

# Planning and Design of Residential Building (ETABS)

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**Abstract** - The aim of this project is planning and design of residential building using ETABS software. we make a plan of a building by using AUTOCAD software for 60\*40 site with full dimension. Then the elevation of building is design by a REVIT software. The design of a building is by using ETABS software by considering Dead Load, Live Load, Floor Finishing Load, and Wall Load. In this project we estimated the quantity of materials required and also amount of this project. Electric supply drawings are provided for placement and layout of electric supply. **Keywords** – Plan, Elevation, Structural design,

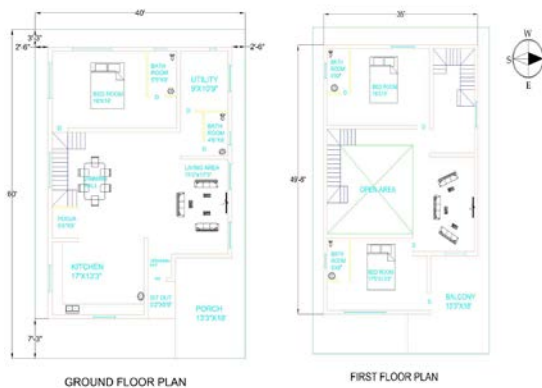
## 1. INTRODUCTION

Every human being has an inherent liking for a peaceful environment needed for his pleasant living, this object is achieved by having a place of living situated at the safe and convenient location, such a place for comfortable and pleasant living requires considered and kept in view.

- A Peaceful environment.
- Safety from all natural source & climate conditions
- General facilities for community of his residential area.

The engineer has to keep in mind the municipal conditions, building bye laws, environment, financial capacity, water supply, sewage arrangement, provision of future, aeration, ventilation etc., in suggestion a particular type of plan to any client.

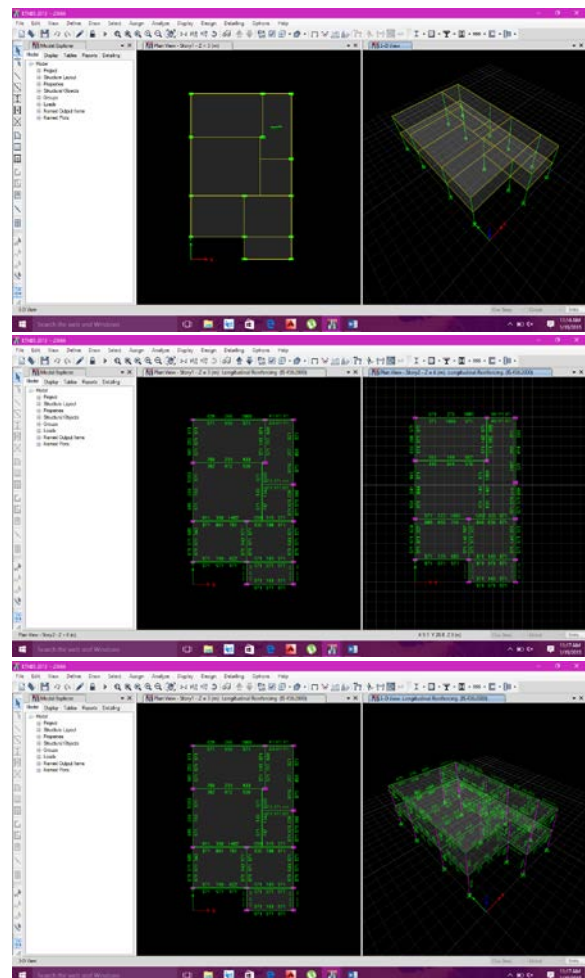
## 2. SYSTEM MODEL



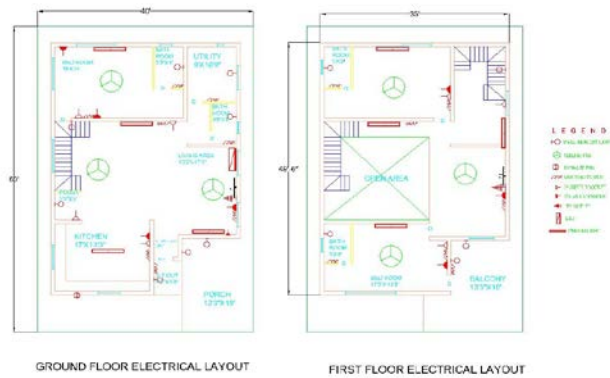
Planning by using AUTOCAD software



Elevation by using REVIT software



Design using ETABS



Electrical supply drawing using AutoCAD

### 3. PREVIOUS WORK

- **R.D.Deshpande1, Manoj. N. Pai, N. Pawan, Aashish.P.Pednekar Assistant professor, Civil Department, KLS Gogte Institute of Technology, Belagavi, Karnataka, India**

Structural analysis is a branch which involves determination of behaviour of structures in order to predict the responses of real structures such as buildings, bridges, trusses etc., with economy, elegance, serviceability and durability of structure. Structural engineers are facing the challenge of striving for the most efficient and economical design with accuracy in solution, while ensuring that the final design of a building must be serviceable for its intended function over its design lifetime.

- **Raja Saha, Rabi Das, Minhaj Aktar Mollah, Abhirup Sadhukhan4, Jhilik Das, Shayantani Dutta**

The structural planning and design requires both imagination and conceptual thinking along with sound knowledge of science of structural engineering, recent design codes by laws, intuition and proper judgment. In this present study G+ 2 residential apartment for a residential complex at Pipulpati More, Hooghly. Using AUTOCAD and ETABS software. Also the estimation of various items of works along with rate analysis with recent schedule of PWD is done.

- **Santhosh Kumar D. Assistant Professor Department of Civil Engineering Shri Madhwa Vadiraja Institute of Technology and Management, Udupi. Karnataka-India**

Every human has desire to own comfortable house and on an average, generally one spends his two-third of lifetime in the house. Therefore there is an increased trend towards the construction of multistoried

buildings for residential as well as for non-residential purposes in the urban areas. Hence nowadays the building construction has become a major work which indicates the social progress of the county. In order to compete with the ever growing competent market it is very important for a structural engineer to save time

### 4. PROPOSED METHODOLOGY

We planned the duplex building using AUTOCAD. Elevation of building is designed by using REVIT software. Structural design of the building is done by using ETABS software. Estimation and electric supply drawings are made. Designed model results from ETABS are compared with manual results.

### 5. SIMULATION/EXPERIMENTAL RESULTS

#### Design of beams

##### 1. Given Data

- Clear span = 7.27m
- Width of support=230mm
- Live load =2kn/m
- Load factor =1.5 for DL & LL

For m-25

- $F_{ck}=25N/mm^2$
- $F_y=500N/mm^2$

##### 2.

- Effective depth =7.27/15=484.66=485mm
- d =485mm
- D =525mm
- b =230mm
- Effective span = 7.27+0.23=7.5m
- L =7.5m

##### 3. Load calculation

- Self-weight =g=0.23\*0.525\*25=3.01kN/m
- Live load =q=2kN/m
- Floor finish =ff=1.5kN/m
- Wall load =wl =12.74kN/m
- Total load =w=19.25kN/m
- Design ultimate load= $w_u=1.5*w=1.5*19.25=28.87kN/m$

##### 4. Ultimate moment and shear force

$$M_u = 0.125w_u l^2 = 0.125 * 28.87 * 7.5^2$$

$$=203\text{kN-m}$$

$$V_u=0.5w_u l=0.5*28.87*7.5=108.26\text{kN}$$

## 5. Tension reinforcement

$$M_{u\text{ lim}}=0.138*f_{ck}*b*d^2$$

$$=(0.138*25*230*485^2)*10^6$$

$$=186.65\text{KN-m}$$

$$M_u > m_{u\text{ lim}}$$

## Design of doubly reinforced beam

$$M_u - M_{u\text{ lim}} = 203 - 186.65 = 16.35\text{KN-m}$$

$$f_{sc} = (0.0035(x_{u\text{ max}} - d')/x_{u\text{ max}}) E_s$$

$$= (0.0035((0.46*485) - 50)/0.46*485)*(2*10^5)$$

$$f_{sc} = 543.11\text{N/mm}^2$$

$$f_{sc} \text{ not greater than } 0.87f_y = (0.87*500) = 435\text{N/mm}^2$$

$$A_{sc} = (M_u - M_{u\text{ lim}})/f_{sc} (d - d')$$

$$A_{sc} = ((203 - 186.65)*10^6)/435*(485 - 40)$$

$$= 84.46\text{mm}^2$$

$$A_{st2} = (A_{sc} * f_{sc}) / (0.87*f_y)$$

$$= (84.46*435) / (0.87*500)$$

$$= 84.46\text{mm}^2$$

$$A_{st1} = (0.36*f_{ck}*b*x_{u\text{ lim}}) / (0.87*f_y)$$

$$= (0.36*25*230*0.46*475) / (0.87*500)$$

$$= 895.36\text{mm}^2$$

$$\text{Total reinforcement} = A_{st1} + A_{st2}$$

$$= 979.82\text{mm}^2$$

$$\text{Provide 2no 25mm dia} = 2*(3.142/4)*25^2$$

$$= 981.74\text{mm}^2$$

## 6. CONCLUSION

- The plan of Residential building can be done accurately by using AutoCAD software
- By using REVIT software elevation of a building designed.
- Structural design of a building can be done using ETABS software easily and accurately as per IS codes.
- By comparing the designed model results using ETABS and manually design results we are getting the same value.
- Approximate cost of a building can be estimated.

## 7. FUTURE SCOPES

- Referring the designed plan we are able to make different plans for the same site dimensions using AutoCAD software.
- Different types of elevations can be done using REVIT software.
- Using ETABS software building can be designed by considering the different types of loads.

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