

# Dynamic Analysis Of Multi Storied Residential Building (G+20) In Earthquake Prone Area (Zone-V) By Using ETABS

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#### Abstract

With the introduction of Limit state design of structures, the safety and serviceability of the structure has accrued prime importance. The present day scenario witnesses a series of natural calamities like earthquakes, tsunamis, floods etc., of these the most damaging and recurrent phenomena is the earthquake. The Effective design and the construction of Earthquake resistant structure have gained greater importance all over the world.

Earthquake load is changing into an excellent concern in our country as a result of not one zone may be selected as earthquake resistant zone. One of the most important aspects is to construct a building structure, which can resist the seismic force efficiently. Study is made on the different structural arrangement to find out the most optimized solution to produce an efficient safe earthquake resistant building. The basic designs for vertical and lateral loads i.e., wind and seismic are the same for low, medium or high rise buildings. The vertical loads increase in direct proportion to the floor area and number of floors. In distinction to the current, the result of lateral loads on a building isn't linear and increase quickly with increase in height. Due to these lateral loads, moments on steel components will be very high.

In this paper the earthquake resistance of a G+20 multi-storey building is analyzed using Equivalent static method with the help of E-TABS 9.7.4 software. The method includes seismic coefficient method as recommended by IS 1893 (part 1):2002.

The building is analyzed in Zone II & Zone V with medium soils in both static & Dynamic Analysis. Moments, Shear, Displacement was compared for all the cases. A commercial package ETABS9.7.4 has been utilized for analyzing high-rise building of 60.3m height and for zone-II & zone-V. The result has been compared using tables & graph to find out the most optimized solution. The parameters studied were displacement, storey drift and storey shears, time history, response spectrum method.

**Keywords:** Earthquake, E-TABS 9.7.4, displacement, story drift, storey shear, time history.

#### Introduction

Natural disasters are inevitable and it is not possible to get full control over them. The history of human civilization reveals that man has been combating with natural disasters from its origin but natural disasters like floods, cyclones, earthquakes, volcanic eruptions have various times not only



disturbed the normal life pattern but also caused huge losses to life and property and interrupted the process of development. With the technological advancement, man tried to combat with these natural disasters through various ways like developing early warning systems for disasters, adopting new prevention measures, proper relief and rescue measures. But unfortunately it is not true for all natural disasters. Earthquakes are one in all such disasters that's connected with in progress tectonic process it suddenly comes for seconds and causes nice loss of life and property. So earthquake disaster prevention and reduction strategy is a global concern today. Hazard maps indicating seismic zones in seismic code are revised from time to time which leads to additional base shear demand on existing buildings.

Building construction is that the engineering offers with the development of constructing to residential buildings in a really effortless constructing will probably be outline as an enclose area via partitions with roof. Fabric and accordingly the basic desires of contributors. Inside the early earlier interval people lived in caves, over bushes or beneath bushes, to safeguard themselves from wild animals, rain, sun, etc. Because the occasions handed as people being started dwelling in huts created from trees branches. The shelters of these previous are developed at the moment into wonderful residences. Rich individuals reside in sophisticated houses.

Structures are the primary indicator of social growth of the country. Every human has wished to possess houses on an average most commonly one spends his two-third life occasions within the houses. The protection civic feel of the responsibility, These are the few motives which are accountable that the man or woman do utmost effort and pay toughearned saving in owning houses.

These days the condominium building is essential work of the social

progress of the county. Day-to-day new techniques are being developed for the development of residences economically, speedily and pleasing the requirements of the group engineers and designers do the seam work, planning and layout etc, of the constructions.

Trained employees are dependable for doing the drawing works of building as for the path of engineers and designers. The trained worker will have to apprehended his job and could also be competent to comply with the instruction of the engineer and could also be able to attract the desired drawing of the building, website plans and layout plans and many others, as for the necessities.

A constructing body consists of variety of bays and storey. A Multi-storey, multi-paneled body would be a tricky statically intermediate structure. A design of R.C building of G+20 flooring body work is preoccupied. The constructing in arrange  $(38.5\times31)$  consists of columns designed monolithically forming a community. The scale of constructing is  $38.5\times31$ m. The amounts of columns are eighty five. It is residential advanced.

The design is created by using ETABS software. The constructing subjected to every the vertical hundreds additionally as horizontal masses. The vertical load consists of lifeless load of structural elements equivalent to beams, columns, slabs etc and are living loads. The horizontal load includes the wind forces so building is intended for lifeless load, reside load and wind load as per IS 875(part3):1987. The constructing is meant as two dimensional vertical body and analyzed as per IS 456-2000. The help is taken via program furnished in institute and for this reason the computations of hundreds, moments and shear forces and received from this program.



#### **ETABS Introduction**

The software used for the present study is ETABS it is a product of Computers and Structures. It is a fully integrated program that allows Model creation, modification, execution of analysis, design optimization, and results review from within a single interface. ETABS is a standalone finite element based structural software for analysis and design of civil structures. It offers a powerful user interface with many tools to aid in quick and accurate construction of Models, along with sophisticated technique to do most complex projects.

#### Building Description

The Modeling of the G+20 storey with bare frame, bare frame with slab element, full wall element structure, first soft storey, two storey soft storey, three storey's soft storey. Plan area of building is  $38.5m \times 31m$ , the building Models having at 3.75m distance in x-direction and 5m distance in y- direction.

#### Analyzing the data

Linear dynamic analysis has been performed as per IS 1893 (Part 1): 2002 for each model using ETABS analysis package. Lateral load calculation and its distribution along the height are done. The seismic weight is calculated using full dead load plus 25% of live load.

#### Statement of the Project:

Salient Features: The design data shall be as follows:-Utility of Buildings : Residential Building No of Storey : G+20 Shape of the Building Square : No. Of Staircases Four No. Of Lifts Two : Types of Walls Brick Wall : Geometric Details Ground Floor 3.3m : Floor-To-Floor Height 3m : Material Details

Concrete Grade : M 30(COLUM NS),M25(BEAM S) All Steel Grades : HYSD reinforcement of Grade Fe415 Bearing Capacity of Soil : 200 KN/m<sup>2</sup> Type Of Construction : R.C.C FRAMED structure

#### **Objectives of the study:**

- i. To study irregularities in structures analyze and design of G+20 storied structure as per code (IS1893:2002(part-1)) provision.
- ii. Analyze the buildings in Etabs software to carry out the storey deflection, storey drift, storey shear force and base shear of regular and irregular structures using response spectrum analysis and compare the results of different structure
- iii. Time history analysis subjected to intermediate frequency ground motion for the response of regular buildings and compare with response spectrum analysis. To analyze the RC frame for static analysis in relation to the storey drift and displacements, base shear using software ETABS.
- iv. To investigate the soft storey behavior at different levels of RC frame building for all cases so as to arrive at suitable practical conclusion for achieving earthquake resistant RC frame building.
- v. To study the comparison of axial forces, storey drift, storey shear of RCC framed building.
- vi. Ductility-based earthquake-resistant design as per IS 13920.

#### MODELING AND METHODS OF ANALYSIS OF STRUCTURE

In the present study analysis of G+20 multi-storey building in most severs zone for wind and earth quake forces is carried out.3D model is prepared for G+20 multi-storey building is in ETABS. Building has a typical size of



Basic parameters considered for the analysis are

Buildings and this method will give good results for this type of buildings. Dynamic analysis Utility of building : Residential building

$\mathcal{O}$		
Number of stories	:	G+20
Shape of building	:	Square
Number of stair cases	:	Four
Number of lifts	:	Two
Type of walls	:	Brick wall
Geometric details		
Ground floor	:	3.3m
floor to floor height	:	3m
Material details		
Concrete Grade	:	
M30(Columns), M25 (Be	eam	s)
All Steel Grades	:	HYSD
reinforcement of Grade F	e41	5
Bearing Capacity of Soil	:	$200 \text{ KN/m}^2$
Type Of Construction :		
structure		

#### Methods of analysis of the structure:

The seismic analysis should be carried out for the buildings that have lack of resistance to earthquake forces. Seismic analysis will consider dynamic effects hence the exact analysis sometimes become complex. However for simple regular structures equivalent linear static analysis is sufficient one. This type of analysis will be carried out for regular and low rise will be carried out for the building as specified by code IS 1893 (part 1):2002. Dynamic analysis will be carried out either by Response spectrum method or site specific Time history method. Following methods are adopted to carry out the analysis procedure.

#### Equivalent Static Analysis:

This approach defines a series of forces acting on building to represent the effect of earthquake ground motion, typically defined by a seismic design response spectrum. It assumes that the building responds in its fundamental mode. For this to be true, the building must be low-rise and must not twist significantly when the ground moves. The response is read from a design response spectrum, given the natural frequency of the building (either calculated or defined by the building code). The applicability of this method is extended in many building codes by applying factors to account for higher buildings with some higher modes, and for low levels of twisting. To account for effects due to yielding of the structure, many codes apply modification factors that reduce the design forces (e.g., force reduction factors).

The seismic design of buildings fallows the dynamic nature of the load. But equivalent static analysis would become sufficient for simpler, regular in plan configuration and it will give more efficient results.

This analysis will flow in a manner with the calculation of design base shear and its distribution to all storey by using the formula given in the code.

#### Linear Dynamic Analysis:

Static procedures are appropriate higher mode effects are not when significant. This is generally true for short, regular buildings. Therefore, for tall buildings, buildin gs with torsional irregularities, or non-orthogonal systems, a dynamic procedure is required. In the linear dynamic procedure, the building is modeled as a multi-degree-of-freedom (MDOF) system with a linear elastic stiffness matrix and an equivalent viscous damping matrix.

The seismic input is modeled using either modal spectral analysis or time history analysis but in both cases, the corresponding internal forces and displacements are determined using linear elastic analysis. The advantage of these linear dynamic procedures with respect to linear static procedures is that higher modes can be considered. However, they are based on linear elastic response and hence the applicability decreases with increasing

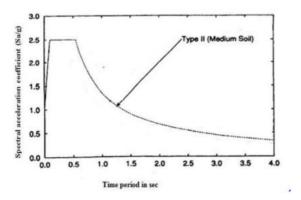


nonlinear behavior, which is approximated by global force reduction factors.

In linear dynamic analysis, the response of the structure to ground motion is calculated in the time domain, and all phase information is therefore maintained. Only linear properties are assumed. The analytical method can use modal decomposition as a means of reducing the degrees of freedom in the analysis.

#### **Response spectrum method:**

The representation of maximum response of idealized single degree freedom system having certain period and damping, during earthquake ground motions. This analysis is carried out according to the code IS 1893-2002 (part1). Here type of soil, seismic zone factor should be entered from IS 1893-2002(part1). The standard response spectra for type of soil considered is applied to building for the analysis in ETABS 2013 software. Following diagram shows the standard response spectrum for medium soil type and that can be given in the form of time period versus spectral acceleration coefficient (Sa/g).



Response spectrum for medium soil type for 5% damping

This approach permits the multiple modes of response of a building to be taken in to account (in the frequency domain). This is required in many building codes for all except very simple or very complex structures. The response of a structure can be defined as a combination of many special shapes (modes) that in a vibrating string correspond to the "harmonic" computer analysis can be used to determine these modes for a structure. For each mode, a response is read from the design spectrum, based on the modal frequency and the modal mass, and they are then combined to provide an estimate of the total response of the structure. In this we have to calculate the magnitude of forces in all directions i.e. X, Y & Z and then see the effects on the building. Combination methods include the following:

- Absolute peak values are added together
- Square root of the sum of the squares (SRSS)
- Complete quadratic combination (CQC)
   a method that is an improvement on SRSS for closely spaced modes.

The result of a response spectrum analysis using the response spectrum from a ground motion is typically different from that which would be calculated directly from a linear dynamic analysis using that ground motion directly, since phase information is lost in the process of generating the response spectrum.

In cases where structures are either too irregular, too tall or of significance to a community in disaster response, the response spectrum approach is no longer appropriate, and more complex analysis is often required, such as non-linear static analysis or dynamic analysis.

#### 3.4 Time history analysis:

In this analysis dynamic response of the building will be calculated at each time intervals. This analysis can be carried out by taking recorded ground motion data from past earthquake database. This analysis overcomes all disadvantages of response spectrum analysis if there is no involvement of nonlinear behavior. Hence this method requires greater efforts in calculating



response of buildings in discrete time intervals. In this project work BHUJ earthquake of magnitude 7.7 with ground acceleration 0.106g is taken for the time history analysis.

#### **Pushover analysis:**

This is a performance based analysis and has aim in controlling the structural damage. In this analysis several built in hinge properties are included from FEM 356 for concrete members. This analysis will be carried out by using nonlinear software ETABS 2013. This software is able to predict the displacement level and corresponding base shear where first yield of structure occurs. The main objective to perform this analysis is to find displacement vs. base shear graph.

hazards. Amongst the natural earthquakes have the potential for causing the greatest damages. Since earthquake forces random are in nature & unpredictable, the engineering tools need to be sharpened for analyzing structures under the action of these forces. Earthquake loads are to be carefully modeled so as to assess the real behavior of structure with a clear understanding that damage is expected but it should be regulated. In this context pushover analysis which is an iterative procedure is looked upon as an alternative for the conventional analysis procedures. Pushover analysis of multi-storey RCC framed buildings subjected to increasing lateral forces is carried out until the preset performance level (target displacement) is reached. The promise of performance-based seismic engineering (PBSE) is to produce structures with predictable seismic performance.

#### Non linear static analysis:

In general, linear procedures are applicable when the structure is expected to remain nearly elastic for the level of ground motion or when the design results in nearly uniform distribution of nonlinear response throughout the structure. As the performance objective of the structure implies greater inelastic demands, the uncertainty with linear procedures increases to a point that requires a high level of conservatism in demand assumptions and acceptability criteria to avoid unintended performance. Therefore, procedures incorporating inelastic analysis can reduce the uncertainty and conservatism. This approach is also known as pushover analysis.

#### Non linear dynamic analysis:

Nonlinear dynamic analysis utilizes the combination of ground motion records with a detailed structural model, therefore is capable of producing results with relatively low uncertainty. In nonlinear dynamic analyses, the detailed structural model to a ground-motion record subjected estimates produces of component deformations for each degree of freedom in the model and the modal responses are combined using schemes such as the squareroot-sum-of-squares.

In non-linear dynamic analysis, the non-linear properties of the structure are considered as part of a time domain analysis. This approach is the most rigorous, and is required by some building codes for buildings of unusual configuration or of special importance.

#### GEO-TECHNICAL CONSIDERATIONS Site Selection

The seismic motion that reaches a structure on the surface of the earth is influenced by local soil conditions. The subsurface soil layers underlying the building foundation may amplify the response of the building to earthquake motions originating in the bedrock. For soft soils the earthquake vibrations can be significantly enlarged and hence the shaking



of structures sited on soft soils can be much greater than for structures sited on firm soils. Hence appropriate soil investigation should be carried out to establish the allowable bearing capacity and nature of soil.

Prevention of view is mainly concerned with the stability of the ground. The very loose sands or sensitive clays are responsible to be destroyed by the earthquake so much as to lose their original structure and thereby undergo compaction. This would result in large unequal settlements and damage the building. If the loose cohesion less soils are saturated with water they are likely to lose their shear resistance altogether during ground shaking. This leads to liquefaction. Although such soil can be compacted, for small building the operation may be too costly and the sites having these soils are better avoided. For large building complexes, such as housing developments, new colonies etc., this factor should be thoroughly investigated and the site have to be selected appropriately. Therefore a site with sufficient bearing capacity and free from the above defects should be chosen and its drainage condition improved so that no water accumulates and saturates the ground especially close to the footing level.

#### LOADS ACTING ON MULTI-STOREY G+20 BUILDING

Loading on tall buildings is different from low-rise buildings in many ways such as large accumulation of gravity loads on the floors from top to bottom, increased significance of wind loading and greater importance of dynamic effects. Thus, multi-storied structures need correct assessment of loads for safe and economical design. Except dead loads, the assessment of loads cannot be done accurately. Live loads can be anticipated approximately from a combination of experience and the previous field observations. Wind and earthquake loads are random in nature and it is difficult to predict them. They are estimated based on a probabilistic approach. The following discussion describes some of the most common kinds of loads on multistoried structures.

#### 4.1 Dead loads

Dead loads consist of the permanent construction material loads comprising the roof, floor, wall, and foundation systems, including claddings, finishes, and fixed equipment. The values for dead loads are for commonly used materials and constructions in light-frame residential buildings. Table 4.3 provides values for common material densities and may be useful in calculating dead loads more accurately. The design examples in Section 4.10 demonstrate the straight-forward process of calculating dead loads.

#### Live loads

Live loads are produced by the use and occupancy of a building. Loads include those from human occupants, furnishings, and non fixed equipment, storage, and construction and maintenance activities. Table 4.4 provides recommended design live loads for residential buildings. As required to adequately define the loading condition, loads are presented in terms of uniform area loads, concentrated loads, and uniform line loads. The uniform and concentrated live loads should not be applied simultaneously in a structural evaluation. Concentrated loads should be applied to a small area or surface consistent with the application and should be located or directed to give the maximum load effect possible in end-use conditions.

## Gravity loads

Dead loads due the weight of every element within the structure as well as live loads that are acting on the structure when in service constitute gravity loads. The dead loads are calculated from the member sizes and estimated material densities. Live loads prescribed by codes are empirical and conservative based on experience and



accepted practice. The equivalent minimum loads for office and residential buildings as per IS 875 are as specified in Table -4.1. LOADS ACTING ON MULTI-STOREY G+20 BUILDING

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Occupancy Classification	Uniformly Distributed Load KN/mm <sup>2</sup>	Concentrated Load in KN	
	Office Buildings		
Offices and Staff Rooms	2.5	2.7	
Class Rooms	3	2.7	
Corridors Staff Rooms and Reading Rooms	4	4.5	
R	esidential Buildings		
· Apartments	2	1.8	
Residence	4	2.7	
- Corridors	3	4.5	

A floor should be designed for the most adverse effect of uniformly distributed load and concentrated load over 0.3 m by 0.3 m as specified in Table- 4.1, but they should not be considered to act simultaneously. All other structural elements such as beams and columns are designed for the corresponding uniformly distributed loads on floors.

Reduction in imposed (live) load may be made in designing columns, load bearing walls etc., if there is no specific load like plant or machinery on the floor. This is



allowed to account for reduced probability of full loading being applied over larger areas. The supporting members of the roof of the multi-storied building is designed for 100% of uniformly distributed load; further reductions of 10% for each successive floor down to a minimum of 50% of uniformly distributed load is done.

The live load at a floor level can be reduced in the design of beams, girders or trusses by 5% for each  $50m^2$  area supported, subject to a maximum reduction of 25%. In cases where the reduced load of a lower floor is less than the reduced load of an upper floor, then the reduced load of the upper floor should be adopted in the lower floor also.

#### Wind loads

Wind load is primarily horizontal load caused by the movement of air relative to earth. Wind load is required to be considered in structural design especially when the heath of the building exceeds two times the dimensions transverse to the exposed wind surface.

For low rise building say up to four to five stories, the wind load is not critical because the moment of resistance provided by the continuity of floor system to column connection and walls provided between columns are sufficient to accommodate the effect of these forces. Further in limit state method the factor for design load is reduced to 1.2 (DL+LL+WL) when wind is considered as against the factor of 1.5(DL+LL) when wind is not considered.

The horizontal force exerted by the components of winds is to be kept in mind while designing is the building. The calculation of wind loads depends on the two factors, namely velocity of wind and size of the building. Complete details of calculating wind load on structures are given below (by the IS-875 (Part 3) - 1987).Using color code, basic wind pressure

 $\mathbb{V}_{\mathbb{H}_{p}}$  is shown in a map of India. Designer can pick up the value of  $\mathbb{V}_{\mathbb{H}_{p}}$  depending upon the locality of the building.

To get the design wind velocity  $\Psi_{a}$  the following expression shall be used:

$$\mathbf{V}_{z} = \mathbf{k}_{1} \cdot \mathbf{k}_{2} \cdot \mathbf{k}_{3} \cdot \mathbf{V}_{b}$$

Where,

 $\mathbf{k}_1 = \text{Risk coefficient}$ 

 $k_{g}$  = Coefficient based on terrain, height and structure size.

 $k_{\rm H} = {\rm Topography factor}$ 

The design wind pressure is given by

 $\mathbf{p}_{\mathbf{z}} = \mathbf{0} \cdot \mathbf{6} \, \mathbf{V}_{\mathbf{z}}^{\mathbf{2}}$ Where,

 $\mathbf{p}_{\star}$  is in N/m<sup>2</sup> at height Z and

**▼**, is in m/sec.

Up to a height of 30 m, the wind pressure is considered to act uniformly. Above 30 m height, the wind pressure increases. For detailed information on evaluating wind load, the reader is referred to IS: 875-1987 (Part-III)

#### NOTE:

Design wind speed up to 10m height from mean G.L shall be considered constant.

 $K_2 = Category 3$ 

For  $k_1$  = basic wind speed =44 m/sec

#### Earth quake load

Seismic motion consists of horizontal and vertical ground motions, with the vertical motion usually having a much smaller magnitude. Further, factor of safety provided against gravity loads usually can accommodate additional forces due to vertical acceleration due to earthquakes. So, the horizontal motion of the ground causes the most significant effect on the structure by shaking the foundation back and forth. The mass of building resists this motion by setting up inertia forces throughout the structure. The magnitude of the horizontal shear force F depends on the mass of the building M, the acceleration of the ground a, and the nature of the structure. If a building and the foundation were rigid, it would have



the same acceleration as the ground as given by Newton's second law of motion, i.e. F =Ma. However, in practice all buildings are flexible to some degree.

For a structure that deforms slightly. thereby absorbing some energy, the force will be less than the product of mass and acceleration. But, a very flexible structure will be subject to a much larger force under repetitive ground motion. This shows the magnitude of the lateral force on a building is not only dependent on acceleration of the ground but it will also depend on the type of the structure. As an inertia problem, the dynamic response of the building plays a large part in influencing and in estimating the effective loading on the structure. The earthquake load is estimated by Seismic coefficient method or Response spectrum method. The later takes account of dynamic characteristics of structure along with ground motion.

#### **STEPS FOR ANALYSIS**

**Design seismic base shear:** The design seismic base shear or total design lateral force ( $V_B$ ) along any principal direction shall be determined by the following expression:  $V_B = A_h X$  W Where,  $A_h =$ Design horizontal acceleration spectrum value using the fundamental natural period 'T' in the considered direction of vibration W = seismic weight of the building. The  $A_h$  shall be determined by the following expression:

 $A_h = ZIS_a/2Rg$ 

The value of Ah shall not be taken less than Z/2 whatever be the value of I/R. Where.

Z = Z one factor is determined from the following table

Seismic Zone	II	III	IV	V
Seismic Intensity	Low	Moderate	Severe	Very Severe
Z	0.10	0.16	0.24	0.36

Table 2: Zone factor for different Seismiczones

I = represents the importance factor and it depends upon the functional use of the structures. It is characterized by hazardous consequences of its failure, post earthquake functional needs, historical value or economic importance. 1.5 is considered for the important structures like hospitals, schools, monumental buildings etc. and the rest of the buildings it is taken as 1.

R = It is Response reduction factor which depends on the perceived seismic damage performance of the structure, characterized by ductile or brittle deformations of the structure. This ration should not be greater than one. The values for R are given in Table 7 of IS: 1893. The value for R varies between 3 and 5 with respect to ductile reinforcement detailing.

Sa/g = Average response acceleration coefficient as per clause 6.4.5 of IS 1893:2002 as given by below figure and it is based on the damping and the natural periods of the structures.

NOTE: The value of Ah will not be taken less than  $\frac{1}{2}$  where ever the value of  $\frac{1}{R}$ 

#### Analyzing the data

Linear dynamic analysis has been performed as per IS 1893 (Part 1): 2002 for each model using ETABS analysis package. Lateral load calculation and its distribution along the height are done. The seismic weight is calculated using full dead load plus 25% of live load.

Table 3: Following data is used in the analysis of the RC frame building



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#### Models

Type of frame	Ordinary moment resisting RC frame OMRF) fixed at the base
Seismic zones	II,V
Number of storey	G+20 storey
Floor height	3 m
Depth of Slab	150 mm
Size of beam	(300× 500) mm
Size of column	(230 × 500) mm
Spacing between frames in x-direction	3.75m
Spacing between frames in y-direction	5m
Density of concrete	25 kN/m3
Type of soil	Medium soil
Seismic zone	As per IS (1893-2002)
Seismic zone factor, Z	For zone II: 0.10 / For zone V: 0.36

#### PLAN AND ELEVATION OF G+20 BUILDING PLAN OF G+20 BUILDING IN ETABS

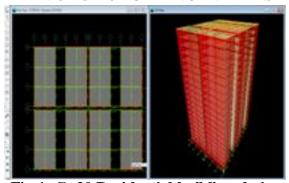


Fig 1: G+20 Residential building design

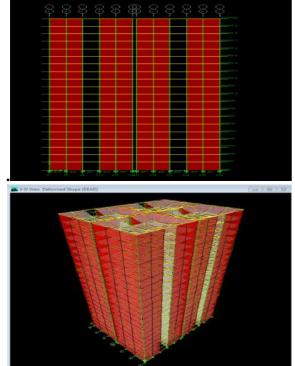


Fig 2: Elevation of G+20 Residential Building Fig3: 3D view Deformed Dead

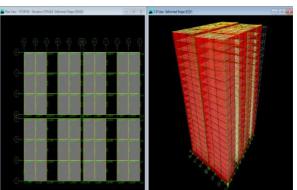
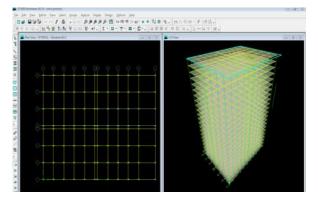


Fig 4: 3D view Deformed shape (EQy)



# Fig 5: Plan View of Elevation PLAN OF G+20 BUILDING:

The above figure represents the plan and elevation and 3d view of G+20 building in ETABS software in both zone II and zone V The plan certainly shows that it's a combination of 4 residences We can realize there's a blend between each and each residences

In every slab the whole flooring includes a 3 mattress area apartment that occupies entire floor of a slab. It represents a wealthy locality with massive areas for each residence. It's a g+20 projected building, as a consequence for 4 slabs we have now received 4\*20=80 residences. The organize indicates the small print of dimensions of each and every space and hence the type of area and orientation of the quite a lot of areas like bed room, toilet, kitchen, corridor and so forth. All of the 4 flats have an identical area association.The



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complete prepare area is regarding 1193 sq.mts.

#### **ELEVATION OF G+20 BUILDING:**

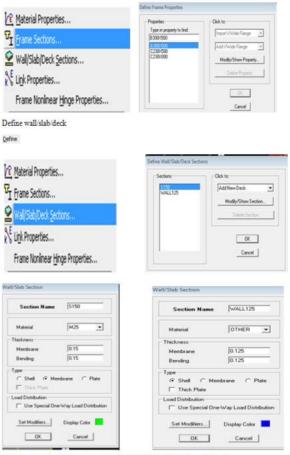
The fig 2 represents the projected elevation of constructing. It suggests the g+20 constructing elevation of а representing the front read which presents the summary of a building slab. The determine represents the location photograph of our structure that's taken on the place .The constructing is surely beneath constructions and every person the analysis and design work is accomplished earlier than the opening of the undertaking. Each and every floor contains top 3m that is taken per GHMC rules for residential as structures.

The building isn't designed for increasing the quantity of floors in future. So the variety of flooring is mounted for future conjointly for this constructing due to the fact of inaccessibility of the permissions of quite a lot of authorities.

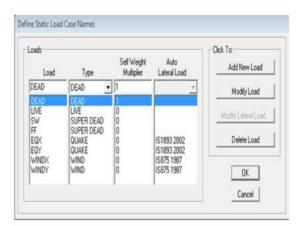
Additionally distinctive substances like ash and self compacted concrete have been conjointly utilized in an effort to decrease the dead load and increase lifetime of the structure and conjointly fortify economy. Nonetheless these materials weren't idea of whereas planning in staad to cut down the complexness and crucial corrections are created for considering the fact that the financial system and defense of the constitution due to the fact it would be a really enormous constructing with thirty residences. This is on the subject of thearrange and small print of the area and subsequent part deals with the seem a part of the building under varied masses that the building is intended.

#### DESIGN STEPS IN ETABS

Define section columns and beams using Define > Frame section Define



Define various loads (Dead load, live load, wind load, Earthquake load) Define > Static Load Cases



Assign support condition Drop-down box in the lower right-hand corner of the ETABS window, Select only bottom single storey level to assign fixed support using assign > Joint/Point>Restrain (Support) command



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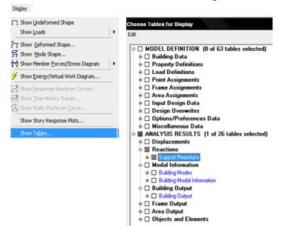
One Story	
All Stories	
Similar Stories	2
One Story	•

Assign		
landare Frankline Shellikes	X Diaphragns 10 Panel Zone 12 Pregnants (Supports)	Action Restricts
Joint Point Loads Framelyine Loads Shell Area Loads	Ren Point Springs Ligk Properties Additional Point Mass	Fransakon X      Protection about X     Formation Y      Franslation Y     Formation about Y     Formation Z     Formation about Z
% Group Names	- •	Fast Restaints
Qear Display of Assigns		1 4 2 .
Copy Assigns Paste Assigns	,	Carcel

Run analysis from Analysis > Run Analysis command

Analyze	
Set Analysis Options Check Model	
🕨 Run Analysis	F5
Run Construction Sequence Analy	sis
Calculate Diaphragm Centers of R	igidity
Li Run Static Nonlinear Analysis	

In ETABS, dead load and other loads are shown from table as shown in figure.



					Support	Reactions			J.
	Story	Point	Load	FX	FY	FZ	MX	MY	MZ
)	BASE	t	DEAD	921.61	-1201.88	9327.64	191.087	112.562	-0.00-
	BASE	t	LIVE	91,69	-119.41	898.54	13.223	8.929	-0.02
	BASE	1	FF	36.73	-47.83	359.91	5.296	3.576	-0.00
	BASE	1	EQX	-919.51	1441.14	-11123.69	-279.326	-523.046	-3.85
	BASE	1	EQY	-134.92	-186.82	-2120.96	122.307	-282.512	-3.57.
-	BASE	1	WINDX	0.00	0.00	0.00	0.000	0.000	0.000
	BASE	1	WNDY	0.00	0.00	0.00	0.000	0.000	0.000
	BASE	1	SPEC1	204.48	494.85	2746.01	131.601	61.221	0.222
	BASE	1	CONB1 MAX	275.18	28278.49	1092.81	209.634	-575.320	-7.体
	BASE	1	COMB1 NN	-11554.32	-743.05	-172184.83	-6958.071	-6057.700	-73.07
	BASE	1	UDCON1	1437.50	-1874.57	14531.33	294.575	174.207	-0.00
	BASE	1	UDCON2	1575.04	-2053.67	15879.14	314,410	187.600	-0.00
	BASE	3	UDCON3	1260.03	-1642.94	12703.31	251.528	150.080	-0.00
	BASE	1	UDCON4	1260.03	-1642.94	12703.31	251.528	150.080	-0.00
	BASE	1	UDCON5	1260.03	-1642.94	12703.31	251.528	150.080	-0.00
	BASE	t	UDCON6	1260.03	-1642.94	12703.31	251.528	150.080	-0.00
	BASE	1	UDCON7	1437.50	-1874.57	14531.33	294.575	174.207	-0.004
	8400		Income	1117 60	1971 67	44634-99	351 675	176 387	*

Seismic force calculation as per IS: 1893(Part 1) - 2002. Static Method

Define static load from Define > Static load command

Define

Loads Load	Type	Sel'Weigh Multpier	Auto LateralLoad	- <b>Cick To</b> Additional
0640	204			
	ubu _	0	2	Mode Load
UNE FF EQX	UNE Super Dead Quare	0 0 0	151889.2012	Storietsilad.
EQY VINDX VINDY	UUAE WNO WNO	0 0	151883-3002 15875 1987 15875 1987	Déte Los
	1			Cancel
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Press modify lateral load to shown below figure and assign various value as per IS1893-2002(part-1).



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Direction and Eccentricity		Seismic Coefficients	
Image: Constraint of the second se	/Dir+Eccen X	Seismic Zone Factor, Z Per Code C User Defined Soil Type Importance Factor, I	0.16 <u>•</u>
Time Period C Approximate Ct (m) Program Calc C User Defined T =			
Story Range Top Story Bottom Story	STORY5 - BASE -	OK	7

#### **Dynamic Analysis Method**

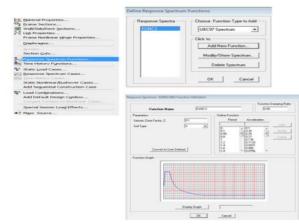
The design response spectra of IS 1893-2002 given as input in the **Define menu** > **Response Spectrum Functions.** Response spectra load cases are define in **Response Spectrum cases** 

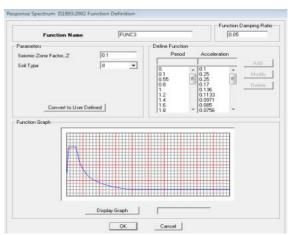
#### Define

🖹 Material Properties 🕆 Erame Sections	Define Response Spectrum Functions
Wall/Slab/Deck ≦ections     Ligk Properties     Frame Nonlinear Hinge Properties	Response Spectra Choose Function Type to Add
Diaphragms	UBC97 Spectrum
Groups Section Guts	DEHRP97 Spectrum     DEuroCode8 Spectrum
Response Spectrum Functions	N254203 Spectrum Chinese2002 Spectrum
Time History Functions     Static Load Cases     Sesponse Spectrum Cases     Time History Cases     Static Nonlinear/Bushover Cases Add Seguential Construction Case	Italiar(274 Spectrum ISTER:2012 Spectrum IBIC:2005 Spectrum NBIC:2005 Spectrum Litelite Spectrum
Add Default Design Combos Congert Combos to Northnear Cases	OK Greet
Special Seismic Load Effects	

#### Site Specific Response Spectrum

Site specific response spectrum is define from **Define > Response Spectrum Function >Spectrum from File.** 





The damping value is specified which is used to generate the response spectrum curve. 5% damping factor and 9.81 (g) scale factor is assigned as shown in above Figure.

#### Site Specific Time History

Site specific time history is define from **Define > Time History Function** 

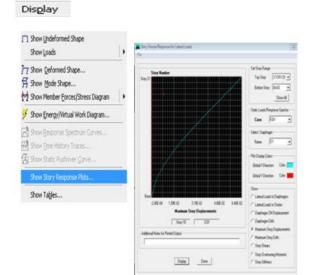
Site specific time history is define from  ${\bf Define} > {\bf Time\ History\ Function}$ 

Define		
K Material Properties	Define Time History Function	ns
Frame Sections     Wal/Slab,Deck Sections     Wal/Slab,Deck Sections     Kulgk Properties     Frame Nonlinear Hinge Properties     Diaphragms     Groups     Section Guts	Functions	Choose Function Type to Add Sine Function  Click. to: Add New Function ModBy/Show Function Delete Function OK Cancel
Response Spectrum Functions		Carta
Prait Load Cases     Static Load Cases     Besponse Spectrum Cases     Jine History Cases     Static Nonlinear/Bushover Cases     Add Seguential Construction Case		
geîne		
Ex gibernial Properties     Expanse Sectors     Wall/Stabl/Dock Sectors     Wull/Stabl/Dock Sectors     Vigo Properties     Displerages     Sectors Sectors Functions     Sectors Sectors Functions		esse Function Type to Add for Function (*) Not Add Here Function ( Oalde Function Of Caucity (
w The History Purchases	Time History Function Defendion	
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	Tueto liqi	
	OK.	Carol



Functions	Choose Function Type to Add
FUNC1	Sine Function
	Click to:
	Add New Function
	Modify/Show Function
	Delete Function
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	1
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nction Graph	
Direlan Crash	
Display Graph	
Display Graph	

#### Run the analysis and various curves is shown from **Display > Show Storey Response Plot**



#### Design under Gravity and Seismic Load

Design is carried out using different combination. ETABS have facility to generate combination as per IS 456-2000.

Define Staterial Properties	Define Load Combination	
Erame Sections     Wall/Slab/Deck Sections     Ligk Properties     Frame Nonlinear Binge Properties	Combinations	Click to:
Diaphragms	UDCON9 .	Add New Combo
Groups Section Guts	UDCON10 UDCON11	Modily/Show Combo
Response Spectrum Functions	UDCON12 UDCON13	Delete Combo
Static Load Cases     Eesponse Spectrum Cases     Jime History Cases     Static Nonlinear/Bushover Cases     Add Seguential Construction Case	UDCON14 UDCON15 UDCON16 UDCON16 UDCON17 UDCON18	
Add Default Design Combos Congert Combos to Nonlinear Cases	UDCON19 *	Cancel
Special Seismic Load Effects		
P Mgss Source	Select assigning comb	ination for Design from D

Select assigning combination for Design from **Design** > **Concrete Frame Design** > **Select Design** 

Combination

I Steel Frame Design		Select Design ⊆ombo
Concrete Frame Design Composite Beam Design		View/Revise gverwrites
Seel Joist Design Shear <u>Wall Design</u>	н н	Start Design/Check of Structure Interactive Concrete Frame Design
Overwrite Frame Design Procedure		Display Design Info
		Change Design Section Reget Design Section to Last Analysis
		Verify Analysis vs Design Section
		Reset All Concrete Overwrites Delete Concrete Design Results

#### Design Load Combinations Selection

COMB1	-	UDCON1	*
	Add ->	UDCON10 UDCON11	
		UDCON12	-
	<- Remove	UDCON13	
	Show	UDCON14 UDCON15	
	511044	UDCON16	
		UDCON17 UDCON18	-

Run the Pushover analysis from **Analysis** > **Run Static Nonlinear Analysis command**.



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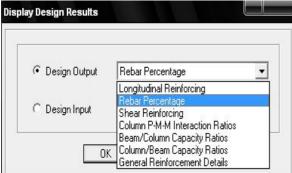
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	Set Analysis Options	
	Check Model	
	Run <u>A</u> nalysis	F5
<b>F</b> •	Run ⊆onstruction Sequence Analysis	
~	Calculate Diaphragm Centers of Rigidity	

Review the pushover analysis results from Display > Show Static Pushover Curve Command

x10 <sup>6</sup> Displac	ement	Static Nonlinear Case	PUSH1 .
15.0		Plot Type	
0.0		Resultant Base Shear vs M	Ionitored Displacement
5.0		C Capacity Spectrum	Color
0		C Capacity Spectrum - Demand Spectrum Seismic Coefficient Ca	
0		Seismic Coefficient Ca	0.4
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Performance Point (Telt,Belf)	1	Damping Parameters	
diffional Notes for Printed Output		Inherent + Additional Damping	0.05
		Structural Behavior Type	
1		CA GB CC	C User Modify/Show_

# Design > Concrete Frame Design > Display Design Information



Select any beam member and left click to shown below figure **REINFORCEMENT DETAILS ZONE II** 

Beam Reinforcement Details: Storey 3:

Story	E	TORY3		Section	Name	BEAM	
Beam		81			(Trunc		
COMBO		STATION	т	DP BOTT	IOM	SHEAR	
ID		LOC	STEE	L ST	EEL	STEEL	
UDCON		127.953	0.17		672	0.022	*
UDCON		147.638	0.67			0.022	
UDCON		147.638 167.323	0.67		672 176	0.022	10
UDCON		187.008	0.67			0.022	
Provide State		Overwrites		1.0.0			
	-	Uverwikes	Summa		Cancel	r Details Enve	ope _
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ection ID		1.0.0	010	dct=1.969	dcb=1.969		
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			10190.050	Hys=68198.656			34
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LONGITUDINAL REINFOR Top (+2 Axis) Botton (-2 Axis)	CEHENT FOR HOHEN Required +ve Rebar 4.550E-04 2.275E-04 Konents	ellonent Rebar 0.000	-vellonent Reg Rebar 4.550E-04 3.1	llaritin S Rebar 1726-14	Rebar 4.337E-04			
TOP (+2 Axis) Botton (-2 Axis) Botton (-2 Axis) Factored Forces and I Factored Nu3	EENENT FOR HONE Repuired +vv Rebar 4.550E-04 2.205E-04 Ionents Factored Tu	Honent - Rebar 0.000 - 0.000 0.000 Torsion Ht	-vellonent Reg Rebar 4.550E-04 3.1	llaritin S Rebar 1726-14	Rebar 4.337E-04			
TOP (+2 Axis) Botton (-2 Axis) Botton (-2 Axis) Factored Forces and I Factored	CEHENT FOR WOHEN Required +ve Rebar 4.550E-04 2.275E-04 fonents Factored	Honent - Rebar 0.000 - 0.000 0.000 Torsion	-vellonent Reg Rebar 4.550E-04 3.1	llaritin S Rebar 1726-14	Rebar 4.337E-04			
Top (+2 Axis) Botton (-2 Axis) Botton (-2 Axis) Factored Forces and I Factored Hu3 -33.900	EENENT FOR HONE Repuired +vv Rebar 4.550E-04 2.205E-04 Ionents Factored Tu	Honent - Rebar 0.000 - 0.000 0.000 Torsion Ht	-vellonent Reg Rebar 4.550E-04 3.1	llaritin S Rebar 1726-14	Rebar 4.337E-04			
LONGITUDINAL REINFOR Top (+2 Axis) Botton (-2 Axis) Factored Forces and I Factored Nu3	EENENT FOR HONE Repuired +vv Rebar 4.550E-04 2.205E-04 Ionents Factored Tu	Honent - Rebar 0.000 - 0.000 0.000 Torsion Ht	-vellonent Reg Rebar 4.550E-04 3.1	llaritin S Rebar 1726-14	Rebar 4.337E-04			
Top (+2 Axis) Botton (-2 Axis) Botton (-2 Axis) Factored Farces and I Factored Hu3 -33.900 Design Honents, Hu3	CENENT FOR HOME Required +W Rebar 4,550E-04 2,275E-04 2,275E-04 Innents Factored Tu 4,922 Design	Honent - Rebar 0.000 - 0.000 0.000 Torsion Ht	-vellonent Reg Rebar 4.550E-04 3.1	llaritin S Rebar 1726-14	Rebar 4.337E-04			

	gratemens	Indian 15 456-2								
e:										
									Unit: Kipi	
Indian 15	456-2080 B	EAM SECTIO	N DESIGN	Type: Ductil	e Frane	Units: Kip-i	n (Shear	Details)	1	T
Level	: STORYS		=196.850							_
Element	: B1	9	-11.811	B=19.68		bF=19.685				
Section ID			s=0.000	éct=1.9		dcb=1.969				1
	: LOCIN2		=3600.020	fc=3.62		Lt.Wt. Fac.=	1.000			
Station Lo	c : 4.528	f	y=68.191	Fys=60.	191					
Ganna(Conci										
Ganna(Stee)	1) : 1.1	50					_		_	
SHEAR/TORS	ION DESIGN	I FOR Vu2 a	od Tu							
surged ingo	Rehar	Rebar		an Design	lesi	m				
	Asu/s	Asvt/s		Ju Tu		Pa				
	0.022	8.819								
Design For	ces									
	Factored	Factored	Equivale	nt Capacity	Gravi	ty				
	U	Te	1	Je 🛛 🗤		lig				
	9.616	43.566	16.8	73 3.919	-9.4	13				
Capacity N				- 2 - 1						
L				nt Cap.Homent			_			
	As(Bot)	As(Top)								
	0.353	8.705	177.9	48 348.472	8				_	
Capacity H										
L				nt Cap.Homent						
	As(Bot)	As(Top)								
	0.295	8.672	149.2	53 332.842						
Design Basi										
u	.Wt.Reduc	Strength								
	Factor	Fy 404								
	1.000	68.191	3.6	26 232.500	2. A					
Concrete C										
		Tensn.Rein		st Allowable					rengh	
	₫C	Area Ast		% Tau_c(MPa)					actor	
	193.758	1.705	8.3	54 8.419	1.1	61 1.00	0 1.	808	1.000	

### For Storey 8:

Indian IS 456-2000	BEAH SECTION DESIGN	Type: Ductile Frame	Units: Kip-in	(Sunnary)
--------------------	---------------------	---------------------	---------------	-----------

indian io	150	2000 00	an ocorron p		·ypc ·	Public II	and ourcost up in foundation
Level	:	STORY8	L=19	5.850			
Element	:	<b>B4</b>	D=11	.811		B=19.685	bf=19.685
Section I	D :	BEAH	ds=0	.000		dct=1.969	dcb=1.969
Combo ID	:	UDCON2	E=36	00.000		fc=3.626	Lt.Wt. Fac.=1.000
Station L	.oc :	4.528	fy=6	0.191		fys=60.191	
Ganna(Con							
Gamma(Ste	el)	: 1.15	0				
Factored	Forc	es and H	onents				
	Fa	ctored	Factored	Facto	red	Factored	
		Hu3	Tu		Vu2	Pu	
	-8	18.136	68.541	15.	087	0.000	
Design Mo							
		ctored	Torsion	Posit		Negative	
		lonent	批		ent	Honent	
	-8	18.136	56.980	0.	000	-875.117	
Longitudi	nal	Reinforc	enent for No				
	-	_	Required	+Mon		-Monent	Hininun
545			Rebar		bar	Rebar	Rebar
Top Bottom		Axis)	2.072		000 000	2.072	0.672 1.036
DUCCUM	112	1112)	1.000		000	0.000	1.000
Shear Rei	nfor	cenent f	or Shear and	Torsio	n (Vu	2, Tu)	
		Rebar	Shear	Sh	iear	Shear	Shear
		Asv/s	Ve		Vc	٧s	Up
		0.022	15.087	18.	452	11.240	9.483
Torsion R	einf	orcenent	for Torsion			Tu, Vu2)	
		Rebar	Torsion	Sh	iear	Core	Core
	1	Asut/s	Tu		Vu	b1	d1
		0.021	68.541	15.	807	16.748	8.874



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#### For Storey 18:

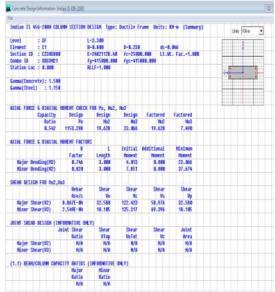
ve)     : ST00198     L-S.400       cment     : E24     D=0.200     B=0.500       ction 10     : E3042502     d=0.400     G=0.400       nt 10     : E3042502     d=0.400     G=0.400       dtion 10     : E3042502     : G=0.400     G=0.400       max(Steel)     : 1.500     : G=0.400     : 1.150	×
COMESO STATION TOP BOTTOM SHEAR TD LOC STEEL STEEL STEEL UDCOR2 2.568 0.000 0.000 0.000 UDCOR2 3.031 0.000 0.000 0.000 UDCOR2 3.958 0.000 0.000 0.000 UDCOR2 4.422 0.000 0.000 0.000 UDCOR2 4.422 0.000 0.000 0.000 UDCOR2 4.885 0.000 0.000 0.000 UDCOR2 4.885 0.000 0.000 0.000 UDCOR2 4.885 0.000 0.000 0.000 UDCOR2 4.685 0.000 0.000 0.000 0.000 UDCOR2 4.685 0.000 0.000 0.000 0.000 UDCOR2 4.685 0.000 0.000 0.000 0.000 0.000 UDCOR2 4.685 0.000	•
ID         LOC         STEEL         STEEL         STEEL         STEEL           UDCOR2         2.568         0.000         0.000         0.000         0.000           UDCOR2         3.031         0.000         0.000         0.000         0.000           UDCOR2         3.031         0.000         0.000         0.000         0.000           UDCOR2         3.958         0.000         0.000         0.000         0.000           UDCOR2         4.422         0.000         0.000         0.000         0.000           UDCOR2         4.422         0.000         0.000         0.000         0.000           UDCOR2         4.685         0.000         0.000         0.000         0.000	•
UDCOR12         2.568         0.000         0.000         0.000           UDCOR12         3.031         0.000         0.000         0.000           UDCOR12         3.495         0.000         0.000         0.000           UDCOR12         4.422         0.000         0.000         0.000           UDCOR12         4.425         0.000         0.000         0.000           UDCOR12         4.425         0.000         0.000         0.000           UDCOR2         4.425         0.000         0.000         0.000	•
UDCOR12         3.031         0.000         0.000         0.000           UDCOR12         3.495         0.000         0.000         0.000           UDCOR12         3.958         0.000         0.000         0.000           UDCOR12         3.958         0.000         0.000         0.000           UDCOR12         4.422         0.000         0.000         0.000           UDCOR12         4.885         0.000         0.000         0.000           UDCOR12         5.8850         0.6950         0.600         0.000           UDCOR12         15.886         0.65.800         0.61.800         0.600           Itian 15 K6-2888         0.63.800         64-8.580         0.61-8.600         0.61-8.600           UDCOR12         1.8885         69-45808.800         0.1.80	•
UDCOR12         3.495         0.000         0.000         0.000           UDCOR12         3.958         0.000         0.000         0.000           UDCOR12         4.422         0.000         0.000         0.000           UDCOR12         4.425         0.000         0.000         0.000           UDCOR14         6.000         0.000         0.000         0.000           UDCOR15         0.6415         0.650         0.6415         0.6415           Itan 15 467-2000         0.650         0.641, 620         0.641, 620         0.641, 620           Itan 15 15 2045568         6410, 620, 620, 620, 620, 620, 620, 620, 62	•
UDCOR2         3.958         0.000         0.000         0.000           UDCOR2         4.422         0.000         0.000         0.000           UDCOR2         4.428         0.000         0.000         0.000           UDCOR2         4.428         0.000         0.000         0.000           UDCOR2         4.428         0.000         0.000         0.000           UDCOR2         4.485         0.000         0.000         0.000           UDCOR2         0.4855         0.000         0.000         0.000           UDCOR2         0.4855         0.000         0.000         0.000           UDCOR2         0.4855         0.4856         0.000         0.000           UDCOR2         0.48568         0.49368         0.49568         0.4968           UDCOR2         0.895688         0.495688         0.497928         0.4975888         0.49788           UDR000000000000000000000000000000000000	•
UDCOR2         4.422         0.000         0.000         0.000           UDCOR2         4.685         0.000         0.000         0.000	2 534 m
UDCXXIZ         4.885         0.000         0.000         0.000	2 534 m
Overwrites         Summary         Flex. Details         Shear Details         Envelope           OK         Cancel           OK         Cancel           Norec Despiriformation Index 5 06-000           Itian 15 466-2000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 466-2000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 466-2000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 466-2000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 466-2000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 466-2000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 468-000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 468-000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 468-000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 468-000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 47-000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 47-000 BEAN SECTION RESIGN Type: Ductlife Frame Units: DH-m (Summary)         Une           Itian 15 47-000	2  534 e
DK         Cancel           DK         Cancel           DK         Cancel           Dian 15 466-2000 DEAN SECTION DESIGN Type: Ductile Frame Units: DFm (Summary)         Um           matter         E24         D-0.300         E-0.500           tion 15 SIGNESB         do-0.000         E-0.500         DF-0.500           tion 10 E SIGNESB         do-0.400         E-0.500         DF-0.500           tion 10 E SIGNESB         fgr-VESIGN.000         E-0.400         E-0.400           tion 10 E SIGNESB         fgr-VESIGN.000         E-0.4500         E-0.4500           stion 10 E : 0000000         Fgr-VESIGN.000         E-0.4500         E-0.4500           tition 10 : 1000000         Fgr-VESIGN.000         E-0.4500         E-0.4500           stition 10x : 1.4000         Fgr-VESIGN.000         E-0.4500         E-0.4500           tition 10x : 1.4000         Fgr-VESIGN.000         E-0.4500         E-0.4500           tition 10x : 1.4000         Fgr-VESIGN.000         E-0.4500         E-0.4500           tition 10x : 1.4000         Fgr-VESIGN.000         E-0.4500         E-0.4500	2 (5)4 m
ve)     : STR0Y10     1-5.400       oment     : E24     D=0.200     B=0.510     D=0.510       ction 10     : E304500     d=0.400     Col=1.600     Col=1.600       ction 10     : E304500     d=0.400     f=0.510.000     L1.11. fac.=1.400       ction 10     : E304500     d=0.400     f=0.510.000     L1.11. fac.=1.400       ction 10     : E304500     d=0.415500.000     fys=415500.000     L1.11. fac.=1.400       una(Chnoretze):     1.500     ma(Steel):     : 1.150	2
cmett         1224         0-0-0.00         B-0.510         6-0.500           ttim 10         12040520         ds-0.00         dc2-0.00         dc2-0.00           tim 10         12040520         ds-0.00         dc2-0.00         dc2-0.00           tim 10         100102         C-VACT120.A0         fc-500.00         ttm.t.fac1.000           tim 10x         1.485         Fg-V1500.00         fgs-V1500.00         ttm.tm.max           wa(Sterl)         1.510         dc2-0.00         dc2-0.00         dc2-0.00           ttmef Forces and Homets         ttmetts         dc2-0.00         dc2-0.00         dc2-0.00	
00         1:00000         E-2402120.40         For-Stell.400         E.V.F. Fac1.400           btion Loc : 4.085         Fg-415001.000         Fg-415001.000         Fg-415001.000         Fg-415001.000           ma(Snerete): 1.500         ma(Snerete): 1.500         Fg-415001.000         Fg-415001.000         Fg-415001.000           three forces and Noments         Fg-415001.000         Fg-415001.000         Fg-415001.000         Fg-415001.000	
tion Loc : 4.885 Fg-4/5001.000 Fys-4/5002.000 + we(Concrete): 1.500 me(Steel) : 1.550 :turef Forces and Homents	
ma(Steel) : 1,558	
Factored Factored Factored NuS Tu Uu2 Pu	
-69.336 4.401 80.253 -13.679	
sign Moments, Muß	
Factored Torsion Positive Negative	
Honent Ht Honent Honest -69,336 4,142 8,000 -73,478	
ngitudinal Reinforcement for Hument and Torsion (Hu0, Tu) Required +Hument -Hument Hinimum	
Rebar Rebar Rebar	
Top (+2 Axis) 8.427E-04 8.808 8.427E-04 4.337E-04 Rotton (-2 Axis) 4.214E-04 0.808 0.4214E-04	
ear Reinforcement for Shear and Torsion (Ru2, Tu)	
Rebar Shear Shear Shear	
Asu/s Ue Uc 0s 0p 5.542E-04 80.253 71.517 54.000 33.135	
sion Reinforcement For Torsion and Shear (Tu, Tu2)	
Rebar Torsion Shear Core Core	

#### For Storey 20:

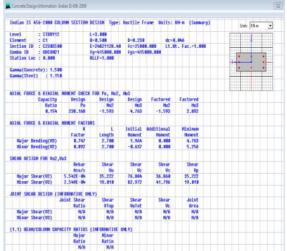
Level : STORY2	8 L-19	6.858			
Element : B123	D=11	.811	B=19.685	bf=19.685	S2
Section ID : BEAM	ds=0	.888	dct-1.969	dcb-1.969	
Combo ID : UDCON29	ID : UDCON29 E=36		Fc=3.626	Lt.Wt. Fa	c.=1.000
Station Loc : 187.00		8.191	Fys-68.191		
Ganna(Concrete): 1.5					
Ganna(Steel) : 1.1	50				
Factored Forces and I	Ionents				
Factored	Factored	Factored	Factored		
Hu3	Tu	Uu2	Pu		
-138.725	0.321	5.339	0.000		
Design Homents, Hu3					
Factored	Torsion	Positive	Hegative		
Honent	Ht	Homent	Honent		
-138.725	0.302	0.000	-139.028		
Longitudinal Reinford	cement for No Required	ment and To +Homent	-Homent	() Minisun	
	Rebar	Rebar	Rebar	Rebar	
Top (+2 Axis)	8.672	0,000	8.277	8.672	
Botton (-2 Axis)	8.168	8.888	8.000	8.168	
Shear Reinforcement	For Shear and	Torsion (U	12. Tu)		
Rebar	Shear	Shear	Shear	Shear	
	Ue	UC	Us	Up	
Asu/s			11,240	3,582	
ASU/S 0.022	8.921	11.534	11.240	9.362	
0.022 Torsion Reinforcement	for Torsion	and Shear	(Tu, Vu2)		
0.022 Torsion Reinforcenen Rebar	t for Torsion Torsion	and Shear Shear	(Tu, Vu2) Core	Core	
0.022 Torsion Reinforcement	for Torsion	and Shear	(Tu, Vu2)		

**Column Reinforcement Details:** 

#### For Storey GF:



#### For Storey 12:



#### For Storey 20:

Indian 15	456	-2888 0	OLUMN SECTION	DESIGN Type:	Ductile F	rame Units:	KN-n (Sunnary)	
								Units KN-n 💌
level		STORY2 C1		L-3.008 8-8.588	0-8.228		. 896	2
Section 1		61		E=24821128,48			t, 640	
Combo 10		UDCDN2		E=24821128.40 Fu=415820,882	fus=415		t. Fac.*1.000	
Station L				RLLF=1.200	195-415	400.640		
SCALLON L		2.700		HLLF-1.680				34
Ganna (Con	cret	-1-1.5	20					
anna(Ste		: 1.1						
XIAL FOR	CE &	BIAXIA	L HOMENT CHEC	I FOR Pu, Nu2,	Nu3			
	0	apacity	Design	Design	Design	Factored	Factored	
		Ratio		Huz	Buff	1912	Hu3	
		8.848	-17.982	8.395	8.945	8.389	0.945	
	1.		and the second					
AXIAL FOR	CE &	BIAXIA	L HOHENT FACT	ORS	10000	and the second second	Constant of	
			K		Initial	Additional	Hininun	
1		1	Factor	Length	Honest	Homent	Nonent 0.358	
uglo.	Bend	ing(H3) ing(H2)	0.742	2.700	1.757	8,882	8,358	
PLINOF	aeue	ing(nz)	0.855	2.700	-0,192	0.000	0.395	
HEAR DES	TCH	FOR Bar	Her?					
			Rebar	Shear	Shear	Shear	Shear	
			Asu/s	Uu	UC.	Us	Up	
Nator	Shea	r(U2)	5.542E-84	76.678	61.580	36,868	76.678	
Hinor	Shea	r(U3)	2.549E-84	38,821	66.456	41.796	28.821	
JOINT SHE	AR D	ESIGN (	INFORMATIVE O					
			Joint Shear	Shear	Shear	Shear	Joint	
			Ratio	UTop	VuTet	Uc	Area	
Major			0.573	8.200	329.261	575.000	8.115	
Hinor	Shea	r(03)	8.138	8.000	156.522	1288.888	8.248	
	-		BACTTU DATION	CINCOMPATINE A				
1.17 82.8	NV CU	LONN CH	Major	(INFORMATIVE (	MLTP			
			Ratin	Ratio				
			1,628	8,301				



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#### **ZONE V Beam Reinforcement Details:** For Storey 1:

Indian IS 456-2000 BEAM SECTION DESIGN Type: Ductile Frame Units: Kip-in (Summary)

Indian 15	450 2000 00	an acorron pe	Stan iyp		c onics. nip i	n (sannary)
Level	: STORY1	L=196	.850		1.000.000.000	
Element	: B1	D=11.	811	B=19.685	bf=19.685	
Section I	D : BEAH	ds=0.	000	dct=1.969	dcb=1.969	
Combo ID	: UDCON29	E=368	0.000	fc=3.626	Lt.Wt. Fac.=	1.000
Station L	oc : 181.102	fy=60	1.191	fys=60.191		
Gamma(Con	crete): 1.50	0				
Gamma(Ste	el) : 1.15	0				
Factored	Forces and N	oments				_
	Factored	Factored	Factored	Factored		
	Hu3 -108.735	Tu 8.693	Vu2 5.000	Pu 0.000		
Design Ho	ments, Hu3					
	Factored	Torsion	Positive	Negative		
	Monent	Ht	Honent	Honent		
	-108.735	8.181	0.000	-116.916		
Longitudi	nal Reinforc			orsion (Hu3, Tu		
		Required	+Honent		Hinimum	
		Rebar	Rebar		Rebar	
Top	(+2 Axis)	0.672	0.000		0.672	
ROLLON	(-2 Axis)	0.168	0.000	0.000	0.168	
Shear Rei	nforcement f					
	Rebar	Shear	Shear	Shear	Shear	
	Asu/s	Ue F eee	UC 44 FOL		Up	
	0.022	5.000	11.534	11.240	3.944	
Torsion R	einforcement					
	Rebar	Torsion	Shear	Core	Core	
	Asvt/s	Tu	Vu	b1 16.748	d1 8.874	
	0.000	8.693	5.000			

For Storey 9:

rugran 12	420	2000 001	n segi	ION D	ESIGN Type	. puttile	11 0102 0111	cs. wip-in	(Summary)
Level	:	STORY9		L=14	7.638				
Element	:	B29		D=11	.811	B=19.685	bf=	19.685	
Section I	D :	BEAH		ds=0	.000	dct=1.969		=1.969	
Combo ID		UDCON2		E=36	00.000	Fc=3.626	Lt.	Wt. Fac.=1	. 888
Station L	oc :	4.528		fy=6	0.191	Fys=60.19	21		
Ganna(Con	cret	e): 1.500							
Ganna(Ste	el)	: 1.150	-						
Contrast.									
Factored				und i	Fratanad	Easter			
	61	ctored	Facto	Tu	Factored Uu2	Factore	20 20		
	-11	Hu3 69.703	188.	0.01	22.620	9.0			
		07.703	100.	007	22.020	0.00			
Design Ho									
	1.1	ctored	Tors	1000	Positive	Negativ			
	_	Honent		Mt	Noment	Moner			
	-11	69.703	102.	484	0.000	-1272.18	36		
Longitudi	nal	Reinforce	nent f	or No	nent and To	rsion (Mu	3. Tu)		
and the second			Requi		+Noment	-Moner		nun	
			Re	bar	Rebar	Reba	ar Re	bar	
Top	(+2	Axis)	3.	891	0.000	3.09	91 0.	773	
Botton	(-2	Axis)	1.	545	0.000	0.79	95 1.	545	
Shear Rei	nfor				Torsion (U				
		Rebar	Sh	iear	Shear	Shea	27.1	ear	
		Asv/s		Ve	Vc		ls	Up	
	-	0.022	22.	620	21.222	11.2	40 25.	458	_
Torsion R	einf				and Shear	(Tu, Vu2)			
		Rebar	Tors	ion	Shear	Cor	re C	ore	
		Asut/s		Tu	Un	1	11	d1	
		HSVL/S	188.		22.628	16.74		874	

For Storey 20: Indian IS 856-2000 BEAN SECTION DESIGN Type: Ductile Frame Units: Kip-in (Sunnary)

indian 13	150 2000 00	an scorron o	cordin Type	. Puttie II and	onico. nip in country,
Level	: STORY20		6.850	0.40.705	10 10 TOT
Element	: 8124	D=11		8-19.685	bF-19.685
Section I		ds=0		dct=1.969	dcb=1.969
Combo ID	: UDCON2		88.888	fc=3.626	Lt.Wt. Fac.=1.000
Station L	oc : 192.323	+y=0	0.191	Fys-60.191	
	crete): 1.50				
Ganna(Ste	el) : 1.15	0			
Factored	Forces and M	onents			
	Factored	Factored	Factored	Factored	
	Mu3	Tu	Vu2	Pu	
	-278.057	226.683	9.482	0.000	
Design Ho	ments, Mu3				
	Factored	Torsion	Positive	Negative	
	Moment	Ht	Moment	Homent	
	-278.057	213.274	0.000	-491.331	
Longitudi	nal Reinforc			rsion (Mu3, Tu)	
		Required	+Moment	-Homent	Hininun
		Rebar	Rebar	Rebar	Rebar
Тор	(+2 Axis)	1.849	0.000	1.849	8.672
Botton	(-2 Axis)	8.525	0.000	0.000	8.525
Shear Rei	nforcement f				
	Rebar	Shear	Shear	Shear	Shear
	Asv/s	Ve	VC	Vs	Up
	8.827	9.482	14.144	13.676	5.702
Torsion R	einforcement				
	Rebar	Torsion	Shear	Core	Core
	Asut/s	Tu	Uu	b1	d1
	0.037	226.683	9.482	16.748	8.874

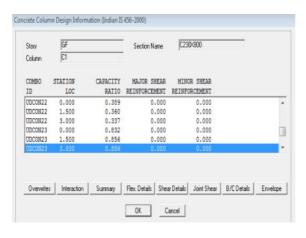
#### Zone V

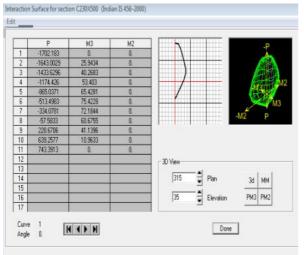
**Column Reinforcement Details:** For Storey GF



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			111			
						Units KN-m 💌
Indian 15 456-2000 CO	LUNH SECTION	DESIGN Type:	Ductile Fr	ane Units:	KH-n (Sunnary)	2
Level : GF		L-3.300				
Element : C1		B~8.800	D=8.238	dc=8		
Section ID : C238X80	8	E-24821128.40	FC=25888		Rt. Fac.=1.000	
Conto ID : UDCOH23		Fy-415888.888	Fys=4150	88.008		· · · ·
Station Loc : 3.000		RLLF=1.088				
Ganna(Concrete): 1.58	8					
Ganna(Steel) : 1.15						
AXIAL FORCE & BLAXIAL	HOMENT CHEC	K FOR Pu, Mu2,	Hua	27 20 10	201 20	
Capacity	Design	Design	Design	Factored	Factored	
Ratie	Pu	Nu2	Hu3	Hu2	Hu3	
8.886	-547.881	-9.788	18.956	-9.788	8.285	
AXIAL FORCE & BIAXIAL	HONENT CACT	290				
	K	L	Initial	Additional	Nininun	
	Factor	Length	Homent	Nonent	Honeat	
Najor Bending(H3)	8.746	3,888	-8.351	8.000	18.956	
Minor Bending(M2)	8.828	3.008	-26.612	0.000	17.895	
SHEAR DESIGN FOR VUZ,	Jus					
	Rebar	Shear	Shear	Shear	Shear	
	Asv/s	Uu	Uc	Us	8p	
Najor Shear(02)	8.867E-84	32.580	81.615	58.976	32.588	
Minor Shear(03)	2.549E-84	18.185	98.211	69.396	18,185	
JOINT SHEAR DESIGN (II	FORMITIVE	HLY)				
	Joint Shear	Shear	Shear	Shear	Joint	
	Ratio	VTop	DuTot	Uc	Area	
Najor Shear(V2)	8.411	8.888	291.819	787.258	8.141	
Minor Shear(V3)	8.078	8.808	156.522	2000.000	8.408	
(1.1) BEANVCOLUMN CAP	ACITY RATIOS	CINEORNATINE O	NI VI			
Trany being colored card	Major	Hinor				
	Ratio	Ratio				
	1,658	8,240				

	Indian IS 456-	2000								
ndian IS 456-2000 CO	UNN SECTI	ON DESIGN	Type: Duc	tile Frame (	Inits: KH-m	(Flexural	Details)	164	ts KN-n	1
evel : GF		L-3.388	100						a para	1.5
lement : C1		B=8.828	D	-0.230	dc=8.846				1	
ection ID : C230(80)		E-24821		c-25000.000	Lt.Wt. Fa	ac1.000				
tation Loc : 3.000	-	Fy-4158 RLLF=1.	10.220 F	ys-415000.00	0	o contration				
Cation Loc : 3.000		KLLF=1.	106					30		1
anna(Concrete): 1.50									1	
anna(Steel) : 1.15										
ATAL FORCE & BIANTAL	MINENT PL	CPU COD Du	10.2 10.2							
and reade a present	Capacity	Rebar	Reba	r Design	Design	Design				
	Ratio	Area		2 Pe	Hu2	Nut	1			
	0.886	0.082	1.12	0 -547.801	-9.788	18.95	5			
actored Biaxial Nomen	-									
ecroned prestat women	Non-Sway	Swau	Factore	4						
	Mis	Hs	H							
Major Bending(N3)	-8.599	8.884	8.20							
Minor Bending(M2)	-4.938	-4.859	-9.78	8					++	
lenderness Effects ()	5 20 7 41	and Minim	Biarial	Naments /10	20 2 25 4					
active as errets (	ndHonent	EndHoment	Initia	1 k*Ha	Minimum	Hinimu			++	
	Nut	Mu2 8.285	Nonen	t Honent	Honent	Eccentroty	i			
Hajor Bending(N3)	-0.722		-0.35		18.956	8.82				
Hinor Bending(H2)	-37.829	-9.788	-26.61	2 0.000	17.895	8,83			++	+
Ffective Length Facto	rs (15 90	2. Annay	0							
	K	K	Franin	P-Delta	0		(			
	Swau	No-Sway	Тур	e Done?	Factor	Used				
Major Bending(N3)	1.698	0.746	Ductil	e No	8.961E-84	8.74				
Hinor Bending(H2)	2.383	8.829	Ductil	e No	8.002	0.82			++	+
additional Noment Red	ction Ear	ter k (IS	9.7.1.13							
in the second second second	Ag	ASC	Pu	z Pb	Pu	1			++	
	8.184	8.882	2711.17	5 968.179	-547.881	1.88	8			
dditional Noment (IS		Section	VI /Dent	N Ki /Barth	N /Berth					
Consider	19.7.1) Length Factor	Section	KL/Dept	h KL/Depth	KL/Depth Exceeded	Honest			++	
Consider Ha Hajor(H3) Yes	Length Factor 0.989	Depth 0.230	Rati 9.73	e Linit 3 12.000	Exceeded	Honent 8,00				
Consider Ha Hajor(HD) Yes Hinner(H2) Voc	Length Factor 0.989 0.980	Septh 8.238 a saa	Rati	e Linit 3 12.000	Exceeded	Honent				83
Consider Hajor (H2) Ves Hit new (H2) Vac Concrete Design Information File	Length Factor 0.909 n 980	Depth 0.230 n ean	Rati 9.73 9.87	0 Linit 3 12.000 19 000	Exceeded No. No.	Honent 0.00		Jaha (Kira		83-1
Consider Hajer (H3) Ves Hinner (H2) Voc	Length Factor 0.909 n 980	Depth 0.230 n ean	Rati 9.73 9.87	0 Linit 3 12.000 19 000	Exceeded No. No.	Honent 0.00		Jaka (KNim		83-1
Hajer(H3) Yes Hinner(H3) Yes Concrete Design Information File Indian 15 456-2000 D1 Level : GF	Length Factor 0.909 n 980	Depth 0.230 n ean	Rati 9.73 9.87	0 Linit 3 12.000 19 000	Exceeded No. No.	Honent 0.00		Jais (Riin 3		83
Consider Ha Hajer (HD) Yes Hinser (HD) Yes Concrete Design Information 1 File Indian 15 456-2980 D1 Level : GT	Length Factor 0.909 a sea Indian 2456-21	Depth 0.230 0 eac 00 00 00 00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 Type: Ducti	6 Linit 3 12.000 c 19 aan	Exceeded No No its: IOI-n () dc-0.045	Honen 0.00 a nai	15)	John (KNim		37
Consider Hajor(H2) Yes Hinner(H2) Yes Concete Design Information File Indian 15 456-2000 CD Level : GF Elevent : Cf Section 10 : 6220084	Length Factor 0.989 n eno heim 2 05-20	Depth 0.230 0 00 00 00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 1gpe: Ducti 0-1 28.40 fc	o Linit 3 12.000 c 19 don ile Frame Uni	Exceeded No No	Honen 0.00 a nai	15)	Jab (Xin		83
Consider Ha Hajer (HD) Yes Hinser (HD) Yes Concrete Design Information 1 File Indian 15 456-2980 D1 Level : GT	Length Factor 0.989 n eno heim 2 05-20	Depth 0.230 n adm 00 00 00 00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 1gpe: Ducti 0-1 28.40 fc	6 Linit 3 12.000 c 19 oon ile Frame Uni 1.230	Exceeded No No its: IOI-n () dc-0.045	Honen 0.00 a nai	15)	Jais (Xia		87
Consider Hajer(H2) Ves Hinesr(H2) Ves Linesr(H2) Ves Conset: Design Information 1 Fac Indian 15 456-2000 Cl Level : G Section 10 : Cl Section 10 : Cl Section 10 : Cl Station Loc : 3.000	Length Factor 0.909 n one Index 2:05-20	Depth 0.230 0 00 00 00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 1gpe: Ducti 0-1 28.40 fc	6 Linit 3 12.000 c 19 oon ile Frame Uni 1.230	Exceeded No No its: IOI-n () dc-0.045	Honen 0.00 a nai	15)	-		83
Consider Hajor(H2) Yes HinserH7) Yec ConceteDesign Information File Indian 15 456-2000 D1 Level : GF Elevent : Cf Section 10 : C22008H	Length Factor 0.987 8 ero Inder 2 45-25	Depth 0.230 0 00 00 00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 1gpe: Ducti 0-1 28.40 fc	6 Linit 3 12.000 c 19 oon ile Frame Uni 1.230	Exceeded No No its: IOI-n () dc-0.045	Honen 0.00 a nai	15)	-		87)
Consider Hajor (10) Yes Hitser (10) Yes Uncer Deign Monaton File Indian 15 456-2008 DI Level : DF Element : C1 Section 10 : 202000 Conto 10 : 202000 Gama(Concrete): 1.51	Length Factor 0.987 8 ero Inder 2 45-25	Depth 0.230 0 00 00 00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 1gpe: Ducti 0-1 28.40 fc	6 Linit 3 12.000 c 19 oon ile Frame Uni 1.230	Exceeded No No its: IOI-n () dc-0.045	Honen 0.00 a nai	15)	-		83
Consider Hajor (10) Yes Hitser (10) Yes Uncer Deign Monaton File Indian 15 456-2008 DI Level : DF Element : C1 Section 10 : 202000 Conto 10 : 202000 Gama(Concrete): 1.51	Length Factor 0.909 n ean Index 3 456-25 LUNH SECTI	Bepth 0,230 0 9 900 00 00 00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 1997: Ducti 29.48 fc 8.00 fy: 00	o Linit 3 12.000 19 000 19 000 19 000 19 000 19 000 19 000 2500.000 2500.000	Exceeded No No No No No No No No No No No No No	Honent 8,00 9 mm Shear Detai	15)	-		87
Consider Hajer(12) Ves Winer(12) Ves Winer(12) Ves Winer(12) Ves Winer(12) Ves Winer(12) Ves Ves Indian 15 4%-2000 Di Haini S 4	Length Factor 0.989 n can Inden 5: (56-2) Lunn SECTI 10 12 12 13 14 14 15 15 16 16 16 16 16 16 16 16 16 16 16 16 16	Bepth 0,230 0 9 900 00 00 00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 1ype: Ducti 0.00 80 Design	5 Linit 3 12.000 19 000 19 000 19 000 19 000 10 Frane Uni 1.739 25600.020 -k1500.020 Shear	Exceeded No No Shear	Honent 0,00 0 on Shear Detais	15)	-		83
Consider Hajer(B) Ves UnterrIN Vec ConceteDesyMonator Indian 15 456-2200 ED Level EF Element Ef Element Ef Element Ef Element Ef Element 1 Canado Conte Des 1 Canado	Length Factor 0.909 9 900 Index 2 (56-2) LUNH SECTI 10 10 10 10 10 10 10 10 10 10 10 10 10	0epth 0.230 0 000 000 000 000 000 000 000 000 000	Rati 9.73 9.87 19pe: Ducti 8.00 fc 80 Design Pu -SA7.801	5 Linit 3 12.000 19 000 19 000 10 Frane Uni 5200.000 2500.000 Shear 00 81.615	Exceeded No No Stars: KN-m () dc-0, KNA Lt.Vt. Fac. Shear US S8, 976	Honen 8.00 9.000 9.000 9.00 9.000 9.00 9.00 9.00 9.000 9.000 9.000 9.000	15)	-		83
Consider Hajer(B) Ves UnterrIN Vec ConceteDesyMonator Indian 15 456-2200 ED Level EF Element Ef Element Ef Element Ef Element Ef Element 1 Canado Conte Des 1 Canado	Length Factor 0.989 n can Inden 5: (56-2) Lunn SECTI 10 12 12 13 14 14 15 15 16 16 16 16 16 16 16 16 16 16 16 16 16	Depth 0.230 0 00 00 00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 1997: Ducti 29.48 fc 8.00 fy: 00	b Linit 3 12.000 ( 17 ann 18 franc Uni 1.230 2500.000 2500.000 500ar bc	Exceeded No No Shear	Honen 8.00 9 mm Shear Detai	15)	-		83
Conscience Hajery(R) Ves Wineer(R) Ves Wineer(R) Ves Wineer(R) Ves Untersystematics File Indian 15 456-2000 El Level : Ef Elevent : Cl Section 10 : CP2400 Elevent : Cl Station (Conscience) : 1.55 Gama(Sacret) : 1.55 Gama(Sacret) : 1.55 Satis Science : 2.400 Hajer Sheer(R) Han Sheer(R)	Length Factor 0.909 9 900 Index 2 (56-2) LUNH SECTI 10 10 10 10 10 10 10 10 10 10 10 10 10	0epth 0.230 0 000 000 000 000 000 000 000 000 000	Rati 9.73 9.87 19pe: Ducti 8.00 fc 80 Design Pu -SA7.801	5 Linit 3 12.000 19 000 19 000 10 Frane Uni 5200.000 2500.000 Shear 00 81.615	Exceeded No No Stars: KH-m () dc-R, Bok Lt.VR. Fac. Shear US SR.976	Honen 8.00 9.000 9.000 9.00 9.000 9.00 9.00 9.00 9.000 9.000 9.000 9.000	15)	-		87
Consider Hajer(2) Ves (timer(10) Ves	Length Factor 0.309 1 0.90 1 0	Bepth 0,230 n 0.00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 19pe: Ducti 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	5 Linit 3 12.000 19 000 19 000 10 Frane Uni 5200.000 2500.000 Shear 00 81.615	Exceeded No No Stars: KH-m () dc-R, Bok Lt.VR. Fac. Shear US SR.976	Honen 8.00 9.000 9.000 9.00 9.000 9.00 9.00 9.00 9.00 9.00 9.00 9.00 9.	15)	*		8
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Conscience Hajery(R) Ves Wineer(R) Ves Wineer(R) Ves Wineer(R) Ves Untersystematics File Indian 15 456-2000 El Level : Ef Elevent : Cl Section 10 : CP2400 Elevent : Cl Station (Conscience) : 1.55 Gama(Sacret) : 1.55 Gama(Sacret) : 1.55 Satis Science : 2.400 Hajer Sheer(R) Han Sheer(R)	Length Factor 0.309 1 0.90 1 0	Bepth 0,230 n 0.00 00 00 00 00 00 00 00 00 00	Rati 9.73 9.87 19pe: Ducti 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	5 Linit 3 12.000 19 000 19 000 10 Frane Uni 5200.000 2500.000 Shear 00 81.615	Exceeded No No Stars: KH-m () dc-R, Bok Lt.VR. Fac. Shear US SR.976	Honen 8.00 9.000 9.000 9.00 9.000 9.00 9.00 9.00 9.00 9.00 9.00 9.00 9.	15)	*		
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Consider Hajer (10) Ves Uline-trill Content-Desy Momation Tela Indian 15 456-2000 El Level : Of Content-Desy Momation Content-Desy Momation Content-Desy Momation Content-Desy Momation Content-Desy Momation Station Los : 3,000 Constitution Content Content Desy Momation Station Los : 3,000 Constitution Constitution Content Desy Momation Hajer Sharer (12) Higher Sharer (12) Higher Sharer (12) Higher Sharer (12) Design Farces Rajer Sharer (22) Design Desis	Length Factor 8,969 8,969 8,969 8,969 8,969 8,969 8,969 8,969 8,967 9,96 8,967 9,967 8,967 9,967 8,967 9,967 8,967 9,967 9,967 9,967 9,969	Bepth 0.230 0.000 000 000 000 000 000 000 000 000	8421 9-73 9-73 9-75 9-75 9-75 9-75 9-75 9-75 9-75 9-75	0 Linit 0 12,000 19,	Exceeded No No Its: DN-m () dc-0.005 Lt.Ut. Fac. Shear Us S8,976 69,196	Honer Detail	15)	*		3
Consider Hajer/ID) Ves Uner/ID) Ves Uner/ID) Ves Uner/ID) Ves Uner/ID) Ves Uner/ID Ves Une	Length Factor 9 8,969 n 960 1 960 2 16-20 1 100 2 16-20 1 1,000 2 1 1,	Beght 6,228 0 0 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8 421 9 473 9 473 9 477 9 4777 9 477 9 477 9 477 9 477 9 477 9 477 9 477 9 477 9 477 9 477	0 Linit 0 12.000 c 19.000 c 19.000 10 frame Unit 1.730 2.730 2.730 2.730 5.80ar 10 41.615 98.211 41.615 98.211 41.615 98.211 41.615 98.211 41.615 98.211 41.615 5.92.25 5.92.25 5.92	Exceeded No. Its: IXH-m () dc-0, IXH It. VT. Fac- Shear US SB, 976 69, 306	Honey Detail	strengh	*		
Consider Hajer(R) Ves (Inter(R) Ves (Inter(R) Ves Conset/Dely Monaton Ha Indian 15 466-2000 D Conset/Dely Monaton Conset Dely Monaton Conset D Conset Conset Conset Conset Conset Conset Conset D Conset Cons	Length Factor 0, 549 (1, 2, 549 (	Bepth 0,220 0,220 0,220 0,220 0 0 0 0 0 0 0 0 0 0 0 0 0	84213 9.73 9.87 9.73 9.87 9.87 9.87 9.84 75 9.84 75 7.84 75 8.00 75 75 8.00 75 75 8.00 75 75 8.00 75 75 8.00 75 75 8.00 75 8.00 75 8.00 75 8.00 75 8.00 75 8.00 75 8.00 75 8.00 75 75 75 75 75 75 75 75 75 75 75 75 75	0 Linit 0 12.000 1 22.000 1 9 000 1 9 000 1 9 000 1 9 000 1 9 000 1 9 000 1 10 0000 1 10 000 1 10 000 1 10 000 1	Exceeded No. No. Shore ( Co.e. Dis Lt.V. Fac. 9,75 97,355 97,355 97,355	Honey Detail	strengh	*		3
Consider Hajfer (10) Ves Unext Desy Monaton Ha Indian 15 456-2000 D Unext Desy Monaton Control Desy Monaton Control Desy Monaton Control D UDCR25 Station Los C 2000 Gana (Incerved) : 1.51 Gana (Incerved) : 1.55 Gana (Incerved) :	Length Factor 9 8,999 n 990 Nom 8 16-20 Land Storage 10 18 18 18 18 18 18 18 18 18 18 18 18 18	Bepth 0,210 0,210 0,210 00 00 00 00 00 00 00 00 00	84213 9.73 9.87 9.73 9.87 9.87 9.87 9.84 75 9.84 75 7.84 75 8.00 75 75 8.00 75 75 8.00 75 75 8.00 75 75 8.00 75 75 8.00 75 8.00 75 8.00 75 8.00 75 8.00 75 8.00 75 8.00 75 8.00 75 75 75 75 75 75 75 75 75 75 75 75 75	0 Linit 0 12,000 c 19,000 c 19,00	Exceeded No. 34 115: Dete ( 60-0. Dd 50. 75 50. 75 69. 305 1.000 1.000	Honey Detail	strengh	*		





Indian 15 456-2000	COLUMN SECTION	N DESIGN Type:	Ductile Fr	ane Units:	KH-n (Sunnary)	Usta (Nin 💌
Level : STOR	rő	L-3.000				
Element : C1		8-0.820	0-0.230	dc=8		4
Section 10 : C230		E-24821128.48	fc-25008		t. Fac1.000	
Combo ID : UDCB		Fy-415008.008 RLLF=1.008	Fgs=4158	44.884		
Station Loc : 0.00		RLLF=1.000				
Ganna(Concrete): 1 Ganna(Steel) : 1	.588 .158					
AXIAL FORCE & BIAX	IAL MORENT CHE	W FOR Pu. 1912.	1912			
Capaci		Design	Pesion	Factored	Factored	
Rati		Ha2	Hu3	Hu2	Hu3	
0.3	821.563	34.198	-16.931	34.198	-1.218	
AXIAL FORCE & BIAX		IORS			a second as	
	No. K			Additional	Hinimm	
Najor Bending(H	Factor 0.887	Length 2.788	Honent - 8, 887	Honent R. BBR	Honent 16.421	
Hinor Sending(H		2,788	18, 125	0,000	26.345	
urnor genurnd/u	c) 0.707	2.100	10,123	0.000	20.040	
SHEAR DESIGN FOR U	2.063					
	Rebar	Shear	Shear	Shear	Shear	
	ASU/S	Qu	Uc	Us	Up	
Hajor Shear(U2)	8.867E-04	34.698	122.423	58.976	34.698	
Hinor Shear(V3)	2.549E-84	19.818	135.317	69.396	19.010	
JOINT SHEAR DESIGN	(THEODINATION	100				
with anon praisi	Joint Shear	Shear	Shear	Shear	Joint	
	Ratio	UTop	UuTot	Uc	Area	
Hajor Shear(02)	N/A	H/A	H/A	N/A	H/A	
Hinor Shear(V3)	N/A	N/A	H/B	N/A	H/A	
(1.1) BERNVCOLUMN	OPOCITY SOTIO					
tree of the second s	Najor	Hinor				
	Batio	Ratio				
	N/A	N/A				
Notes:						
N/A: Not Applic	able					
Har Hat Palant						

#### For Storey 20

ie						
						Units KN-m
Indian IS 456-2000 C	LUMN SECTION	DESIGN Type:	Ductile P	rame Units:	KN-n (Sunnary)	2
Level : STORY2	1	L=3.000				
Element : C1		B=0.500	D=0.230			
Section ID : C230X5	88	E=24821128.48	Fc=2588	8.880 Lt.N	t. Fac.=1.000	
Conbo ID : UDCDN2:		Fy=A15000.000	FUS=415	000.000		
Station Loc : 2.700		RLLF=1.000				• • •
Ganna(Concrete): 1.5 Ganna(Steel) : 1.1						
AXIAL FORCE & BIAXIA	HOMENT CHEC	V COD Pre Mart	1012			
Capacity	Design	Design	Design	Factored	Factored	
Ratio	Pu	Hu2	1913	Mu2	Mu3	
8,941	-18,849	8,416	8,941	8,340	8,941	
	K Factor	L Length	Initial Moment	Additional Honent	Hinimun Noment	
Major Bending(M3)	8.782	2.700	1.762	8.000	8.377	
Hinor Bending(H2)	0.855	2.700	-0.203	0.000	8.416	
SHEAR DESIGN FOR VU2	Uu3					
	Rebar	Shear	Shear	Shear	Shear	
	Asv/s	Uu	Vc	Us	Up	
Major Shear(V2)	5.542E-84	76.678	61.588	36.860	76.678	
Minor Shear(V3)	2.549E-84	38.821	66.456	41.796	38.821	
JOINT SHEAR DESIGN (	INFORMATIVE O	HLY)				
JOINT SHEAR DESIGH (1	Joint Shear	Shear	Shear	Shear	Jeint	
	Joint Shear Ratio		VuTot	Uc	Area	
Hajor Shear(U2)	Joint Shear Ratio 8.573	Shear UTop 8.000	UuTot 329.261	Uc 575.000	Area 8.115	
	Joint Shear Ratio	Shear UTop	VuTot	Uc	Area	
Hajor Shear(U2)	Joint Shear Ratio 0.573 0.130	Shear UTop 8,000 8,000	UuTot 329.261 156.522	Uc 575.000	Area 8.115	
Major Shear(U2) Minor Shear(U3)	Joint Shear Ratio 0.573 0.130 PACITY RATIOS Najor	Shear UTop 8.000 8.000 (INFORMATIVE 0 Hinor	UuTot 329.261 156.522	Uc 575.000	Area 8.115	
Major Shear(U2) Minor Shear(U3)	Joint Shear Ratio 0.573 0.130 PACITY RATIOS	Shear UTop 8.000 8.000 (INFORMATIVE 0	UuTot 329.261 156.522	Uc 575.000	Area 8.115	

#### **CONCLUSIONS**

The behavior of high rise structure for both the scheme is studied in present paper. In this paper we got the results from mathematical model for models. The graph clearly shows the storey drift, lateral displacement and time period. It is also observed that the results are more conservative in Static analysis as compared to the dynamic method resulting uneconomical structure. Because of the Box effect of modular type scheme, it is increasing overall stiffness of the building thus, reducing the sway problem in the structure. As building is in irregular the behavior in both directions is not similar. Further, the comparison between regular and modular type indicates the overall feasibility of the scheme without affecting its stability in gravity as well as lateral loads.

- 1. In zone II soils from the table 2, graph 1 and table 3, graph 2 it clearly shows that the storey drift x and storey drift y are higher in earth quake than the spectrum.
- 2. As we compared in zone II and zone V from table 20, graph 19 and table 21, graph 20 the storey drift is higher in zone V than zone II.
- 3. From table 22, graph 21 and table 23, graph 22 the storey shear is higher in zone V than zone II.
- 4. Designing by Software's like ETABS reduces of your time in design work.
- 5. Details of every and each member will be obtained by ETABS.
- 6. All the List of unsuccessful beams will be obtained and conjointly higher Section is given by the software.

7. Accuracy is improved by using software. **REFERENCES** 

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