

## DESIGN AND ANALYSIS OF INSTITUTIONAL BUILDING (G+3) USING STAAD PRO

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**Abstract :** The basic needs of a human being are food, clothing and shelter. There have different kinds of housing, but multi storeyed RCC buildings from the core and it has become the need of the day. The main reason shifted from independent bungalows to RCC multi storeyed sky scrapers is the shortage of space metropolitan cities. Shortage of space in cities has pushed up the land cost necessitating the construction of multi storeyed structures. The planning and designing of multi storey structures involves a number of steps. The plan based on the functional requirements and the utility considerations. The loads coming on to the structures are taken as per IS:875. The loads are calculated as per provisional of IS:456-2000. This project is reflected in the recent revision of the code of practice of plain and reinforced cement concrete IS-456-2000 and design aids for reinforced concrete to IS: 456-1978(SP:16-1980) interaction diagrams. These codes place more emphasis on providing sufficient strength and ductility besides satisfactory Serviceability requirements of cracking and deflection in concrete structures. Both these codes are based on the principles of limit state design rather than working stress design. A complete structural analysis of a multi storeyed building is done in this project. When a lateral load act on building (wind) than there will be effect on structure for that we have considered wind load in our project from IS 875 PART 3.

### INTRODUCTION:

The objective of structural design is to plan a structure which meets the basic requirements of structural science and those of the user. The basic requirements of structural design are safety serviceability, durability and economy. In this project work it is proposed to design a multi-storeyed residential building consisting of 4 floors. Each floor consists of 4 flats. The building is served by one stair case and one lift.

### IMPORTANCE OF MULTISTORIED BUILDINGS:

The rapid increase in population and Industrial growth and of shelter there is considerable rise in the price of shelter there is considerable rise in the price of city land and as the space is

limited horizontal expansion is difficult. Hence vertical expansion has become compulsory. This has led to the conception of apartments or flats. An apartment consists of 3 to 7 storeys and each storey may accommodate 2 to 4 tenements. The land and other amenities of apartments are shared by all the occupants.

As our country is in developing stage. The economy of people may permit to acquire costly flats. Hence for low income group LIG flats are within reach and are most preferred.

### Multi storeyed building has been broadly classified into five types

- Load bearing constructions.
- Composite Constructions.
- Framed Construction.
- Reinforced Concrete framed Construction.

- Steel framed Construction.

The first method has got the limitation that it will be economical only up to 2-3 storey. By means of composite constructions technique the economy is achieved number is in between 3 to 5. Any building having more than 6 storeys has to be dealt by means of framed constructions.

### **ADVANTAGES OF FRAMED CONSTRUCTION OVER OTHER TYPES:**

1. Foundation cost will be due to reduction wall thickness.
2. Considerable speed is achieved in the reaction of building.
3. Floor area will be more due to reduction in thickness of wall.
4. Greater glazing area can be obtained.
5. This type of construction permits removal or change of partition walls to suit varying requirements.

### **STRUCTURAL DESCRIPTIONS:**

The building has to be four storied with plinth area of and served by one lift and staircase.

The Various loads considered in the design of this building are dead load, live load. As the height of building is not more than 1.5 times the least lateral dimension, wind load is not taken into consideration in the design of this building. Earthquake loads are not considered in the design of this building.

### **DESCRIPTION OF STRUCTURAL ANALYSIS:**

Structural analysis is branch of physical sciences which deals with the behavior of structures in given design conditions. Structures are defined as the systems that carry loads and the word behaviour is understood to be their tendency to deform, vibrate, buckle or yield, depending upon the conditions confronting them. The results of analysis used to determine the deformed shape of structures and to verify their adequacies is to carry the loads for which they are being designed.

Considering that the deformation is the summation of strains and yielding is the excess and further considering that stress and strains are related to each other by the modulus of elasticity  $E'$  the analysis of structures thereby reduces itself to the determination of the state of strain and stress throughout the structures. Since the stresses on the other hand are the limiting values of internal forces what actually remains to be done is the evaluation of internal force in the system.

Structural analysis along with stress analysis and design are the three basic topics with which structural engineering is primarily concerned. All in spite of being so inter-related are so distinct that they are often studied independently.

When the static equilibrium equations alone are not sufficient to analyse a structure the use of displacement compatibility which rely on the physical properties of the structure become imperative. Whether the equilibrium equations alone are

sufficient or not the results of analysis must always satisfy the following three conditions.

1. Equilibrium
2. Compatibility
3. Boundary

## LITERATURE REVIEW

1. Assistant Professor Harshitha M N ,Binod Kumar, Rajiv Kumar Chaudray, Saurabh Singh, Shivam Shivhar **“Study on Analysis and Design of a Commercial Building”**

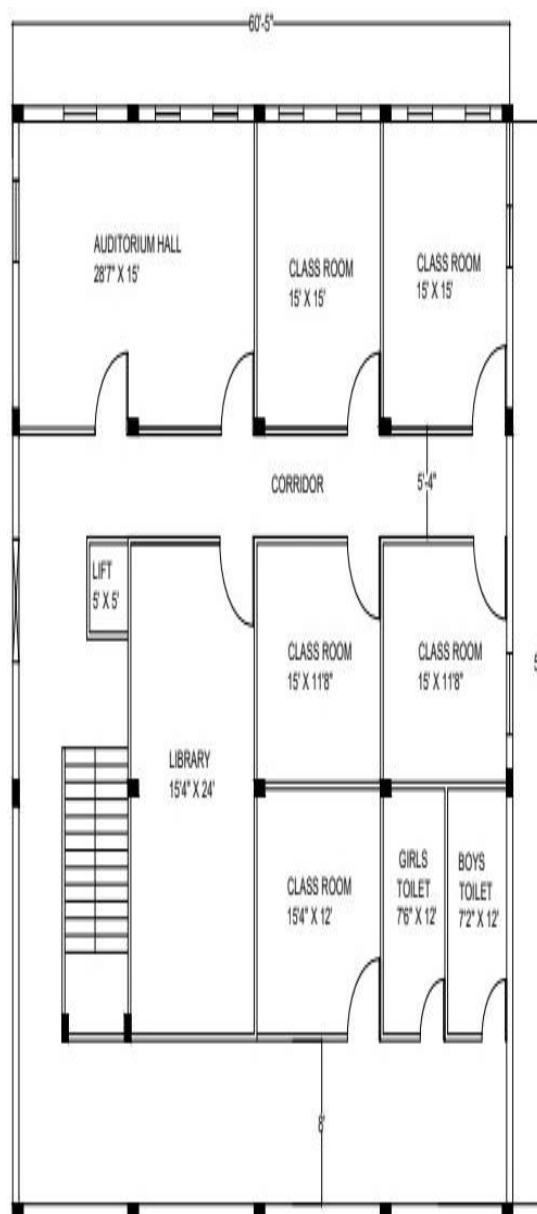
This paper investigates about the Analysis and Design of a Commercial Building by using ETABS software and also gain sufficient knowledge in complete Analysis and Design Procedure. In this research they checked on G+4 Commercial Building frame made up of Reinforced Concrete. Providing with all necessary specifications. This project mostly stressed on Indian Standard Code Books and National Building Code (NBC) because planning and design of any building will be recognized as per the standards by these design aids. This paper provides information about the design procedure Analysis Results i.e. Shear Force, Bending Moment, Deflections etc. and various IS Code books.

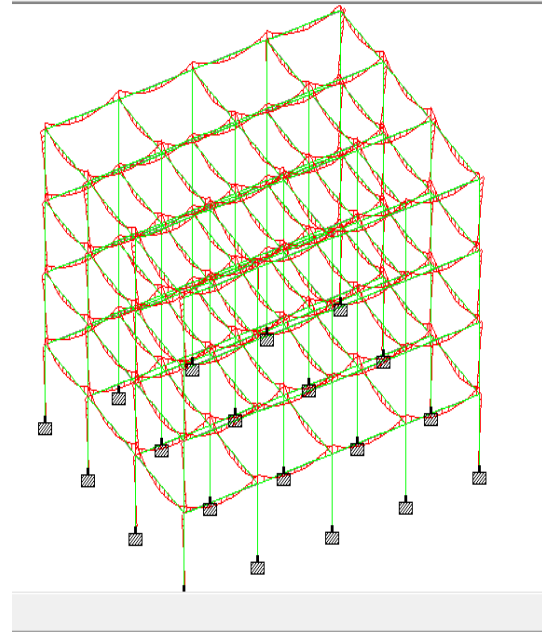
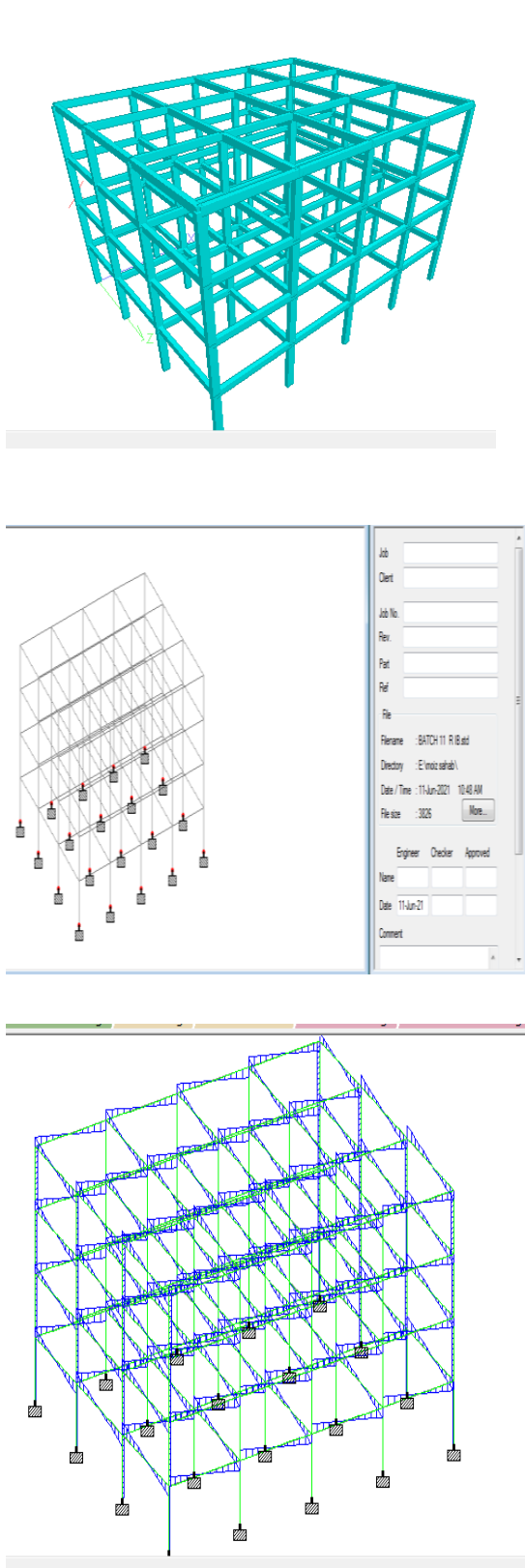
2. Prof. Dr. H.J.Shah, Prof.Dr.Sudhir K Jain **“Seismic Analysis and Design of a five Storey Building”**

This Project has been developed by using Building Codes. In this paper the structure designed is used for exhibition an art gallery. It is the expanded with the existing building site therefore analysis and design is for this building is

performed. Based on the span of structural member in each floor Dimension are found. Also they used M25,M30 Grade concrete, Fe-415steel, L.L, D.L, Seismic Load as per the IS:1893-2016.Analysis and complete Design of structure is completed in step by step procedur

## ARCHITECTURAL PLANS





## CONCLUSION

- 1) This project is mainly concentrated with the Design and Analysis of multi-storied Commercial building with all possible cases of the load combinations as per IS Code using Analysis Softwares tool meeting the design challenges are described in conceptual way.
- 2) To understand the Basic principles of structures by Understanding the standard Indian code. The scope of the study is to Produce good Structural work for performing Analysis and Design for residential/Commercial Structures.
- 3) This facilities for the implementations of more effective & professional engineering software
- 4) Further in case of rectification it is simple to change the values at the place where error

occurred and the obtained results are generated in the output.

## REFERENCES

- **IS: 875 (Part 1) – 1987 for Dead Loads**, Indian Standard Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures.
- **IS: 875 (Part 2) – 1987 for Imposed Loads**, Indian Standard Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures.
- **IS: 875 (Part 3) – 2015 for Wind Loads**, Indian Standard Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures.
- **IS: 875 (Part 5) – 1987 for Special Loads and Combinations**, Indian Standard Code of Practice for Design Loads (Other Than Earthquake).
- **IS 1893 (Part 1)-2016**, Indian Standard Criteria for Earthquake Resistant Design of Structures, (Part 1-General Provisions and Buildings).
- **IS 456-2000**, Indian standard code of practice for plain and reinforced concrete (fourth revision), Bureau of Indian Standards, New Delhi, July 2000.

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