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ANALYSIS AND DESIGN OF (G+12) RESIDENTIAL BUILDING UNDER DIFFEENT BEARING CAPACITY BY USING E-TABS

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ABSTRACT - *We are living in the 21st century number of complex and irregular structure and designed to resists the Earthquake, Wind and needs to analyze, design the structure by the various software like ETABS,STAD PRO and to design the structure in this project we used the ETABS software due to company suggestion and to find stress analysis in slab, shear force for the beam and area reinforcement for the column and design the foundation depends upon the reaction an foundation level depends upon site and safe bearing capacity of the soil due to stability purpose designed the retaining wall in this project.*

Key Words: Stress analysis, IS 875, Shear force, Bending moment, Deflection, Compression members...

1. INTRODUCTION

1.1 Objective

To perform analysis and design of the structure without any type of failures -

1. To understand the basic principles of structures by using Indian Standard Codes
2. To understand the parameters of the design for beams, columns, slabs and other structural components.
3. To prepare the 3D model of the structure by using the E-TABS Software for detailed analysis and design.

1.2 Scope of study

The scope of the study is to produce good structural work for performing analysis and design for a residential building.

1.3 Loads and Combination

As per the limit state design of reinforced concrete structures and pre-stressed concrete structures, the following load combination has been taken -

1. 1.5(D.L+L.L)
2. 1.2(D.L+L.L±Ex)
3. 1.2(D/L+L.L±Ey)
4. 1.5(D.L±Ex)
5. 1.5(D.L±Ey)
6. 0.9D.l±1.5Ex
7. 0.9D.L±1.5Ey

The live load was taken as 3 KN/m² since the analysis and design is being done for residential building as per IS Code 875 part-2 and as Dead load was taken as 0.52KN/m²in E-TABS which is an advantageous thing. Wall load for 9 inches is given as 12.42 KN/m2 and for inner walls 3.519KN/m2 and outer wall load is 4.59KN/m². Floor finish was given as 0.8 KN/m².

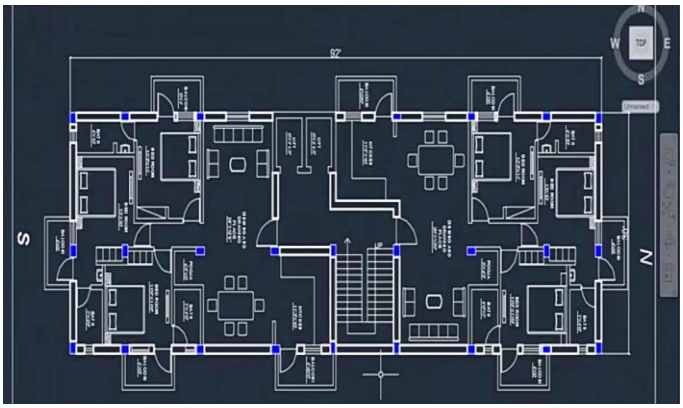
height of the

1.4 Material properties of the structure

Grade of concrete for slab, beams & columns = M35
Columns Size = 1000 x 1500 mm
Beam Size = 1000 x 1500 mm
Slab Thickness = 150 mm
No. of Stories = 14
Height of floor = 3 meter and plinth height = 1.5 meter
Live Load on slab = 2 kN/sqm. and Dead load on slab = 1.5 kN/sqm.

1.5 Architectural plan

The plan was taken from the architecture in Bangalore and been analyzed and designed by the software package E-TAB.



In fig 1 :- It shows the Auto cad plan diagram of the building

2. METHODOLOGY & RESULTS

Step - 1: Initial setup of Standard Codes and Country codes.

Step - 2: Creation of Grid points & Generation of structure After getting opened with ETABS we select a new model and a window appears where we had entered the grid dimensions and story dimensions of our building.

Step - 3: Defining of property

Here we had first defined the material property by selecting define menu material properties. We add new material for our structural components (beams, columns, slabs) by giving the specified details in defining. After that we define section size by selecting frame sections as shown below & added the required section for beams, columns etc.

Step - 4: Assigning of Property

After defining the property we draw the structural components using command menu. Draw line for beam for beams and create columns in region for columns by which property assigning is completed for beams and columns.

Step - 5: Assigning of Supports

By keeping the selection at the base of the structure and selecting all the columns we assigned supports by going to assign menu joint\frame Restraints (supports)fixed.

Step - 6: Defining of loads

In ETABS all the load considerations are first defined and then assigned. The loads in ETABS are defined as using static load cases command in define menu.

Step - 7: Assigning of Dead loads

After defining all the loads. Dead loads are assigned for external walls, internal walls in staad but in E-TABS automatically taken care by the software i.e., inbuilt

Step - 8: Assigning of Live loads

Live loads are assigned for the entire structure including floor finishing.

Step - 9: Assigning of wind loads

Wind loads are defined and assigned as per IS 875 1987 PART 3 by giving wind speed and wind angle. But since this is a G+3 Residential Building having total height less than 12 meters there is no need of assigning of wind loads or earth quake loads.

Step - 10: Assigning of Seismic loads

Seismic loads are defined and assigned as per IS 1893: 2002 by giving zone, soil type, and response reduction factor in X and Y directions. But since this is a G+3 Residential Building having total height less than 12 meters there is no need of assigning Seismic loads.

Step - 11: Assigning of load combinations

Using load combinations command in define menu 1.5 times of dead load and live load will be taken as mentioned in above.

Step - 12: Analysis

After the completion of all the above steps we have performed the analysis and checked for errors.

Step - 13: Design

After the completion of analysis we had performed concrete design on the structure as per IS 456:2000. ETABS performs the design for every structural element.

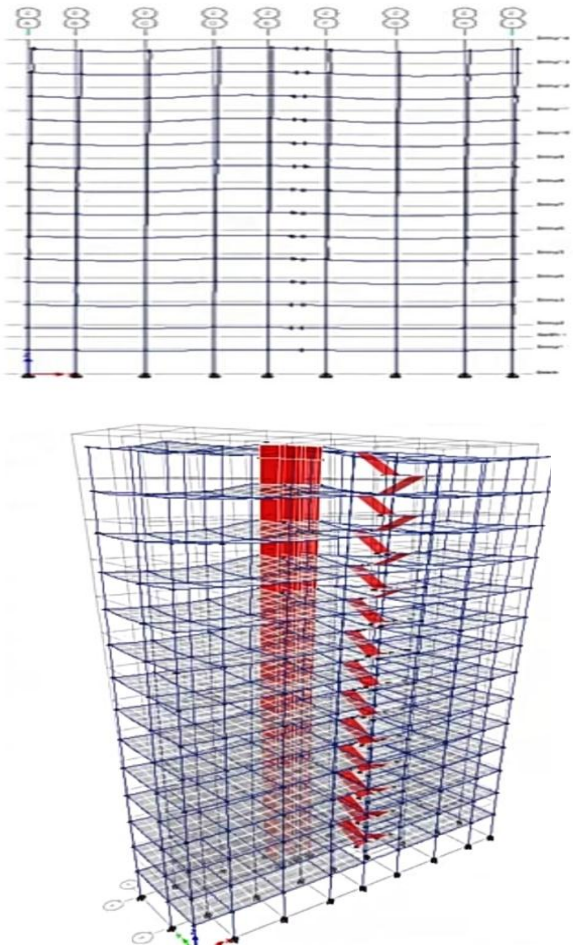


Fig-2 In E-TAB

By using center line diagram the grid system is given by X and y c0-ordinates & spacing method of grid system is adopted for convenient of user.

- **Results of Analysis**
- **Shear force for the analysis part**

Shear and **bending moment diagram**are analytical tools used in conjunction with structural analysis to help performed structural design by determining the value of **shear force** and **bending moment** as a given point of structural elements such as a beam.

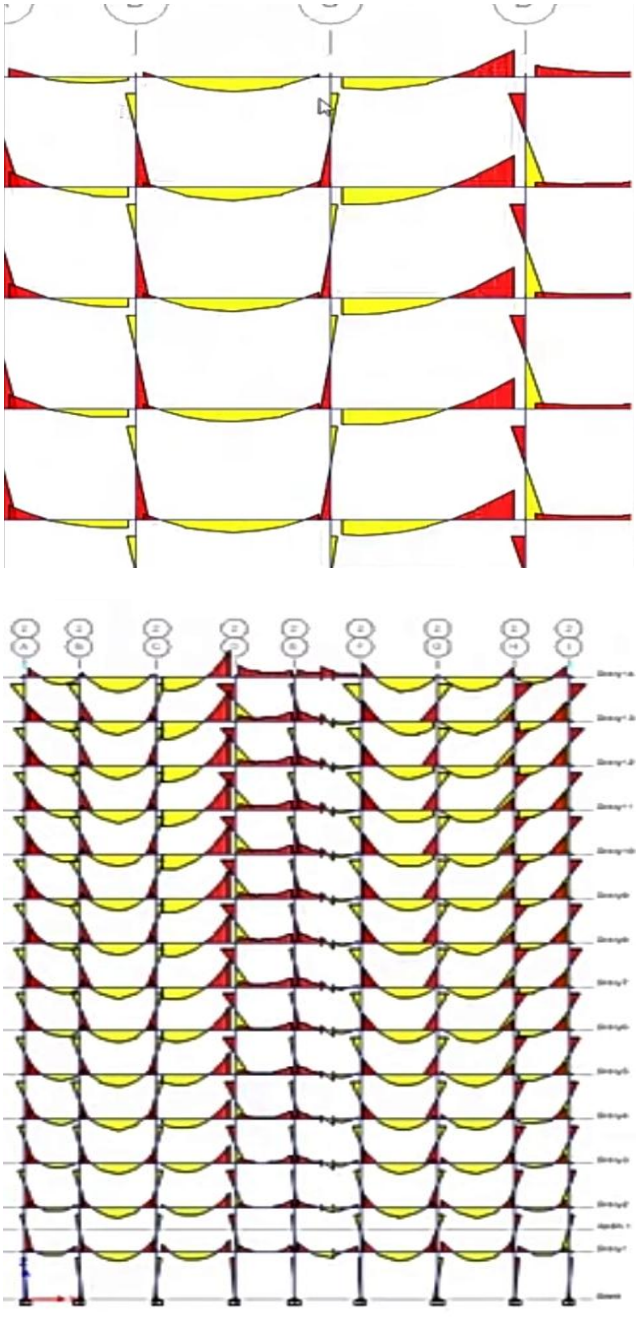


Fig-3 Shear Force& Bending Moment for the structure

For area of longitudinal reinforcement, go to design menu in ETABS, concrete frame design and start design check

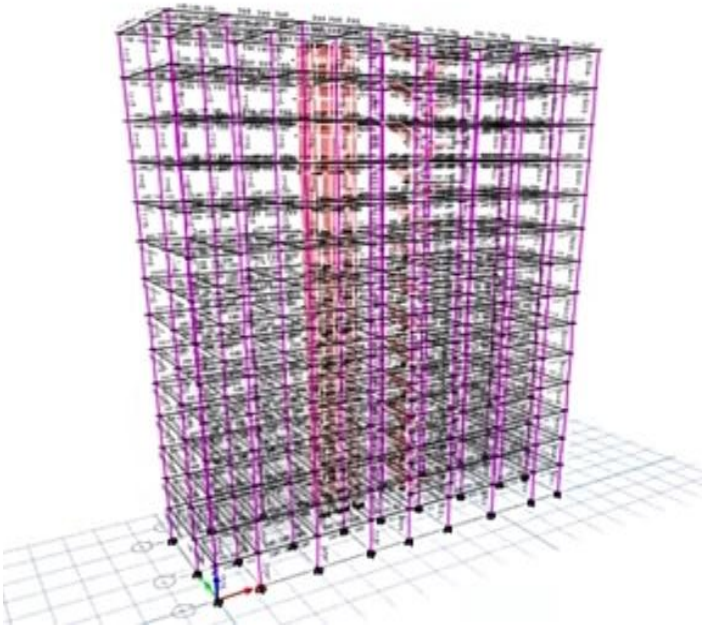


Fig-4 Longitudinal reinforcement of the structure

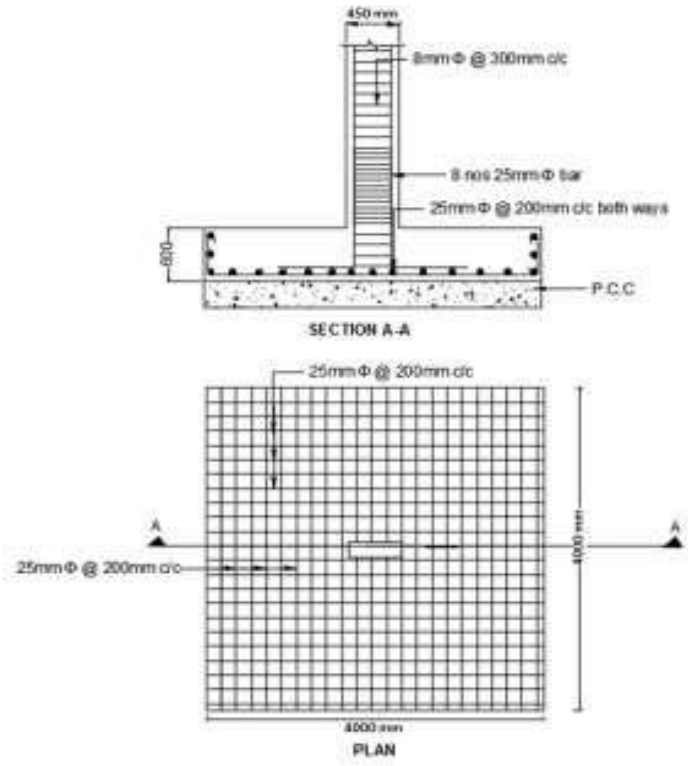


Fig-5 Reinforcement of the foundation

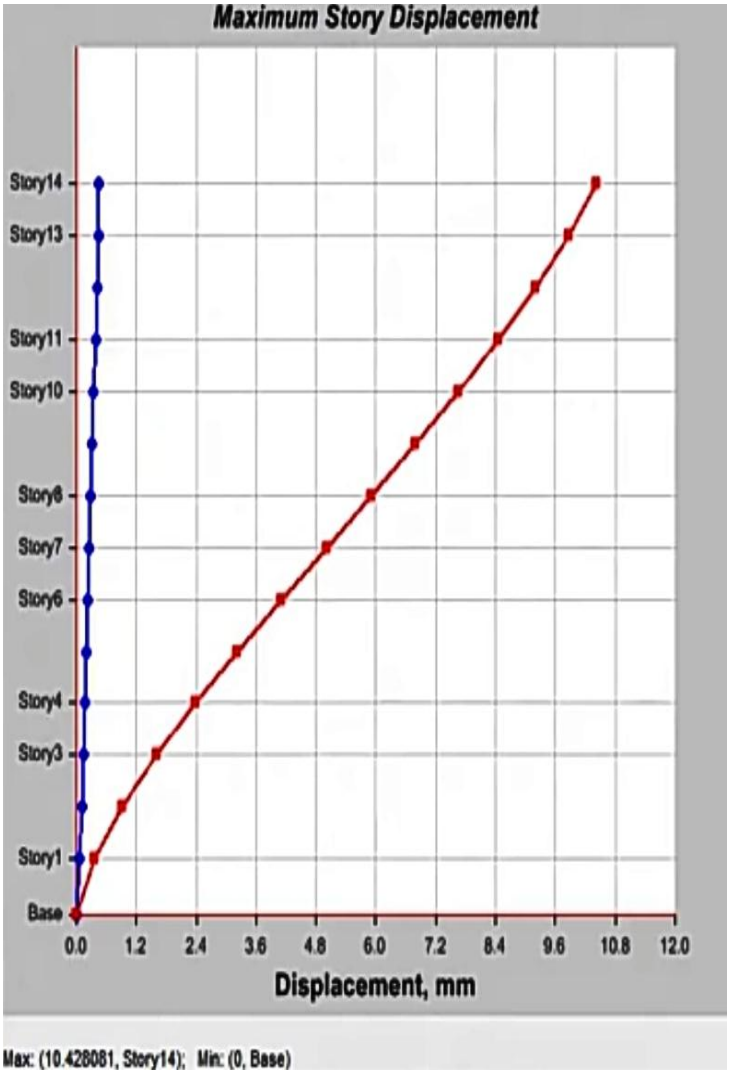


Fig-6 Story displacement

3. CONCLUSIONS

The structure is design based on the E-TABS, and the theory of LIMIT STATE METHOD which provide adequate strength, serviceability, and durability besides economy. The displacement, shear force, bending moment variation has been shown. If any beam fails, the dimensions of beam and column should be changed and reinforcement detailing can be produced. Analysis and design of an apartment building having G+12 storey is done. Analysis is done by using the software ETABS V18, which proved to be premium of great potential in analysis and design of various sections. The structural elements like RCC frame, shear wall provided. The design of RCC frame members like beam and column was done using ETABS. The analysis and design was done according to standard specifications to the possible extend. The various difficulties encountered in the design process and the various constraints faced by the structural engineer in designing up to the architectural drawing were also understood.

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