
Study of Concrete Frame Structure of Commercial Building with Floating Column

Bhavani Nithya R^{#1}, Ram Prakash M^{#2}, Mr.Saravananaraja R^{#3}, Dr.Thirumalai Raja K^{#4}

Department of Civil Engineering, SNS College of Technology, Sathy main road,

Vazhiampalyam pirivu, Coimbatore - 641035

Corresponding Author Orcid ID : ¹ <https://orcid.org/0009-0008-0436-238X>

ABSTRACT

The planning process is the art and science of design with the construction that is economical, robust and durable. This project is primarily based on code Design and Analysis of Frame Buildings. The entire standard planning and design process requires thinking, knowledge, and reflection. Analysis and design of G+2 storey commercial buildings using IS criteria. Analysis and all samples were generated by and analyzed by STAAD Pro. software. All the drawing and detailing was done by AutoCAD, which was also the basis for the conversion of structure to analysis and design in STAAD Pro. Floors, beams, stairs, etc. in this project. It design adopts the IS: 456-2000. Consider the difference between the positions of members pursuant to IS; 875-1987 (Part 1, Part 2, Part 3). Therefore, the construction of buildings has been planned as per the Indian National Building Code.

KEY WORDS: STAAD Pro, AutoCAD, Floating column, Commercial Building, Load combinations.

1. INTRODUCTION

The Project is a G+2 Commercial Building which includes Parking area, Bank and Residential Buildings. The building is facing at the North direction. The total area of the site is 1230.17sqft, the area of the basement is 1371.83sqft, the area of the ground floor is 1371.83sqft and the area of the first floor is 1352.02sqft.

In this project work we are planning, analyzing and designing an G+2 Commercial building. We are using limit state method for design of various members. The analysis of the structure is to be done using STAAD Pro software. A design of RC building work is taken up. The design is made using software on structural analysis and design (STAAD Pro). The building is subjected to both vertical loads as well as horizontal loads. The vertical load consists of dead load of structural components such as beam, columns, slabs etc and live loads. The horizontal load consists of wind forces, thus building is designed for dead load, live load and wind load as per IS 875 (All 5 Parts). The building is designed and analyzed for the maximum and minimum bending moments and shear forces as per IS 456-2000. The help is taken from software available in institute and computations of loads, moments and shear forces is obtained from this software.

Statement of project

| | |
|------------------------|-------------------------------------|
| Utility of building | : Commercial + Residential Building |
| No of stories | : G+2 |
| Shape of the building | : Rectangular shape |
| Type of construction | : R.C.C framed structure |
| Concrete grade | : M 20 |
| Area of the building | : 1230.17sqft |
| Height of the building | : 14m |

2. PLANNING

AutoCAD is computer graphics application package developed in 1980 by Autodesk U.S.A. The word Auto itself derives from the corporation of Autodesk while the CAD stands for computer added drafting AutoCAD is an application package cum programming language in their advance version from 1990. As an application package it suited for the engineering purpose designing of almost of the

stream of the engineering such as civil, mechanical, electrical etc.

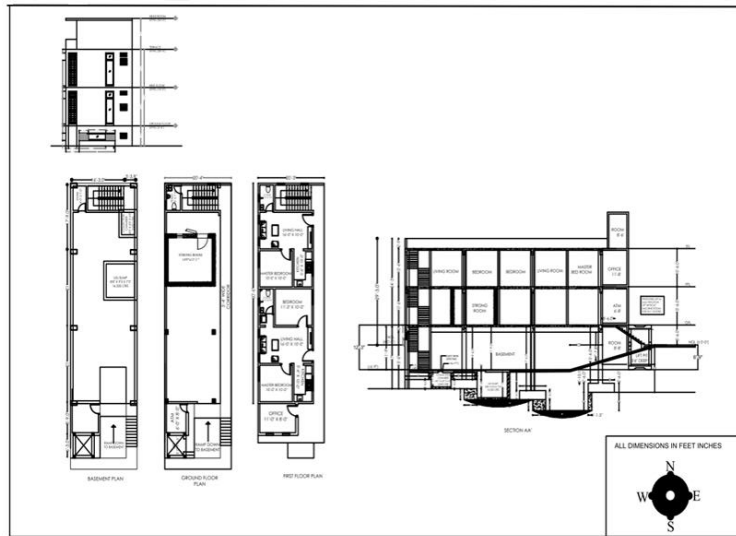


Fig.1 Plan

3. ANALYSIS

Dead Loads

These are the self-weights of the structure to be designed. The dimensions of the cross section are to be assumed initially which enable to estimate the dead load from the known unit weights of the structure. The values of the unit weights of the materials are specified in IS875:1987(Part I).

Live Loads

They are also known as imposed loads and consist of all loads other than the dead loads of the structure. The values of the imposed loads depend on the functional requirement of the structure. Commercial buildings will have comparatively higher values of the imposed loads.

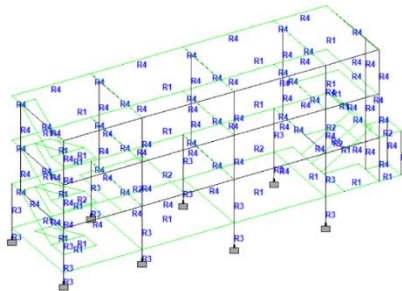


Fig.2 Commercial Building

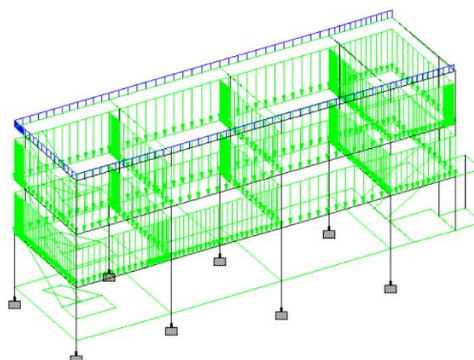


Fig.3 Dead Load

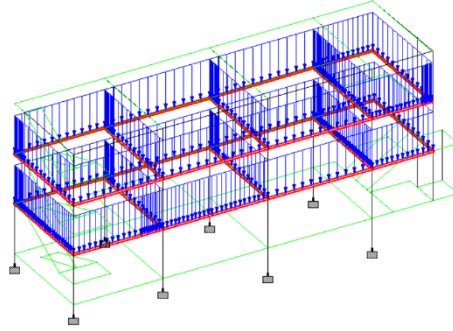


Fig.4 Live Load

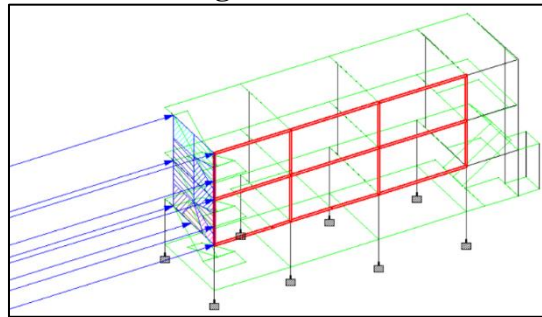


Fig.5 WL X direction

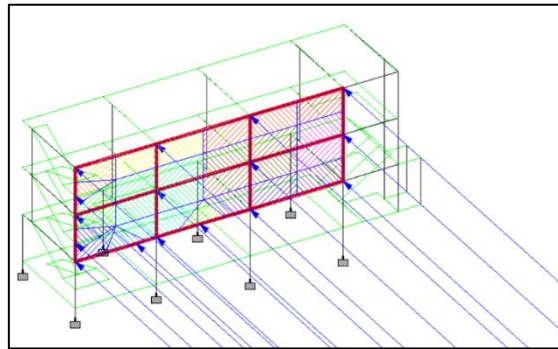


Fig.6 WL Z direction

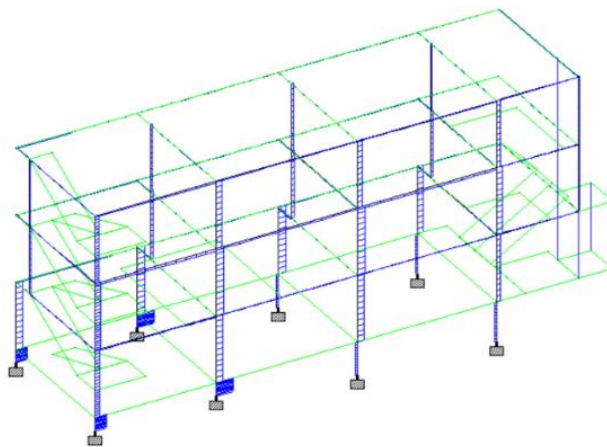


Fig.7 Shear force

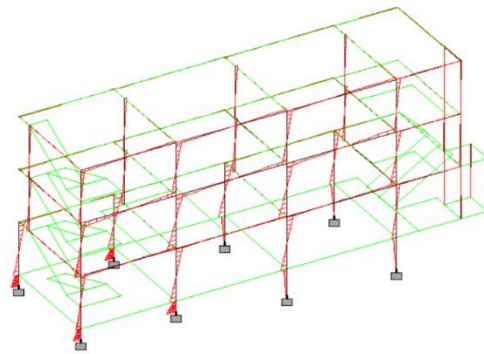


Fig.8 Bending Moment

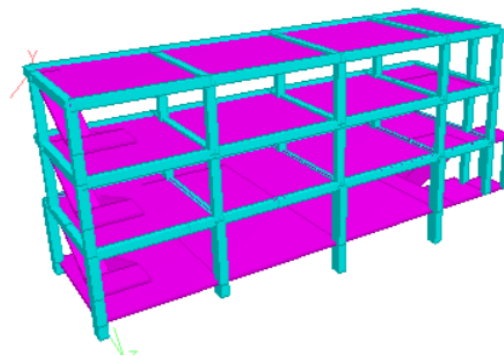


Fig.9 3D view

4. DESIGNING

A. Design Calculation for Slab

Shorter Span:

Provide 10 mm ϕ bars @177.8 mm c/c spacing in shorter span.

Longer Span:

Provide 10 mm ϕ bars @127 mm c/c spacing in longer span.

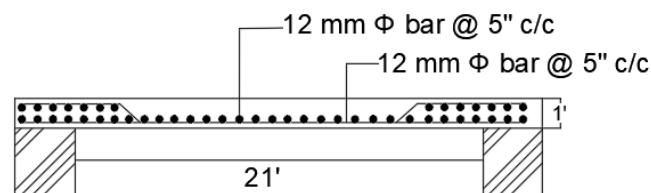


Fig.11 slab

B. Design Calculation for Beam

Clear span = 6.3m.

ultimate load, $W_u = 1.5 \times 4 = 6 \text{ KN/m}$

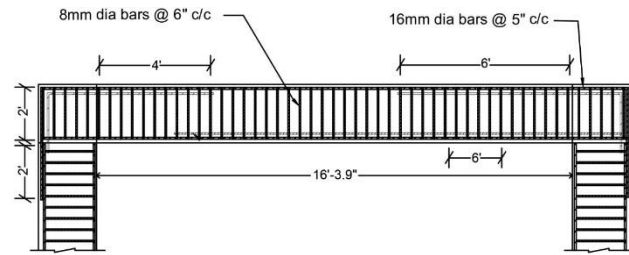


Fig.11 Sag Rod

C. Design Calculation for Column

Dimension = (380 x 600) mm

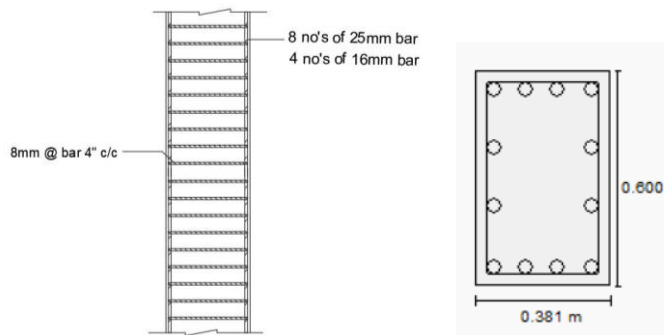


Fig.12 Column

D. Design Calculation for Footing

Footing size 380 mm x 600 mm

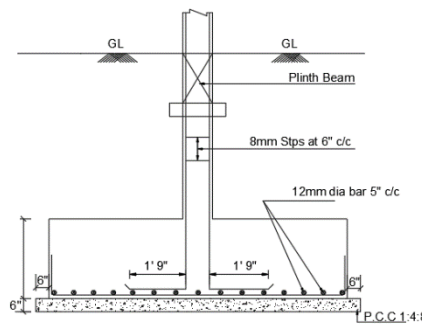


Fig.12 Footing

ESTIMATION

| SINo | Description | Qty | Unit | Rate | Amount |
|----------|---------------------------------|---------|------|---------|-------------------|
| A | Cost of building | | | | |
| 1 | Cost of Basement floor building | 1209.83 | Sft | 3183.73 | 3851770 |
| 2 | Cost of Ground floor building | 1209.83 | Sft | 1461.86 | 1768605 |
| 3 | Cost of First Floor building | 1209.83 | Sft | 2023.32 | 2447869 |
| | Total | | | | 8068243.70 |

CONCLUSION

Planning has been done for 1230.17sqft with the specifications made by NATIONAL BUILDING CODE. This project Gives the brief Idea about how to analyze and design auditorium with minimum facilities required. Used AutoCAD 2010, STAAD.Pro V8i effective representation of drawings. Used IS-456:2000 & SP-16, for the design of the structural members. Materials used are M20 grade concrete and Fe 415 steel unless mentioned in the particular design elements. The construction of Commercial Building used for multipurpose

References

1. IS 456 code year 2000 for plain and reinforced concrete.
2. SP 16 for Design ads for reinforced concrete to IS: 456-1978
3. Handbook on concrete reinforcement and detailing SP 34 1987
4. IS 800 : 2007 code book for steel.
5. Dead load from IS 875 Part 1 1987
6. Live load from IS 875 Part 2 1987
7. Wind loads from IS 875 Part 3 1987
8. Bhavikatti S.S., Design of Steel Structures by Limit State Method as per IS: 800- 2007, K. International Publishing, New Delhi.
9. Comparative study on design of steel structures and RCC frame structures based on column span concept by Rachakonda Divya, K. Murali
10. Comparative Study of R.C.C, Steel and Composite (G+30 Storey) Building D. R. Panchal and P. M. Marathe
11. Comparative Study of R.C.C and Steel Concrete Composite Structures by Shweta A. Wagh, Dr. U. P. Waghe
12. Comparative Study on Structural Parameter of R.C.C and Composite Building by Prof. S. S. Charantimath , Prof. Swapnil B.Cholekar , Manjunath M. Birje
13. Varalakshmi V,G shivakumar and R S Sarma (2014) DzDesigned and d G+5 residential building by ETABSdz, International Conference on Advance in Engineering and Technology.
14. Chandrashekarand and Rajashekar (2015), DzAnalysis and Design of Multi Storied Building by Using ETABS Softwaredz, International journals of scientific and research vol.4: issue.7: ISSN no. 2277-8179.
15. Balaji and Selvarasan (2016), DzDesign and Analysis of multi-storeyed building under static and dynamic loading conditions using ETABSdz, International Journal of Technical Research and Applications e-ISSN: 2320-8163, www.ijtra.com Volume 4, Issue 4, PP. 1-5
16. Geethu S N, Depthi M, Abdul Nasir N A and Izzudeen K M(2016)DzComparative study on design and analysis of multi storied building by STAAD.Pro and ETABS softwaredz.