



## DESIGN AND ANALYSIS OF COMMERCIAL BUILDING (G+7) UNDER WIND LOAD ANALYSIS USING ETABS

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**Abstract:** The main steps of any building construction and planning is drafting, analysing and designing the building. In the present days of improving science and technology, analysing and designing of a building has been made easy by using ETABS software. ETABS software helps civil engineers to make their work easy and decreases time necessary for planning. The project going to be done is design of a multi-storey building which is going to be used as a commercial. The building plan has been drafted using the AutoCAD software by the requirement and available area. The super structure i.e. the building frame has been analysed and designed using the ETABS software. In the present project G+7 building consider to analysis and design for gravity and lateral (wind and earth quake) loads as per Indian standards. By using the software building can be analysed and we can check for any failures in the analysis and redesign them, so that we can prevent failures after construction. By using the output building can be constructed according to the design.

### Introduction to the project

Our main aim is to complete a Multi-storey building is to ensure that the structure is safe and economical against all possible loading conditions and to fulfill the function for which they have built.

Safety requirements must be so that the structure is able to serve its purpose with the maintain cost.

Detailed planning of the structure usually comes from several studies made by town planners, investors, users, architects and other engineers on that, and a structural engineer has the main influence on the overall structural design and an architect is involved in aesthetic details.

For the Design of the structure, the deadload, live loads, seismic and wind load are considered. The analysis and design for

the structure done by using a software package ETABS

In this project multistoried construction, we have adopted limit state method of analysis and design the structure. The design is in confirmation with IS456-2000. The analysis of Frame is worked out by using ETABS

### Literature Review

Method of analysis of statically indeterminate portal frame.

- I. Method of Flexibility Coefficients.
- II. Slope Displacement Method (Iterative Methods)
- III. Moment Distribution Method.
- IV. Kani's Method (Approximate Method).
- V. Cantilever Method.



- VI. Portal Method.
- VII. Matrix Method.
- VIII. STADD Pro
- IX. ETABS.

## Methods of analyzing beams

### Force method

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 method

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.

## Architecture

Architecture is the art and science of designing buildings and structures. A 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, arttechnology, social sciences, politics, history and philosophy. Vitruvius 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 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 precedent, fictional necessities and socially aware concerns, but most also be a transcendent synthesis of all of the former and a creation of worth in and of itself. As Nunziarodanini stated, “through its aesthetic 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 the meaning of formalism to art for art's sake is not only reactionary; it can be a purposeless quest for perfection or originality which degrades form, into a mere 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 biological cells, or explicitly planned architectures of human made things such as software, computers, enterprises, and databases, in addition to buildings. In every usage an architecture may be seen as subjective mapping from a human perspective (that of the user in the case of abstract or physical artifacts) to the elements or components.

Architecture is both the process and product of planning designing and constructing space that reflects functional, social and aesthetic 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 often perceived as cultural and political symbols

and as work of art. Historical civilization is often identified with their surviving architectural achievements. Brunelleschi, in the building of the dome of Florence cathedral, not only transformed the cathedral and the city of Florence, but also the role and status of the architecture.

With the consolidation of knowledge in scientific such as engineering and the rise of new building material and technology; the architect began to lose ground on the technical aspect of building. Therefore he concerned playing field that of aesthetics.

There was the rise of the "gentlemen architect" who usually dealt with wealthy clients and concentrated predominantly on visual qualities derived usually from historical prototypes. In the 19<sup>th</sup> century, Ecole des Beaux Arts in France, the training was toward producing quick sketch schemes involving beautiful drawings without much emphasis on context. The rise of profession of industrial design is usually placed here. Following this lead, the Bauhaus school, founded in Germany in 1919, consciously rejected history and looked at architecture as synthesis of art craft and technology.

Architects such as Mies van der Roë worked to reject the virtually all that had come before, trading handcrafted details and sentimental historic forms for a machine-driven architectural geometry made possible by the Industrial Revolution. They felt that architecture was not a personal philosophical or aesthetic pursuit by individual rather it had to consider everyday needs of people and use technology to give a livable environment. That design Methodology Movement involving people



such as chirrs Jones, Christopher Alexander started for more people-oriented designs.

Extensive studies on areas such as behavioral, environmental, and social science were done started informing the design process. as many other concerns began to be recognized, complexity of buildings began to increase in terms of aspect to be recognized, and complexity of buildings began to increase in terms of aspect such as services, architecture started becoming more multi-disciplinary than ever. While the notion that structural and aesthetic consideration should be entirely subject to functionality, which met with both popularity an skepticism, it had the effect of introducing the concept of “function” in the place of Vitruvius “utility”. “Function” came to be seen as encompassing all criteria of the use, perception and enjoyment of a building, not only practical but also aesthetic, psychological and cultural.

*“Now-a-day’s Architecture required a team of professionals in its making”.*

An architect is being one among the many and sometimes the leader. This I the state of the professional today, however, individually o still cherished and sought the design of buildings seems as cultural symbols – the museum of fine arts centre has become a showcase for new experiments in style, tomorrow may be something’s else.

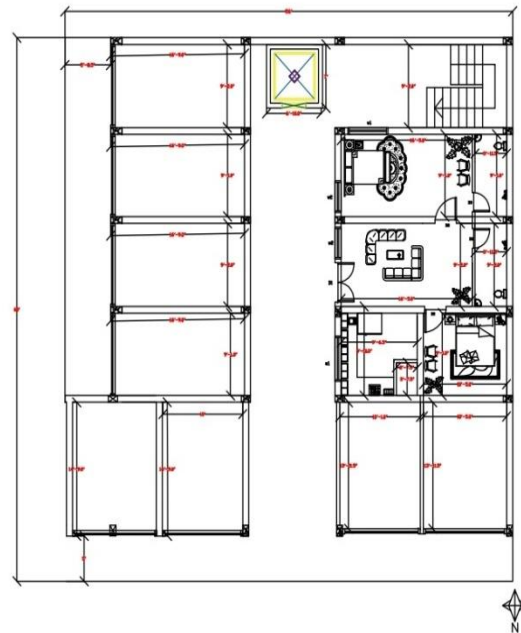
In the late 20<sup>th</sup> century, a new concept was added to those include in the compass of both structure and function, the consideration of sustainability. To satisfy the contemporary ethos a building should be constructed in materials its impact upon the natural and built

environment of its surroundings area and the demands that it makes upon non-sustainable power sources for the heating, cooling water and waste management and lighting. When modern architecture was first practiced, it was an avant-garde movement with moral, philosophical, and aesthetic Underpinnings. Modernist architects sought to reduce buildings to a pure form, removing historical references in favors of purely fictional structures.

The column arches and gargoyles of classical architecture were dubbed unnecessary. Buildings that flaunted their construction exposing steel beams and concrete surfaces instead of hiding them behind traditional forms were beams and concrete surfaces instead of hiding them behind traditional forms were seen as beautiful in their own right. Architecture first evolved out of the dynamics between needs (shelter, security, worship etc.) and means (available building material and attendant skills). As human culture evolved and knowledge began to be formalized through oral tradition and practices, architectures became a craft.

A building is a man-made structure with a roof and walls standing more or less permanently in one place. Buildings come in a variety of shapes, sizes and functions, and have been adapted throughout history for a wide number of factors, from building materials available, to weather conditions, to land prices, ground conditions, specific uses and aesthetic reasons. To better understand the term building compares the list of

structures. Buildings serve several needs of society – primarily as shelter from weather, security, living space, privacy, to store belongings, and to comfortably live and work. A building as a shelter represents a physical division of the human habitat (a place of comfort and safety) and the outside (a place that at times may be harsh and harmful). Ever since the first cave paintings, buildings have also become objects or canvases of artistic expression. In recent years, interest in sustainable planning and building practices has also become an intentional part of the design process of many new buildings. A slab is a flat two dimensional planar structural element having thickness small compared to its other two dimensions. It provides a working flat surface or a covering shelter in buildings. It primarily transfers the load by bending in one or two directions. Reinforced concrete slabs are used in floors, roofs and walls of buildings and as the decks of bridges. The floor system of a structure can take many forms such as in situ solid slab, ribbed slab or pre-cast units. Slabs may be supported on monolithic concrete beam, steel beams, walls or directly over the columns. Concrete slab behave primarily as flexural members and the design is similar to that of beams.



ground floor plan of  
area 56'x60'

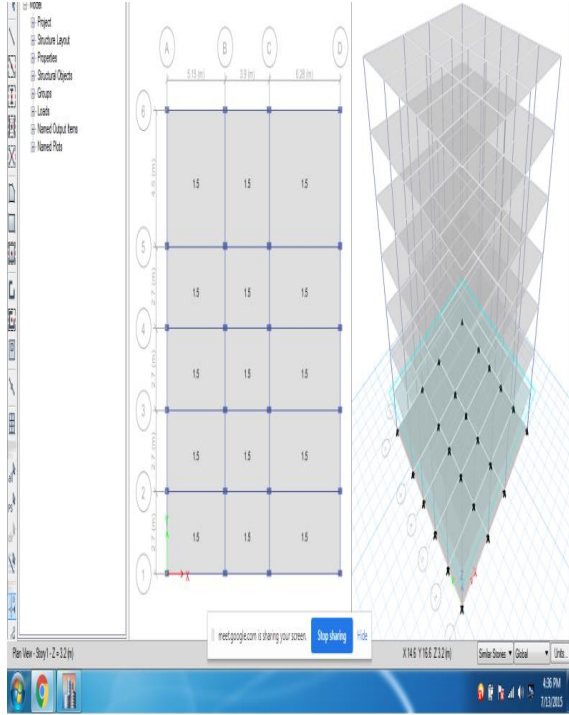


Fig: Bending moment Diagram

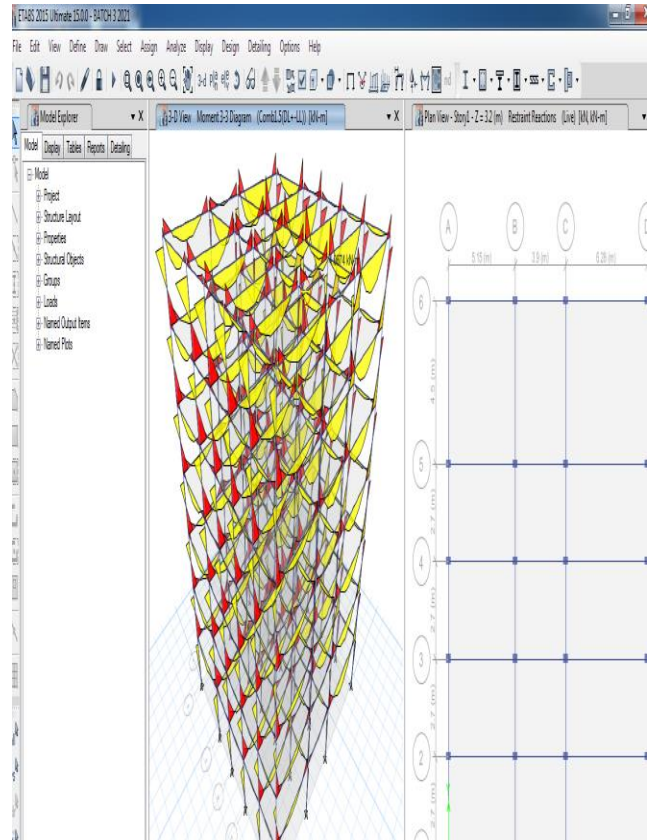
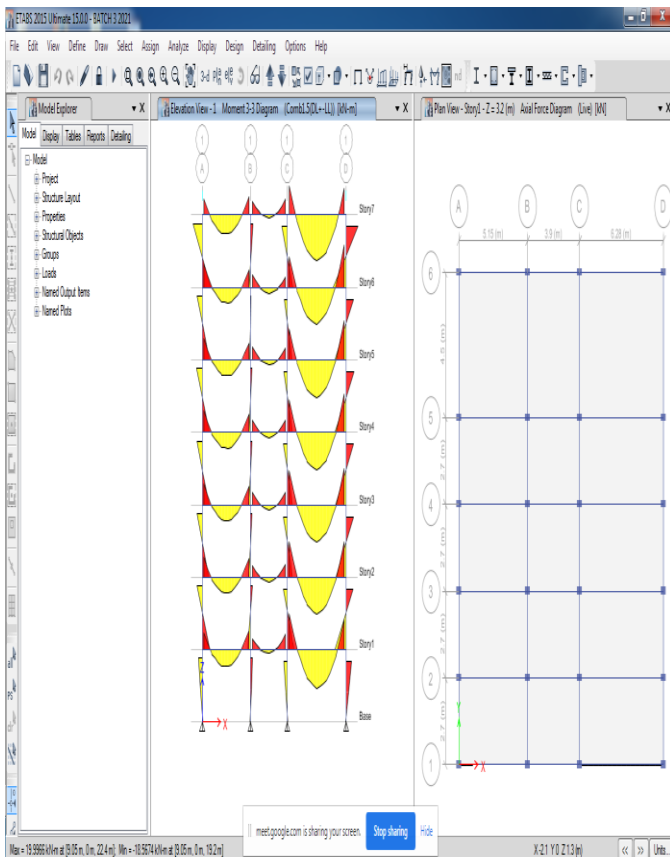


Fig: 3D view of the structure



## CONCLUSION

The design of multi storied Commercial building is a project which provides accommodation for more number of people in less space with their minimum requirements . In this project it is completed



and verified as per codes (IS:456-2000) and the results are found to be satisfactory.

Our goal is economic design with minimum space utilization for more number of people in less space with their minimum requirements will be successful when accomplished.

## BIBLIOGRAPHY

We have used a number of books and code as a reference for carrying out this project work. Some of the books 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

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