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A Research Paper on Residential G+2 Story Building

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Abstract: ***The principle objective of this project is to analyse and design a multi-storied building {G + 2(3-dimensional frame)} using STAAD Pro.***
The design involves load calculations manually and analysing 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 and manually checked the accuracy of the software with our results.
The results proved to be very accurate. We analysed and designed a G +1 storey building (2-D Frame) initially for all possible load combinations (dead and live). STAAD. Pro has 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 G + 2 3-D RCC frame under various load combination.

I. INTRODUCTION TO STAAD PRO

STAAD's full form is Structural Analysis and Design. STAAD Pro is one of the popular software that is used for analysing & designing structures like – buildings, towers, bridges, industrial, transportation, and utility structures. Designs may include any building structures like tunnels, culverts, bridges, piles, and petrochemical plants; and building materials like timber, concrete, steel, cold-formed steel, and aluminium.
STAAD or STAAD.Pro was developed by Research Engineers International at Yorba Linda, CA in 1997.
To get rid of the boring & time-consuming manual procedures Structural Engineers started using automated software STAAD.Pro
STAAD.Pro is one of the most widely-used software for developing and analysing the designs of various structures, such as petrochemical plants, tunnels, bridges, etc. STAAD.Pro v8i, the latest version, allows civil engineering individuals to analyse structural designs in terms of factors like force, load, displacements, etc.

A. Features Of Staad Pro

1) Model Development.
2) GUI based modelling.
3) Analysis and Design tool.
4) Input File/Output File.
5) Report Generation.
6) Results as per Indian and other standards.

II. OBJECTIVES

Computer aided analysis and design of residential building by using STAAD PRO Includes -

1) Generation of structural framing plan
2) Creation of model of structure in STAAD PRO
3) Application of various load combinations on the member
4) Analysis of the structure
5) Design of the structure

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III. METHODOLOGY

1) *Step 1:* To model the residential building using the STAAD Pro software and analyse the same structure using STAAD Pro.
2) *Step 2:* To analyse the residential building and structural elements like beams, stairs, columns, slabs.
3) *Step 3:* To design the residential building using STAD Pro - To design the structural elements like beams, stairs, columns, slabs using software.

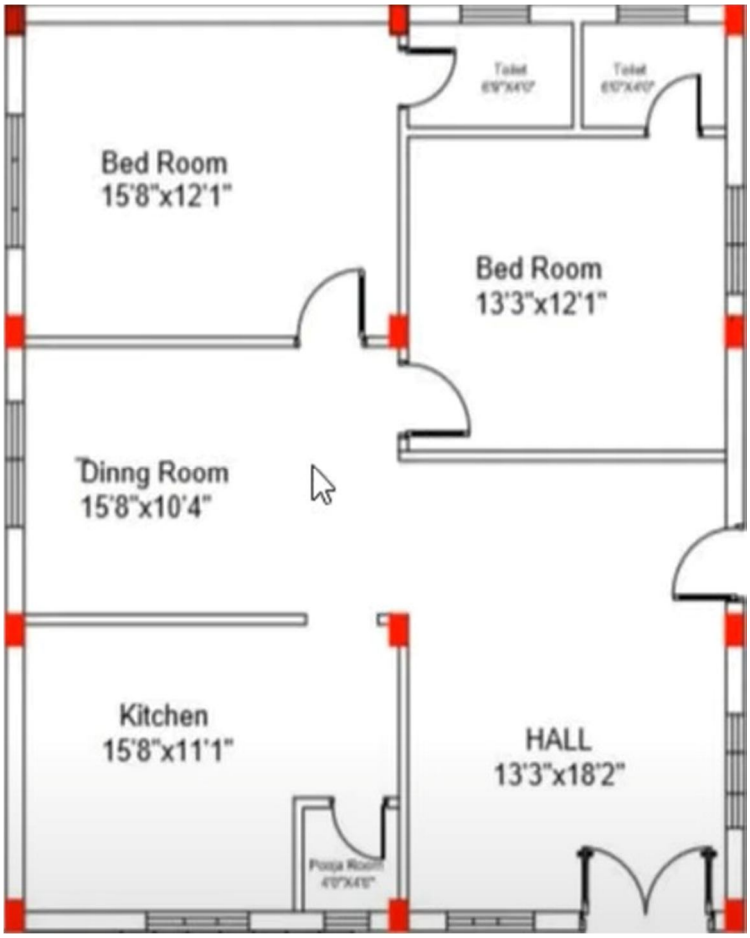


Fig.1-Plan of the Structure

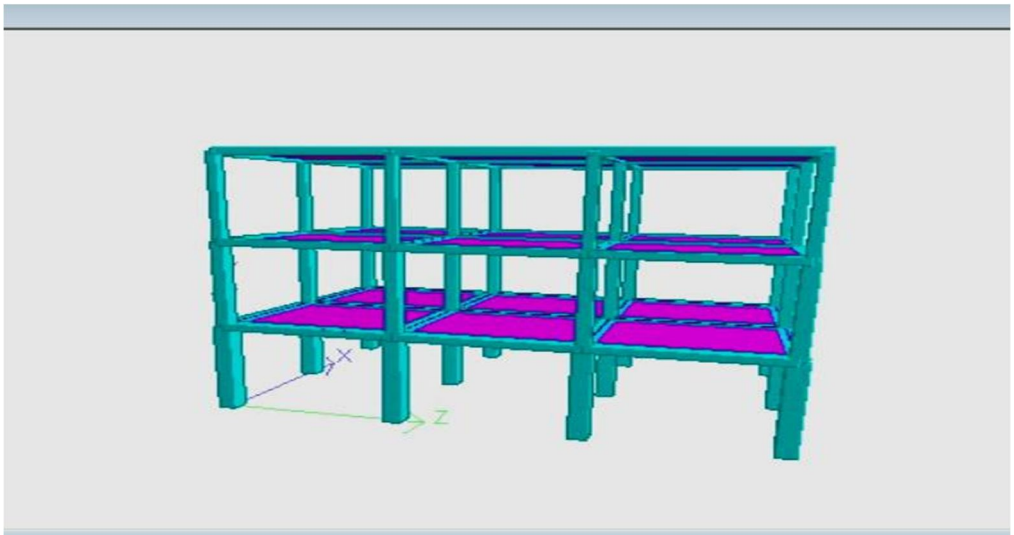


Fig.2- 3D Rendered View of Structure after assigning properties

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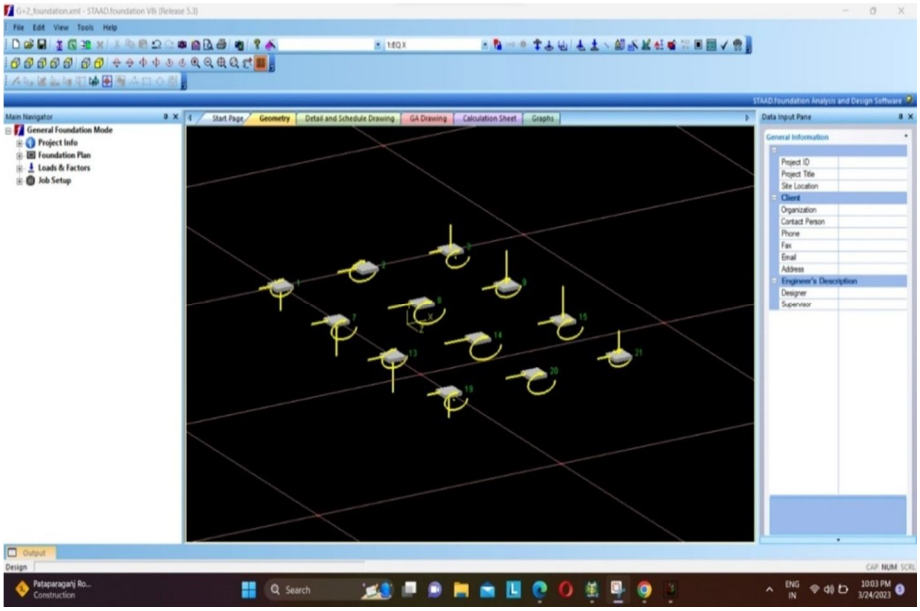


Fig.3- Column Position

IV. DESIGN OF RCC ELEMENTS

1) Design of Beams

- b = 230 mm
- D = 400 mm
- Cover = 25 mm
- fck = 25 N/mm2
- fy = 550 N/mm2
- Mu = KN-m

2) Design of columns:

- b = 400 mm
- D = 400 mm
- Cover = 40 mm
- fck = 25 N/mm2
- fy = 550 N/mm2
- Pu = KN
- Mz = KN-m
- My = KN-m

3) Design of Footings

- b = 400 mm
- D = 400 mm
- Safe bearing capacity = 200 KN/m2
- Provided dimensions of combined footing = 3.5m * 8m(on node no 101 &102 having c/c distance 2.4m)
- Depth of footing = 600 mm
- Reinforcement of combined footing =longitudinal direction 12 mm dia. @ 120mm & transverse direction 24mm dia. @ 80mm c/c
- Provided dimensions of isolated footing = 1.8m * 1.8m
- Depth of isolated footing = 800 mm
- Reinforcement for individual footing = 16 mm dia. @ 300mm c/c

V. CONCLUSIONS

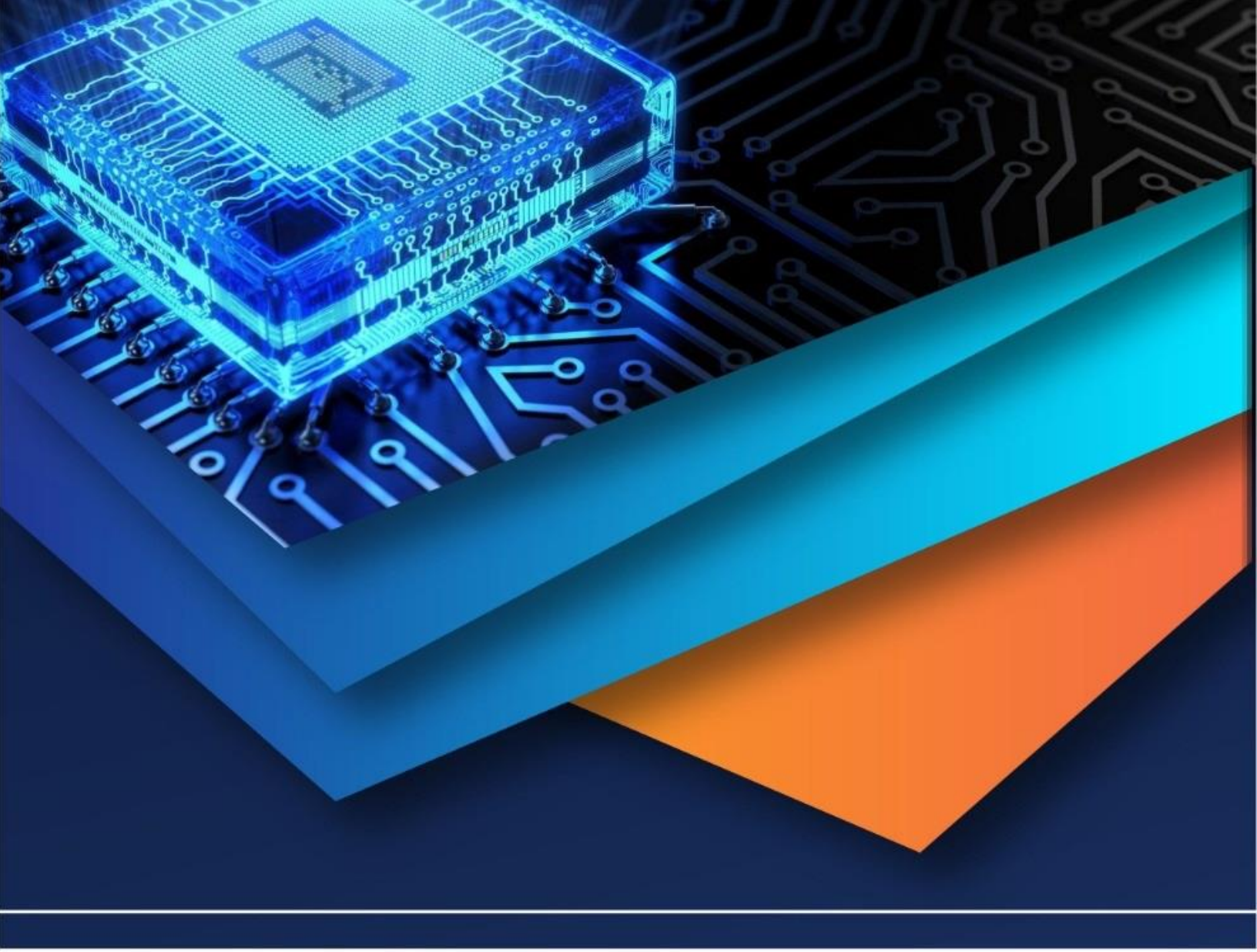
1) The structural elements of building are safe in flexure and shear.
2) Quantity of steel provided for building is economical and adequate.
3) Proposed sizes of structural elements can be used in building as it is.
4) The design of beam, slab, column, footing and stair case are safe in deflection, bending, shear and other aspects.
5) On comparison of the manual design and geometrical model using STAAD Pro, the area of steel required for beam, column, footing, slab, staircase are comparatively similar to that of the requirement.

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SOFTWARE
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