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Design And Analysis Of Commerical Builiding Using Etabs G+5

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Abstract: In this Commercial building we are doing G+5 office building. It consists of 4 floors. A four stored office building having a regular layout and which can be divided in to a number of similar vertical plane frames has been considered in this project to illustrate the analysis and design of a rigid jointed plane

Structural planning, Estimation of load, Analysis of structure, Member design, Drawing, Preparation of schedules Structural planning: Involves determination of Form of the structure, Material of the structure, Structural system, Layout of components, Method of analysis, Philosophy of structural design. In Estimation of loads we are taking dead loads, live loads according to code IS: 875 To Analysis the structure we are using ETABS. Member design: Slabs, Beams, Columns, Footings.

Designing process is doing by the Limit state method & Analysis is by using ETABS. Condition of a structure just before failure is called Limit state method. The structure should have same load carrying capacity, serviceability throughout the life time.

1. INTRODUCTION

In this Commercial building we are doing G+5 office building. A five stored office building having a regular layout and which can be divided in to a number of similar vertical plane frames has been considered in this project to illustrate the analysis and design of a rigid jointed plane frame.

PROCESS OF STRUCTURE DESIGN INVOLVES:

Structural planning, Estimation of load, Analysis of structure, Member design, Drawing Detailing & Preparation of schedules

Structural planning: They are Form of the structure, Material of the structure, Structural system, Layout of components, Method of analysis, Philosophy of structural design.

Estimation of loads: In Estimation of loads we are taking dead loads, live loads according to code IS: 875. Analysis the structure: To Analysis the structure we are using moment distribution method. Member design: They are Slabs, Beams, Column, and Footings.

The multistoried structure, with the increase in height, the effect of horizontal loads requires consideration. Therefore, such structures are provided with rigid frames having rigid joints. In a rigid frame force get distributed between the component members due to rigidity of connection and hence analysis of the structure as a whole becomes necessary. Therefore, a five storied office building having a regular layout and which can be divided in to a number of similar vertical plane frames has been considered in this project to illustrate the analysis and design of a rigid jointed plane frame.

The analysis of one intermediate floor frame has been illustrated giving detailed calculations for all the substitute frames floor frame, bay frame, beam-column systems used in the analysis. The results obtained by the methods have been compared to examine

the relative merits and demerits of each in regards to simplicity and degree of accuracy. Analyses of top story frame and bottom story frame have been done. Frame package prepared by the authors for personal computer. Design of members of only one frame that is analyses has been presented. The purpose of this project is to illustrate the design of building.

2. LITERATURE REVIEWS:

Method of analysis of statically indeterminate portal frame.

- Method of Flexibility Coefficients.
- Slope Displacement Methods (Iterative Methods)
- Moment Distribution Method.
- Kani's Method (Approximate Method).
- Cantilever Method.
- Portal Method.
- Matrix Method.
- STAAD.Pro.
- ETABS

Force methods:

Originally developed by James Clerk Maxwell in 1864, later developed by Otto Mohr and Heinrich Muller-Breslau, the force method was one of the first methods available for analysis of statically indeterminate structures. As compatibility is the basis for this method, it is sometimes also called as compatibility method or the method of consistent displacements. In this method, equations are formed that satisfy the compatibility and force-displacement requirements for the given structure in order to determine the redundant forces. Once these forces are determined, the remaining reactive forces on the given structure are found out by satisfying the equilibrium requirements.

Displacement methods:

The displacement method works the opposite way. In these methods, we first write load displacement relations for the members of the structure and then satisfy the equilibrium requirements for the same. In here, the unknowns in the equations are displacements. Unknown displacements are written in terms of the loads (i.e. forces) by using the load displacement relations and then these equations are solved to determine the displacements. As the displacements are determined, the loads are found out from the compatibility and load- displacement equations. Some classical techniques used to apply the displacement method are discussed.

Slope deflection method:

This method was first devised by Heinrich Manderla and Otto Mohr to study the secondary stresses in trusses and was further developed by G.A. Maney extend its application to analyze indeterminate beams and framed structures. The basic assumption of this method is to consider the deformations caused only by bending moments. It's assumed that the effects of shear force or axial force deformations are negligible in indeterminate beams or frames.

The fundamental slope-deflection equation expresses the moment at the end of a member as the superposition of the end moments caused due to the external loads on the member, while the ends being assumed as restrained, and the end moments caused by the displacements and actual end rotations. A structure comprises of several members, slope deflection equations are applied to each of the member. Using appropriate equations of equilibrium for the joints along with the slope-deflection equations of each member we can obtain a set of simultaneous equations with unknowns as the displacements. Once we get the values of these unknowns i.e. the displacements we can easily determine the

end moments using the slope-deflection equations.

Moment distribution method:

This method of analyzing beams and multi-storied frames using moment distribution was introduced by Prof. Hardy Cross in 1930, and is also sometimes referred to as Hardy Cross method. It is an iterative method in which one goes on carrying on the cycle to reach to a desired degree of accuracy. To start off with this method, initially all the joints are temporarily restrained against

Rotation and fixed end moments for all the members are written down. Each joint is then released one by one in succession and the unbalanced moment is distributed to the ends of the members, meeting at the same joint, in the ratio of their distribution factors. These distributed moments are then carried over to the far ends of the joints. Again, the joint is temporarily restrained before moving on to the next joint. Same set of operations are performed at each joint till all the joints are completed and the results obtained are up to desired accuracy. The method does not involve solving a number of simultaneous equations, which may get quite complicated while applying large structures, and is therefore preferred over the slope-deflection method.

Kani's method:

This method was first developed by "Prof. Gasper Kani" of Germany in the year "1947". The method is named after him. This is an indirect extension of slope deflection method. This is an efficient method due to simplicity of moment distribution. The method offers an iterative scheme for applying slope deflection method of structural analysis. Whereas the moment distribution method reduces the number of linear simultaneous equations and such equations needed are equal to the number of translator displacements, the number of equations needed is zero in case of the Kani's method. This method may be considered as a further simplification of moment distribution method wherein the problems involving sway were attempted in a tabular form thrice (for double story frames) and two shear coefficients had to be determined which when inserted in end moments gave us the final end moments. All this effort can be cut short very considerably by using this method.

- Frame analysis is carried out by solving the slope−deflection equations by successive approximations. Useful in case of side sway as well.
- Operation is simple, as it is carried out in a specific direction. If some error is committed, it will be eliminated in subsequent cycles if the restraining moments and distribution factors have been determined correctly

3. ARCHITECTURE

Architecture is the art and science of designing buildings and structures. Wider definition would include within its scope also the design of the total built environment, from the macro level of creating furniture. In the field of building architecture, the skill demanded of an architect range from the more complex, such as for a hospital or stadium, to the apparently simpler, such as planning residential houses. Many architectural works may be seen also as cultural and political symbols, and or work of art. The role of architect though changing, has been central to the successful design and implementation of pleasing-built environments in which people live.

Scope:

Architectural is an interdisciplinary field, drawing upon mathematics, science, art technology, social sciences, politics, history and philosophy. Vitrifies states: "architecture

is a science, arising out of many other sciences, and adorned with much and varied learning: by the help of which is judgment t is formed of those works which are result of other arts".

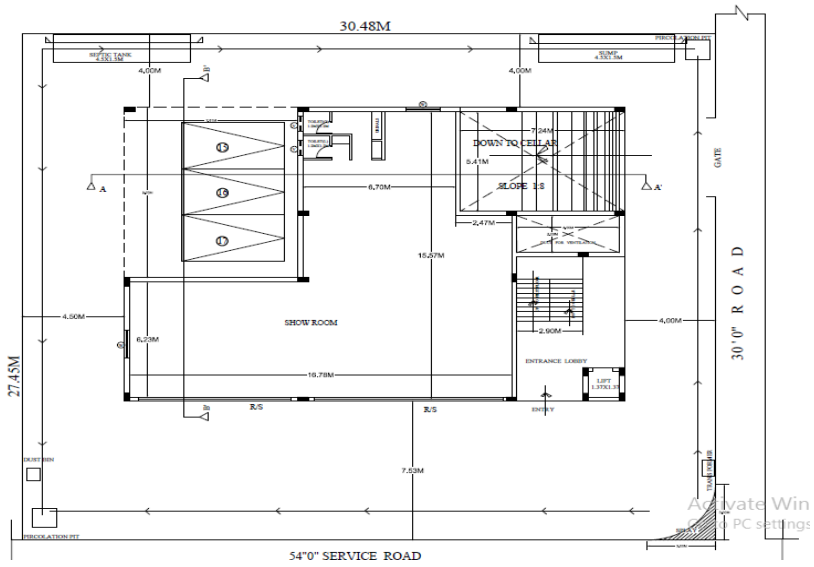
Most modern- Day definition of "good buildings" recognize that because architecture does not exist in a vacuum, architectural form cannot be merely a completion of historical l precedent, fictional necessities; and socially aware concerns, but most also be a trance ends synthesis of all of the form errand creation of worth in and of itself. As Nunziarodanini stated, "through it's an esthetic dimension architecture goes beyond the functional aspects that it has in common with other human sciences…through its own particular way of expressing values, architecture can stimulate and influence social life without presuming that, in and of itself, it will promote social development. To restrict them earning off or malism to art for art's sake is not only reactionary; it can be a purpose less quest for perfection or originality which degrades for, into a me re instrumentally"

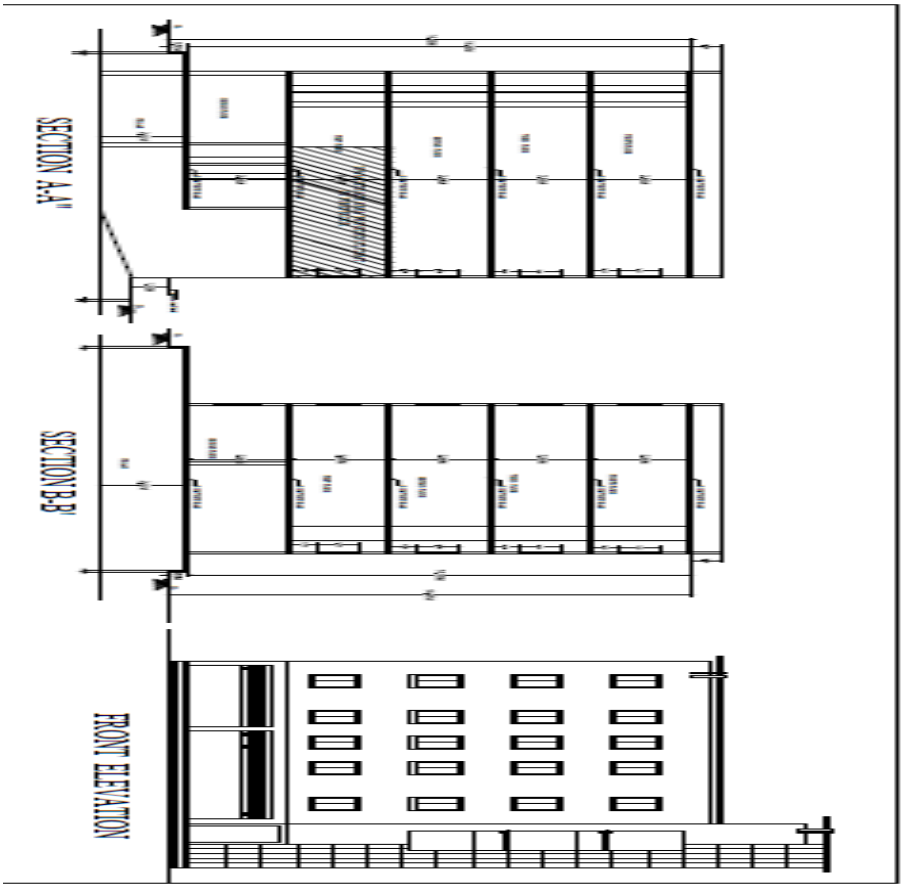
The term can be used to connect the implied architecture of abstract things such as music or mathematics the apparent architecture of natural things, such as geological formations or the structure of natural things such as geological formations or the structure of natural things such as geological formation or the structure of biological cells, or explicitly planned architectures of human made things such as software, computers, enterprises, and databases, in addition to buildings. In every usage san architecture may be seen as subjective mapping fro, a human perspective (that of the user in the case of abstract or physical art I facts) to the elements or components.

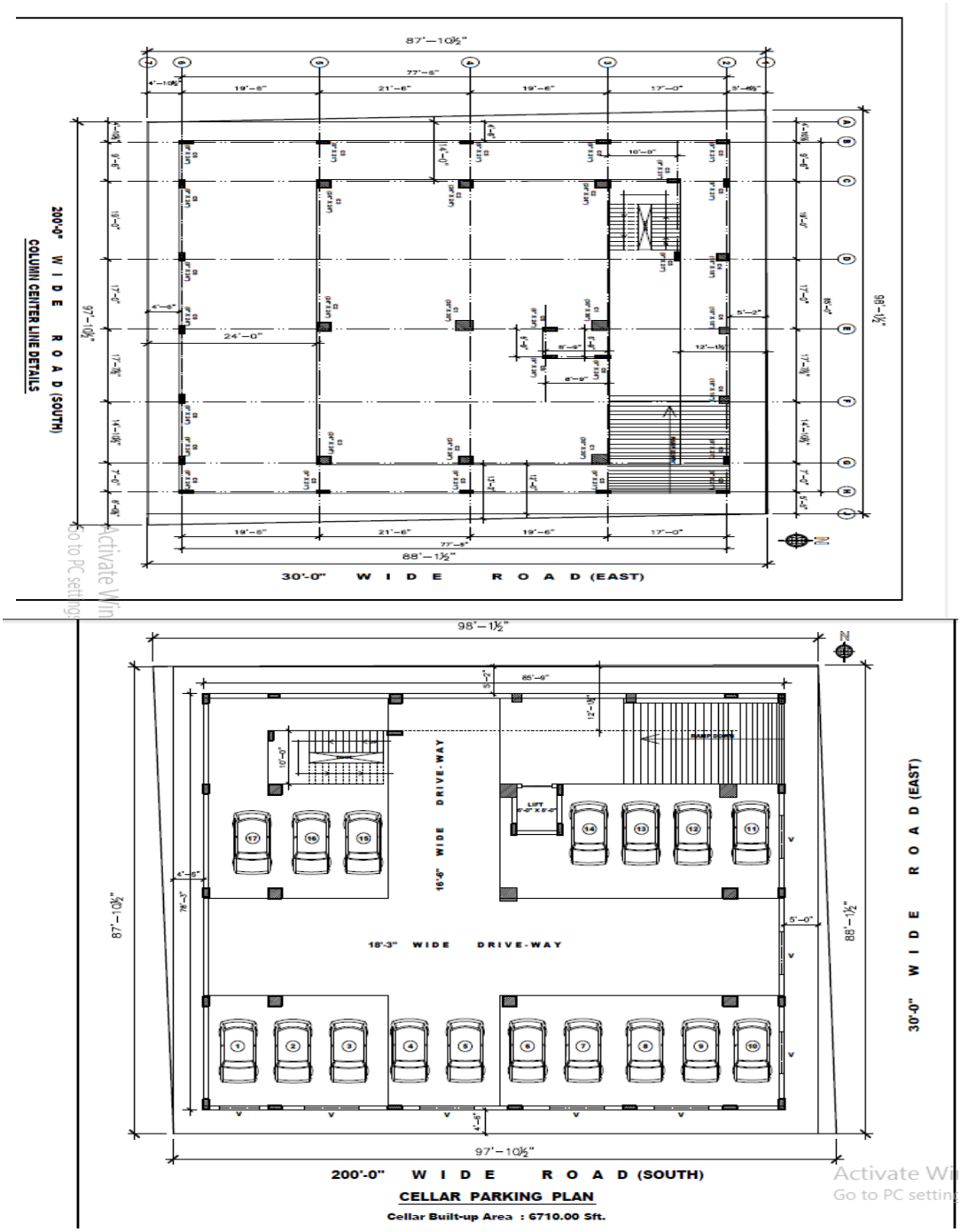
Architecture is both the process and product of planning designing and constructing space the reflects functional, social and a esthetic considerations. It requires the manipulation and coordination of material. Technology, light and shadow Architecture also encompassed the pragmatic aspects of realizing designed spaces, such as project planning, cost estimating and construction administration.

Architectural works are of tense received as cultural and political symbols and as work of art. Historical civilization is often identified with their surviving architectural achievements.

4. ARCHITECTURAL LAYOUT DRAWINGS


30.48M
4.00M
4.00M
DOWN TO CELLAR
SLOPE 1:8
7.24M
5.41M
6.70M
2.47M
18.27M
SHOW ROOM
4.50M
6.23M
16.78M
2.90M
4.00M
ENTRANCE LOBBY
27.45M
30'0" R O A D
R/S
R/S
7.53M
54"0" SERVICE ROAD

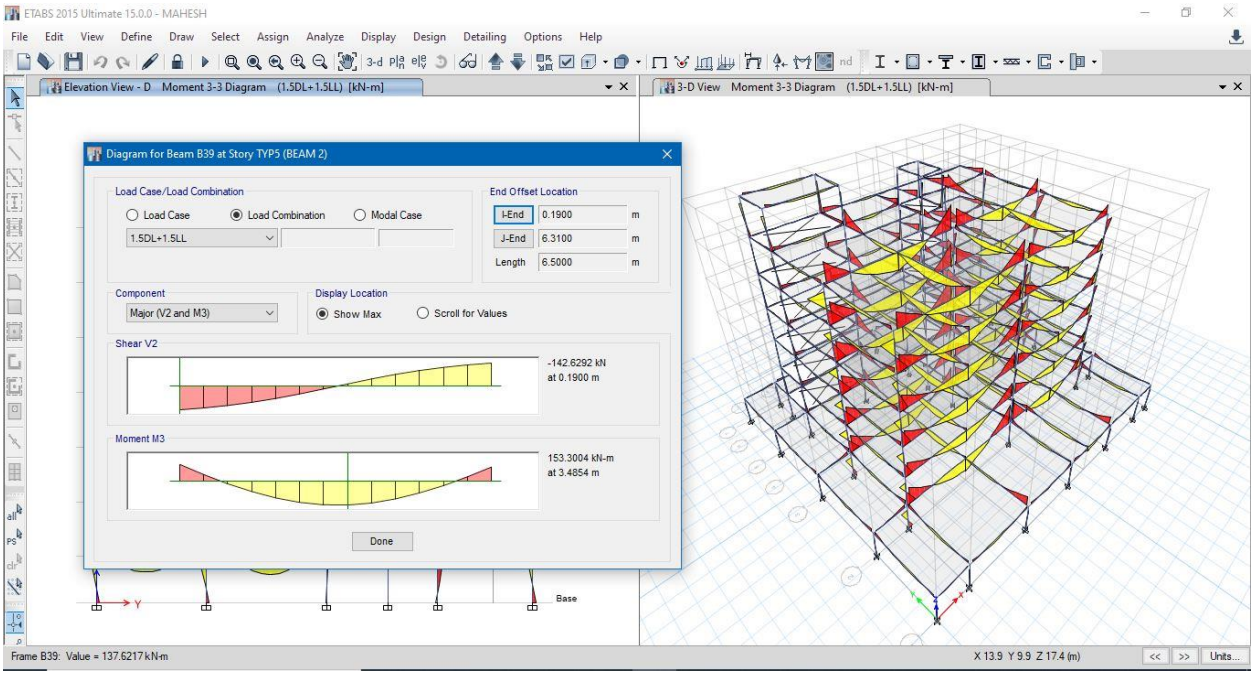

SECTION A-A'
SECTION B-B'
FRONT ELEVATION



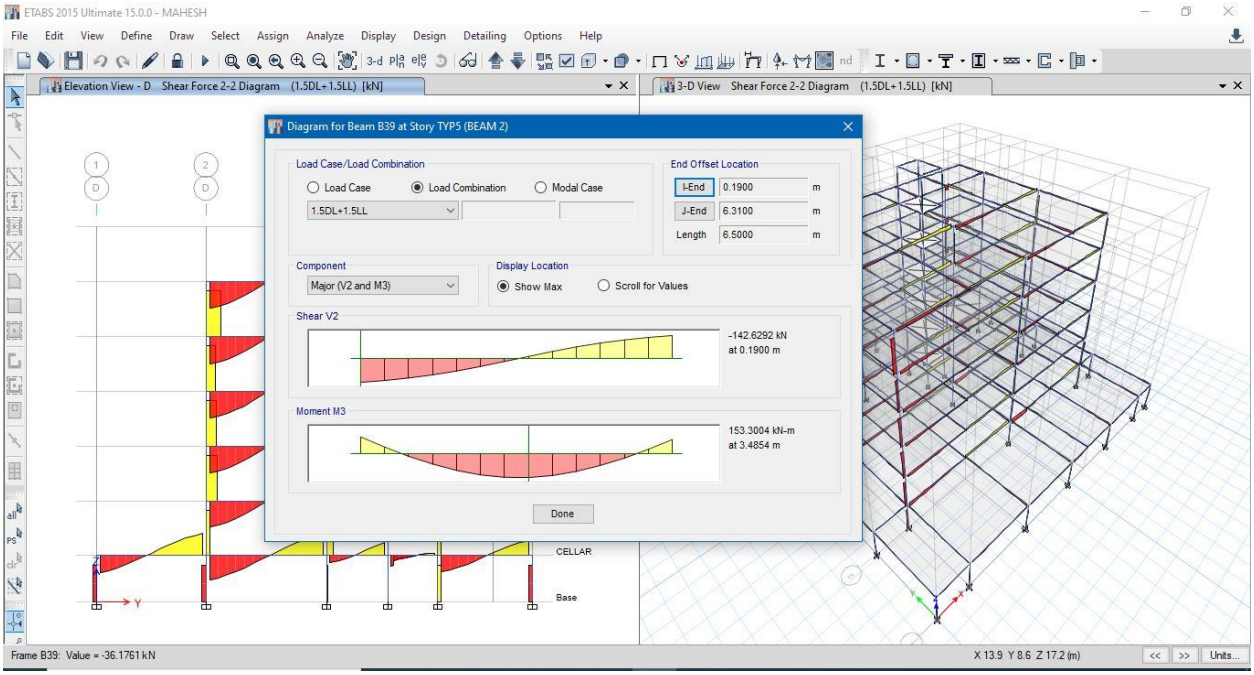
5. ANALYSIS AND RESULTS

The present structure is modelled and analyzed and analysis using ETABS. For the analysis of gravity load and seismic loads. The live load of the structure is considered 2 kN/m2. For the lateral load analysis (earthquake) parameter are considered as per Indian code basis.

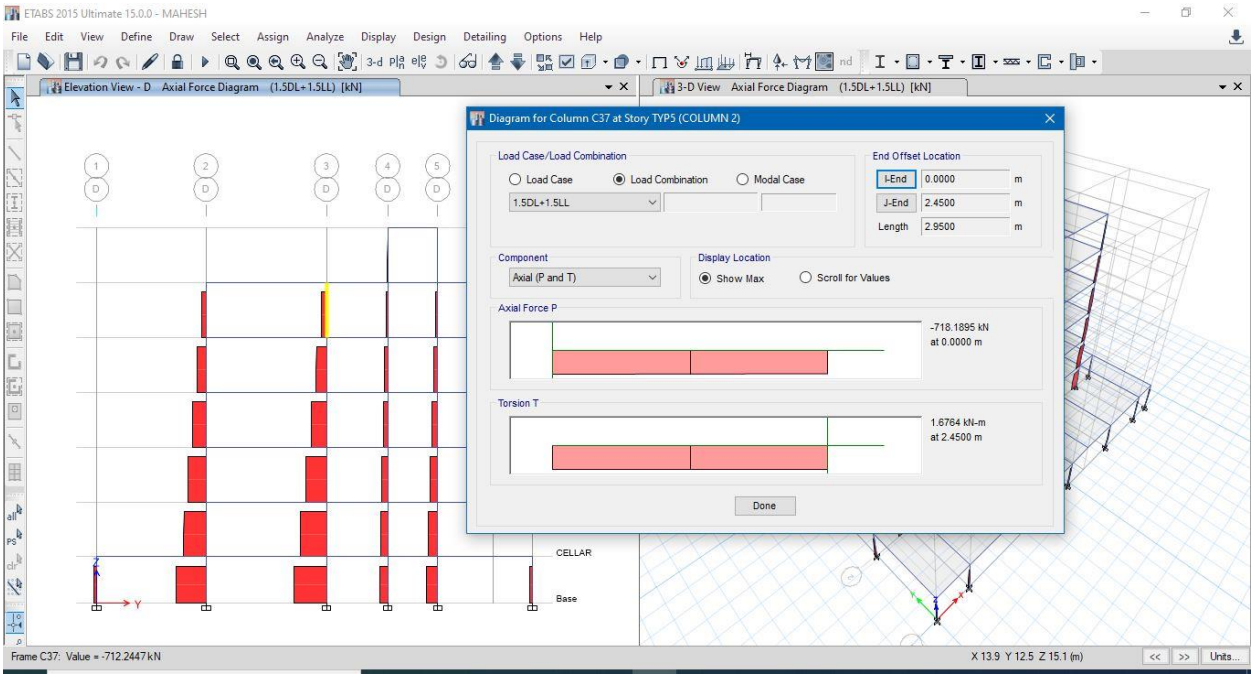
Analysis structure:



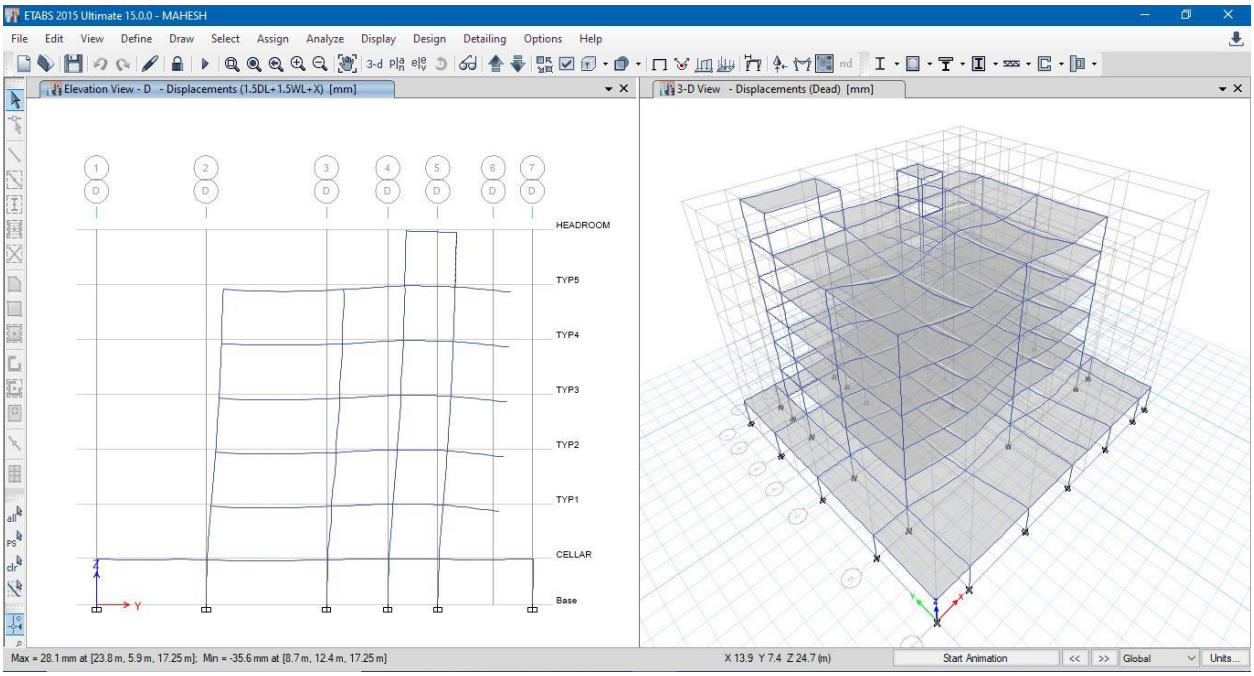
BENDING MOMENT WHOLE STRUCTURE



SHEAR FORCE WHOLE STRUCTURE



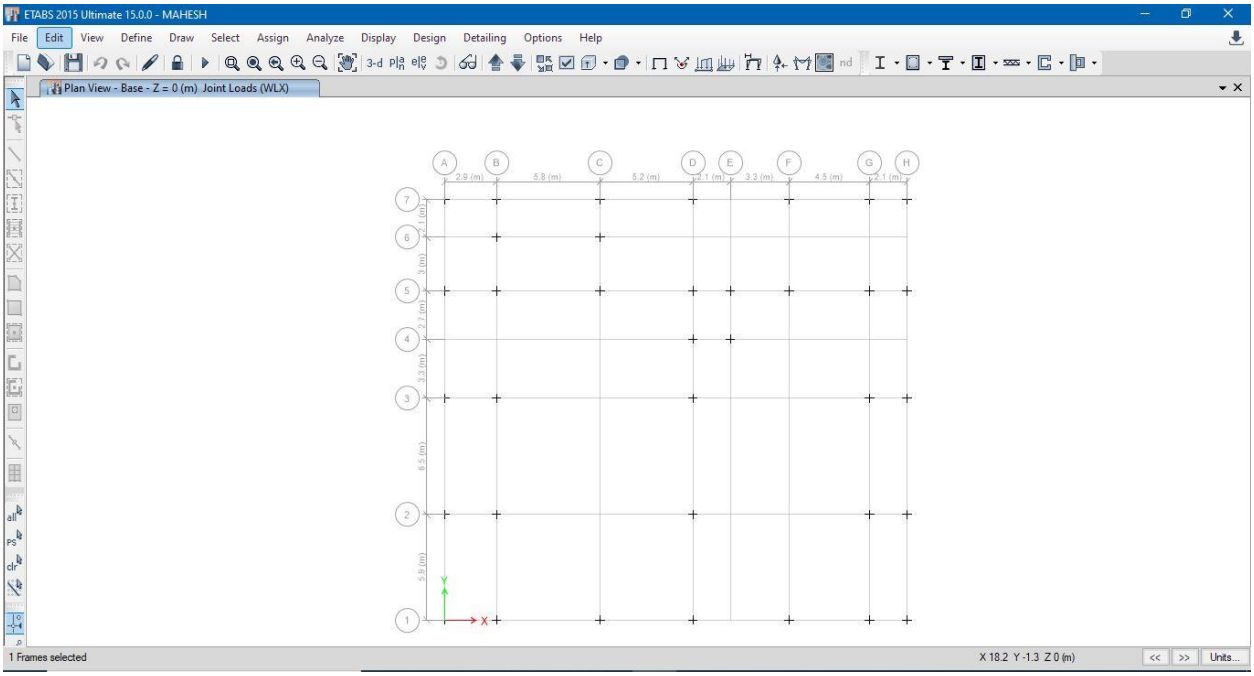
AXIAL WHOLE STRUCTURE



DISPLACEMENT OF WHOLE STRUCTURE

RESULTS

SUPPORT REACTIONS:



6. CONCLUSION

From the data revealed by the manual design as well as Software analysis for the structures following conclusions Are drawn:

- Analysis was done by using ETABS software and successfully verified manually as per IS456.
- Calculation by both manual work as well as software analysis gives almost same result.
- Further the work is extended for a 5 story building and found that the results are matching
- As per 5-story building has similar floors ETABS is the perfect software which can be adopted for Analysis and Design
- Usage of ETABS software minimizes the time required for analysis and design

BIBLIOGRAPHY

We have used a number of books and code as a reference for carrying out this project work. Some of the books (s) that we refer are mentioned below. INDIAN STANDARD CODE

- IS CODE 456-2000
- IS CODE 875-1987 PART I
- IS CODE 875-1987 PART II
- IS CODE 875-1987 PART III
- DESIGN AIDS TO IS -456-2000 (SP 16)
- ARRANGEMENT OF REINFORCEMENT USING SP 34