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Planning Designing and Analysis of Civil Engineering Department Block at EKCTC

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Abstract: ***The project's goal is to create a civil engineering department building at the technical campus of Eranad in Manjeri. The IS codes, Kerala Panchayat Building Rules, and AICTE Building Rules are all taken into consideration when creating the design. Layout of the building or structure is always the first step in any construction project, followed by design and structural analysis. Using AutoCAD 2017, a layout plan for the proposed building is created. The building has a main floor and two further storeys. Planning is done in accordance with Indian standard code requirements. STAAD Pro V8i is utilised to analyse the structure. The soil condition is used as the medium for the foundation's isolated footing design.***
Keywords: Department Building, AICTE, STAAD Pro V8i, Structural Analysis, Isolated footing

I. INTRODUCTION

Project work plays a significant role in the development of an engineer's professional and practical abilities. The goal of project work is to gain exposure to real-world engineering disciplines. We would gain a better understanding of engineering practice in general and a feeling of common and potential issues as a result of this exposure. The development of cement and man's hunt for new building techniques resulted in the adoption of multi-story buildings with framed structures. It was simpler to build on top of one another because of the R.C.C. roofing. The lack of available land and the high population density make multi-story buildings necessary in today's society. The number of towering buildings—institutional, residential, and commercial—has significantly increased recently. The current trend is for structures to go bigger and taller. The development of science and technology had made it possible to erect tall buildings in locations that were even vulnerable to earthquakes and cyclones. As a result, the significance of lateral loads such as wind loads and earthquake forces is growing, and practically every designer is challenged to provide sufficient strength and stability against lateral loads. These lateral pressures may cause the structure to experience critical stresses, create unwanted vibrations, and sway laterally, all of which may cause discomfort for the people inside. The goal of reinforced concrete structure design is to create a construction that is functional, usable, long-lasting, affordable, and visually beautiful. The building must be able to withstand the worst loading scenarios in order to be considered safe. During the structure to continue to be functional, robust, and aesthetically acceptable for the expected design life, the deformation and cracking must not be excessive under typical working conditions. The structure should also be affordable in terms of both construction and maintenance costs.

II. LITERATURE REVIEW

1) *Varsha S et.al (2016):* The goal of the project was to construct a multi-story building with G+ 5 storeys at Kalakode, which is about 4 kilometres from Paravoor. The design adheres to the criteria and specifications suggested by the IS code, Kerala building regulations, and national building regulations. AutoCAD 2014 and the 3D modelling programme Revit 2011 are used for planning. Using STAAD, the structure analysis and design are completed. Using the limit state technique of design in accordance with IS 456-2000, Pro V8i is used to cross-check certain members. The project's goal included developing nodal points based on the STAAD.Pro V8i, 3D representation of the construction with beams and columns.
2) *Manjunath Nalwadgi et.al (2021):* In this paper, the major objective was to create the framework for a secure computing system. C+G+5 residential and commercial buildings make up the design. Finite element analysis that takes into account the impact of dynamic loads, including the wind and earthquake effects, among others. The purpose of the current effort is to examine the effectiveness of certain civil engineering application software. The Unity Builders are responsible for carrying out this project in Gulbarga City. Bharat Pride is the name of the initiative. STAAD.Pro V8i is the professional's choice for steel, concrete, timber, aluminium, and cold-formed steel design of low and high-rise buildings, culverts, petrochemical plants, tunnels, bridges, piles, and much more. This includes model generation, analysis, and design, as well as visualisation and result verification.

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3) *V.Varalakshmi et..al (2014):* The Study uses the well-known civil engineering programme STAAD.Pro V8i to design and analyse columns, beams, footings, and slabs. The loads are computed, with the live loads using the IS:456-2000 code and HYSD BARS FE415 in accordance with IS:1786-1985, and the dead loads depending on the unit weight of the materials used (concrete, brick). A soil analysis was done to determine the best sort of foundation, and a structural design was done to figure out the size of the footings and how much reinforcement was needed. According to the analysis, the location is situated in granite rock, which is appropriate for a firm foundation. The footing is a standalone rectangular pedestal footing with a slope. The soil's safe bearing capacity was tested.
4) *S.Ananda Rao et.al:* Paper argues that Shear walls are vertical components of the system that resists horizontal forces. To mitigate the consequences of lateral load exerted on a structure, shear walls are built. Shear walls are straight exterior walls used in residential construction that normally come from a box and offer all of the lateral support for the building. Over the past few years, shear wall system development for building has improved significantly. Shear wall systems were first created to lessen damage from earthquakes, save labour costs, boost building strength, and improve quality of life during construction.
5) *Anjum Algur et.al (2016):* The study suggests that when in multistorey buildings, one should be aware of all the forces at work on the building. The soil beneath the building should be sufficiently dense to evenly distribute the weight on the foundation. For loose soil, a deep foundation is preferred. Manual calculations get more difficult, take longer, and have a higher probability of human error as the number of floors rises. Here 30 stories are present (G+29). We take into account seismic zone II. For the current study, a multi-storey plane frame with a fixed joint is taken into consideration. Considerable soil is used. Analysis of response spectra is performed based on IS 1893.

III. DETAILS OF PROJECT

A. *Statement of Project*

1) Utility of building: Institutional building
2) No of stories: G+2
3) No of staircases: 2
4) Type of construction: RCC framed structure
5) Types of wall: Brick wall

B. *Survey Details*

The following has been observed during the chain survey conducted at the site.

1) Site is located at Cherukulam,Manjeri
2) Levelling is required since the land is non uniform level.
3) Buildings are located near by the site.

C. *Codes Referred*

1) Kerala Panchayat Building Rules (KPBR)
2) National Building Code (NBC)
3) IS 456-2000
4) IS 875 Part 2
5) SP-16
6) IS-875 (Part 1)
7) IS-875 (Part 3)

D. *Area of Floors*

1) Ground floor = 543.697 m2
2) First floor = 544.210 m2
3) Second floor = 544.229 m2

E. *Materials Used*

1) Concrete grade: M20
2) All steels grade: Fe415grade

F. Facilities Provided

1) Classrooms
2) Laboratories
3) Staffrooms
4) HOD room
5) Lobby
6) Reading room
7) Sick room
8) Store
9) Seminar hall
10) Drawing hall
11) Wash rooms

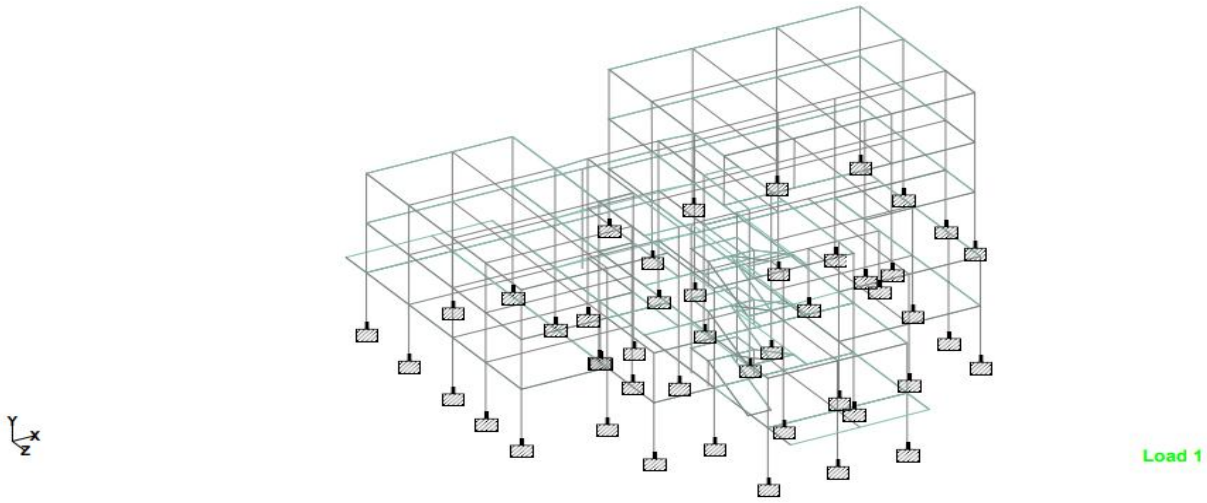


Fig 1 Analysis of Whole Structure in STAAD Pro V8i

IV. RESULT AND DISCUSSION

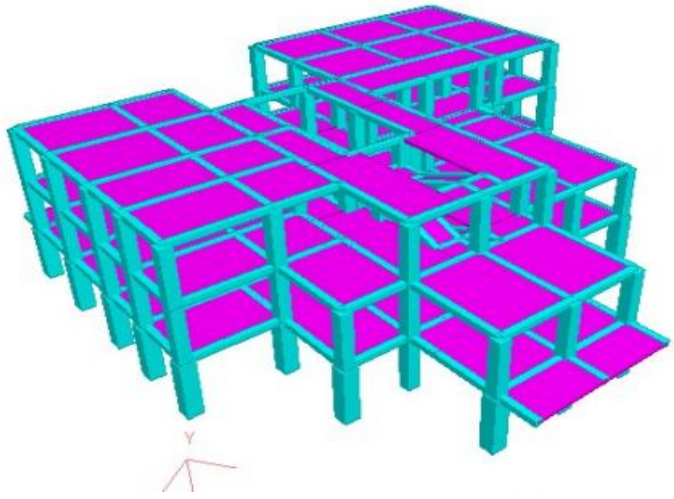


Fig 2 3-D Rendered View of Model

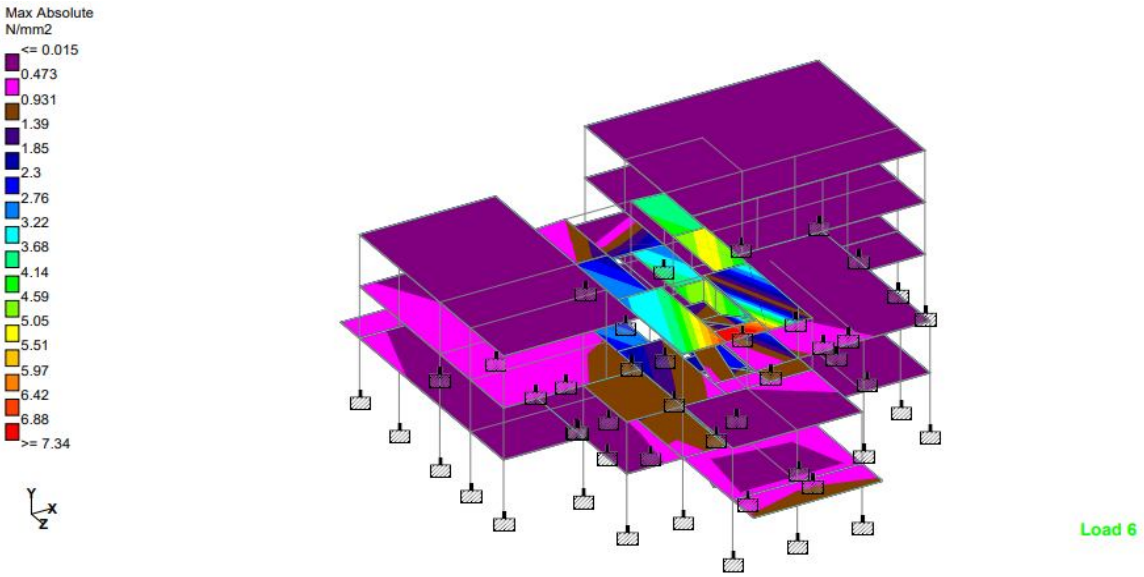


Fig 3 Stress Distribution On Plates Due To Load Combination

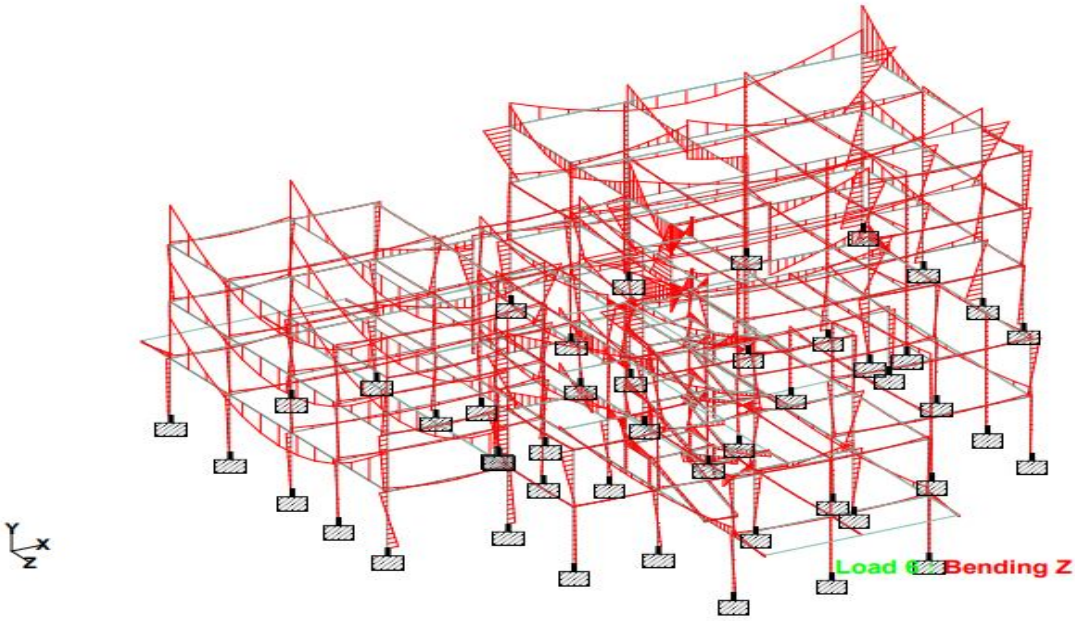


Fig 4 Load Combinations

V. CONCLUSION

As a summary of the key civil engineering subjects, the project has demonstrated its ability to give students practical planning, analysing, and designing experience. STAAD Pro, which has proven to be top-notch software with enormous potential in the analysis and design sectors of the construction industry, was used to model and evaluate the structure. The project has given the knowledge of working with Auto CAD and STAADPro. The study and design were completed as closely as feasible to the standard specifications. It is thought that the planned project has a sturdy structural foundation. Cities are expanding quickly in emerging nations like India, where the institution has a significant impact on the growth of the national economy. This caused us to consider this, and we chose to follow it. The expertise we obtained from working on this project will enable us to approach future endeavours with confidence and boldness.

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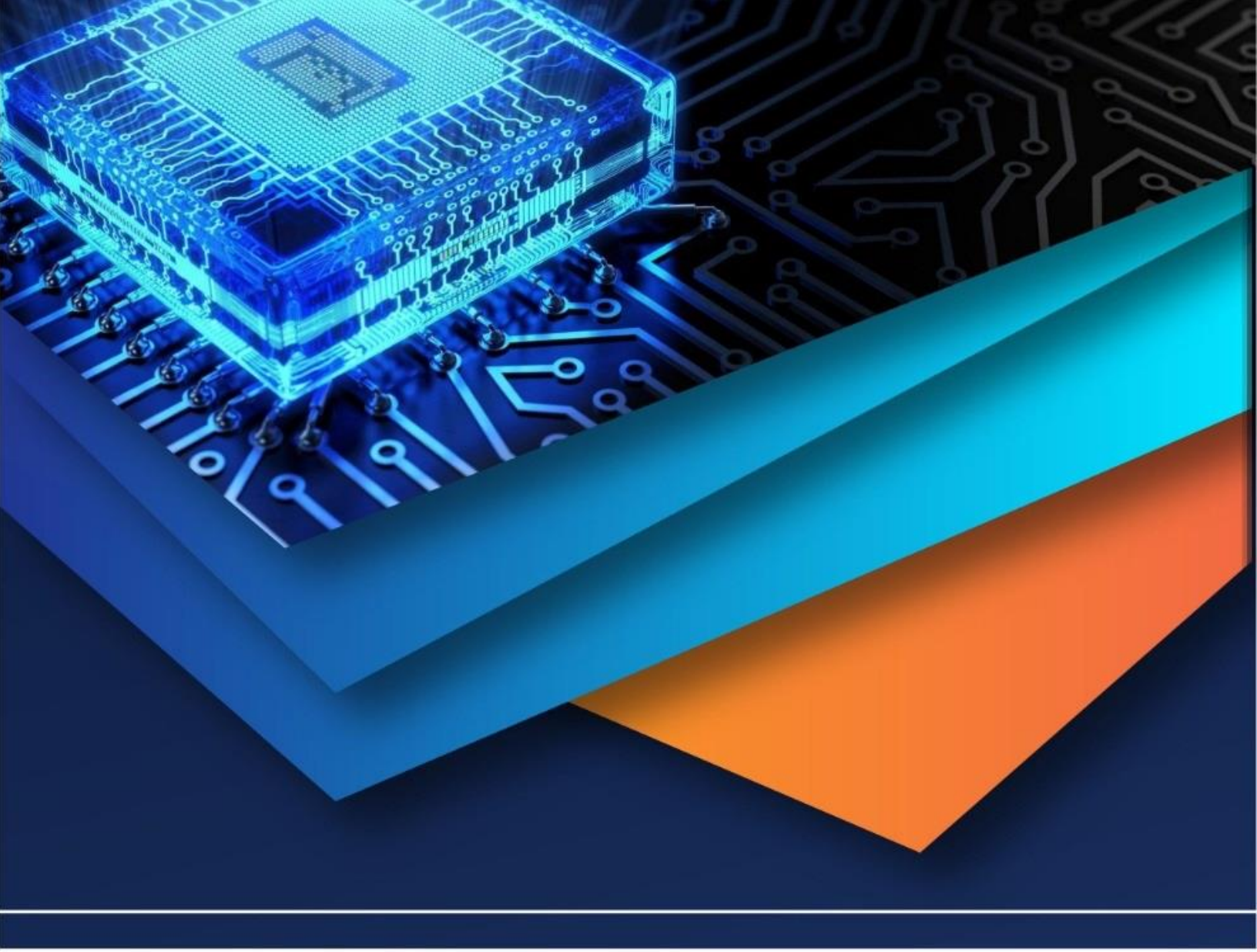
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