Analysis And Design of A Multi Storey Residential Building G+5 Using Staad Pro

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Abstract- *In order to compete in the ever growing marketit is very important for a structural engineer to save time. Structural design is the main aspect of civil engineering. For analysing a multi storied building, one has to consider all the possibilities of loadings and see that the structure is safe against all possible loading conditions. There are several methods for analysing of different frames like kani's method, cantilever method, portal method, Matrix method.*

This project deals with the analysis and design of a multi storeyed residential building using staad pro. The live loads& dead loads are applied and the design for beams, columns, footing is obtained STAAD Pro with its new features surpassed its predecessors, and compotators with its data sharing capabilities with other major software like AutoCAD. We concluded that staad pro is a very powerful tool which can save much time and is very accurate in design. Finally we concluded that staad pro package is suitable for the design of a multi-storeyed building.

Keywords- Auto CAD, STAAD PRO, Shear force, Bending moments,Manual

I. INTRODUCTION

A residential area is a land used in which housing predominates, as opposed to industrial and commercial areas. These include single-family housing, multi-family residential, or mobile homes. Residential zoning usually includes a smaller floor area ratio than business, commercial or industrial/manufacturing zoning. The area may be large or small. The principle objective of this project is to Plan, analyze and design of an residential building manually and also compare the manually obtained results with the results obtained by using the STAAD Pro software. We propose use M_{25}concrete and Fe415 bars for all structural components like slabs, beams, columns and Foundation. We have used the AUTO CAD for effective representation of the plans.

1.1 **Classification of shear wall**

Shear walls are classified based on materials used for construction. Some of them are:

i. RCC Shear Wall
ii. RC Hollow Concrete Block Masonry Wall
iii. Steel Plate Shear Wall
iv. Flanged Cantilever Shear Walls

We have chosen STAAD Pro because of its following Advantages:

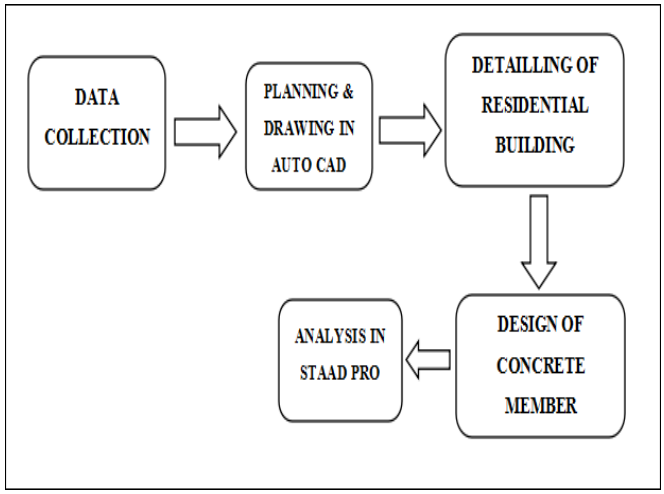
- Easy to use interface, and Accuracy of the solution.
- Conformation with the Indian Standard Codes.
- Versatile nature of solving any type of problem.

II. METHODOLOGY

Analysis of a structure for resistingforces is the basic need of this study. The methodology adopted to achieve the objectives of the study, and the analysis procedures applied to investigate various method.

The main objectives of this project are as follows:

1. To study the behavior of providing shear walls in high rise building.
2. Different location of shear wall in R.C. building will be modeled in STAAD-Pro software.
3. To calculate different parameters in the modeled structure.



III. PLANNING

Building planning is mostly done by architects. But even Engineers some time have to perform this job. Hence knowledge of building planning in its board prospective is essential for all the civil engineers also. There may be two conditions of planning for an architect or engineer. When site plan is given ,when site plan is yet to be decided in the latter case, architect can show his full competence by suitably selecting the site, orientation, planning and designing the building.

Table -1: The dimensions and size of individual elements.

Parameter	Dimensions
Height of the Each Storey	3m
Number of floors	G+5
Column Size	0.3mx0.6m
Beam Size	0.23mx0.45m
Slab Thickness	0.15m
Shear Wall Thickness	0.23m
Proposed Software	Staad pro

Table -2: Properties of Materials & Gravity Loads

Property of Material	Loads
Grade of Concrete	M25
Grade of Steel	Fe 415
Unit Weight of Concrete	25 kN/m^3
Live Load (Roof Level)	3 kN/m^2
Live Load (Terrace)	1.5 kN/m^2
Floor Finish Load	1.0 kN/m^2
Terrace Finish Load	1.5 kN/m^2

IV. STAAD PRO OUTPUT

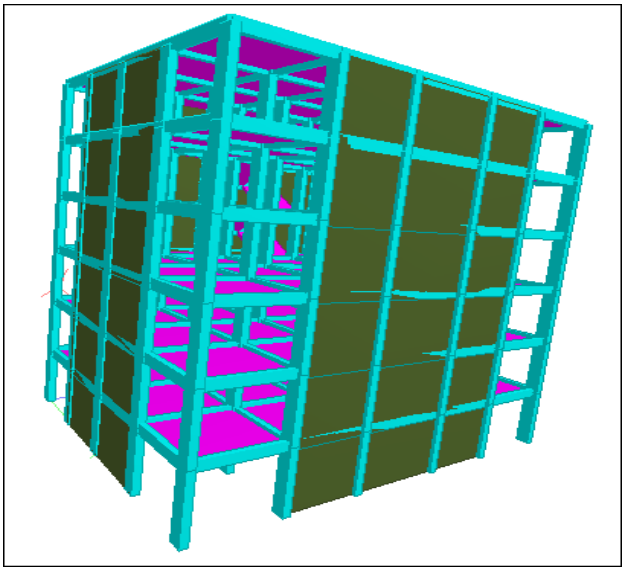


Fig1: 3D rendering model of building plan

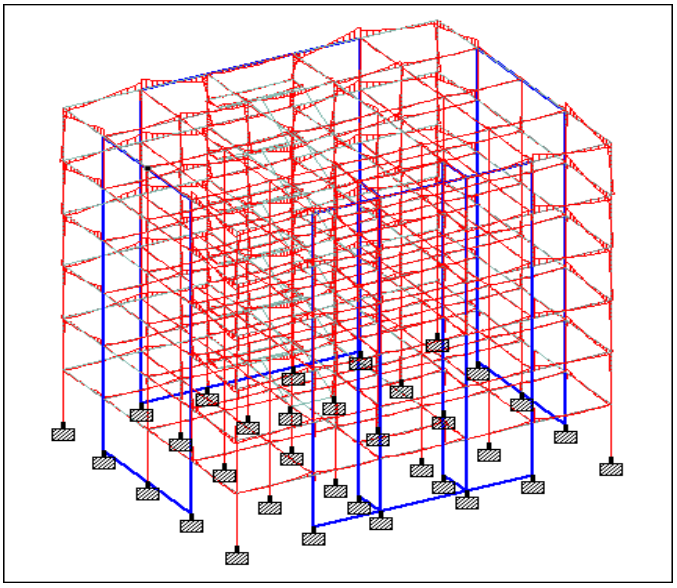


Fig2: Bending moment on member

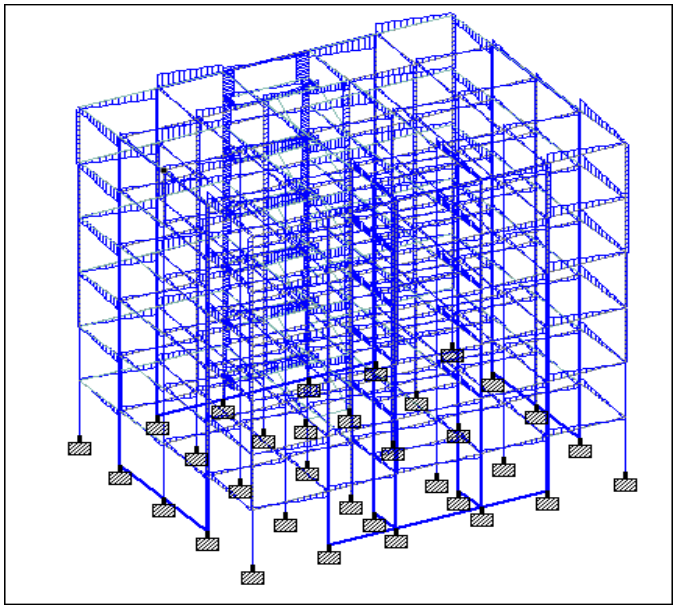


Fig3: Shear force on member

V. CALCULATIONS

COLUMN NO. 8 DESIGN RESULTS

M25 Fe415 (Main) Fe415 (Sec.)

LENGTH: 1500.0 mm CROSS SECTION: 600.0 mm X 300.0 mmCOVER: 40.0 mm

** GUIDING LOAD CASE: 4 END JOINT: 3 SHORT COLUMN

REQD. STEEL AREA : 565.00 Sq.mm.

REQD. CONCRETE AREA: 70624.90 Sq.mm.

MAIN REINFORCEMENT : Provide 8 - 12 dia. (0.50%, 904.78 Sq.mm.)

(Equally distributed)

TIE REINFORCEMENT : Provide 8 mm dia. rectangular ties @ 190 mm c/c

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)

Puz : 2194.50 Muz1 : 85.07 Muy1 : 177.46

INTERACTION RATIO: 0.17 (as per Cl. 39.6, IS456:2000)

SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)

WORST LOAD CASE: 1

END JOINT: 61 Puz : 2296.43 Muz : 91.35 Muy : 194.66 IR: 0.16

B E A M N O. 121 D E S I G N R E S U L T S

M25 Fe415 (Main) Fe415 (Sec.)

LENGTH: 3657.6 mm SIZE: 230.0 mm X 450.0 mm COVER: 25.0 mm

SUMMARY OF REINF. AREA (Sq.mm)

SECTION 0.0 mm 914.4 mm 1828.8 mm 2743.2 mm 3657.6 mm

TOP 197.38 197.38 0.00 0.00 197.38

REINF. (Sq. mm) (Sq. mm) (Sq. mm) (Sq. mm) (Sq. mm)

BOTTOM 0.00 197.38 197.38 197.38 197.38

REINF. (Sq. mm) (Sq. mm) (Sq. mm) (Sq. mm) (Sq. mm)

SUMMARY OF PROVIDED REINF. AREA

SECTION 0.0 mm 914.4 mm 1828.8 mm 2743.2 mm 3657.6 mm

TOP 2-12í 2-12í 2-12í 2-12í 2-12í

REINF. 1 layer(s) 1 layer(s) 1 layer(s) 1 layer(s) 1 layer(s)

BOTTOM 2-12í 2-12í 2-12í 2-12í 2-12í

REINF. 1 layer(s) 1 layer(s) 1 layer(s) 1 layer(s) 1 layer(s)

SHEAR 2 legged 8í 2 legged 8í 2 legged 8í 2 legged 8í 2 legged 8í

REINF. @ 145 mm c/c @ 145 mm c/c @ 145 mm c/c @ 145 mm c/c @ 145 mm c/c

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SHEAR DESIGN RESULTS AT DISTANCE d (EFFECTIVE DEPTH) FROM FACE OF THE SUPPORT

SHEAR DESIGN RESULTS AT 569.0 mm AWAY FROM START SUPPORT

VY = 13.63 MX = 0.00 LD= 4

Provide 2 Legged 8í @ 145 mm c/c

SHEAR DESIGN RESULTS AT 569.0 mm AWAY FROM END SUPPORT

VY = -14.28 MX = 0.00 LD= 4

Provide 2 Legged 8í @ 145 mm c/c

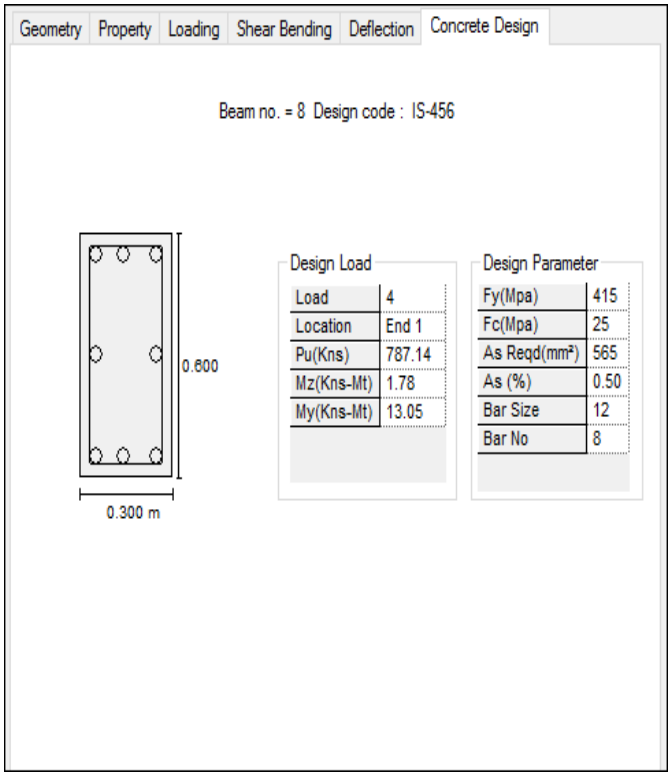

Fig4: Column design in STAAD.PRO

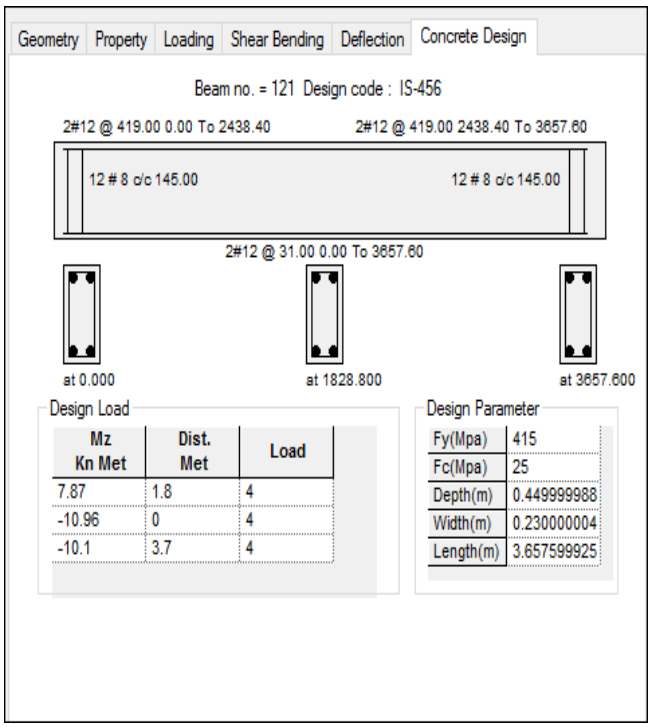

Fig5: Beam design in STAAD.PRO

VI. CONCLUSION

- Using STADD Pro., analysis and design of multi-storey building has completed much quickly and easier than the manual calculation.
- The dimensions of structural members are specified and the loads such as live load, dead load, roof load and floor loads are applied.
- Bending moments and shear forces are checked for beams, columns and slabs.
- Percentage variation between manual and staad pro (shear forces) =4.32%
- Percentage variation between manual and staad pro (column A_{st}) =1.24%
- Very less space is required for the storage of the data.

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