



# Planning, Analysis and Design of Commercial Building using Staad Pro

Eswaraprabhu T<sup>1</sup>, Chitra M<sup>2</sup>

M.E Scholar<sup>1</sup>, Assistant Professor<sup>2</sup>, Department Of Civil Engineering / Sengunthar Engineering College /  
Tiruchengode, India

Corresponding Author Email: Mchitra.Civil@Scteng.Co.In

## How to Cite this Article:

T, E. (2026). Planning, Analysis and Design of Commercial Building using Staad Pro. International Journal of Creative and Open Research in Engineering and Management, <i>02</i>(03).  
<https://doi.org/10.55041/ijcope.v2i3.116>

## License:

This article is published under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and the source are credited.

© The Author(s). Published by International Journal of Creative and Open Research in Engineering and Management.



<https://doi.org/10.55041/ijcope.v2i3.116>

## Abstract—

The main objective of this project is to gain knowledge on different phases in the construction of buildings such as planning of projects, analysis, and design of various structural members, drawings, etc., A Commercial building of G + 1 has been selected for this project and the complete planning, analysis and design works have been done. And also provides a pleasant ambience & environment to the people. The proposed commercial building is a framed structure. The load calculations have been done as per IS 875-1987(PART 1 2 & 3) and the analysis of the frame has been done using the STAAD pro software package. The limit state method of design and analysis has been followed for the components of the building. Detailed drawings showing the reinforcement details for different members are presented using the Auto CAD software. Main road, College, hospital, and departmental store will be at an affordable distance. This building will be easily accessible and noticed by people. The analysis and design of the entire structure have been completely adapted by the limit state method. The results include the various forces acting on various members as well as various schedules for various members. Also, we got the concrete take-off as well as the weight of the various reinforcement bars. For designing the framed structure, we followed the limit state method of design and referred to IS 456-2000 and IS 875 (parts I, II & III). Size of the layout: 8000 Sq.ft. Building area:4800 Sq.ft.

**Key words:** Commercial Building, Staad Pro, Auto Cad Software



## I. INTRODUCTION

Engineering is the professional art of applying science to the efficient conversion of natural resources for the benefit of man. Engineering therefore requires above all creative imagination for innovative useful applications for natural phenomenon.

Building construction is the process of adding structure to real property or construction of buildings the vast majority of building construction jobs are small renovations such as the addition of a room or renovation of a bathroom. Often, the owner of the property acts as a laborer, paymaster, and design team for the entire project. However, all building construction projects include some elements in common design, financial, estimating, and legal considerations. Many projects of varying sizes reach undesirable results, such as structural collapse, cost overruns, and litigation. For this reason, those with experience in the field make detailed plans and maintain careful oversight during the project to ensure a positive outcome. Commercial building construction is procured privately or publicly utilizing various delivery methodologies, including cost estimating, hard bid, negotiated price, traditional, management contracting, construction management-at-risk, design & build, and design-build bridging.

## II. DESIGN OF STRUCTURE

The structure should satisfy the criteria of ultimate load, flexure, shear, compression, tension, and torsion developed under a system of loads and their combinations. The structure should satisfy the criteria of serviceability. The structure should have adequate stability against overturning, sliding, buckling, and vibrations under the action of loads. A satisfactory structural design should satisfy strength, serviceability, and stability.. The most common type of structural element used to cover floors and roofs of buildings is reinforced concrete slabs of different types. Usually, there are two types of slabs.

They are

1. One-way slabs
2. Two-way slabs

One-way slabs are supported on all four sides with such dimensions that the load is carried to support along both directions. Two-way slabs are common on the floor of multistoried buildings. Reinforced concrete slabs supported on two opposite sides with their longer

dimension exceeding two times the shorter dimension are referred to as ONE. WAY SLABS.

Reinforced concrete slabs supported on all four sides with an effective span in the longer direction not exceeding two times the effective span in the shorter direction is defined as TWO-WAY SLABS.

The bending moment in the slabs depends upon the following parameters:

1. The short and the long spans.
2. Edge conditions at the support.
3. Magnitude and type of load on the slab.

The design of reinforced concrete is to resist a given system of external load involves the material properties and the skeletal demands such as width and depth are assumed based on specific guidelines. The cross-sectional dimension is generally assumed to satisfy the serviceability criteria and the housing of reinforced cements with suitable spacing and cover is required to estimate the dead loads and moments.

A comprehensive design of a beam requires the considerations of safety under the ultimate limit state of flexure, shear, tension, and bond together with the limit state of serviceability criteria by an empirical method.

## SCOPE

- Design a restaurant building which utilizes several different fields to create a sustainability and a healthy environment.
- The power needs achieved through renewable energy sources and decrease the impact on the environment
- Safety for all natural resource and climate conditions
- Enhance adaptability and future flexibility and ensure safety and security to consumers.

## III. METHODOLOGY

### LOAD CALCULATION

Loading on the building is in many ways such as large accumulation of gravity loads on the floors from top to bottom, increased significance of loading, and greater importance of dynamic effects. Thus, structures need correct assessment of loads for safe and economical design. Expecting dead loads, the assessment of loads cannot be done accurately. Live loads can be anticipated approximately from a



combination of experience and previous field observations.

### DEAD LOAD AND LIVE LOAD

Dead loads due to the weight of every element within the structure and live loads that are acting on the structure when in service constitute gravity loads. The dead loads are calculated from the member sizes and estimated material densities.

Live loads, sometimes referred to a probabilistic loads include all the forces that are variable within the object's normal operating cycle not including construction or Environmental loads.

Live loads (roof) produced during maintenance by workers, equipment and materials; and during the life of the structure by movable objects such as planters and by people.

Imposed loads – The imposed loads to be assumed in the design of buildings shall be the greatest loads that probably will be produced by the intended use or occupancy, but shall not be less than the equivalent minimum loads.

### ANALYSIS OF STRUCTURE BY STAAD-PRO

- Imported the AUTO CAD drawing file into STAAD Pro to create a model.
- The model has been created using the add beam method.
- The fixed support has been assigned to support.
- The material has given concrete.
- The properties for the various members were given.
- The following loads were considered for analyzing the structure,
- Dead load
- Live load
- Finally, the structure has been analyzed.
- The analyzed result has been taken to design the structural members

## IV RESULTS AND DISCUSSION

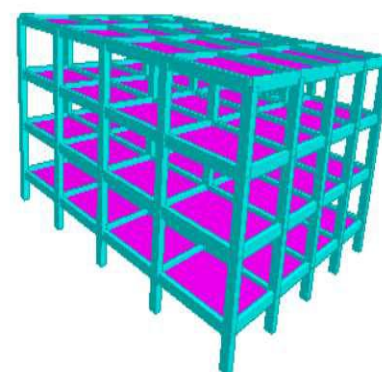
Modern reinforced structures are mostly complex and they are assembled as structure comprising of structural elements namely beams, columns, slabs, walls, and pile foundation. These elements are subjected structural loads of various combinations and for these structures have to be analysed and designed after.

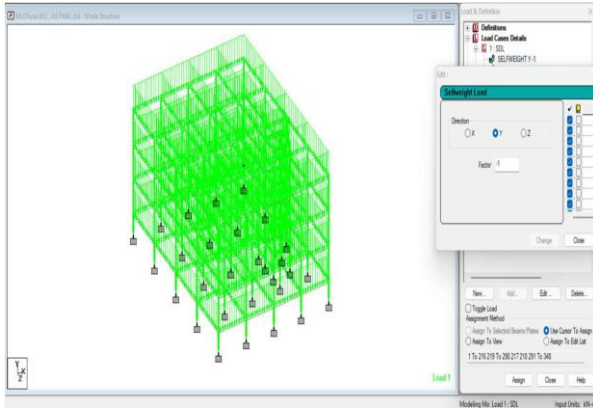
### ANALYSIS OF A STRUCTURE

The prime motive of analysis of a structure is to find out, what magnitude of force acts on the structure, what sort of forces will tend to act on the structure, how will the structure react when the load begins to act, will the structure safely withstand the load etc., the solution for all these can be obtained from of load analysis and frame analysis.

### FRAME ANALYSIS

A building frame contains a number of continuous beams and columns. For design purposes bending moments, shear forces and direct thrust in beams and columns at critical sections are required to be obtained. The structure being highly indeterminate, an exact analysis becomes tedious. In fact the assumptions involved even in exact analysis lead to considerable error and thus approximate method of analysis can be considered as reasonably accurate for practical purposes. Such approximate methods of analysis are preferred because of simplicity.





## V. CONCLUSION

The purpose of this project is to have a better understanding of the structural analysis and design. Proper approval is one of the essential criteria to avoid unnecessary actions from DTCP such as building demolition orders and similar penal actions. In taking this project we learned various basic requirements of buildings, and design procedures and gained practical knowledge in DTCP rules and regulations and reinforcement detail. The factor of safety of the building is considered and designed according to the local provisions. The calculations have been done for loads on beams and columns and thus designed the frame. We have also learned to use software such as STAAD Pro and AUTO CAD for the required purpose. It is an important learning requirement since this software is mandatory in the engineering field of study.

## REFERENCES

- [1] K. Wailkar, P. Chide, M. Shende, J. Ralekar, D. Walke, and A. Kurzekar, "Analysis and design of a residential building by using STAAD Pro," *International Journal of Modern Agriculture*, vol. 10, no. 2, pp. 1200–1207, 2021.
- [2] K. S. Rao, N. Yesubabu, P. Koushik, T. S. Kumar, and O. Aparna, "Analysis, design and estimation of G+5 residential building using STAAD Pro," *International Journal of Research in Engineering, Science and Management*, vol. 7, no. 4, pp. 87–93, Apr. 2024.
- [3] A. Kumar, A. Gautam, A. Kashyap, A. Kumar, and A. Kumar, "Analysis and design of multistorey building using STAAD Pro," *International Journal for Research in Applied Science and Engineering Technology*, 2025.
- [4] K. Harshavardhana Reddy, D. M. Rafi, and C. Ramachandrudu, "Comparative study on the analysis results of multi-storeyed commercial building (G+12) by using STAAD.Pro and ETABS," *International Journal of Scientific Research in Science and Technology*, 2019.
- [5] B. Nithya, R. Prakash, S. Raja, and T. Raja, "Study of concrete frame structure of commercial building with floating column," *International Journal of Engineering Technology and Management Sciences*, vol. 7, no. 2, 2023.

