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Analysis and Design of G+10 Building using Staad Pro

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Abstract: *The principle objective of this project is to analyze and design a multi-storied building .using STAAD Pro. The design involves load analyzing the whole structure by STAAD Pro. The design methods used in STAAD-Pro analysis are Limit State Design conforming to Indian Standard Code of Practice. STAAD.Pro features a state-of-the-art user interface, visualization tools, powerful analysis and design engines with advanced finite element and dynamic analysis capabilities. From model generation, analysis and design to visualization and result verification, STAAD.Pro is the professional's choice. Initially we started with the analysis of simple 2 dimensional frames accuracy of the software with our results. The results proved to be very accurate. We analyzed and designed G+10 building floor of storey building [2-D Frame] initially for all possible load combinations [dead and live]. STAAD.Pro has a very interactive user interface which allows the users to draw the frame and input the load values and dimensions. Then according to the specified criteria assigned it analyses the structure and designs the members with reinforcement details for RCC frames. Our final work was the proper analysis and design of a 3-D RCC frame under various load combinations. We considered a 3-D RCC frame consisting of 3 bays. The ground floor height was 3.2m and rest of the 10 floors had a height of 3.2m.The structure was subjected to self weight, dead load, live load under the load case details of STAAD.Pro. The materials were specified and cross-sections of the beam and column members were assigned. The supports at the base of the structure were also specified as fixed. The codes of practice to be followed were also specified for design purpose with other important details. Then STAAD.Pro was used to analyze the structure and design the members.*
The design of the building is dependent upon the minimum requirements as prescribed in the Indian Standard Codes. The minimum requirements pertaining to the structural safety of buildings are being covered by way of laying down minimum design loads which have to be assumed for dead loads, imposed loads, and other external loads, the structure would be required to bear. Strict conformity to loading standards recommended in this code, it is hoped, will ensure the structural safety of the buildings which are being designed. Structure and structure element were normally designed by limit state method. Complicated and high-rise structures need very time taking .STAAD.Pro provides us a fast, efficient, easy to use and accurate platform for analysing and designing structures.

Keywords: Analysis, STAAD PRO, Building with geometric plan irregularities, Shear Force, Bending Moment

I. INTRODUCTION

The construction of building in civil engineering begins only after the structural analysis and design of a building.The building is to be checked for the resistance to different types of loads acting on it.The behaviour of different types of loads has impact on different types of structural members like beams,slabs,columns,shear wall and footing.By studying the behaviour of the members we need to design the members.So analysis plays a pivotal role in the structural design of a building.Also the analysis helps in designing a safe and economical construction of any structure.

1.1 STAAD PRO

STAAD.Pro is a widely utilized software program for structural analysis and design, catering to a diverse range of structures including buildings, towers, bridges, industrial facilities, and utility structures. Its flexible modelling environment, advanced features. and seamless data communication capabilities empower structural engineers to analyze and design almost any type of structure effectively. STAAD Pro has gained popularity among engineers, particularly for steel structures, due to its specialization, user-friendly interface, and incorporation of steel structural specifications

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from various countries. This article focuses on the application of STAAD in structural analysis. Developed by Research Engineers International in California, USA, STAAD offers a patented program known as STAAD Structural Analysis and Design. Noteworthy features of STAAD. Pro include modernized finite element analysis, advanced visualization capabilities, a robust analysis and design engine, and a cutting-edge user interface.3.3 STAAD pro user interface in the industry standard.

Complex models can be quickly and easily generated through powerful graphics, text and spread-sheet interfaces that provide true interactive model generation, editing, and analysis. STAAD easily generates comprehensive custom reports for management, architects, owners, etc. The STAAD Structure Wizard contains a library of trusses and frames. Use Structure Wizard to quickly generate models by specifying height, width, breadth and number of bays in each direction. Reports contain only the information you want, where you want it. Add your own logo as well as graphical input and output results.

Export all data to Microsoft Word and Microsoft Excel. STAAD is intelligent software for steel structure design, the main process is model generation, loading, analysis, criterion check, drawing, repeat design and optimize, then get the safety, reliable, reasonable and economical steel structure.

1.2 Advantages of STAAD PRO

- First of all, it does not involve any manual calculations.
- The visual interface is user-friendly.
- It is based on the latest programming technolggy that enables to create of an exact 3d model of the required building or structure.
- It is suitable for almost all types of materials including concrete, steel, aluminum etc.
- International country codes are available.
- The results are sturdy.
- Designs can be imported from Autocad.Modernise IT it with Intellige
- Easy to learn.
- Faster methods of designing a structure.

1.3 Objectives

- To configure a workable and economic structural system. This involves the selection of the appropriate structural types and laying out the location and arrangements of the structural elements such as columns and beams
- To select structural dimension, depth and width of individual member and concrete cover
- To determine the required reinforcement, both longitudinal and transverse
- Detailing of reinforcement such as development length, hooks and bends
- To satisfy serviceability requirements such as deflection and crack width

1.4 Scope of Study

The scope of the study is to produce good structural analysis results for a G+10 building.

II. METHODOLOGY

In order to achieve the objectives of the study that is to analyse the building in STAAD PRO following methodology has been followed

- Data Collection
- Analysis of the data
- Model generation
- Load calculation
- Building analysis
- Design of building

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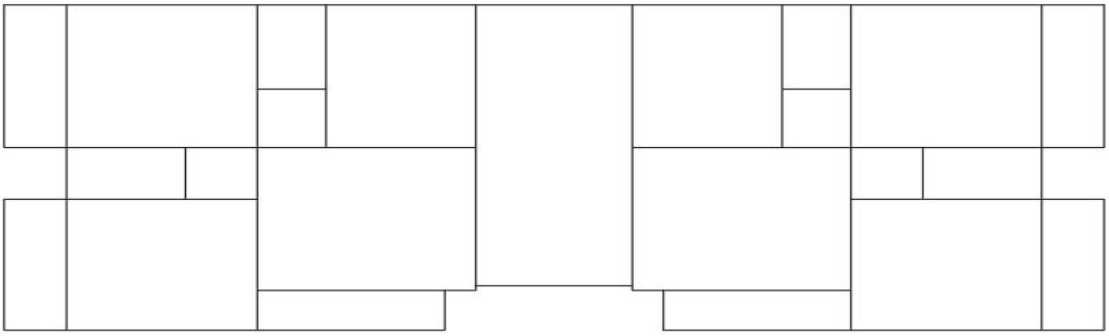
- Result analysis

2.1 Description of the Model

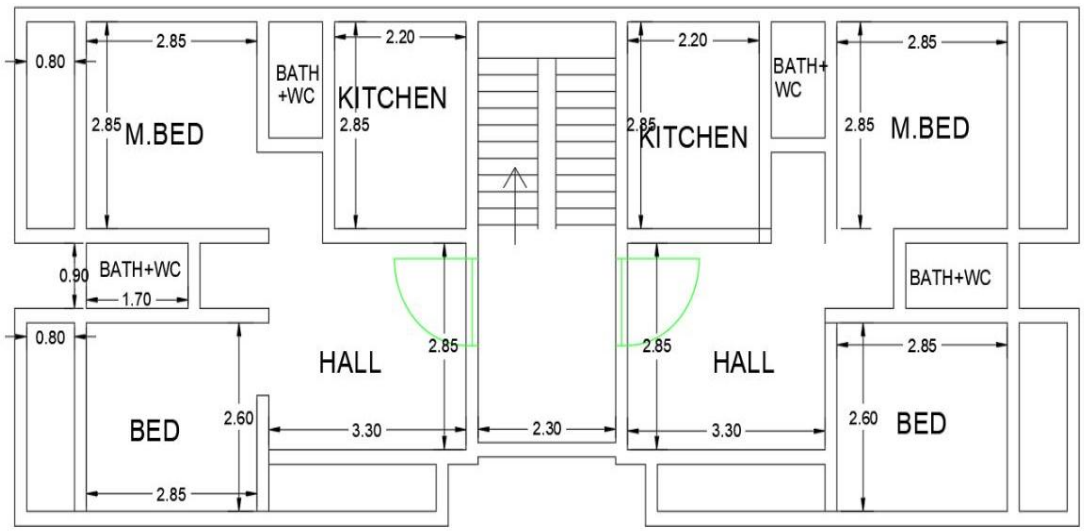
Modeling of the building is done using STAAD PRO software.The structure is of G+10 storeys .
Height of structure - 35m
Floor height -3.200m
For live load we use IS code is IS 875 part 2-1987 and the wind load is IS 875 part3-2015
And the seismic load is IS 1893 PART 4-2015. Basic wind speed is 39m/s and for seismic load we take zone 3.

2.2 Structural Element Properties

Columns : (300 x 700) mm
Beams:
Primary beam (230 x 450) mm
Secondary beam (230 x 300) mm
Building plan



CENTRE LINEPLAN



GROUND PLAN

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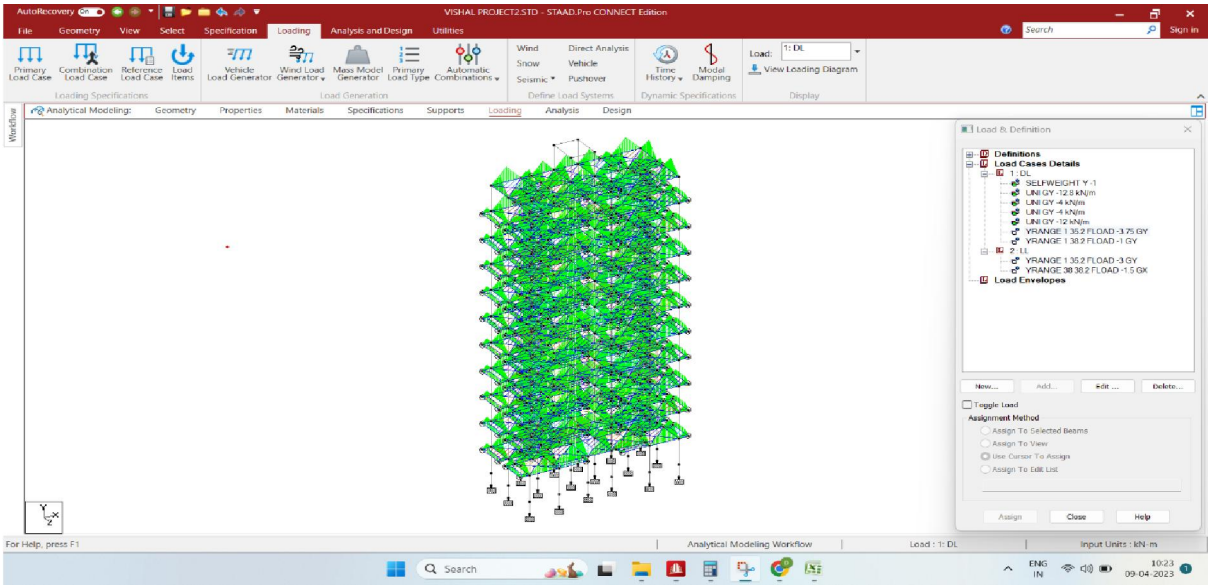
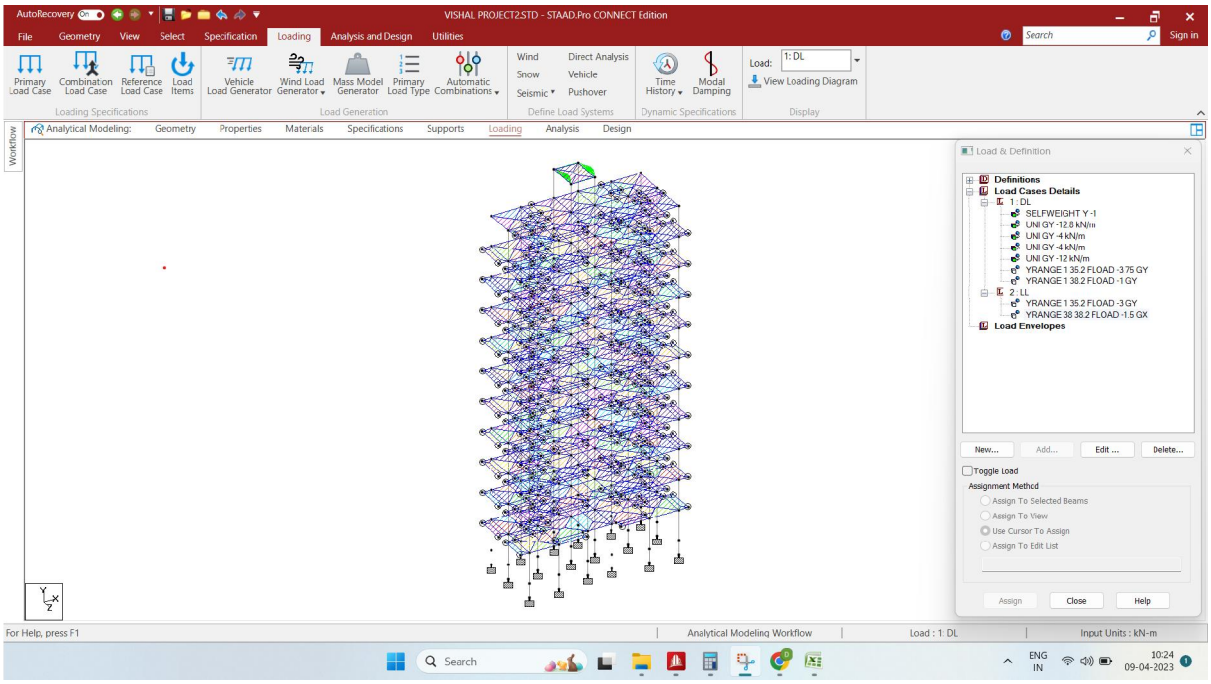
III. RESULTS

After doing the analsyis for the building results were found like dead load,live laod,wind load and seismic load.Some of the results are attached .



Dead load



Live lioad

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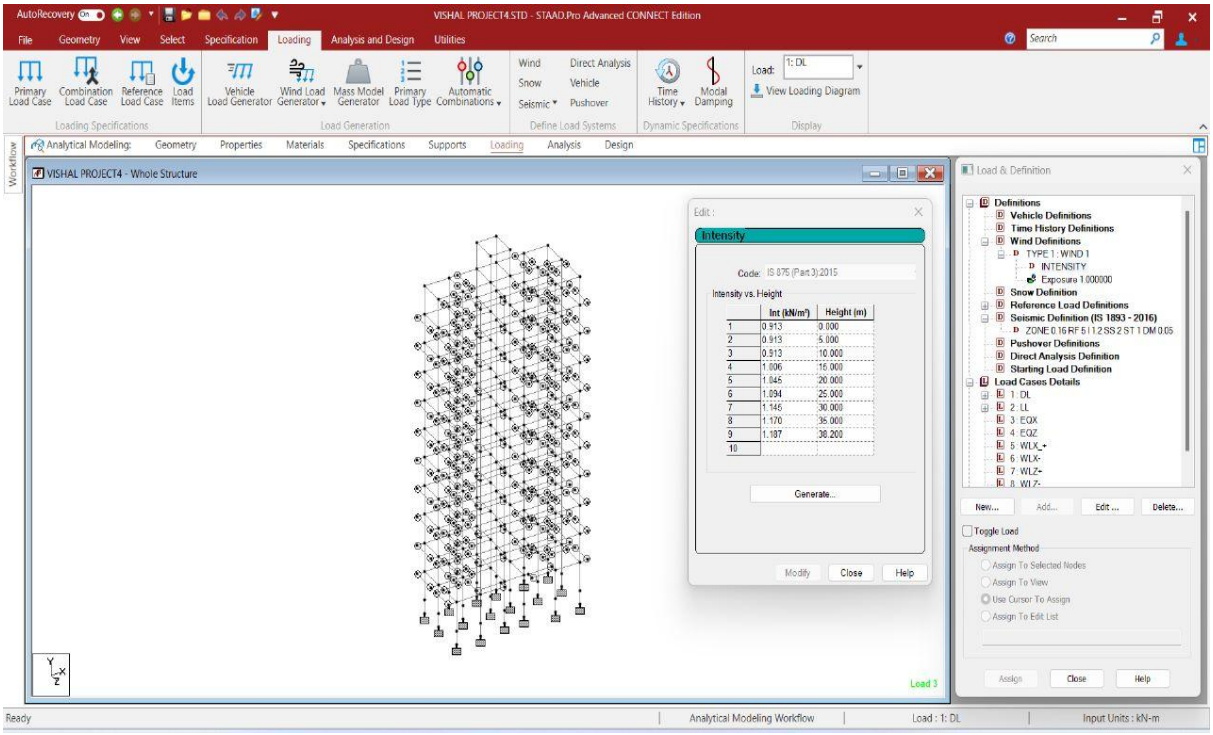
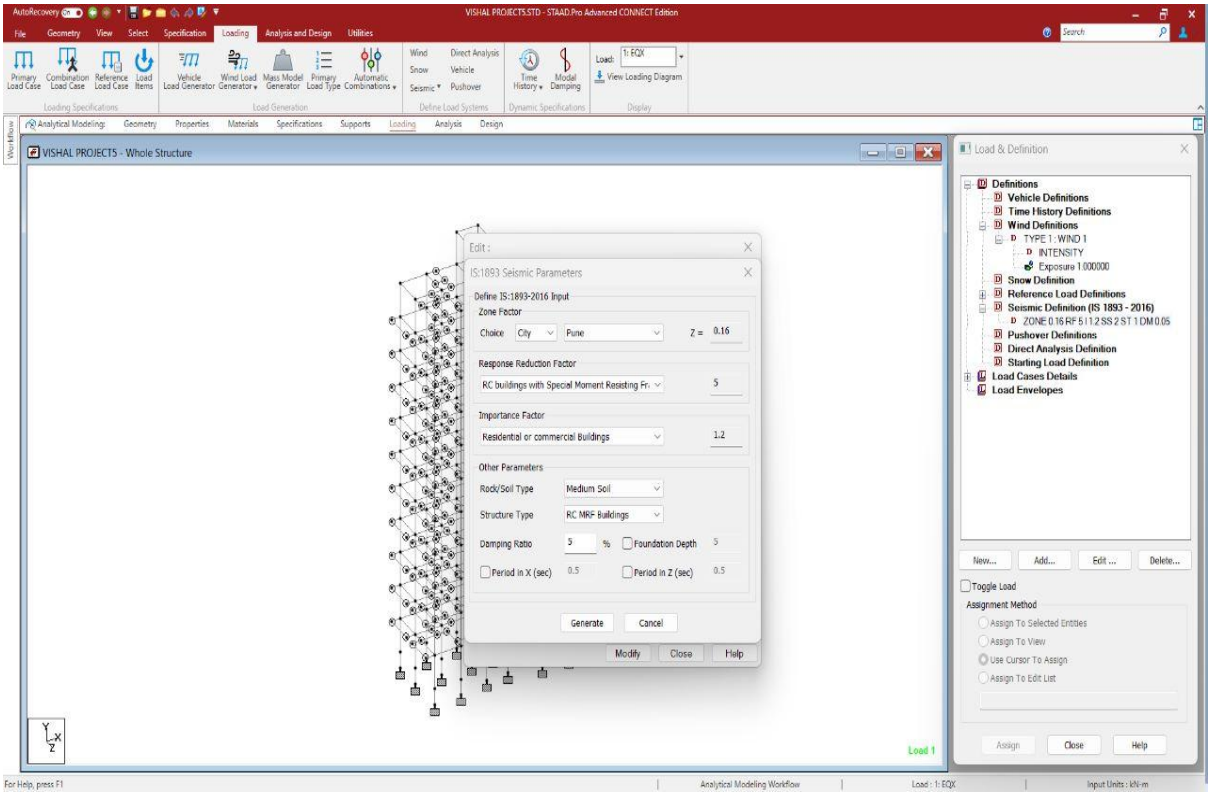


Wind load intensity



Seismic load

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IV. CONCLUSION

The aim of our project was planning, analysis and design of a multi-storeyed, earthquake resistant residential building. We were able to complete the project in a successful and efficient manner by considering all the relevant features given as six chapters.

Planning of this building has been done based on the space requirements suggested by the prevailing rules stipulated in Kerala Building Rules, 1999. The design is completely based on relevant Indian Standard Codes. The analysis has been done with the help of STAAD Pro and the drawings have been made with the help of AutoCAD. We have completed this project to the best of our knowledge and ability.

V. FUTURE SCOPE

The same model can analysed for dynamic loading condition for earthquake loads using either response spectrum method or time history method or both.

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