	118.93	118.9
14 TH FLOOR	119.53	118.97	118.95	118.93	118.91
15 TH FLOOR	119.53	118.97	118.97	118.98	118.88
TOP FLOOR	119.53	118.97	118.97	118.98	118.98

The same observations were made for complete quadratic combination shear, the values of which are more than both the previous type of shear.

The same pattern of variation is observed as discussed earlier for the previous two cases of shear.

The trend lines observed are

$$y = -4E-06x^4 + 0.001x^3 - 0.149x^2 + 7.626x - 25.47 \text{for 1st and 2nd floor}$$

$$y = 5E-05x^3 - 0.010x^2 + 0.777x + 100.1 \text{for 15th and top floor}$$

$$y = 2E-06x^4 - 0.000x^3 + 0.075x^2 - 3.710x + 186.8 \text{for remaining floors.}$$

[Type text]

The graph of variation is plotted which is shown below.....

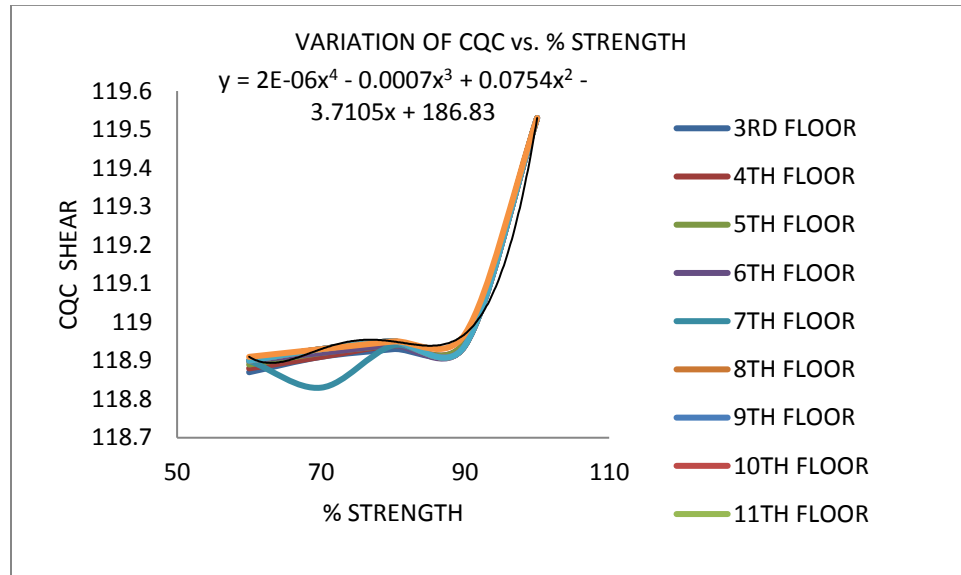
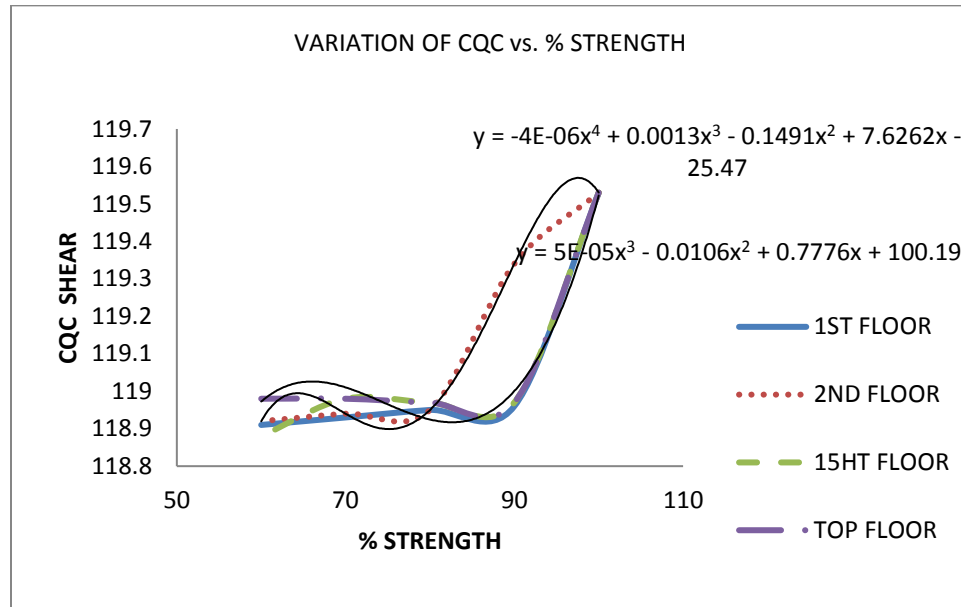


FIGURE 13- VARIATION OF COMBINED QUADRATIC COMBINATION vs. % STRENGTH

[Type text]

TABLE 11- VARIATION OF ABSSUM vs. % STRENGTH

% STRENGTH	100	90	80	70	60
1 ST FLOOR	207.44	208.93	208.92	208.91	208.91
2 ND FLOOR	207.44	210.07	208.92	208.92	208.91
3 RD FLOOR	207.44	208.92	208.91	208.91	208.89
4 TH FLOOR	207.44	208.92	208.92	208.91	208.9
5 TH FLOOR	207.44	208.92	208.92	208.91	208.9
6 TH FLOOR	207.44	208.92	208.92	208.91	208.9
7 TH FLOOR	207.44	208.92	208.92	208.91	208.9
8 TH FLOOR	207.44	208.92	208.92	208.91	208.91
9 TH FLOOR	207.44	208.92	208.92	208.91	208.9
10 TH FLOOR	207.44	208.92	208.92	208.91	208.9
11 TH FLOOR	207.44	208.92	208.92	208.91	208.9
12 TH FLOOR	207.44	208.92	208.92	208.91	208.9
13 TH FLOOR	207.44	208.92	208.92	208.91	208.9
14 TH FLOOR	207.44	208.93	208.92	208.91	208.91
15 ^T FLOOR	207.44	208.93	208.93	208.93	208.94
TOP FLOOR	207.44	208.93	208.93	208.93	208.94

In this case lateral forces at the joints are calculated as ABSSUM, it may be noted from the data above that for 1st floor full strength case the shear is 207.44 MTON & the same thing for 90 % shear is 208.93 MTON. i.e. the shear is increasing, then again decreasing the strength of the same floor by 20% it becomes 208.92 MTON, there after it is constant. So this point of 80% strength is of importance. The importance of which is to be investigated.

This pattern is observed for each floor by varying the % strength to different degree.

More or less the same pattern is observed.

For the second floor this variation is much pronounced for the case of 100% to 90%.

The variation is of about 1.26% increase in shear if the strength is reduced by 10 % for the 2nd storey. Thereafter for 2nd storey 80% case the shear observed is 208.92 MTON.

There after it remains more or less constant if strength is reduced further.

The graphs of the above discussions are shown below for each case.

[Type text]

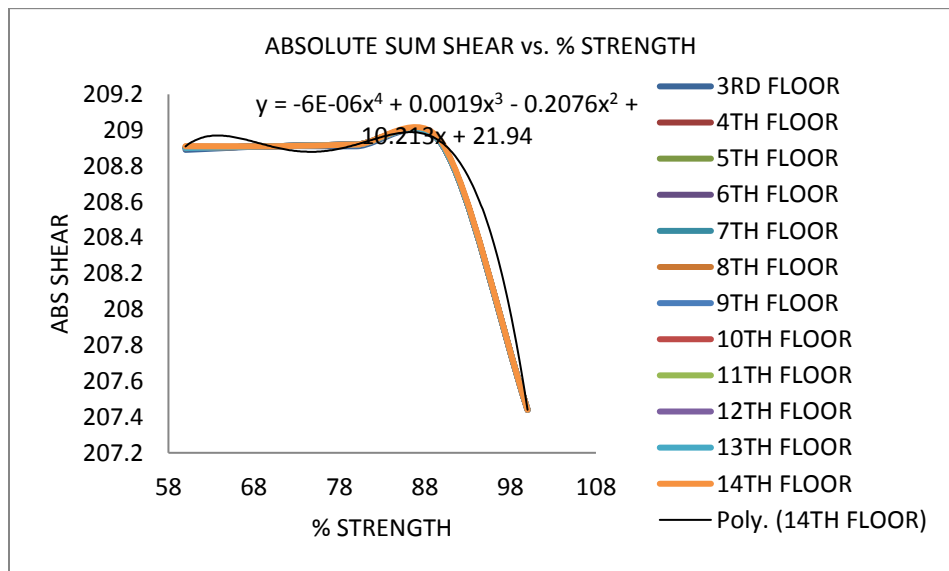
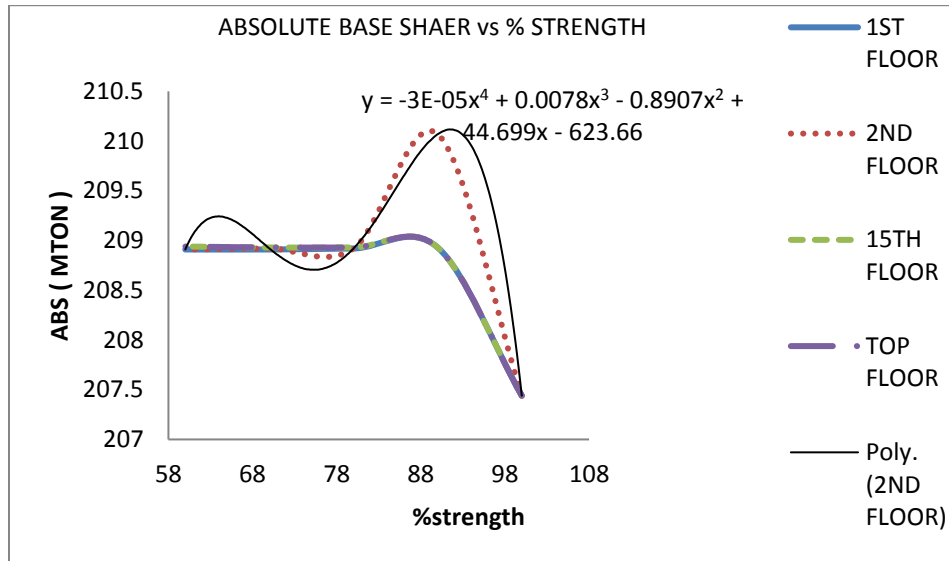


FIGURE 14 – VARIATION OF ABSOLUTE BASE SHEAR vs. % STRENGTH

[Type text]

TABLE 12-VARIATION OF 10 PCT vs. % STRENGTH DATA

%STRENGTH	100	90	80	70	60
1 ST FLOOR	118.04	116.85	116.83	116.81	116.78
2 ND FLOOR	118.04	117.01	116.84	116.82	116.8
3 RD FLOOR	118.04	116.84	116.81	116.78	116.73
4 TH FLOOR	118.04	116.84	116.8	116.78	116.74
5 TH FLOOR	118.04	116.83	116.82	116.79	116.75
6 TH FLOOR	118.04	116.83	116.83	116.8	116.76
7 TH FLOOR	118.04	116.83	116.83	116.8	116.77
8 TH FLOOR	118.04	116.82	116.83	116.8	116.77
9 TH FLOOR	118.04	116.82	116.83	116.81	116.77
10 TH FLOOR	118.04	116.82	116.83	116.81	116.77
11 TH FLOOR	118.04	116.82	116.83	116.81	116.77
12 TH FLOOR	118.04	116.82	116.83	116.81	116.77
13 TH FLOOR	118.04	116.82	116.83	116.81	116.77
14 TH FLOOR	118.04	116.87	116.84	116.81	116.78
15 ^T FLOOR	118.04	116.87	116.88	116.88	116.88
TOP FLOOR	118.04	116.87	116.88	116.88	116.88

For the case of each analysis the above tabular for is prepared for checking the variation which is observed in previous cases, & for the purpose of plotting the graph between variation between 10 PCT and % STRENGTH.

It can be seen from the above values and the graph plotted below, that value of this parameter is decreasing as the % strength is varied for each floor case taken individually.

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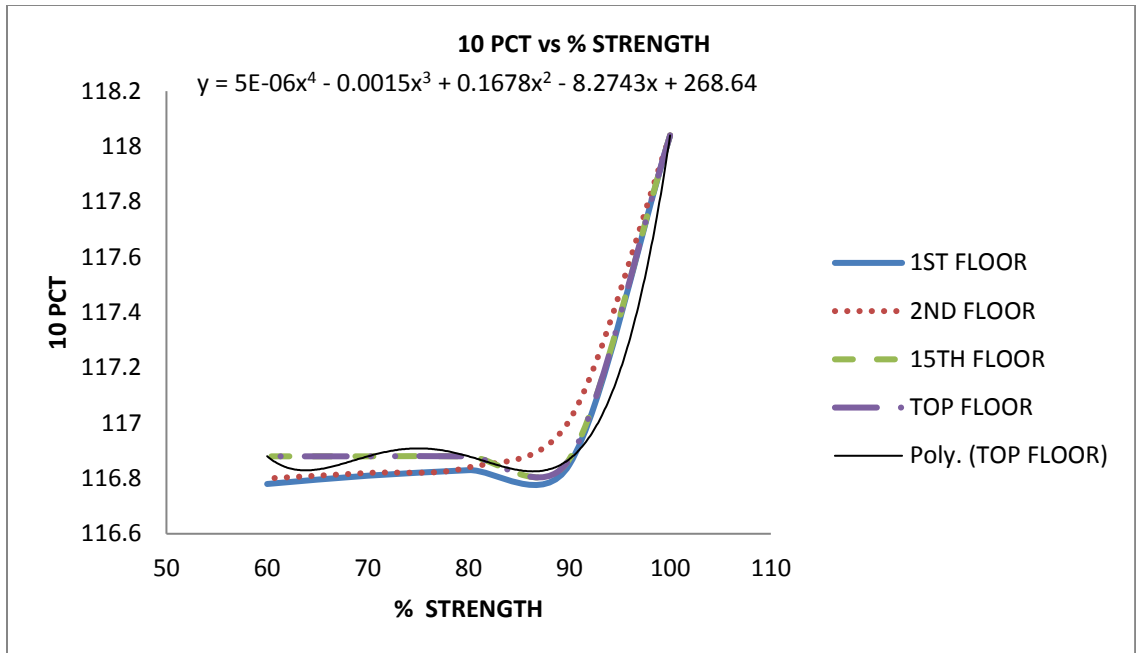


FIGURE 15(A) – VARIATION OF 10 PCT SHEAR vs. % STRENGTH

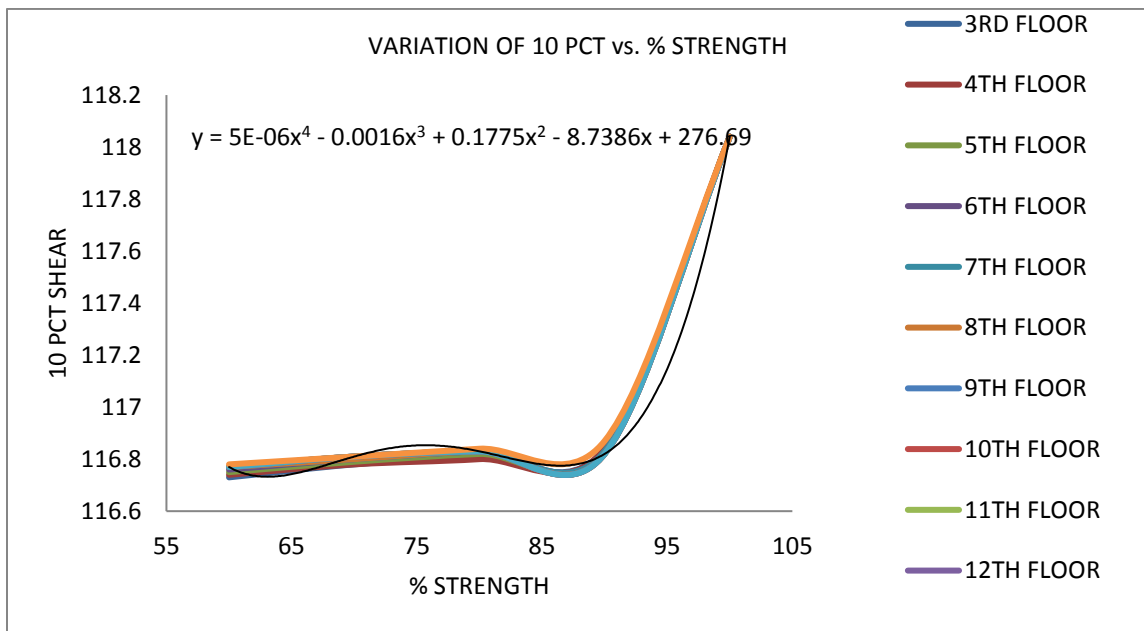


FIGURE 15(B) – VARIATION OF 10 PCT SHEAR vs. % STRENGTH

[Type text]

TABLE 13-VARIATION OF ROOF DRIFT vs. % STRENGTH

%STRENGTH	100	90	80	70	60
1 ST FLOOR	0.0487	0.274	0.274	0.274	0.274
2 ND FLOOR	0.0487	0.2739	0.274	0.274	0.3022
3 RD FLOOR	0.0487	0.3023	0.3022	0.3022	0.3022
4 TH FLOOR	0.0487	0.3023	0.3022	0.3022	0.3022
5 TH FLOOR	0.0487	0.3023	0.3022	0.3022	0.3022
6 TH FLOOR	0.0487	0.3023	0.3022	0.3022	0.3022
7 TH FLOOR	0.0487	0.3023	0.3023	0.3022	0.3022
8 TH FLOOR	0.0487	0.3023	0.3023	0.3022	0.3022
9 TH FLOOR	0.0487	0.3023	0.3023	0.3023	0.3023
10 TH FLOOR	0.0487	0.3023	0.3023	0.3023	0.3023
11 TH FLOOR	0.0487	0.3023	0.3023	0.3023	0.3023
12 TH FLOOR	0.0487	0.3023	0.3023	0.3023	0.3023
13 TH FLOOR	0.0487	0.3023	0.3023	0.3022	0.3022
14 TH FLOOR	0.0487	0.3023	0.3023	0.3022	0.3022
15 ^T FLOOR	0.0487	0.3024	0.3027	0.303	0.3033
TOP FLOOR	0.0487	0.3025	0.3027	0.303	0.3033

For each case of analysis the roof drift is noted and is arranged in tabular for as shown in the above table. It may be noted that for full strength case the value for roof drift is 0.0487 cm, but as the strength ratio is decreased the variation in changes for the roof drift are noted, the drift changes from 0.0487 to 0.274 cm. thus as the strength of 1st storey is changed from 100% to 90%, roof drift is increasing. All these values can be observed in the table. And increase in drift for each case is checked.

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The plot of Roof drift vs. % STRENGTH are drawn-

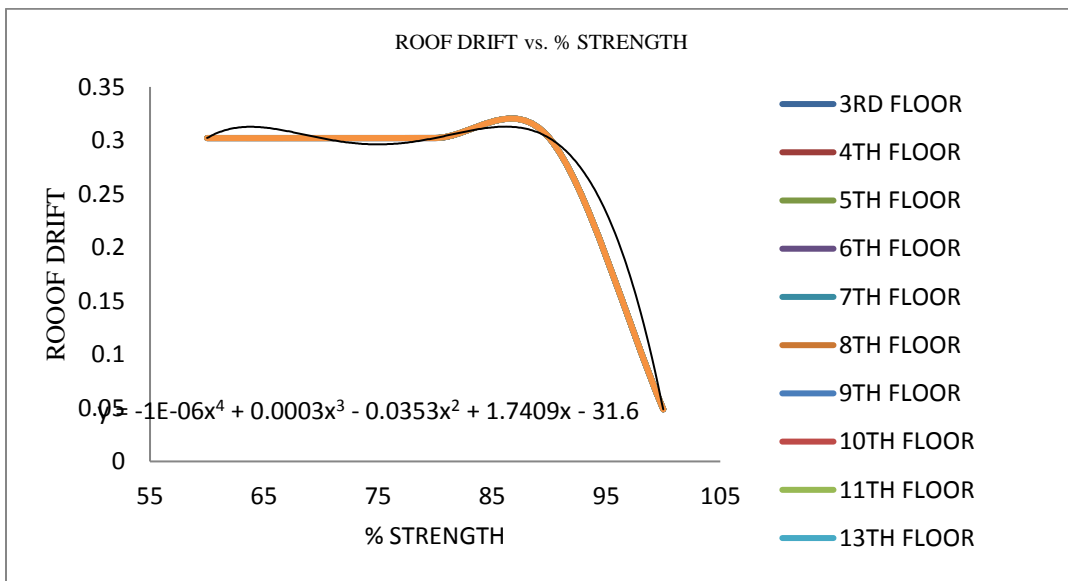
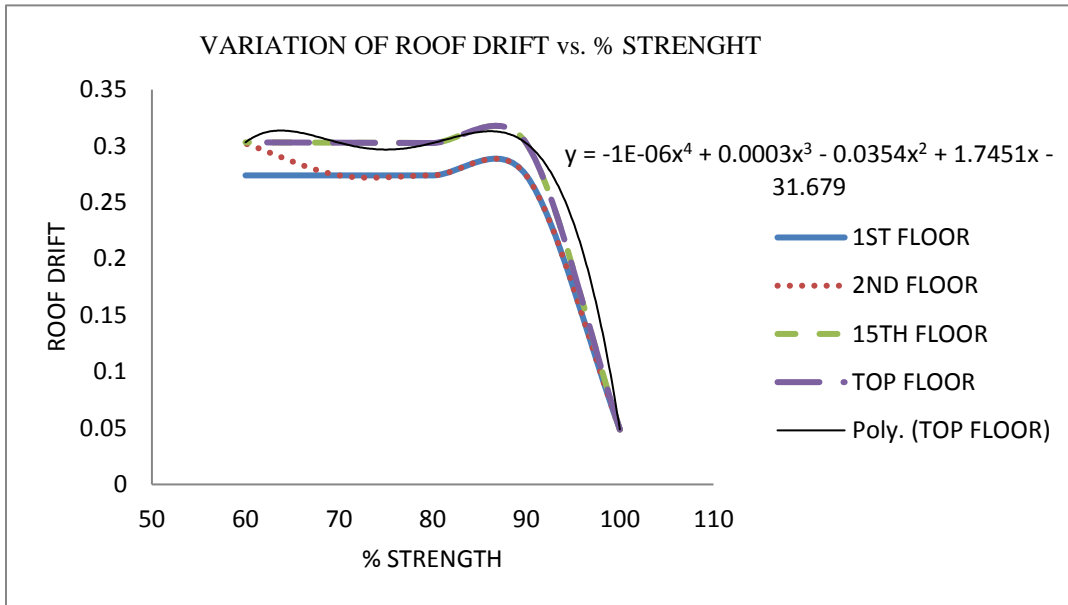


FIGURE 16- VARIATION OF ROOF DRIFT vs. % STRENGTH

[Type text]

TABLE 14 –MAXIMUM FORCES & MOMENTS DATA FOR EACH CASE
CONSIDERED

	STRENGTH %	Max Fx(N)	Max Fy(N)	Max Fz(N)	Max Mx(kNm)	Max My(kNm)	Max Mz(kNm)
FULL STRENGTH	100	3.97E+05	7.58E+06	6.13E+05	2941.669	84.093	1199.014
	90	8.05E+05	7.36E+06	7.78E+05	2668.358	24.247	2755.637
1ST FLOOR	80	8.05E+05	7.36E+06	7.78E+05	2667.8	24.266	2755.389
	70	8.04E+05	7.36E+06	7.77E+05	2667.341	24.287	2755.121
	60	8.04E+05	7.36E+06	7.77E+05	2667.021	24.31	2754.822
	90	8.18E+05	6.96E+06	7.56E+05	2559.797	23.611	2750.335
2ND FLOOR	80	8.05E+05	7.36E+06	7.78E+05	2667.447	24.242	2755.369
	70	8.05E+05	7.36E+06	7.77E+05	2666.746	24.248	2755.089
	60	8.04E+05	7.36E+06	7.77E+05	2666.118	24.253	2754.78
	90	8.05E+05	7.36E+06	7.78E+05	2667.573	24.253	2755.407
3RD FLOOR	80	8.04E+05	7.36E+06	7.77E+05	2666.253	24.279	2754.912
	70	8.04E+05	7.36E+06	7.77E+05	2665.054	24.304	2754.386
	60	8.04E+05	7.36E+06	7.76E+05	2664.031	24.331	2753.807
	90	8.05E+05	7.36E+06	7.77E+05	2666.839	24.258	2.76E+03
4TH FLOOR	80	8.05E+05	7.36E+06	7.77E+05	2666.35	24.277	2754.97
	70	8.04E+05	7.36E+06	7.77E+05	2665.199	24.303	2754.477
	60	8.04E+05	7.36E+06	7.76E+05	2664.215	24.331	2753.941
	90	8.05E+05	7.36E+06	7.77E+05	2666.169	24.263	2.76E+03
	80	8.05E+05	7.36E+06	7.77E+05	2666.477	24.276	2754.985
5TH FLOOR	70	8.04E+05	7.36E+06	7.77E+05	2665.385	24.302	2754.502
	60	8.04E+05	7.36E+06	7.76E+05	2664.457	24.329	2753.978
	90	8.05E+05	7.36E+06	7.77E+05	2665.57	24.268	2754.821
	80	8.05E+05	7.36E+06	7.77E+05	2666.618	24.275	2755.013
6TH FLOOR	70	8.04E+05	7.36E+06	7.77E+05	2665.592	24.3	2754.545
	60	8.04E+05	7.36E+06	7.76E+05	2664.727	24.327	2754.041
	90	8.05E+05	7.36E+06	7.77E+05	2665.027	24.272	2754.625
	80	8.05E+05	7.36E+06	7.77E+05	2666.728	24.274	2754.992
7TH FLOOR	70	8.04E+05	7.36E+06	7.77E+05	2665.753	24.299	2754.517
	60	8.04E+05	7.36E+06	7.76E+05	2664.937	24.325	2754.006
	90	8.04E+05	7.35E+06	7.77E+05	2664.542	24.276	2754.433
	80	8.05E+05	7.36E+06	7.77E+05	2666.839	24.273	2755
8TH FLOOR	70	8.04E+05	7.36E+06	7.77E+05	2665.917	24.297	2754.529
	60	8.04E+05	7.36E+06	7.77E+05	2665.149	24.323	2754.025

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	90	8.04E+05	7.35E+06	7.77E+05	2664.116	24.279	2754.243
9TH FLOOR	80	8.05E+05	7.36E+06	7.77E+05	2666.956	24.272	2755.005
	70	8.04E+05	7.36E+06	7.77E+05	2666.088	24.296	2754.539
	60	8.04E+05	7.35E+06	7.76E+05	2663.503	24.336	2753.256
	90	8.04E+05	7.35E+06	7.77E+05	2663.754	24.281	2754.07
	80	8.05E+05	7.36E+06	7.77E+05	2667.082	24.271	2755.04
10TH FLOOR	70	8.04E+05	7.36E+06	7.77E+05	2666.274	24.295	2754.593
	60	8.04E+05	7.35E+06	7.76E+05	2663.742	24.333	2753.318
	90	8.04E+05	7.35E+06	7.77E+05	2663.815	24.281	2754.079
	80	8.05E+05	7.36E+06	7.77E+05	2667.201	24.27	2755.06
11TH FLOOR	70	8.04E+05	7.36E+06	7.77E+05	2666.451	24.293	2754.624
	60	8.04E+05	7.35E+06	7.76E+05	2.66E+03	24.331	2753.361
	90	8.04E+05	7.35E+06	7.77E+05	2663.882	24.28	2754.1
	80	8.05E+05	7.36E+06	7.77E+05	2667.333	24.269	2755.103
12TH FLOOR	70	8.04E+05	7.36E+06	7.77E+05	2666.646	24.292	2754.689
	60	8.04E+05	7.35E+06	7.76E+05	2664.231	24.33	2753.448
	90	8.04E+05	7.35E+06	7.77E+05	2663.962	24.28	2754.124
	80	8.05E+05	7.36E+06	7.77E+05	2667.494	24.268	2755.15
13TH FLOOR	70	8.04E+05	7.36E+06	7.77E+05	2666.885	24.29	2754.76
	60	8.04E+05	7.35E+06	7.76E+05	2664.547	24.328	2753.543
	90	8.05E+05	7.36E+06	7.78E+05	2669.071	24.231	2755.809
	80	8.05E+05	7.36E+06	7.78E+05	2667.968	24.269	2755.27
14TH FLOOR	70	8.04E+05	7.36E+06	7.77E+05	2667.597	24.291	2754.941
	60	8.04E+05	7.36E+06	7.77E+05	2667.37	24.315	2754.584
	90	8.05E+05	7.36E+06	7.78E+05	2669.073	24.232	2755.807
	80	8.05E+05	7.36E+06	7.78E+05	2669.161	24.236	2755.743
15TH FLOOR	70	8.05E+05	7.36E+06	7.78E+05	2669.253	24.239	2755.681
	60	8.05E+05	7.36E+06	7.78E+05	2669.348	24.243	2755.623
	90	8.05E+05	7.36E+06	7.78E+05	2669.073	24.233	2755.805
	80	8.05E+05	7.36E+06	7.78E+05	2669.161	24.236	2755.743
TOP FLOOR	70	8.05E+05	7.36E+06	7.78E+05	2669.253	24.239	2755.681
	60	8.05E+05	7.36E+06	7.78E+05	2669.348	24.243	2755.623

[Type text]

All the above values of forces and moments in X, Y, Z were calculated by analyzing for each case and arranged in tabular form as shown in above table. It can be noted that the lateral force in X direction for full strength case is less than all the values of Fx for each variation in strength of storey.

Thus it can be stated from the above data that Fx is least when strength is full, as the strength is decreased further for 90%, 80%, 70%, 60% the values increase which can be seen in table above. The plot of this variation for all 1st, 2nd, 15th, top floor is shown below. The general trend line is also found which is written in the variation plot below.

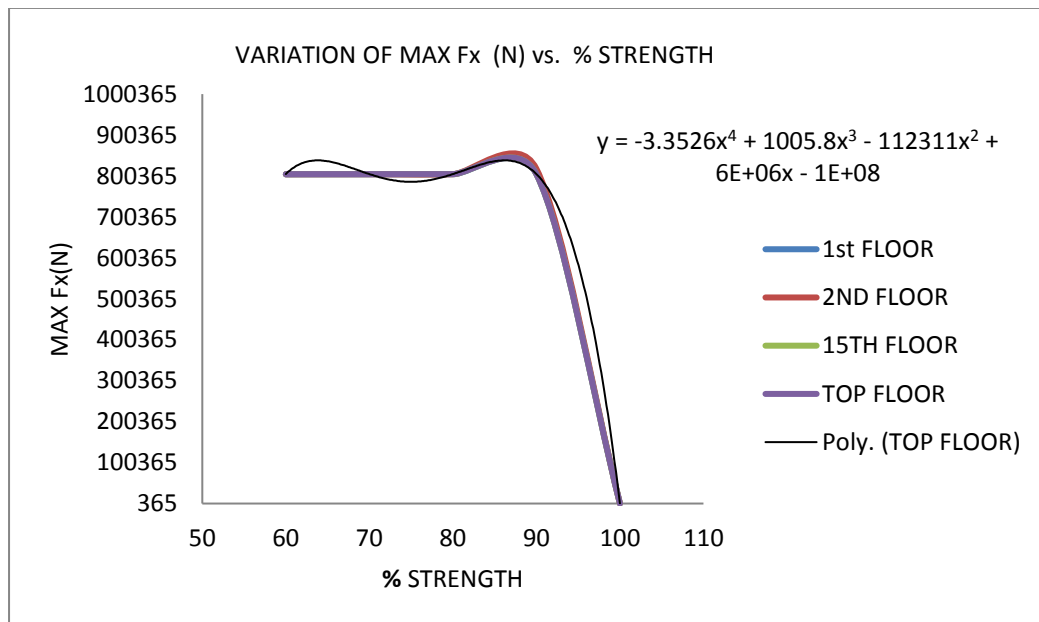


FIGURE 17- VARIATION OF MAXIMUM FORCE IN X DIRECTION vs. % STRENGTH

The variation for Fy in N is also noted the values of which are written in tabular fashion above. From the above values it can be concluded that Fy values remains constant for each individual case under consideration for a particular storey for different strength values.

[Type text]

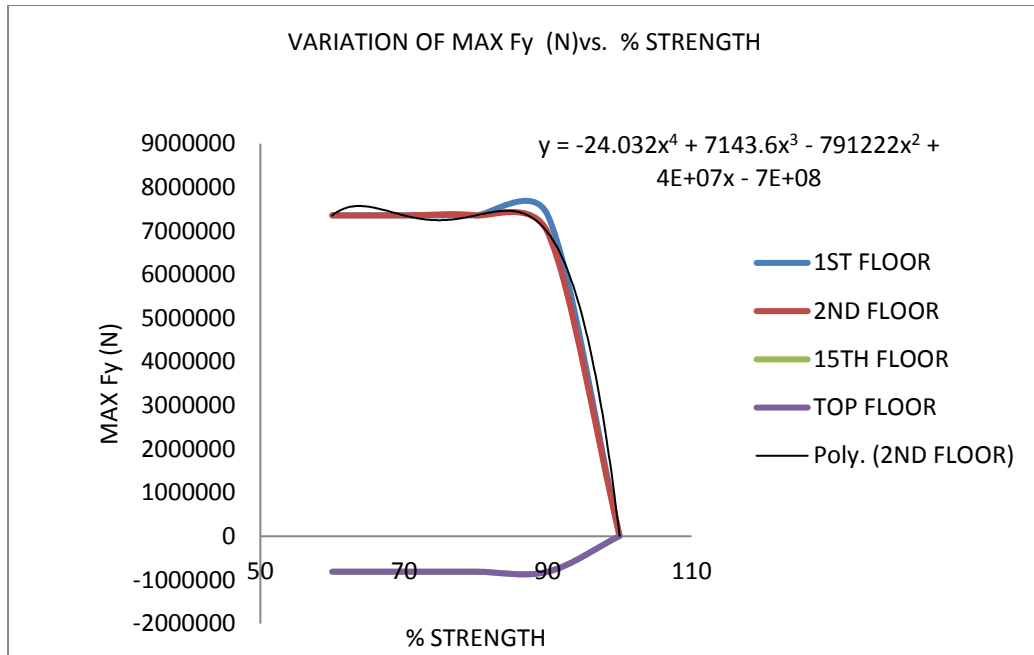


FIGURE 18- VARIATION OF MAXIMUM FORCE IN Y DIRECTION vs. % STRENGTH

The similar things were observed for Max F_z (N) for different cases which are stated in previous discussions. The trend line of this case is $y = -2.871x^4 + 857.7x^3 - 95414x^2 + 5E+06x - 8E+07$ & conclusions are made. It can be observed that the variation for F_x is more as compared to F_z. And F_y remains more or less constant for all the cases.

[Type text]

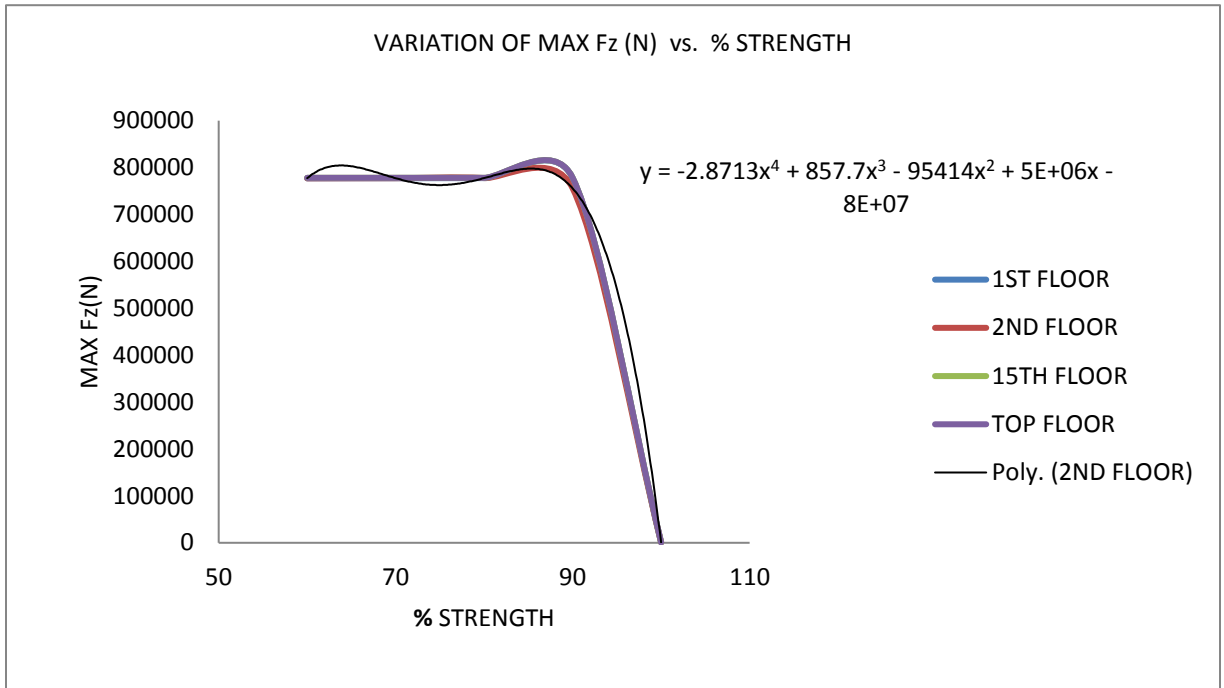


FIGURE 19- VARIATION OF MAXIMUM FORCE IN Z DIRECTION VS. % STRENGTH

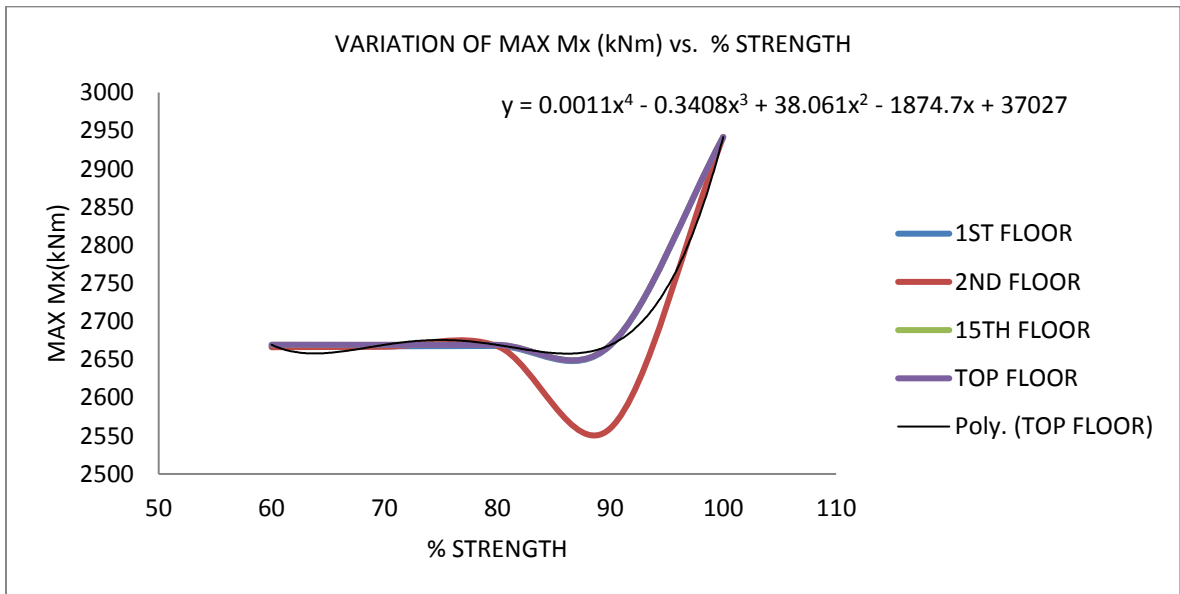


FIGURE 20- VARIATION OF MAXIMUM MOMENT IN X DIRECTION vs. % STRENGTH

[Type text]

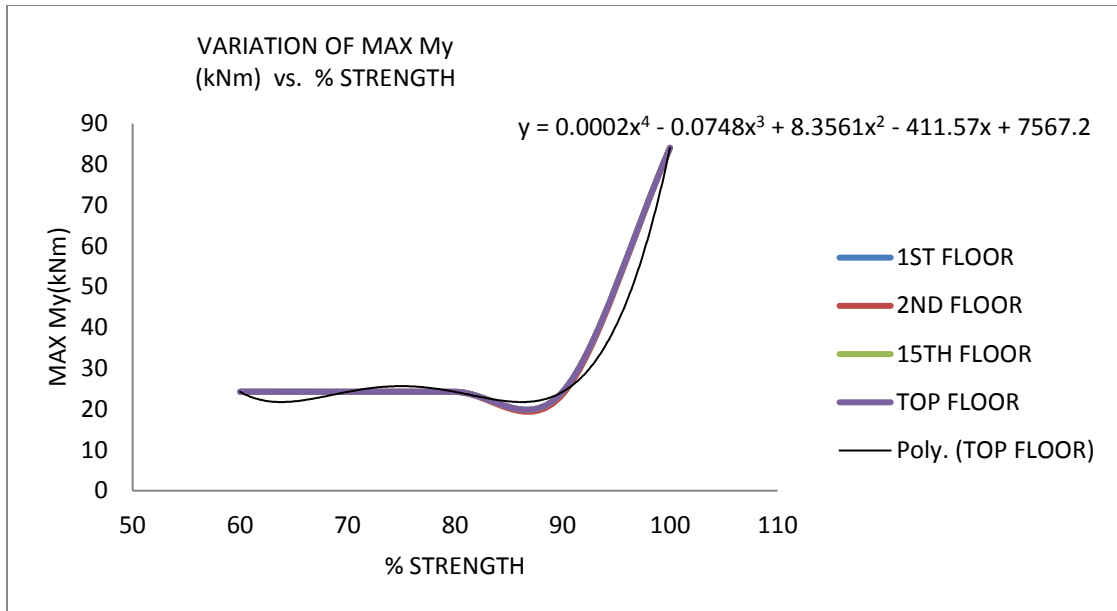


FIGURE 21- VARIATION OF MAXIMUM MOMENT IN Y DIRECTION vs. % STRENGTH

The variation for different cases for the moment forces in X, Y, Z, direction is observed and presented in tabular form as shown in the last table. The variation observed for moments in X , Y direction is decreasing in nature as the graph is plotted & values are observed.

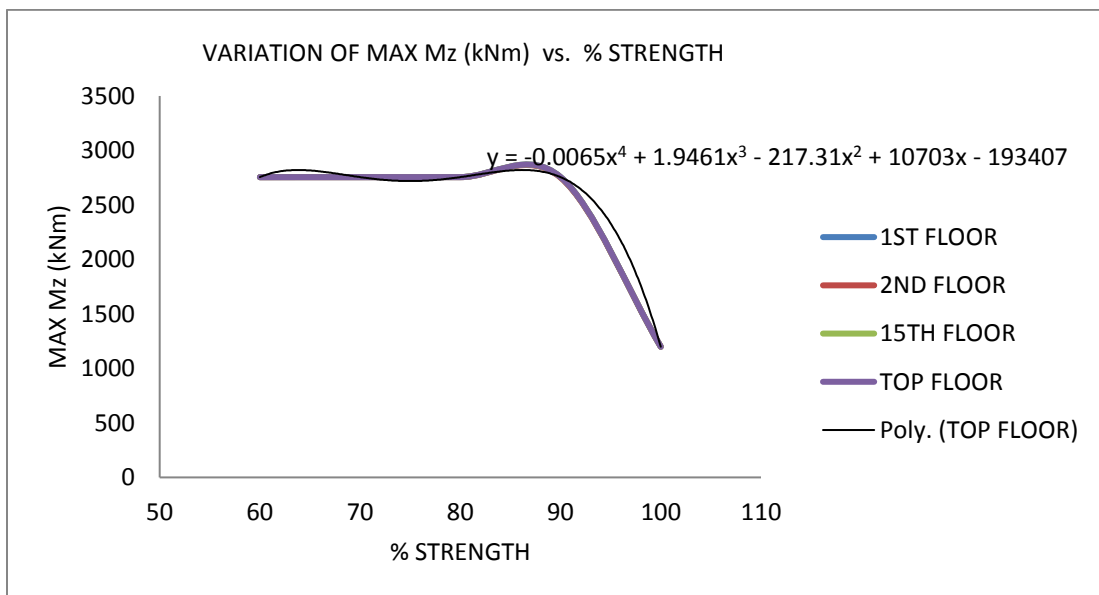


FIGURE 22- VARIATION OF MAXIMUM MOMENT IN Z DIRECTION vs. % STRENGTH

[Type text]

Moment in Z direction is increased. This is due to the fact that as the building strength is reduced for all the floors as the case may be, the flexibility of building is increased, and moments produced are less than the stiffer building.

TABLE 15-MODAL MASS PARTICIPATION IN X,Y,Z DIRECTION

MODE	PARTICIPATION IN X DIRECTION	PATICIPATION IN Y DIRECTION	PARTIVIPATION IN Z DIRECTION
1	76.807	0	0.036
2	2.127	0	15.351
3	0.264	0	61.234
4	10.271	0	0
5	0.281	0	0.01
6	0	0.002	11.805
7	3.469	0.002	0.006
8	0.238	0	0.183
9	0.003	0.002	3.998
10	1.952	0.008	0.058
11	0.201	0	0.183
12	1.298	0.021	0.004
13	0	0.024	2.335
14	0.099	0	0.024
15	0.776	0.132	0.004
16	0.001	0.01	0.009
17	0.015	13.052	0.888
18	0.001	42.312	0.287
19	0.045	0.665	0.259
20	0.173	0.633	0.002

[Type text]

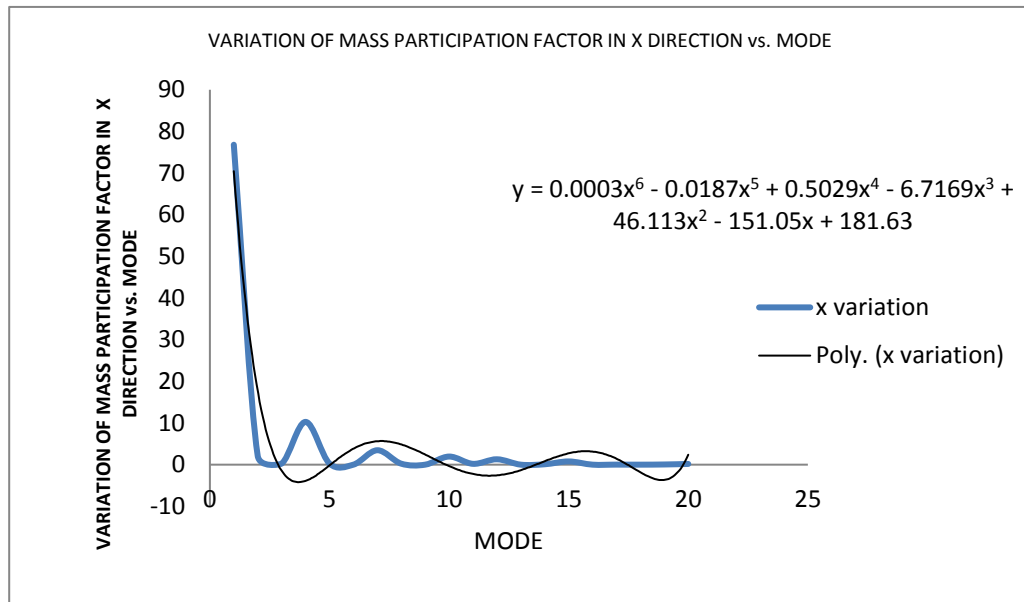


FIGURE 23- VARIATION OF MASS PARTICIPATION FACTOR IN X DIRECTION VS. MODE OF BUILDING

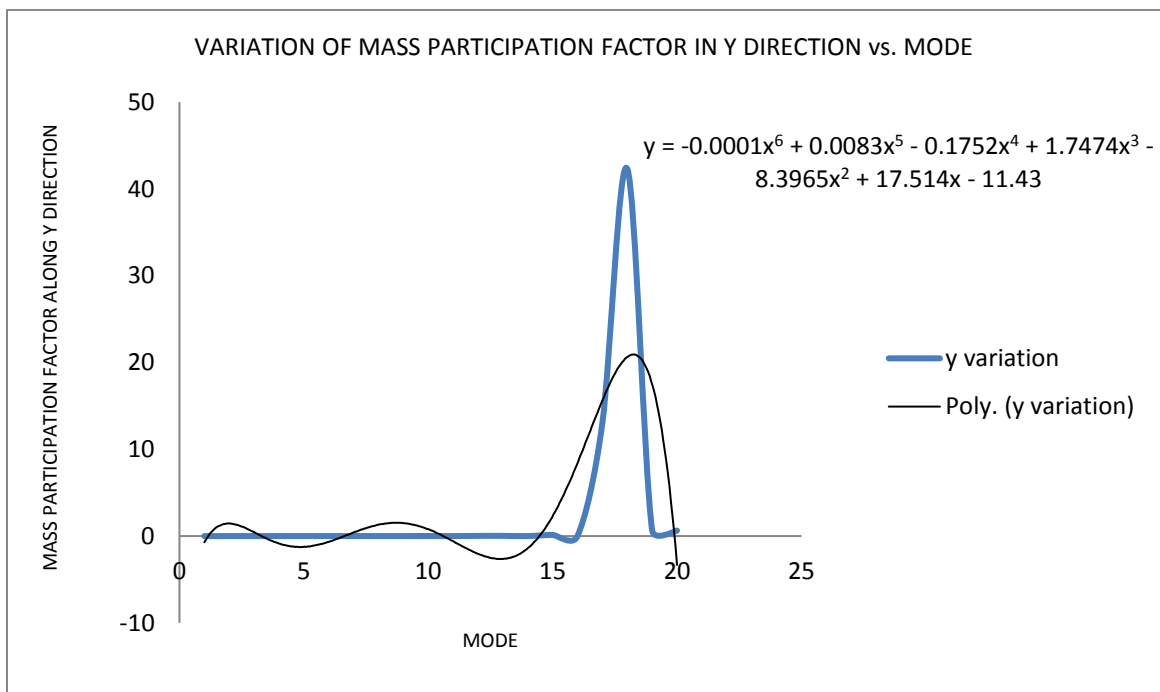


FIGURE 24- VARIATION OF MASS PARTICIPATION FACTOR Y DIRECTION VS. MODE OF BUILDING

[Type text]

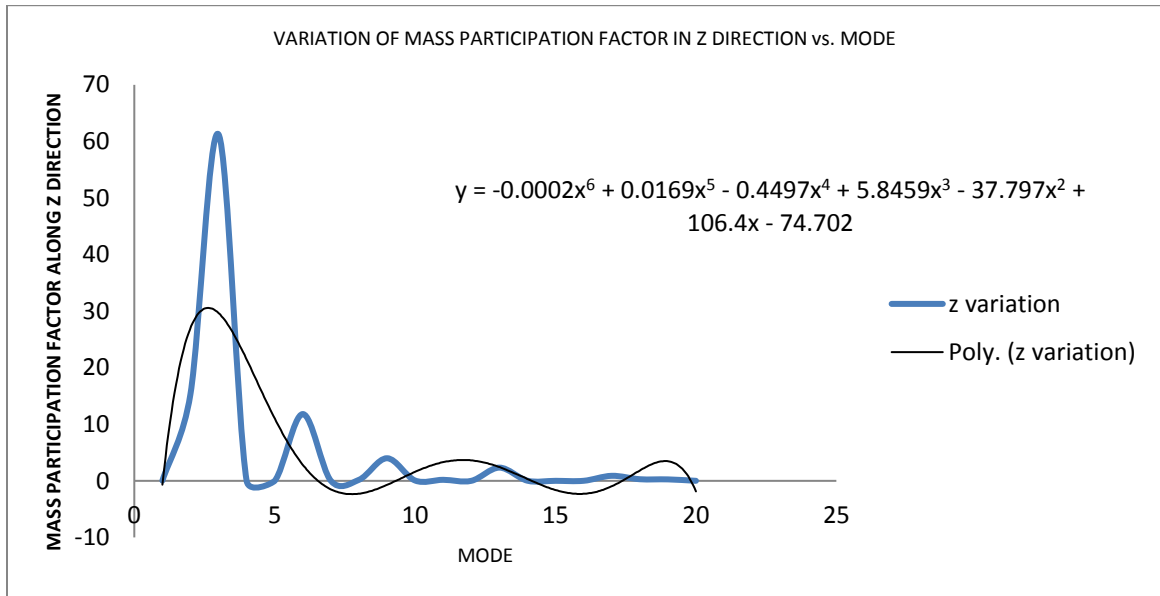


FIGURE 25- VARIATION OF MASS PARTICIPATION FACTOR IN Z DIRECTION VS. MODE OF BUILDING

The building is analyzed for different cases as discussed in previous discussion for 20 modes.

It is observed that mode 1 is dominant for 100% strength case for which modal mass participation is approx 77% in X direction and that in the Z direction is approximately 62%, the exact values corresponding to all modes are stated in the table above.

[Type text]

TABLE 16-DATA OF PEAK STOREY SHEAR CALCULATED FOR EACH FLOOR WITH % STRENGTH AS VARIABLE FOR DIFFERENT CASES UNDER CONSIDERATION

90%	18	17	16	15	14	13	12	11	10
1ST	6.46	25.05	34.18	44.99	54.72	62.99	69.87	76.09	81.52
2ND	6.49	25.25	34.45	45.24	54.94	63.2	70.05	76.24	81.67
3rd	6.46	25.05	34.18	44.99	54.72	62.99	69.87	76.08	81.52
4th	6.46	25.06	34.18	44.99	54.72	62.98	69.87	76.08	81.51
5th	6.46	25.05	34.18	44.98	54.71	62.98	69.86	76.08	81.51
6th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.51
7th	6.46	25.06	34.18	44.99	54.71	62.98	69.87	76.08	81.51
8th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.51
9th	7.18	28.73	40.83	55.06	67.12	76.84	84.16	90.36	95.76
10th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.51
11th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.51
12th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.51
13th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.51
14th	6.46	25.05	34.18	44.99	54.72	62.99	69.88	76.09	81.53
15th	6.46	25.07	34.19	44.99	54.72	62.99	69.88	76.09	81.53
TOP	6.46	25.07	34.19	44.99	54.72	62.99	69.88	76.09	81.53

[Type text]

90%	9	8	7	6	5	4	3	2	1
1ST	86.76	91.62	96.55	101.54	106.69	111.53	116.67	118.77	118.77
2ND	86.89	91.76	96.7	101.69	106.85	111.74	117.01	119.15	119.15
3rd	86.75	91.61	96.55	101.53	106.68	111.53	116.66	118.76	118.76
4th	86.76	91.61	96.55	101.55	106.68	111.57	116.7	118.95	118.95
5th	86.74	91.61	96.54	101.52	106.67	111.52	116.65	118.75	118.75
6th	86.74	91.61	96.54	101.52	106.67	111.51	116.65	118.75	118.75
7th	86.75	91.61	96.54	101.54	106.67	111.57	116.69	118.94	118.94
8th	86.74	91.6	96.53	101.52	106.67	111.51	116.65	118.75	118.75
9th	101.15	106.81	113.3	119.92	126.78	133.11	138.82	141.26	141.26
10th	86.74	91.6	96.53	101.52	106.66	111.51	116.65	118.74	118.74
11th	86.74	91.6	96.53	101.52	106.67	111.51	116.65	118.74	118.74
12th	86.74	91.6	96.53	101.52	106.67	111.51	116.65	118.74	118.74
13th	86.74	91.6	96.53	101.52	106.67	111.51	116.65	118.74	118.74
14th	86.76	91.63	96.56	101.55	106.7	111.54	116.68	118.78	118.78
15th	86.76	91.63	96.56	101.55	106.7	111.54	116.68	118.78	118.78
TOP	86.76	91.63	96.56	101.55	106.7	111.54	116.68	118.78	118.78

TABLE 17-FOR CASE OF 80 % STRENGTH

80%	18	17	16	15	14	13	12	11	10
1ST	6.46	25.05	34.18	44.99	54.71	62.98	69.86	76.08	81.51
2ND	6.46	25.05	34.18	44.99	54.72	62.98	69.87	76.08	81.52
3rd	6.46	25.05	34.17	44.98	54.71	62.98	69.85	76.07	81.5
4th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.5
5th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.51
6th	6.46	25.05	34.18	44.98	54.71	62.98	69.86	76.07	81.51
7th	6.46	25.05	34.18	44.98	54.71	62.98	69.86	76.07	81.51
8th	6.46	25.05	34.18	44.98	54.71	62.98	69.86	76.08	81.51
9th	6.46	25.05	34.18	44.99	54.71	62.98	69.86	76.08	81.51
10th	6.46	25.05	34.18	44.99	54.71	62.98	69.86	76.08	81.51
11th	6.46	25.05	34.18	44.99	54.71	62.98	69.86	76.08	81.51
12th	6.46	25.06	34.18	44.99	54.72	62.98	69.87	76.08	81.51
13th	6.46	25.06	34.18	44.99	54.72	62.98	69.87	76.08	81.51
14th	6.46	25.05	34.18	44.99	54.71	62.98	69.86	76.08	81.51
15th	6.47	25.08	34.19	44.99	54.72	62.99	69.88	76.09	81.53
TOP	6.47	25.08	34.19	44.99	54.72	62.99	69.88	76.09	81.53

[Type text]

80%	9	8	7	6	5	4	3	2	1
1ST	86.74	91.61	96.54	101.53	106.67	111.52	116.66	118.75	118.75
2ND	86.75	91.61	96.55	101.53	106.68	111.53	116.66	118.76	118.76
3rd	86.73	91.59	96.52	101.51	106.66	111.5	116.64	118.74	118.74
4th	86.74	91.6	96.53	101.52	106.66	111.51	116.64	118.74	118.74
5th	86.74	91.6	96.53	101.52	106.67	111.51	116.65	118.75	118.75
6th	86.74	91.6	96.54	101.52	106.67	111.51	116.65	118.75	118.75
7th	86.74	91.61	96.54	101.52	106.67	111.52	116.65	118.75	118.75
8th	86.74	91.61	96.54	101.52	106.67	111.52	116.65	118.75	118.75
9th	86.74	91.61	96.54	101.52	106.67	111.52	116.65	118.75	118.75
10th	86.74	91.61	96.54	101.53	106.67	111.52	116.65	118.75	118.75
11th	86.74	91.61	96.54	101.53	106.67	111.52	116.66	118.75	118.75
12th	86.76	91.61	96.55	101.55	106.67	111.57	116.7	118.95	118.95
13th	86.76	91.61	96.55	101.55	106.67	111.57	116.7	118.95	118.95
14th	86.75	91.61	96.54	101.53	106.67	111.52	116.66	118.75	118.75
15th	86.77	91.63	96.57	101.55	106.7	111.54	116.68	118.78	118.78
TOP	86.77	91.63	96.57	101.55	106.7	111.54	116.68	118.78	118.78

TABLE 18- FOR THE CASE OF 70%

70%	18	17	16	15	14	13	12	11	10
1ST	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.5
2ND	6.46	25.06	34.18	44.99	54.72	62.98	69.87	76.08	81.51
3rd	6.46	25.05	34.17	44.98	54.71	62.97	69.85	76.06	81.48
4th	6.46	25.05	34.17	44.98	54.7	62.97	69.84	76.05	81.49
5th	7.17	28.71	40.82	55.04	67.07	76.81	84.14	90.3	95.7
6th	6.46	25.05	34.17	44.98	54.7	62.97	69.85	76.06	81.49
7th	6.46	25.05	34.17	44.98	54.71	62.97	69.85	76.06	81.5
8th	6.46	25.05	34.17	44.98	54.71	62.97	69.85	76.06	81.5
9th	6.46	25.05	34.17	44.99	54.71	62.97	69.86	76.07	81.5
10th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.5
11th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.5
12th	6.46	25.05	34.17	44.98	54.71	62.98	69.86	76.07	81.5
13th	6.46	25.06	34.18	44.99	54.71	62.98	69.86	76.07	81.5
14th	6.46	25.05	34.18	44.98	54.71	62.98	69.86	76.07	81.5
15th	6.48	25.09	34.2	45	54.72	62.99	69.88	76.09	81.53
TOP	6.48	25.09	34.2	45	54.72	62.99	69.88	76.09	81.53

[Type text]

70%	9	8	7	6	5	4	3	2	1
1ST	86.73	91.59	96.53	101.51	106.66	111.5	116.64	118.74	118.74
2ND	86.75	91.6	96.54	101.54	106.67	111.57	116.69	118.94	118.94
3rd	86.72	91.58	96.51	101.51	106.63	111.53	116.66	118.91	118.91
4th	86.72	91.58	96.51	101.49	106.64	111.48	116.62	118.72	118.72
5th	101.1	106.74	113.2	119.87	126.68	132.94	138.76	140.75	140.75
6th	86.72	91.59	96.52	101.5	106.65	111.49	116.63	118.73	118.73
7th	86.73	91.59	96.52	101.5	106.65	111.5	116.63	118.73	118.73
8th	86.73	91.59	96.52	101.51	106.65	111.5	116.64	118.73	118.73
9th	86.74	91.59	96.53	101.53	106.65	111.55	116.68	118.93	118.93
10th	86.73	91.59	96.52	101.51	106.66	111.5	116.64	118.74	118.74
11th	86.73	91.59	96.53	101.51	106.66	111.5	116.64	118.74	118.74
12th	86.73	91.59	96.53	101.51	106.66	111.5	116.64	118.74	118.74
13th	86.74	91.6	96.53	101.53	106.66	111.56	116.68	118.93	118.93
14th	86.73	91.6	96.53	101.51	106.66	111.5	116.64	118.74	118.74
15th	86.77	91.63	96.57	101.55	106.7	111.54	116.68	118.78	118.78
TOP	86.77	91.63	96.57	101.55	106.7	111.54	116.68	118.78	118.78

TABLE 19- FOR THE CASE OF 60% STRENGTH

60%	18	17	16	15	14	13	12	11	10
1ST	6.46	25.05	34.17	44.98	54.7	62.97	69.85	76.05	81.49
2ND	6.46	25.05	34.17	44.98	54.71	62.97	69.85	76.06	81.49
3rd	6.46	25.05	34.17	44.97	54.69	62.95	69.82	76.03	81.46
4th	6.46	25.05	34.17	44.97	54.69	62.95	69.83	76.03	81.46
5th	6.46	25.05	34.17	44.97	54.69	62.96	69.83	76.04	81.47
6th	6.46	25.05	34.17	44.97	54.7	62.96	69.83	76.04	81.47
7th	6.46	25.05	34.17	44.98	54.7	62.96	69.84	76.05	81.48
8th	6.46	25.05	34.17	44.98	54.7	62.96	69.84	76.05	81.48
9th	6.46	25.05	34.17	44.97	54.7	62.96	69.84	76.05	81.48
10th	6.46	25.05	34.17	44.97	54.7	62.96	69.84	76.05	81.48
11th	6.46	25.05	34.17	44.98	54.7	62.96	69.85	76.05	81.48
12th	6.46	25.05	34.17	44.98	54.7	62.96	69.84	76.05	81.48
13th	6.46	25.05	34.17	44.98	54.7	62.96	69.84	76.05	81.48
14th	6.46	25.05	34.18	44.98	54.7	62.97	69.85	76.05	81.49
15th	6.49	25.12	34.21	45	54.73	62.99	69.88	76.1	81.53
TOP	6.49	25.12	34.21	45	54.73	62.99	69.88	76.1	81.53

[Type text]

60%	9	8	7	6	5	4	3	2	1
1ST	86.71	91.58	96.51	101.49	106.64	111.48	116.62	118.72	118.72
2ND	86.72	91.59	96.52	101.5	106.65	111.5	116.63	118.73	118.73
3rd	86.68	91.54	96.47	101.45	106.6	111.44	116.58	118.68	118.68
4th	86.69	91.55	96.48	101.46	106.61	111.45	116.59	118.69	118.69
5th	86.7	91.56	96.49	101.47	106.61	111.46	116.6	118.69	118.69
6th	86.7	91.56	96.49	101.47	106.62	111.47	116.6	118.7	118.7
7th	86.72	91.57	96.5	101.5	106.63	111.52	116.65	118.9	118.9
8th	86.71	91.57	96.5	101.48	106.63	111.47	116.61	118.71	118.71
9th	86.7	91.57	96.5	101.48	106.63	111.47	116.61	118.71	118.71
10th	86.71	91.57	96.5	101.48	106.63	111.47	116.61	118.71	118.71
11th	86.72	91.57	96.51	101.51	106.63	111.53	116.65	118.9	118.9
12th	86.71	91.57	96.5	101.48	106.63	111.47	116.61	118.71	118.71
13th	86.71	91.57	96.5	101.48	106.63	111.47	116.61	118.71	118.71
14th	86.72	91.58	96.51	101.49	106.64	111.48	116.62	118.72	118.72
15th	86.78	91.64	96.58	101.58	106.7	111.6	116.72	118.98	118.98
TOP	86.78	91.64	96.58	101.58	106.7	111.6	116.72	118.98	118.98

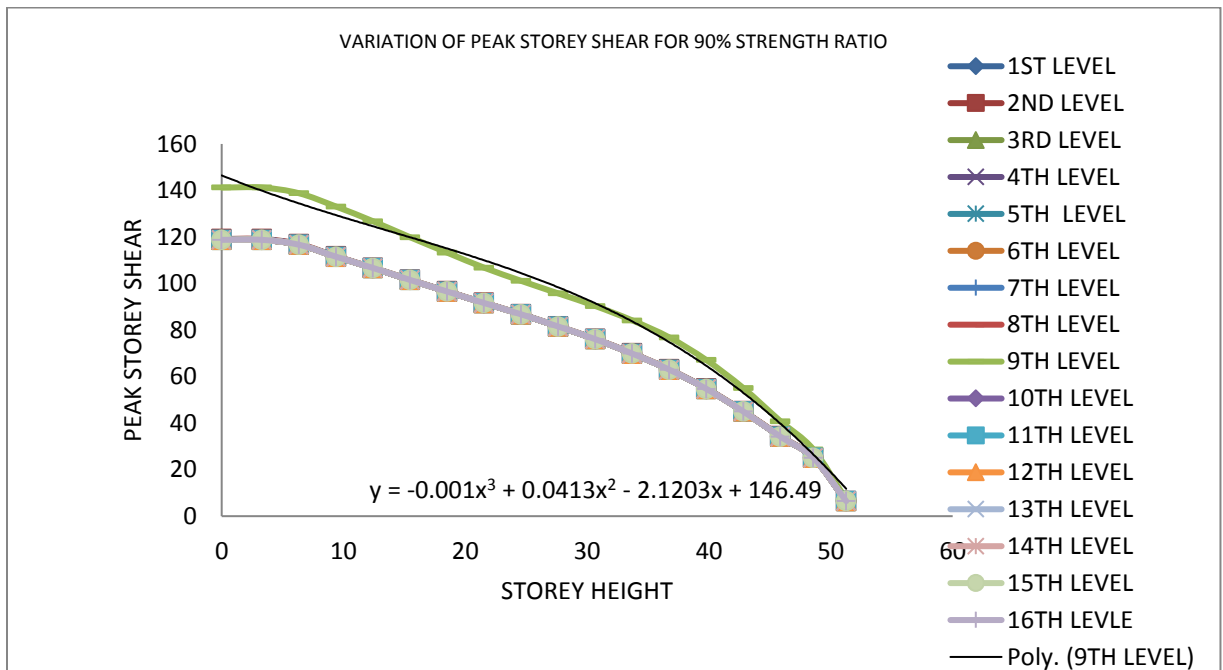


FIGURE 26 – VARIATION OF PEAK STOREY SHEAR VS. STOREY HEIGHT FOR 90% STRENGTH RATIO

[Type text]

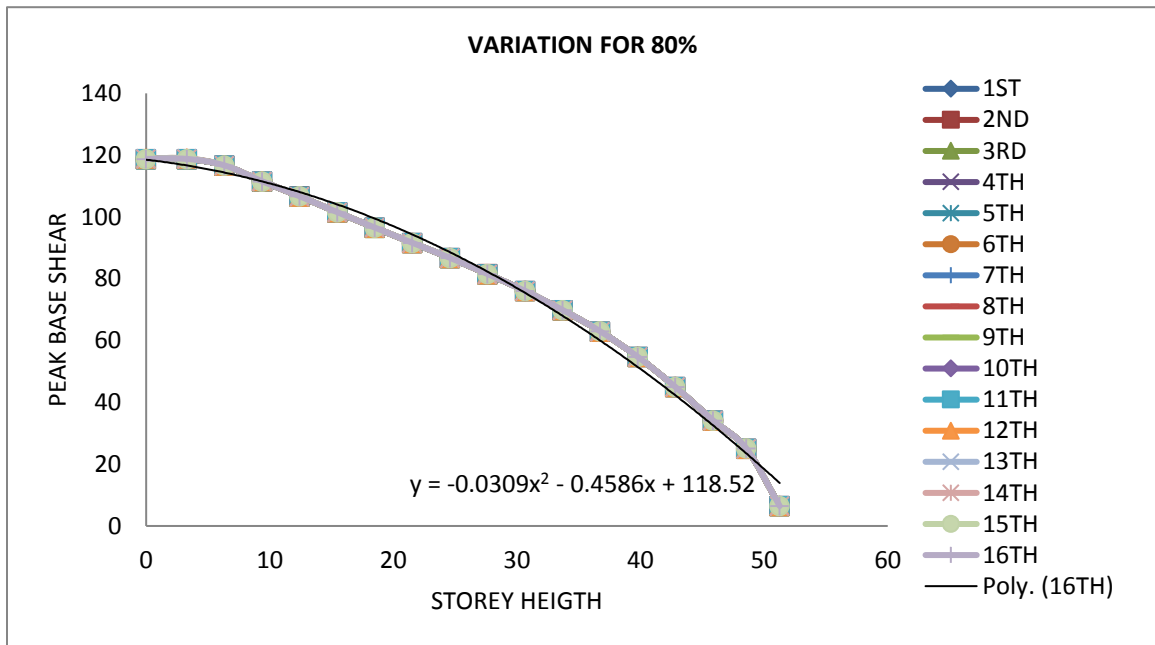


FIGURE 27– VARIATION OF PEAK STOREY SHEAR VS. STOREY HEIGHT FOR 80% STRENGTH RATIO (BELOW)

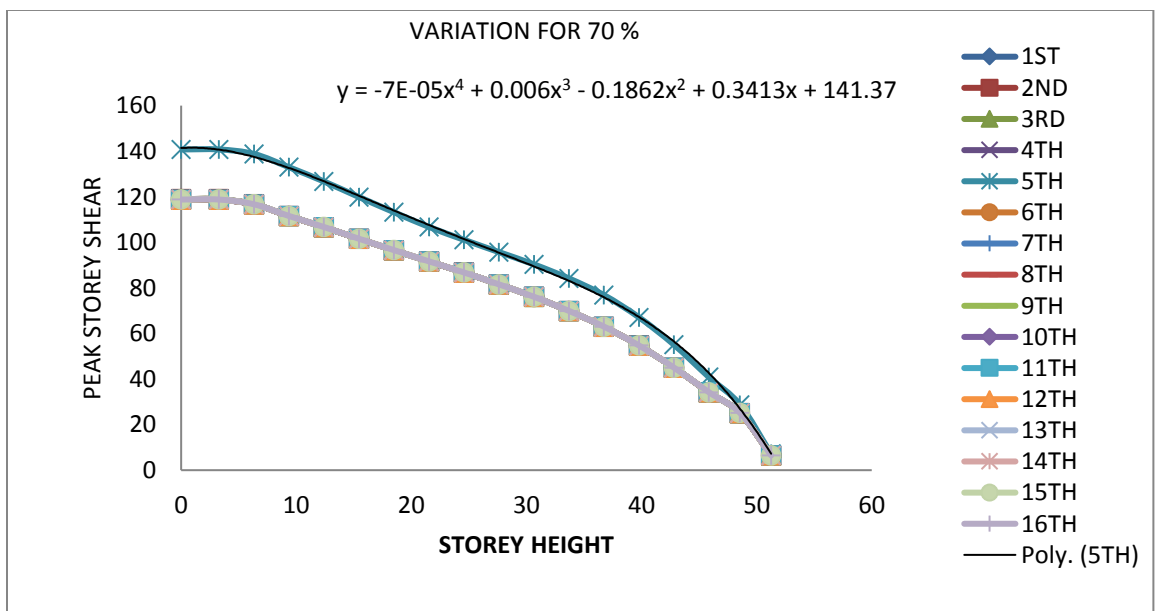


FIGURE 28 – VARIATION OF PEAK STOREY SHEAR VS. STOREY HEIGHT FOR 70% STRENGTH RATIO

[Type text]

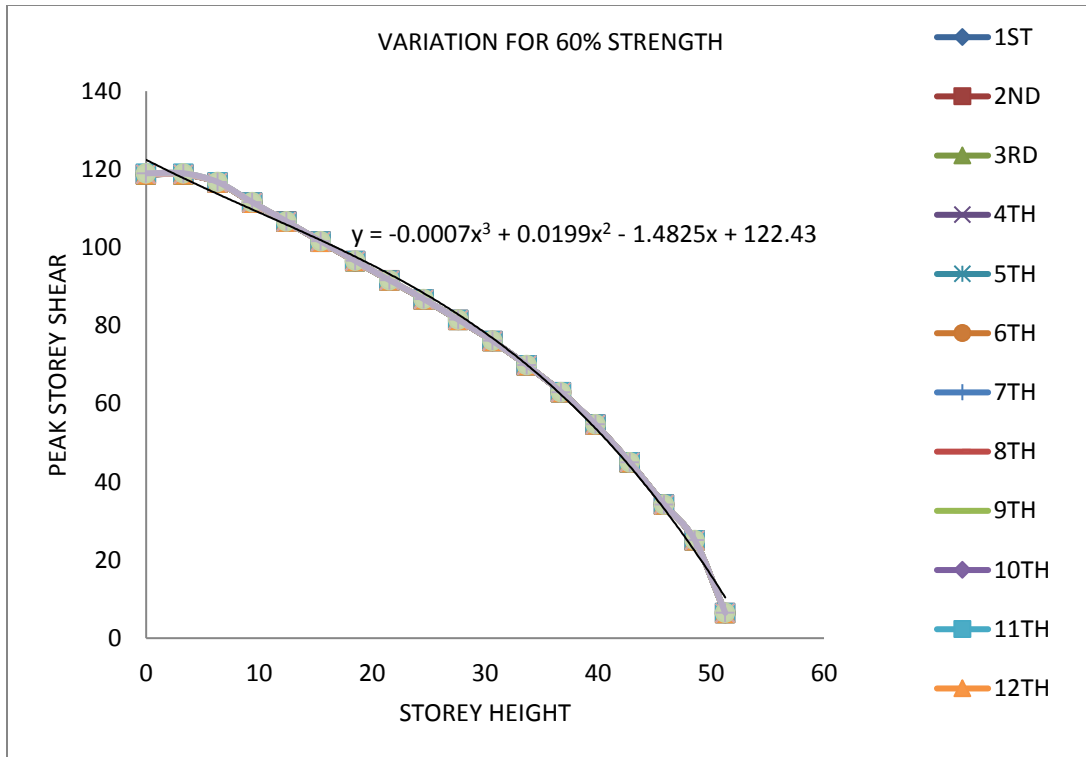


FIGURE 29 – VARIATION OF PEAK STOREY SHEAR VS. STOREY HEIGHT FOR 60% STRENGTH RATIO

Peak storey shear decreases with increase in floor. It can be interpreted that effect of change of strength has very little effect on its location. Maximum variation is observed in 9th floor for 90% while for 70%, the variation is maximum in 5th floor.

Minor change is observed in value of storey shear with change in strength.

CONCLUSIONS

Following conclusions may be drawn from this study-

1. The variation in frequency is very low in the present multi storey building. Time period follows inverse nature to the frequency while spectral acceleration follows approximately the same variation pattern as the frequency follows with strength.
2. As the strength ratio of building is being decreased the base shear is decreasing for the base of the building. The effect of change in shear is more pronounced for 1st storey and top storey than for middle storey .
3. SRSS shear decreases as the % strength of the building is decreased. CQC shear, shear 10 PCT, abs ABS shear follows the same trend.
4. As the strength of building is decreased, the roof drift is increasing.
5. Peak storey shear decreases with increase in height. It can be interpreted that effect of change of strength has very little effect on its location. Minor change is observed in value of storey shear with change in strength in the present building with discussed variation.
6. For mass participation factor in X direction, mode 1 is dominant while that in Z direction mode 3 is dominant. Higher modes are dominant in Y & Z direction than that in X direction.

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SCOPE OF FURTHER STUDY

In this work, a multi storey building is analyzed for the effect of weak storey, for different cases, and effect and performance of different output parameter is studied for this particular multi storey building.. An exhaustive study of different irregular buildings can be carried out to develop the generalized method to design such type of structures.

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APPENDIX

STAAD SPACE

START JOB INFORMATION

ENGINEER DATE 17-Feb-12

END JOB INFORMATION

INPUT WIDTH 79

PAGE LENGTH 1000000

UNIT METER MTON

JOINT COORDINATES

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DENSITY 2.5

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END DEFINE MATERIAL

MEMBER PROPERTY INDIAN

***** COLUMNS**

1 TO 102 PRIS YD 0.9 ZD 0.3

103 TO 310 PRIS YD 0.75 ZD 0.3

311 TO 395 PRIS YD 1.095 ZD 0.3

396 TO 463 PRIS YD 2.18 ZD 0.3

464 TO 521 PRIS YD 0.829 ZD 0.685

522 TO 606 PRIS YD 0.48 ZD 0.48

607 TO 686 PRIS YD 0.6 ZD 0.3

687 TO 802 PRIS YD 0.45 ZD 0.45

803 TO 860 PRIS YD 0.995 ZD 0.3

861 TO 877 PRIS YD 1.285 ZD 0.3

****** BEAMS**

878 TO 1006 PRIS YD 0.45 ZD 0.15

1007 TO 1062 PRIS YD 0.55 ZD 0.23

1063 TO 1066 PRIS YD 0.55 ZD 0.15

1067 TO 1103 PRIS YD 0.6 ZD 0.23

1104 TO 1297 PRIS YD 3.04 ZD 0.3

1298 TO 2365 PRIS IY 100 YD 0.45 ZD 0.23

2366 TO 2384 PRIS IY 100 YD 0.45 ZD 0.23

2385 TO 2729 PRIS IY 100 YD 0.45 ZD 0.23

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2730 TO 2972 PRIS IY 100 YD 0.45 ZD 0.23

2973 TO 3236 PRIS IY 100 YD 0.45 ZD 0.23

CONSTANTS

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166 TO 240 242 243 246 247 250 251 254 255 258 259 262 263 266 267 270 271 -

274 275 278 279 282 283 286 287 290 291 294 295 297 TO 521 622 TO 638 656 -

657 TO 672 803 TO 877

MATERIAL CONCRETE ALL

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104 TO 117 166 TO 171 196 TO 198 213 TO 218 241 TO 252 297 TO 299 311 TO 313 -

328 TO 330 345 TO 347 362 TO 364 379 TO 381 396 TO 398 413 TO 415 -

430 TO 432 447 TO 449 464 TO 466 479 TO 481 494 TO 496 508 TO 510 -

522 TO 524 539 TO 541 556 TO 558 573 TO 575 590 TO 592 607 TO 609 -

622 TO 624 639 TO 641 656 TO 658 673 TO 675 687 TO 689 702 TO 704 -

717 TO 719 732 TO 734 747 TO 749 761 TO 763 775 TO 777 789 TO 791 -

803 TO 805 818 TO 820 833 TO 835 847 TO 849 861 TO 863

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118 TO 145 172 TO 185 199 TO 205 219 TO 232 253 TO 280 300 TO 306 -

314 TO 320 331 TO 337 348 TO 354 365 TO 371 382 TO 388 399 TO 405 -

416 TO 422 433 TO 439 450 TO 456 467 TO 473 482 TO 488 497 TO 503 -

511 TO 517 525 TO 531 542 TO 548 559 TO 565 576 TO 582 593 TO 599 -

610 TO 616 625 TO 631 642 TO 648 659 TO 665 676 TO 682 690 TO 696 -

705 TO 711 720 TO 726 735 TO 741 750 TO 756 764 TO 770 778 TO 784 -

792 TO 798 806 TO 812 821 TO 827 836 TO 842 850 TO 856 864 TO 870

END GROUP DEFINITION

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SUPPORTS

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806 FX 7 FY 7 FZ 7

807 FX 7 FY 7 FZ 7

808 FX 15 FY 15 FZ 15

809 FX 15 FY 15 FZ 15

810 FX 7 FY 7 FZ 7

811 FX 7 FY 7 FZ 7

812 FX 15 FY 15 FZ 15

813 FX 15 FY 15 FZ 15

814 FX 7 FY 7 FZ 7

815 FX 7 FY 7 FZ 7

816 FX 15 FY 15 FZ 15

817 FX 15 FY 15 FZ 15

[Type text]

818 FX 7 FY 7 FZ 7

819 FX 7 FY 7 FZ 7

820 FX 15 FY 15 FZ 15

821 FX 12 FY 12 FZ 12

822 FX 3 FY 3 FZ 3

823 FX 3 FY 3 FZ 3

824 FX 12 FY 12 FZ 12

825 FX 7 FY 7 FZ 7

826 FX 7 FY 7 FZ 7

827 FX 9 FY 9 FZ 9

828 FX 9 FY 9 FZ 9

829 FX 8 FY 8 FZ 8

830 FX 7 FY 7 FZ 7

831 FX 7 FY 7 FZ 7

832 FX 7 FY 7 FZ 7

833 FX 8 FY 8 FZ 8

834 FX 7 FY 7 FZ 7

835 FX 7 FY 7 FZ 7

836 FX 7 FY 7 FZ 7

837 FX 8 FY 8 FZ 8

838 FX 7 FY 7 FZ 7

839 FX 7 FY 7 FZ 7

840 FX 7 FY 7 FZ 7

841 FX 8 FY 8 FZ 8

842 FX 7 FY 7 FZ 7

843 FX 7 FY 7 FZ 7

844 FX 7 FY 7 FZ 7

845 FX 8 FY 8 FZ 8

846 FX 7 FY 7 FZ 7

847 FX 7 FY 7 FZ 7

848 FX 7 FY 7 FZ 7

[Type text]

849 FX 7 FY 7 FZ 7

850 FX 7 FY 7 FZ 7

851 FX 7 FY 7 FZ 7

852 FX 7 FY 7 FZ 7

853 FX 7 FY 7 FZ 7

854 FX 7 FY 7 FZ 7

855 FX 4 FY 4 FZ 4

856 FX 4 FY 4 FZ 4

857 FX 7 FY 7 FZ 7

858 FX 7 FY 7 FZ 7

859 FX 16 FY 16 FZ 16

860 FX 14 FY 14 FZ 14

861 FX 5 FY 5 FZ 5

862 FX 5 FY 5 FZ 5

863 FX 13 FY 13 FZ 13

864 FX 16 FY 16 FZ 16

865 FX 12 FY 12 FZ 12

866 FX 11 FY 11 FZ 11

867 FX 4 FY 4 FZ 4

868 FX 4 FY 4 FZ 4

869 FX 11 FY 11 FZ 11

870 FX 12 FY 12 FZ 12

871 FX 14 FY 14 FZ 14

872 FX 11 FY 11 FZ 11

873 FX 4 FY 4 FZ 4

874 FX 4 FY 4 FZ 4

875 FX 11 FY 11 FZ 11

876 FX 13 FY 13 FZ 13

877 FX 12 FY 12 FZ 12

878 FX 11 FY 11 FZ 11

879 FX 4 FY 4 FZ 4

[Type text]

880 FX 4 FY 4 FZ 4

881 FX 11 FY 11 FZ 11

882 FX 12 FY 12 FZ 12

883 FX 14 FY 14 FZ 14

884 FX 11 FY 11 FZ 11

885 FX 4 FY 4 FZ 4

886 FX 4 FY 4 FZ 4

887 FX 11 FY 11 FZ 11

888 FX 13 FY 13 FZ 13

889 FX 12 FY 12 FZ 12

890 FX 11 FY 11 FZ 11

891 FX 4 FY 4 FZ 4

892 FX 4 FY 4 FZ 4

893 FX 11 FY 11 FZ 11

894 FX 12 FY 12 FZ 12

895 FX 14 FY 14 FZ 14

896 FX 11 FY 11 FZ 11

897 FX 4 FY 4 FZ 4

898 FX 4 FY 4 FZ 4

899 FX 11 FY 11 FZ 11

900 FX 13 FY 13 FZ 13

901 FX 12 FY 12 FZ 12

902 FX 11 FY 11 FZ 11

903 FX 4 FY 4 FZ 4

904 FX 4 FY 4 FZ 4

905 FX 11 FY 11 FZ 11

906 FX 12 FY 12 FZ 12

907 FX 14 FY 14 FZ 14

908 FX 11 FY 11 FZ 11

909 FX 4 FY 4 FZ 4

910 FX 4 FY 4 FZ 4

[Type text]

911 FX 11 FY 11 FZ 11

912 FX 13 FY 13 FZ 13

913 FX 12 FY 12 FZ 12

914 FX 11 FY 11 FZ 11

915 FX 4 FY 4 FZ 4

916 FX 4 FY 4 FZ 4

917 FX 11 FY 11 FZ 11

918 FX 12 FY 12 FZ 12

919 FX 14 FY 14 FZ 14

920 FX 11 FY 11 FZ 11

921 FX 4 FY 4 FZ 4

922 FX 4 FY 4 FZ 4

923 FX 11 FY 11 FZ 11

924 FX 13 FY 13 FZ 13

925 FX 12 FY 12 FZ 12

926 FX 11 FY 11 FZ 11

927 FX 4 FY 4 FZ 4

928 FX 4 FY 4 FZ 4

929 FX 11 FY 11 FZ 11

930 FX 12 FY 12 FZ 12

931 FX 11 FY 11 FZ 11

932 FX 6 FY 6 FZ 6

933 FX 2 FY 2 FZ 2

934 FX 2 FY 2 FZ 2

935 FX 6 FY 6 FZ 6

936 FX 10 FY 10 FZ 10

SPECTRUM CQC 1893 TOR X 0.024 ACC SCALE 1 DAMP 0.05 MIS

SOIL TYPE 2

LOAD 2 SIS-Z

SPECTRUM CQC 1893 TOR Z 0.024 ACC SCALE 1 DAMP 0.05 MIS

[Type text]

SOIL TYPE 2

LOAD 3 DL

SELFWEIGHT Y -0.8

FLOOR LOAD

***STILT FLOOR**

YRANGE 3 4 FLOAD -0.5 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 10 13.61 ZRANGE 0 5.37 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 16.84 ZRANGE 0 3.42 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 22.05 ZRANGE 3.42 6.8 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 8.45 13.61 ZRANGE 5.37 6.8 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 15.64 ZRANGE 6.8 12.83 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 15.64 18.07 ZRANGE 6.8 8.57 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 20.29 22.05 ZRANGE 6.8 9.11 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 11.68 13.61 ZRANGE 11.77 12.83 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 15.64 18.07 ZRANGE 11.06 12.83 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 20.29 22.05 ZRANGE 10.51 12.83 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 22.05 ZRANGE 12.83 16.21 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 16.84 ZRANGE 16.21 19.62 GY
YRANGE 3 4 FLOAD -0.5 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

*** BASEMENT EXTN**

[Type text]

YRANGE 3 4 FLOAD -0.5 XRANGE 0 5.25 ZRANGE 0 3.5 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 0 5.25 ZRANGE 16 20 GY

*******isft FLOOR**

YRANGE 5 7 FLOAD -0.45 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 10 13.61 ZRANGE 0 5.37 GY

YRANGE 5 7 FLOAD -1.05 XRANGE 13.61 16.84 ZRANGE 0 3.42 GY

YRANGE 5 7 FLOAD -1.05 XRANGE 13.61 22.05 ZRANGE 3.42 6.8 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 8.45 13.61 ZRANGE 5.37 6.8 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY

YRANGE 5 7 FLOAD -1.05 XRANGE 13.61 15.64 ZRANGE 6.8 12.83 GY

YRANGE 5 7 FLOAD -1.05 XRANGE 15.64 18.07 ZRANGE 6.8 8.57 GY

YRANGE 5 7 FLOAD -1.05 XRANGE 20.29 22.05 ZRANGE 6.8 9.11 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 11.68 13.61 ZRANGE 11.77 12.83 GY

YRANGE 5 7 FLOAD -1.05 XRANGE 15.64 18.07 ZRANGE 11.06 12.83 GY

YRANGE 5 7 FLOAD -1.05 XRANGE 20.29 22.05 ZRANGE 10.51 12.83 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY

YRANGE 5 7 FLOAD -1.05 XRANGE 13.61 22.05 ZRANGE 12.83 16.21 GY

YRANGE 5 7 FLOAD -1.05 XRANGE 13.61 16.84 ZRANGE 16.21 19.62 GY

YRANGE 5 7 FLOAD -0.45 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

* FF EXTN

YRANGE 5 7 FLOAD -0.5 XRANGE 0 5.25 ZRANGE 16 20 GY

*BALCONY ALT-1

YRANGE 6 47 FLOAD -0.45 XRANGE 5.22 8.45 ZRANGE -2.44 0 GY

[Type text]

YRANGE 6 47 FLOAD -0.45 XRANGE 13.61 16.84 ZRANGE -2.44 0 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 13.61 16.84 ZRANGE 19.62 22.06 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 5.22 8.45 ZRANGE 19.62 22.06 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 0 2.88 ZRANGE 2.18 3.42 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 0 2.88 ZRANGE 16.21 17.45 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 19.17 22.05 ZRANGE 2.18 3.42 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 19.17 22.05 ZRANGE 16.21 17.45 GY

*BALCONY ALT-2

YRANGE 6 47 FLOAD -0.45 XRANGE 3.08 5.22 ZRANGE 0 3.42 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 0 3.08 ZRANGE 2.18 3.42 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 3.08 5.22 ZRANGE 16.21 19.62 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 0 3.08 ZRANGE 16.21 19.62 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 16.84 18.98 ZRANGE 0 3.42 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 18.98 22.05 ZRANGE 2.18 3.42 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 16.84 18.98 ZRANGE 16.21 19.62 GY
YRANGE 6 47 FLOAD -0.45 XRANGE 18.98 22.05 ZRANGE 16.21 17.45 GY

**** 1ST FLOOR TO 12 TH FLOOR

YRANGE 8 41 FLOAD -0.45 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 10 13.61 ZRANGE 0 5.37 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 13.61 16.84 ZRANGE 0 3.42 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 13.61 22.05 ZRANGE 3.42 6.8 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 8.45 13.61 ZRANGE 5.37 6.8 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 13.61 15.64 ZRANGE 6.8 12.83 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 15.64 18.07 ZRANGE 6.8 8.57 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 20.29 22.05 ZRANGE 6.8 9.11 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY

[Type text]

YRANGE 8 41 FLOAD -0.45 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 11.68 13.61 ZRANGE 11.77 12.83 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 15.64 18.07 ZRANGE 11.06 12.83 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 20.29 22.05 ZRANGE 10.51 12.83 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 13.61 22.05 ZRANGE 12.83 16.21 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 13.61 16.84 ZRANGE 16.21 19.62 GY
YRANGE 8 41 FLOAD -0.45 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

**13 TH FLOOR

YRANGE 42 43 FLOAD -0.45 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 10 13.61 ZRANGE 0 5.37 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 13.61 16.84 ZRANGE 0 3.42 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 13.61 22.05 ZRANGE 3.42 6.8 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 8.45 13.61 ZRANGE 5.37 6.8 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 13.61 15.64 ZRANGE 6.8 12.83 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 15.64 18.07 ZRANGE 6.8 8.57 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 20.29 22.05 ZRANGE 6.8 9.11 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 11.68 13.61 ZRANGE 11.77 12.83 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 15.64 18.07 ZRANGE 11.06 12.83 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 20.29 22.05 ZRANGE 10.51 12.83 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY

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YRANGE 42 43 FLOAD -0.45 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 13.61 22.05 ZRANGE 12.83 16.21 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 13.61 16.84 ZRANGE 16.21 19.62 GY
YRANGE 42 43 FLOAD -0.45 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

******* TERRACE**

YRANGE 44 47 FLOAD -0.7 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 10 13.61 ZRANGE 0 5.37 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 10 13.61 ZRANGE 5.37 6.8 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY
YRANGE 44 47 FLOAD -0.7 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

*******MACHINE ROOM AND WATER TANK FLOOR SLAB**

YRANGE 48 49 FLOAD -1.5 XRANGE 8 14 ZRANGE 0 20 GY

*******MACHINE ROOM AND WATER TANK ROOF SLAB**

YRANGE 51 52 FLOAD -0.75 XRANGE 8 14 ZRANGE 0 20 GY

*** OH WATER TANK**

YRANGE 48 49 FLOAD -3 XRANGE 8 14 ZRANGE 0 6 GY
YRANGE 48 49 FLOAD -3 XRANGE 8 14 ZRANGE 12 20 GY

*** STAIRCASE STEPS**

YRANGE 3 47 FLOAD -0.3 XRANGE 10 14 ZRANGE 0 6 GY
YRANGE 3 47 FLOAD -0.3 XRANGE 8 14 ZRANGE 14 20 GY

MEMBER LOAD

1007 1011 1023 TO 1028 1033 1034 1037 1038 1057 TO 1060 1136 TO 1159 1169 -

[Type text]

1170 TO 1173 1204 TO 1227 1237 TO 1241 1302 TO 1337 1462 1463 1466 1467 1470 -
1471 1474 1475 1478 1479 1482 1483 1486 1487 1490 1491 1494 1495 1524 1525 -
1528 1529 1532 1533 1536 1537 1540 1541 1544 1545 1548 1549 1552 1553 1557 -
1560 TO 1577 1695 TO 1697 1699 1702 TO 1704 1706 1709 TO 1711 1713 -
1716 TO 1718 1720 1723 TO 1725 1727 1730 TO 1732 1734 1737 TO 1739 1741 1744 -
1745 TO 1746 1748 1751 TO 1753 1755 1765 1766 1769 1771 1772 1775 1777 1778 -
1781 1783 1784 1787 1789 1790 1793 1795 1796 1799 1801 1802 1805 1807 1808 -
1811 1813 1814 1817 1831 1832 1834 1835 1837 1838 1840 1841 1843 1844 1846 -
1847 1849 1850 1852 1853 1855 1856 1961 1965 1968 1972 1975 1979 1982 1986 -
1989 1993 1996 2000 2003 2007 2010 2014 2084 TO 2115 2118 TO 2133 2140 2141 -
2144 2145 2148 2149 2152 2153 2156 2157 2160 2161 2164 2165 2168 2169 2192 -
2193 2196 2197 2200 2201 2204 2205 2208 2209 2212 2213 2216 2217 2220 2221 -
2334 TO 2365 2385 TO 2396 2428 2429 2432 2433 2436 2437 2446 2447 2450 2451 -
2454 TO 2459 2491 TO 2493 2495 2498 TO 2500 2502 2505 TO 2507 2509 2512 2513 -
2516 2518 2519 2522 2524 2525 2530 2531 2533 2534 2536 2537 2603 2607 2610 -
2614 2617 2621 2644 TO 2659 2662 2663 2666 2667 2677 2678 2681 2682 2685 -
2686 2718 TO 2729 2795 2796 2805 2806 2834 2848 2850 2851 2925 2926 2931 -
2932 TO 2934 UNI GY -1.3

1174 TO 1180 1186 TO 1197 1242 TO 1248 1254 TO 1265 UNI GY -1.3

1160 1161 1181 1198 1228 1229 1249 1266 2730 TO 2733 2782 2783 2799 2800 2835 -
2836 2838 2854 2864 2865 2904 2908 UNI GY -1.3

1016 1018 1020 1021 1031 1032 1039 1040 1045 TO 1050 1055 1056 1106 1108 1110 -
1112 1114 1116 1118 1120 1122 1124 1272 TO 1291 1342 1343 1346 1347 1350 -
1351 1354 1355 1358 1359 1362 1363 1366 1367 1370 1371 1374 1375 1397 1399 -
1401 1403 1405 1407 1409 1411 1413 1422 TO 1457 1464 1465 1468 1469 1472 -
1473 1476 1477 1480 1481 1484 1485 1488 1489 1492 1493 1496 1497 1522 1523 -
1526 1527 1530 1531 1534 1535 1538 1539 1542 1543 1546 1547 1550 1551 1554 -
1555 1623 1624 1627 1628 1631 1632 1635 1636 1639 1640 1643 1644 1647 1648 -
1651 1652 1655 1656 1661 1663 1664 1666 1667 1669 1670 1672 1673 1675 1676 -
1678 1679 1681 1682 1684 1685 1687 1767 1773 1779 1785 1791 1797 1803 1809 -
1815 1869 TO 1877 1881 1883 1885 1887 1889 1891 1893 1895 2020 2022 2023 -

[Type text]

2025 2026 2028 2029 2031 2032 2034 2035 2037 2038 2040 2041 2043 2049 2050 -
2053 2054 2057 2058 2061 2062 2065 2066 2069 2070 2073 2074 2077 2078 2138 -
2139 2142 2143 2146 2147 2150 2151 2154 2155 2158 2159 2162 2163 2166 2167 -
2194 2195 2198 2199 2202 2203 2206 2207 2210 2211 2214 2215 2218 2219 2222 -
2242 TO 2273 2278 TO 2293 2300 2301 2304 2305 2308 2309 2312 2313 2316 2317 -
2320 2321 2324 2325 2328 2329 2397 2398 2414 2418 TO 2421 2430 2431 2444 -
2445 2471 2472 2482 2484 2514 2562 2568 2570 2623 2625 2633 2634 2660 2661 -
2676 2679 2680 2694 TO 2697 2706 2707 2712 2713 UNI GY -0.72

2367 TO 2374 2376 TO 2384 2556 2557 2564 UNI GY -0.72

1126 1128 1130 1292 TO 1297 2401 2402 2405 2406 2416 2422 TO 2427 2434 2435 -
2438 2448 2449 2452 2453 2475 2476 2479 2480 2485 2487 2488 2490 2520 2526 -
2558 2563 2565 2566 2572 2626 2628 2629 2631 2637 2638 2641 2642 2664 2665 -
2668 2669 2683 2684 2687 2698 TO 2705 2708 2709 2716 2717 2739 2740 2751 -
2753 2757 TO 2762 2781 2784 2785 2797 2798 2820 2821 2827 2829 2852 2870 -
2871 2875 2876 2878 2881 2883 2918 2920 2922 2923 2935 2936 2941 2944 2945 -
2949 TO 2956 2963 2964 2967 2968 UNI GY -0.72

878 TO 890 933 TO 958 995 TO 1006 1014 1015 1029 1030 1043 1044 1061 TO 1066 -
2975 2976 2989 TO 2998 3000 3001 3020 3022 TO 3034 3063 TO 3091 3122 TO 3133 -
3141 TO 3152 3165 TO 3176 3207 3208 3219 TO 3228 UNI GY -0.3

1019 1022 1035 1036 1041 1042 1051 1052 1378 TO 1386 1417 1500 1501 1504 1505 -
1508 1509 1512 1513 1516 1517 1622 1625 1630 1633 1638 1641 1646 1649 1654 -
1657 2052 2055 2060 2063 2068 2071 2076 2079 2174 2175 2178 2179 2182 2183 -
2186 2187 2231 TO 2237 2408 2409 2441 2442 2474 2477 2636 2639 2672 2673 -
2691 TO 2693 2747 2748 2791 2792 2819 2822 2921 2924 2939 2940 2947 2948 -
3035 TO 3047 3193 TO 3204 UNI GY -0.35

891 TO 905 907 909 911 913 915 917 926 TO 932 959 TO 964 977 TO 994 2973 2974 -
2977 TO 2988 3048 TO 3061 3153 TO 3164 3205 3206 3209 TO 3218 UNI GY -0.3

1387 TO 1394 1502 1503 1506 1507 1510 1511 1514 1515 2172 2173 2176 2177 2180 -
2181 2184 2185 2223 TO 2230 2410 TO 2413 2439 2440 2443 2670 2671 2674 2675 -
2688 TO 2690 2749 2750 2767 TO 2780 2790 2793 2794 2946 2957 TO 2960 3185 -
3186 TO 3192 UNI GY -0.35

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1626 1629 1634 1637 1642 1645 1650 1653 2048 2051 2056 2059 2064 2067 2072 -
2075 2470 2473 2478 2481 2632 2635 2640 2643 UNI GY -0.5

1068 1069 1072 1073 1077 1078 1087 1092 1095 1098 1099 1102 1103 1162 1163 -
1182 1199 1230 1231 1250 1267 2841 TO 2847 2855 TO 2857 2860 2867 2868 2893 -
2911 TO 2917 UNI GY -1.1

2874 UNI GY -1.1

LOAD 4 LL

FLOOR LOAD

***STILT FLOOR**

YRANGE 3 4 FLOAD -0.5 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 10 13.61 ZRANGE 0 5.37 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 16.84 ZRANGE 0 3.42 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 22.05 ZRANGE 3.42 6.8 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 8.45 13.61 ZRANGE 5.37 6.8 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 15.64 ZRANGE 6.8 12.83 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 15.64 18.07 ZRANGE 6.8 8.57 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 20.29 22.05 ZRANGE 6.8 9.11 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 11.68 13.61 ZRANGE 11.77 12.83 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 15.64 18.07 ZRANGE 11.06 12.83 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 20.29 22.05 ZRANGE 10.51 12.83 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 22.05 ZRANGE 12.83 16.21 GY

[Type text]

YRANGE 3 4 FLOAD -0.5 XRANGE 13.61 16.84 ZRANGE 16.21 19.62 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

*** BASEMENT EXTN**

YRANGE 3 4 FLOAD -0.5 XRANGE 0 5.25 ZRANGE 0 3.5 GY

YRANGE 3 4 FLOAD -0.5 XRANGE 0 5.25 ZRANGE 16 20 GY

*******isft FLOOR**

YRANGE 5 7 FLOAD -0.2 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 10 13.61 ZRANGE 0 5.37 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 13.61 16.84 ZRANGE 0 3.42 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 13.61 22.05 ZRANGE 3.42 6.8 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 8.45 13.61 ZRANGE 5.37 6.8 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 13.61 15.64 ZRANGE 6.8 12.83 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 15.64 18.07 ZRANGE 6.8 8.57 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 20.29 22.05 ZRANGE 6.8 9.11 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 11.68 13.61 ZRANGE 11.77 12.83 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 15.64 18.07 ZRANGE 11.06 12.83 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 20.29 22.05 ZRANGE 10.51 12.83 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 13.61 22.05 ZRANGE 12.83 16.21 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 13.61 16.84 ZRANGE 16.21 19.62 GY

YRANGE 5 7 FLOAD -0.2 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

*** FF EXTN**

[Type text]

YRANGE 5 7 FLOAD -0.3 XRANGE 0 5.25 ZRANGE 16 20 GY

***BALCONY ALT-1**

YRANGE 6 47 FLOAD -0.3 XRANGE 5.22 8.45 ZRANGE -2.44 0 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 13.61 16.84 ZRANGE -2.44 0 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 13.61 16.84 ZRANGE 19.62 22.06 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 5.22 8.45 ZRANGE 19.62 22.06 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 0 2.88 ZRANGE 2.18 3.42 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 0 2.88 ZRANGE 16.21 17.45 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 19.17 22.05 ZRANGE 2.18 3.42 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 19.17 22.05 ZRANGE 16.21 17.45 GY

***BALCONY ALT-2**

YRANGE 6 47 FLOAD -0.3 XRANGE 3.08 5.22 ZRANGE 0 3.42 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 0 3.08 ZRANGE 2.18 3.42 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 3.08 5.22 ZRANGE 16.21 19.62 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 0 3.08 ZRANGE 16.21 19.62 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 16.84 18.98 ZRANGE 0 3.42 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 18.98 22.05 ZRANGE 2.18 3.42 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 16.84 18.98 ZRANGE 16.21 19.62 GY

YRANGE 6 47 FLOAD -0.3 XRANGE 18.98 22.05 ZRANGE 16.21 17.45 GY

****** 1ST FLOOR TO 12 TH FLOOR**

YRANGE 8 41 FLOAD -0.2 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 10 13.61 ZRANGE 0 5.37 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 13.61 16.84 ZRANGE 0 3.42 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 13.61 22.05 ZRANGE 3.42 6.8 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 8.45 13.61 ZRANGE 5.37 6.8 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY

YRANGE 8 41 FLOAD -0.2 XRANGE 13.61 15.64 ZRANGE 6.8 12.83 GY

[Type text]

YRANGE 8 41 FLOAD -0.2 XRANGE 15.64 18.07 ZRANGE 6.8 8.57 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 20.29 22.05 ZRANGE 6.8 9.11 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 11.68 13.61 ZRANGE 11.77 12.83 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 15.64 18.07 ZRANGE 11.06 12.83 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 20.29 22.05 ZRANGE 10.51 12.83 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 13.61 22.05 ZRANGE 12.83 16.21 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 13.61 16.84 ZRANGE 16.21 19.62 GY
YRANGE 8 41 FLOAD -0.2 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

****13 TH FLOOR**

YRANGE 42 43 FLOAD -0.2 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 10 13.61 ZRANGE 0 5.37 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 13.61 16.84 ZRANGE 0 3.42 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 13.61 22.05 ZRANGE 3.42 6.8 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 8.45 13.61 ZRANGE 5.37 6.8 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 13.61 15.64 ZRANGE 6.8 12.83 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 15.64 18.07 ZRANGE 6.8 8.57 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 20.29 22.05 ZRANGE 6.8 9.11 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 11.68 13.61 ZRANGE 11.77 12.83 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 15.64 18.07 ZRANGE 11.06 12.83 GY

[Type text]

YRANGE 42 43 FLOAD -0.2 XRANGE 20.29 22.05 ZRANGE 10.51 12.83 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 13.61 22.05 ZRANGE 12.83 16.21 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 13.61 16.84 ZRANGE 16.21 19.62 GY
YRANGE 42 43 FLOAD -0.2 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

****** TERRACE**

YRANGE 44 47 FLOAD -0.15 XRANGE 5.22 8.45 ZRANGE 0 3.42 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 0 8.45 ZRANGE 3.42 6.8 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 10 13.61 ZRANGE 0 5.37 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 8.45 13.61 ZRANGE 5.37 6.8 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 0 1.77 ZRANGE 6.8 9.11 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 3.98 6.42 ZRANGE 6.8 8.57 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 6.42 8.45 ZRANGE 6.8 12.83 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 10.58 13.61 ZRANGE 6.8 11.77 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 0 1.77 ZRANGE 10.51 12.83 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 3.98 6.42 ZRANGE 11.06 12.83 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 0 8.45 ZRANGE 12.83 16.21 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 5.22 8.45 ZRANGE 16.21 19.62 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 8.45 14 ZRANGE 14.26 19.62 GY
YRANGE 44 47 FLOAD -0.15 XRANGE 8.45 13.61 ZRANGE 12.83 14.26 GY

*******MACHINE ROOM AND WATER TANK FLOOR SLAB**

YRANGE 48 49 FLOAD -1 XRANGE 8 14 ZRANGE 0 20 GY

*******MACHINE ROOM AND WATER TANK ROOF SLAB**

YRANGE 51 52 FLOAD -0.15 XRANGE 8 14 ZRANGE 0 20 GY

*** STAIRCASE AND CORRIDOR EXTRA**

YRANGE 3 47 FLOAD -0.1 XRANGE 8 14 ZRANGE 0 6 GY
YRANGE 3 47 FLOAD -0.1 XRANGE 8 12 ZRANGE 14 20 GY
YRANGE 3 47 FLOAD -0.1 XRANGE 8 11 ZRANGE 5 7 GY
YRANGE 3 47 FLOAD -0.1 XRANGE 10 14 ZRANGE 5 12 GY

[Type text]

YRANGE 3 47 FLOAD -0.1 XRANGE 8 14 ZRANGE 11 15 GY

LOAD COMB 5 (DL+LL)*1.5

3 1.5 4 1.5

LOAD COMB 6 (DL+LL+EQX)*1.2

1 1.2 3 1.2 4 1.2

LOAD COMB 7 (DL+LL+EQZ)*1.2

2 1.2 3 1.2 4 1.2

LOAD COMB 8 (DL+LL-EQX)*1.2

1 -1.2 3 1.2 4 1.2

LOAD COMB 9 (DL+LL-EQZ)*1.2

2 -1.2 3 1.2 4 1.2

LOAD COMB 10 (DL+EQX)*1.5

1 1.5 3 1.5

LOAD COMB 11 (DL+EQZ)*1.5

2 1.5 3 1.5

LOAD COMB 12 (DL-EQX)*1.5

1 -1.5 3 1.5

LOAD COMB 13 (DL-EQZ)*1.5

2 -1.5 3 1.5

LOAD COMB 14 0.9DL+EQX*1.5

1 1.5 3 0.9

LOAD COMB 15 0.9DL+EQZ*1.5

2 1.5 3 0.9

LOAD COMB 16 0.9DL-EQX *1.5

1 -1.5 3 0.9

LOAD COMB 17 0.9DL-EQZ*1.5

2 -1.5 3 0.9

****** FOR FOUNDATION**

LOAD COMB 18 (DL + 0.5LL)

3 1.0 4 0.5

[Type text]

* (DL+EQ)

LOAD COMB 19 FOUNDATION LOAD(DL+EQX+LL)

1 1.0 3 1.0 4 0.5

LOAD COMB 20 FOUNDATION LOAD(DL+EQZ+LL)

2 1.0 3 1.0 4 0.5

LOAD COMB 21 FOUNDATION LOAD(DL-EQX+LL)

1 -1.0 3 1.0 4 0.5

LOAD COMB 22 FOUNDATION LOAD(DL-EQZ+LL)

2 -1.0 3 1.0 4 0.5

PERFORM ANALYSIS

***FOR FOUNDATION LOADS**

***LOAD LIST 18 TO 22**

***PRINT SUPPORT REACTION**

LOAD LIST 5 TO 17

START CONCRETE DESIGN

CODE INDIAN

UNIT MMS NEWTON

CLEAR 40 MEMB 1 TO 877

CLEAR 30 MEMB 878 TO 3236

******* B+S+1**

FC 35 MEMB 1 TO 3 16 TO 18 31 TO 33 46 TO 48 61 TO 63 75 TO 77 89 TO 91 103 -
104 TO 117 166 TO 171 196 TO 198 213 TO 218 241 TO 252 297 TO 299 311 TO 313 -
328 TO 330 345 TO 347 362 TO 364 379 TO 381 396 TO 398 413 TO 415 -
430 TO 432 447 TO 449 464 TO 466 479 TO 481 494 TO 496 508 TO 510 -
522 TO 524 539 TO 541 556 TO 558 573 TO 575 590 TO 592 607 TO 609 -
622 TO 624 639 TO 641 656 TO 658 673 TO 675 687 TO 689 702 TO 704 -
717 TO 719 732 TO 734 747 TO 749 761 TO 763 775 TO 777 789 TO 791 -
803 TO 805 818 TO 820 833 TO 835 847 TO 849 861 TO 863

***** 2ND STOREY TO 9TH STOREY**

FC 30 MEMB 4 TO 10 19 TO 25 34 TO 40 49 TO 55 64 TO 70 78 TO 84 92 TO 98 118

-

[Type text]

119 TO 145 172 TO 185 199 TO 205 219 TO 232 253 TO 280 300 TO 306 314 TO 320 -
331 TO 337 348 TO 354 365 TO 371 382 TO 388 399 TO 405 416 TO 422 -
433 TO 439 450 TO 456 467 TO 473 482 TO 488 497 TO 503 511 TO 517 -
525 TO 531 542 TO 548 559 TO 565 576 TO 582 593 TO 599 610 TO 616 -
625 TO 631 642 TO 648 659 TO 665 676 TO 682 690 TO 696 705 TO 711 -
720 TO 726 735 TO 741 750 TO 756 764 TO 770 778 TO 784 792 TO 798 -
806 TO 812 821 TO 827 836 TO 842 850 TO 856 864 TO 870

******* 10 ONWARD**

FC 25 MEMB 11 TO 15 26 TO 30 41 TO 45 56 TO 60 71 TO 74 85 TO 88 99 TO 102 -
146 TO 165 186 TO 195 206 TO 212 233 TO 240 281 TO 296 307 TO 310 -
321 TO 327 338 TO 344 355 TO 361 372 TO 378 389 TO 395 406 TO 412 -
423 TO 429 440 TO 446 457 TO 463 474 TO 478 489 TO 493 504 TO 507 -
518 TO 521 532 TO 538 549 TO 555 566 TO 572 583 TO 589 600 TO 606 -
617 TO 621 632 TO 638 649 TO 655 666 TO 672 683 TO 686 697 TO 701 -
712 TO 716 727 TO 731 742 TO 746 757 TO 760 771 TO 774 785 TO 788 -
799 TO 802 813 TO 817 828 TO 832 843 TO 846 857 TO 860 871 TO 3236

FYMAIN 500 ALL

FYSEC 415 ALL

****** BASEMENT AND STILT FLOOR COLUMN**

*MMAG 2.5 MEMB 1 2 16 17 31 32 46 47 61 62 75 76 89 90 103 TO 113 166 TO 169 -
*196 197 213 TO 216 241 TO 248 297 298 311 312 328 329 345 346 362 363 379 -
*380 396 397 413 414 430 431 447 448 464 465 479 480 494 495 508 509 522 523 -
*539 540 556 557 573 574 590 591 607 608 622 623 639 640 656 657 673 674 687 -
*688 702 703 717 718 732 733 747 748 761 762 775 776 789 790 803 804 818 819 -
*833 834 847 848 861 862

DESIGN COLUMN 1 TO 877

****DESIGN BEAM 878 TO 3236**

CONCRETE TAKE

DESIGN BEAM 878 TO 3236

END CONCRETE DESIGN

[Type text]

***UNIT METER KN

***LOAD LIST 18

***PRINT SUPPORT REACTION

***PRINT STORY DRIFT

***PARAMETER 2

***CODE AISC

***PARAMETER 3

***CODE AISC

***STEEL TAKE OFF LIST 1 TO 3236

***PARAMETER 4

***CODE AISC

***PARAMETER 5

***CODE AISC

***PARAMETER 6

***CODE AISC

***PARAMETER 7

***CODE AISC

***FINISH

FINISH