

Analysis and Design of G+4 RCC Building Using Staad Pro

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Abstract - Structural engineering plays a crucial role in ensuring that buildings are safe, serviceable, durable, and economical. The integration of computer-aided design tools has transformed the way engineers approach structural analysis and design. Among the various software available, STAAD Pro are the most widely used programs for analysing and designing building structures. Each offers unique modelling approaches, analysis techniques, and design capabilities, making a comparative evaluation valuable for engineers and researchers.

This study focuses on the design and comparative analysis of a building using STAAD Pro. The primary objective is to examine and compare the structural behaviour, load distribution, member forces, and overall economy of the design obtained from both software. G+4 (Ground plus 4 floors) building is modelled in both platforms, applying identical material properties, loading conditions, and design parameters as per relevant Indian Standards (IS codes).

The analysis results are compared in terms of parameters such as bending moments, shear forces, deflections, and reinforcement requirements. The comparative study highlights the differences in analytical accuracy, design output, and software usability. The outcome of this research provides insights into the efficiency and reliability of each software package and assists engineers in selecting the appropriate tool for structural design of buildings.

Key Words: Stadd pro design, analysis, deflection, shear force, bending moment.

1. INTRODUCTION

1.1 General- Structural design is an art and science of creating structures that are not only safe and serviceable but also durable, economical, and elegant in appearance. The design process involves more than just the application of formulas and codes — it requires imagination, creativity, and sound engineering judgment. A good structural design must satisfy all essential requirements: it must be safe against collapse, functional under service loads, durable throughout its intended life, and economical in terms of material usage and construction cost. Achieving a balance among these aspects is what makes structural engineering both a technical and artistic discipline.

The entire process of structural planning and design demands a combination of theoretical knowledge and practical

experience. It involves a clear understanding of the behaviour of different structural elements such as beams, columns, slabs, and foundations, as well as familiarity with design codes, construction practices, and local bye-laws. Moreover, a structural engineer must consider environmental factors, material properties, and the type of loading that the structure will encounter throughout its life span. These factors together form the foundation for developing a design that is reliable, sustainable, and adaptable to modern construction needs.

In the past, structural design and analysis were largely manual, relying heavily on simplified assumptions and laborious calculations. However, with the rapid advancement in computational technology, the field of structural engineering has undergone a revolutionary transformation. The introduction of computer-aided design (CAD) and finite element analysis (FEA) tools has made it possible to model, analyse, and design complex structures with high precision and efficiency. Among these, STAAD Pro have emerged as two of the most powerful and widely used software programs in the field of structural engineering.

1.2 NEED FOR THE STUDY

The selection of appropriate software is essential for ensuring both the structural safety and economic efficiency of building projects. Although both STAAD Pro widely used, differences in their modelling capabilities, analysis methods, and design outputs can result in variations in structural behaviour and material usage. A comparative study between these software tools is therefore necessary to:

Evaluate their accuracy in predicting structural responses such as bending moments, shear forces, and deflections.
Assess their efficiency in material usage and cost-effectiveness.
Determine their suitability and user-friendliness for building design.

Such a study provides valuable insights for engineers, designers, and researchers in selecting the most appropriate tool for specific structural projects.

1.3 OBJECTIVES OF THE STUDY

The main objectives of this research are:

- To design a multi-storey building using STAAD Pro according to IS codes.
- To analyze and compare the structural behavior in terms of bending moments, shear forces, axial forces, and deflections.

- To evaluate the differences in material quantities and design efficiency obtained from both software tools.
- To study the impact of seismic and wind loads on the building using both STAAD Pro.

1.4 SCOPE OF STUDY

The scope of this study includes:

- Structural analysis and design of a multi-storey reinforced concrete building.
- Application of Indian Standard (IS) codes for loads, design, and safety.
- Comparative evaluation of STAAD Pro based on:
 - Structural response (bending moment, shear force, axial force, and deflection)
 - Material consumption and cost-effectiveness
 - Design efficiency and user-friendliness
- Limitation to typical RC frame structures without considering complex foundation systems or non-structural architectural elements.

1.5 METHODOLOGY (OVERVIEW)

The research methodology consists of the following steps:

- Literature Review: Study previous research related to building design using STAAD Pro.
- Building Modeling: Create the building model, define geometry, material properties, and boundary conditions in both software.
- Load Application: Apply dead loads, live loads, wind loads, and seismic loads as per IS codes.
- Structural Analysis: Analyze the building in both STAAD Pro to determine structural responses.
- Design: Design beams, columns, slabs, and foundations in compliance with IS 456 and relevant design codes.
- Comparative Study: Compare results from both software in terms of structural behavior, material utilization, and design efficiency.
- Conclusion and Recommendations: Summarize findings and provide recommendations for software selection and best practices in building design.

2. OVERVIEW OF THE METHODOLOGY

The methodology adopted in this dissertation is aimed at performing a comprehensive analysis, design, and comparative evaluation of a Ground + 4 storey reinforced concrete building using STAAD Pro. These software packages are extensively used in professional structural engineering practice; however, differences in modeling philosophy, analysis approach, and design output often lead to variations in results.

To critically assess these differences, a systematic procedure is followed wherein the same building configuration, material properties, loading conditions, and design standards are applied in both software platforms. The entire methodology is structured to minimize subjective assumptions and to ensure uniformity, thereby enabling a meaningful comparison of results.

2.1 SELECTION AND DESCRIPTION OF THE BUILDING MODEL

2.1.1 Rationale for Selection of G+4 Building

A G+4 building is chosen for the present study as it represents a commonly constructed low-rise structure in urban and semi-urban regions of India. Such buildings are primarily governed by gravity loads, with seismic forces playing a significant role depending on the seismic zone. The selected height allows for evaluation of lateral load behaviour while keeping the structural system relatively simple and economical.

2.1.2 General Building Details

The building is assumed to be a regular RCC framed structure with uniform storey heights and a symmetrical plan layout. Regularity in plan and elevation ensures that torsional effects are minimized and that the comparison between software outputs is not influenced by geometric irregularities.

- Structural system: Reinforced concrete moment-resisting frame
- Number of storeys: Ground + 4
- Storey height: 3.20 m
- Total structural height: 16.50 m
- Floor system: Cast-in-situ RCC slab supported on beams
- Support condition: Fixed supports at foundation level

The building is assumed to be resting on firm soil strata, and soil-structure interaction effects are not considered in the present study.

2.2 MATERIAL PROPERTIES AND DESIGN STANDARDS

2.2.1 Material Specifications

The material properties used for analysis and design are selected in accordance with Indian Standard codes and are uniformly applied in both software packages.

Concrete

- Grade: M30
- Unit weight: 25 kN/m³
- Modulus of elasticity: Calculated as per IS 456:2000

Reinforcing Steel

- Grade: Fe 500
- Unit weight: 78.5 kN/m³

These material properties ensure adequate strength and durability for construction and reflect common engineering practice.

2.2.2 Design Codes Considered

The following Indian Standard codes are adopted throughout the study:

- IS 456:2000 – Plain and Reinforced Concrete – Code of Practice
- IS 875 (Part 1):1987 – Dead Loads
- IS 875 (Part 2):1987 – Live Loads
- IS 1893 (Part 1):2016 – Criteria for Earthquake Resistant Design of Structures

2.3 STRUCTURAL MODELING PROCEDURE

2.3.1 Modeling Philosophy

Accurate modelling is a critical step in structural analysis. In this study, care is taken to replicate the same structural configuration in both STAAD Pro, despite differences in their modelling environments. Member sizes, connectivity, and boundary conditions are maintained consistently to ensure uniform load transfer behavior.

2.3.2 Modeling of Structure in STAAD Pro

In STAAD Pro, the structure is modelled as a three-dimensional space frame. The modelling procedure involves:

- Defining nodal coordinates corresponding to column locations
- Connecting nodes using beam elements to represent beams and columns
- Assigning cross-sectional dimensions and material properties to all members
- Specifying fixed support conditions at the base of columns
- Representing slab action through floor load distribution on beams

Since STAAD Pro does not automatically model slab diaphragm action, slab loads are applied manually to beams, and load distribution is carefully verified.

2.4 LOAD ESTIMATION AND APPLICATION

2.4.1 Dead Load Calculation

Dead loads consist of the permanent loads acting on the structure. These include the self-weight of all structural components, which is automatically calculated by both software packages.

Additional dead loads considered are:

- Floor finish load
- Masonry wall load
- Roof finishing and waterproofing load

Dead loads are computed in accordance with IS 875 (Part 1):1987 and applied uniformly in both models.

2.4.2 Live Load Consideration

Live loads represent the transient loads due to occupancy. Based on the nature of the building, live loads are applied as per IS 875 (Part 2):1987.

- Typical floor live load: 3.0 kN/m²
- Roof live load: As specified by the code

Live load reductions, where applicable, are applied consistently in both software packages.

2.4.3 Seismic Load Assessment

Seismic loads are calculated using the equivalent static method as per IS 1893(Part 1):2016. The following seismic parameters are defined:

- Seismic zone factor
- Importance factor for buildings
- Response reduction factor corresponding to RCC moment-resisting frames
- Soil type

Seismic forces are applied along both principal horizontal directions, and the resulting base shear is distributed along the height of the structure as per code provisions.

2.4.4 Load Combinations

To ensure structural safety under various loading conditions, load combinations are generated in accordance with IS 456 and IS 1893. These combinations account for possible simultaneous action of gravity and lateral loads.

2.5 ANALYSIS METHODOLOGY

Linear static analysis is carried out in both STAAD Pro. The analysis provides internal force results and global response parameters, including:

- Bending moments and shear forces in beams
- Axial forces in columns
- Storey-wise displacement
- Inter-storey drift
- Base shear

The analysis results are carefully extracted for identical members and storeys to facilitate accurate comparison.

2.6 DESIGN METHODOLOGY

2.6.1 Design of Structural Members Using STAAD Pro

STAAD Pro performs the design of RCC beams and columns based on limit state principles as per IS 456:2000. The software calculates the required reinforcement by considering the most critical load combinations.

Design output includes:

- Area of longitudinal reinforcement
- Shear reinforcement spacing
- Member utilization ratios

2.7 COMPARATIVE EVALUATION

The comparative study is conducted based on the following parameters:

- Bending moment and shear force values
- Axial load variation in columns
- Storey displacement and drift
- Base shear distribution
- Reinforcement quantity and detailing
- Modeling effort and computational efficiency

Tabular and graphical comparisons are used to highlight differences between the two software tools.

2.8 INTERPRETATION AND DISCUSSION

Differences in analysis and design results are interpreted with respect to the inherent modeling assumptions, stiffness formulation, and load distribution mechanisms used by each software. The suitability of STAAD Pro for low-rise buildings is discussed based on accuracy, ease of use, and practical applicability.

2.9 POST PROCESSING FACILITIES

All output from the STAAD run may be utilized for further processing by the STAAD.Pro.

STABILITY REQUIREMENTS: Slenderness ratios are calculated for all members and checked against the appropriate maximum values. IS:800 summarize the maximum slenderness ratios for different types of members. In STAAD implementation of IS: 800, appropriate maximum slenderness ratio can be provided for each member. If no maximum slenderness ratio is provided, compression.

DEFLECTION CHECK: This facility allows the user to consider deflection as criteria in the CODE CHECK and MEMBER SELECTION processes. The deflection check may be controlled using three parameters. Deflection is used in addition to other strength and stability related criteria. The local deflection calculation is based on the latest analysis results.

CODE CHECKING: The purpose of code checking is to verify whether the specified section is capable of satisfying applicable design code requirements. The code checking is based on the IS: 800 (1984) requirements. Forces and moments at specified sections of the members are utilized for the code checking calculations. Sections may be specified using the BEAM parameter or the SECTION command. If no sections are specified, the code checking is based on forces and moments at the member ends.

GENERATION OF MEMBER PROPERTY & SUPPORTS: The base supports of the structure were assigned as fixed. The supports were generated using the STAAD.Pro support generator.

2.10 GENERATION OF MEMBER PROPERTY

Generation of member property can be done in STAAD.Pro by using the window as shown above. The member section is selected and the dimensions have been specified. The beams are having a dimension of 0.3*0.4 m and the columns are having a dimension of 0.4*0.4 m.

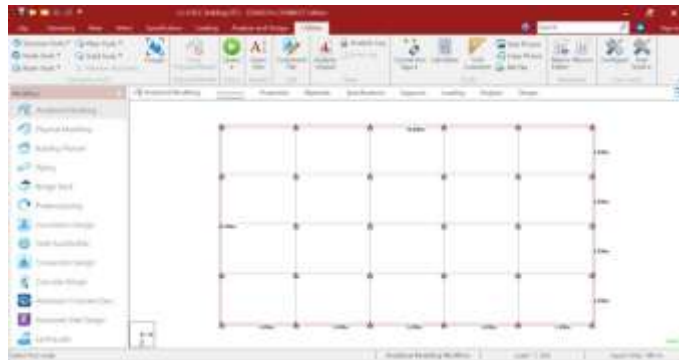


Figure 1: Plan of the G+4 RCC building

All columns = 0.40 * 0.40 m (15.75" x 15.75")

All beams = 0.30 * 0.40 m (11.81" x 15.75")

All slabs = 0.125 m thick

Physical parameters of building

Dead load on the floors is -10kN/m²

Live load on the roof is -3kN/m²

Grade of concrete M30

Grade of steel Fe500

Wind effect is not considered

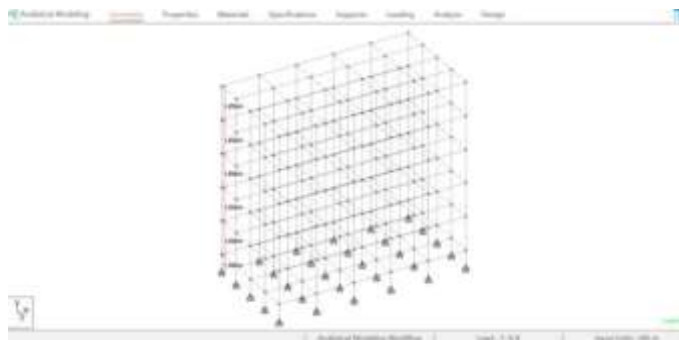


Figure 2: Elevation of the G+4 RCC building

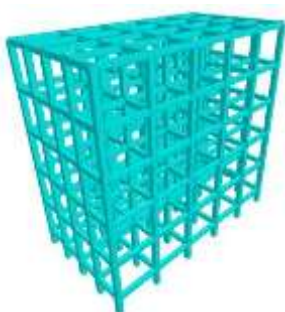


Figure 3: 3D View of the G+4 RCC building

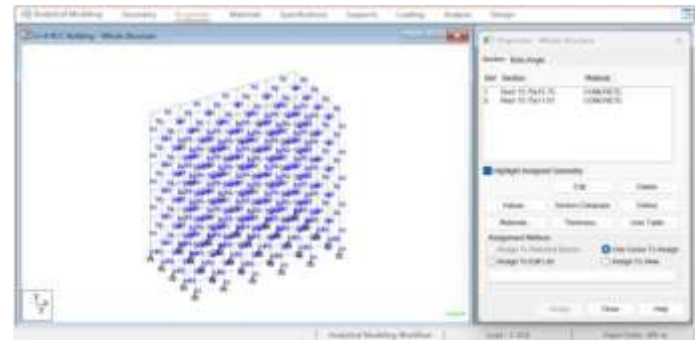


Figure 4: Member properties

Supports

The base supports of the structure were assigned as fixed. The supports were generated using the STAAD.Pro support generator.

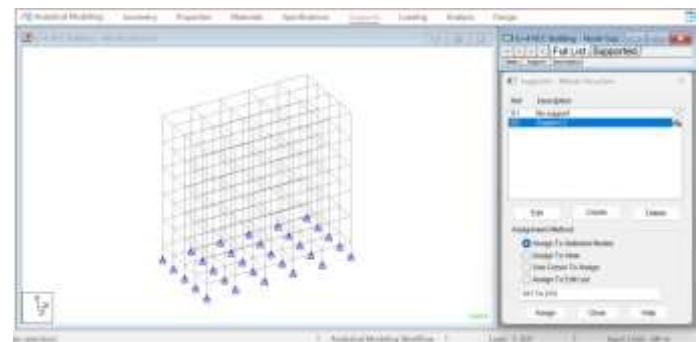


Figure 5: Fixing support of the structure

Materials of the structure

The materials for the structure were specified as concrete with their various constants as per standard IS code of practice.

Loading

The loadings were calculated partially manually and rest was generated using STAAD.Pro load generator. The loading cases were categorized as

- Self-weight
- Dead load from slab
- Live load
- Seismic load
- Load combinations

2.11 SELF- WEIGHT

The self-weight of the structure can be generated by STAAD.Pro itself with the self-weight Command in the load case column.

2.12 DEAD LOAD

Dead load from slab can also be generated by STAAD.Pro by specifying the floor thickness and the load on the floor per sqm. Calculation of the load per sq m was done considering the weight of beam, weight of column, weight of RCC slab, weight of terracing, external walls.

2.13 LIVE LOAD

The live load considered in each floor was 3.0 KN/sq m. The live loads were generated in a similar manner as done in the earlier case for dead load in each floor. This may be done from the member load button from the load case column.

2.14 SEISMIC LOAD

The seismic load values were calculated as per IS 1893-2002/2005. STAAD.Pro has a seismic load generator in accordance with the IS code mentioned.

General Format > Define 1893 Load > Zone As Per 1893- Spec > Self-weight > Joint Weight



Figure 8: Seismic Definition

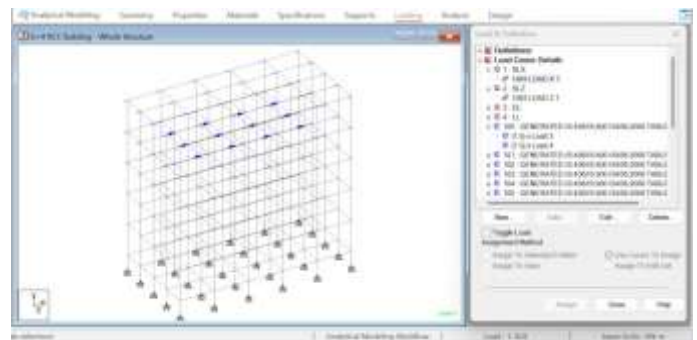


Figure 9: Structure under Seismic load

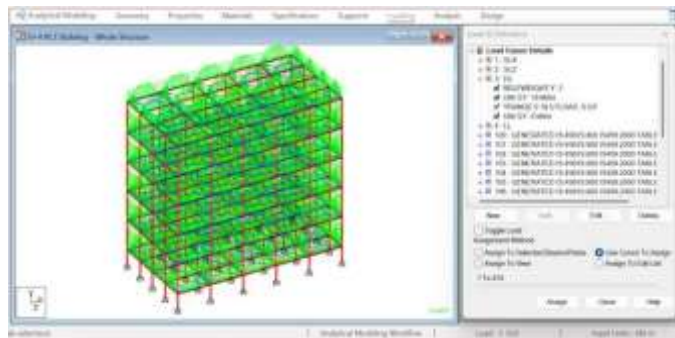


Figure 6: Dead Load

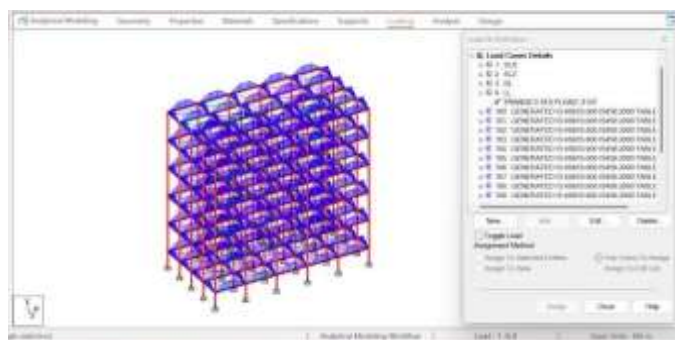


Figure 7: Live Load

2.15 LOAD COMBINATION

The structure has been analyzed for load combinations considering all the previous loads in proper ratio. In the first case a combination of self-weight, dead load, live load and wind load was taken in to consideration. In the second combination case instead of wind load seismic load was taken into consideration.

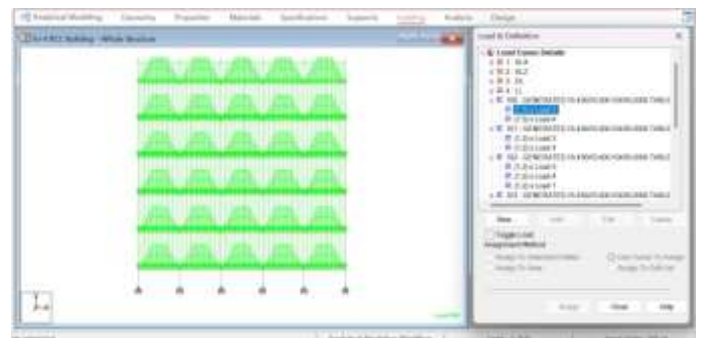


Figure 10: Structure under Combination load



Figure 11: Analysis window



Figure 12: Beam Design

2.16 COLUMN DESIGN

A column may be defined as an element used **primarily** to support axial compressive loads and with a height of a least three times its lateral dimension. The strength of column depends upon the strength of materials, shape and size of cross section, length and degree of proportional and dedicational restrains at its ends.

Section Properties

- Beam size: $b = 400 \text{ mm}$, $D = 400 \text{ mm}$
- Effective depth: $d \approx D - \text{cover} - \frac{\phi}{2}$
- Assuming 40 mm cover and 12 mm bars: $d = 400 - 40 - 6 = 354 \text{ mm}$

Applied Loads

From the design table:

- Axial load $P_u = -3.0 \text{ kN}$ (compression, negligible compared to bending)
- Moment $M_z = 65.08 \text{ kN}\cdot\text{m} = 65.08 \times 10^6 \text{ N}\cdot\text{m}$

Material Properties

- Concrete grade: M30 $\rightarrow f_{ck} = 30 \text{ MPa}$
- Steel grade: Fe500 $\rightarrow f_y = 500 \text{ MPa}$

Required Steel Area

Using IS 456 limit state design:

$$M_u = 0.87 f_y A_{st} d \left(1 - \frac{A_{st} f_y}{f_{ck} b d}\right)$$

For trial, assume tension-controlled section. Simplify with approximate formula for balanced section:

$$A_{st} = \frac{M_u}{0.87 f_y j d}$$

where $j \approx 0.9$.

$$A_{st} = \frac{65.08 \times 10^6}{0.87 \times 500 \times 0.9 \times 354}$$

$$A_{st} \approx 1180 \text{ mm}^2$$

STAAD output showed **1280 mm² required**, which matches closely.

Provided Steel

- 12 bars of 12 mm dia $\rightarrow$ area per bar $= \pi \times (12^2) / 4 = 113 \text{ mm}^2$
- Total $= 12 \times 113 = 1356 \text{ mm}^2$ So,

provided > required $\rightarrow$ section is safe.

Percentage of Steel

$$p = \frac{A_{st}}{b d} \times 100 = \frac{1356}{400 \times 354} \times 100 \approx 0.96\%$$

IS 456 minimum steel $= 0.85\%$ for Fe500 $\rightarrow$ safe.

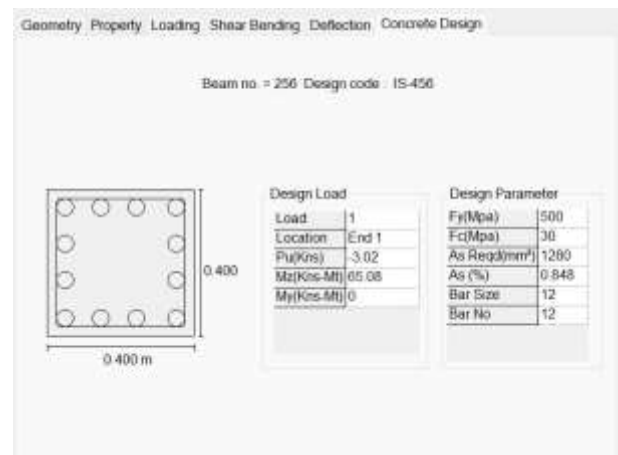


Figure 13: Column Design

Required steel $\approx 1180\text{--}1280 \text{ mm}^2$

Provided steel $= 1356 \text{ mm}^2$

Section is safe in bending under the given load.

2.17 ANALYSIS RESULTS

2.17.1 GEOMETRY & PROPERTY OF BEAM



Figure 14: Beam Geometry

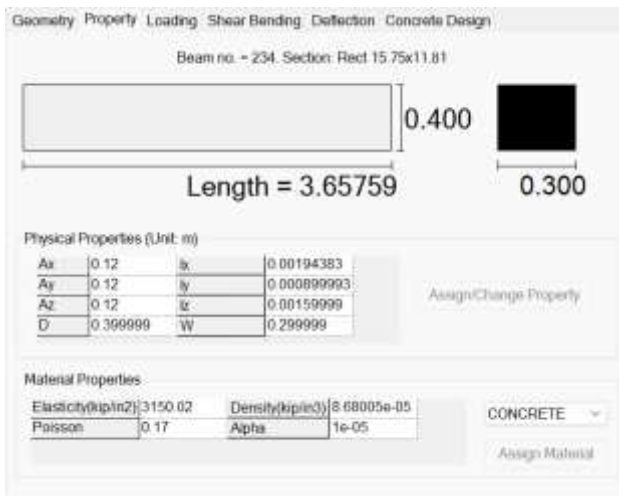


Figure 15: Beam Property

2.17.2 SHEAR BENDING & DEFLECTION OF BEAM

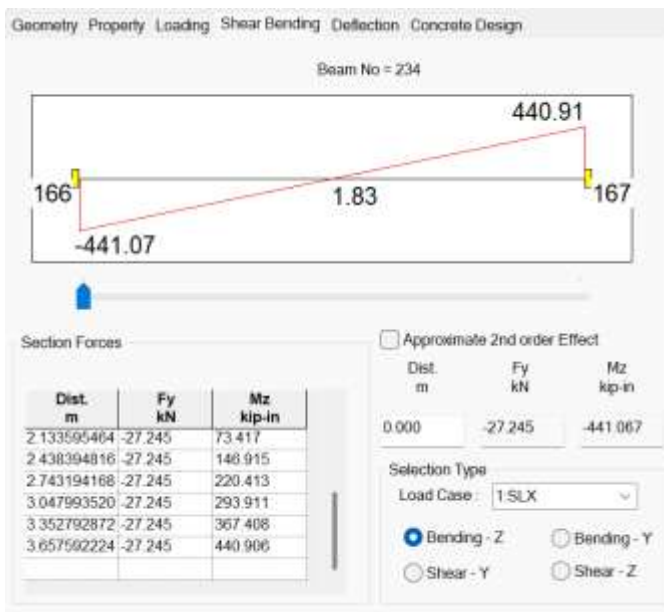


Figure 16: Beam Shear bending

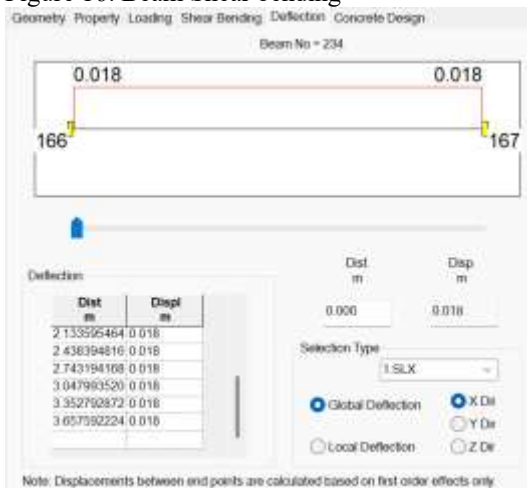


Figure 17: Beam Deflection

2.17.3 GEOMETRY & PROPERTY OF COLUMN

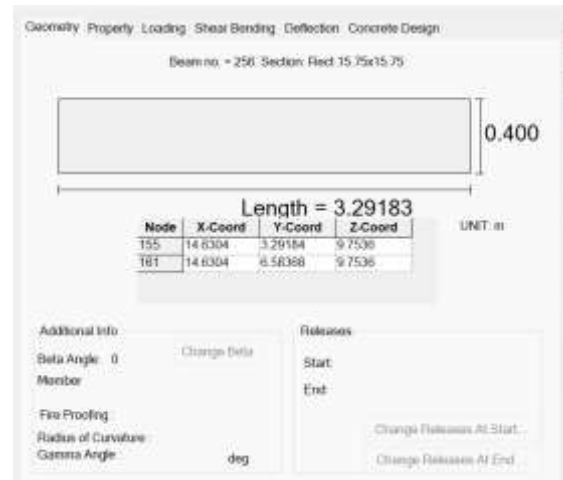


Figure 18: Column Geometry

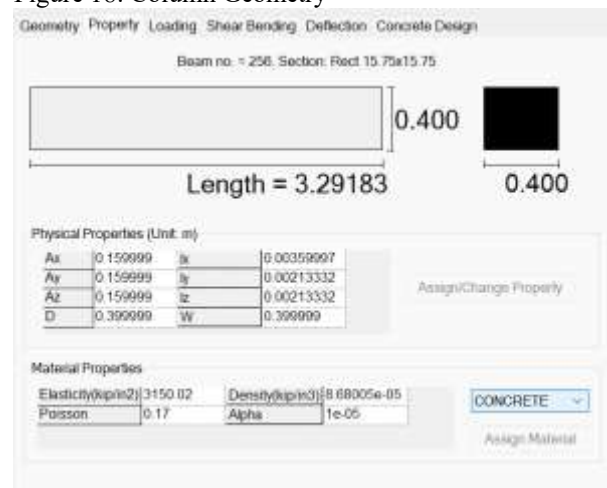


Figure 19: Column Property

2.17.4 SHEAR BENDING & DEFLECTION OF COLUMN

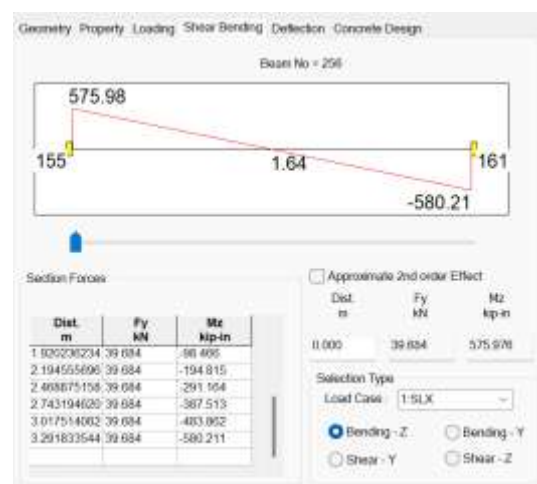


Figure 20: Column Shear bending

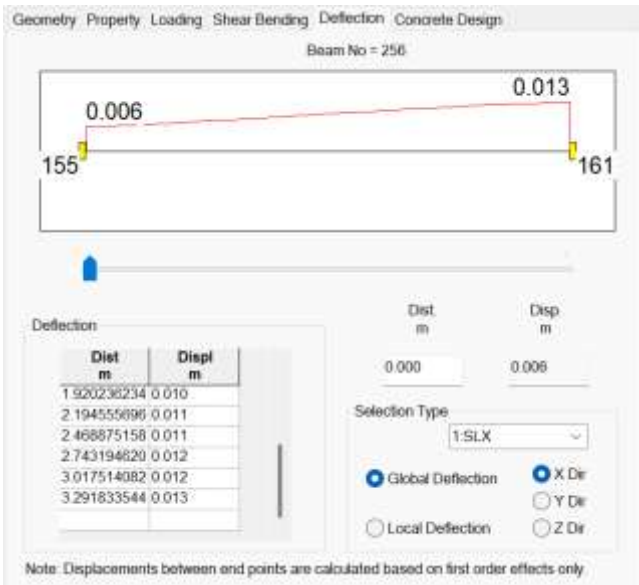


Figure 21: Column Deflection

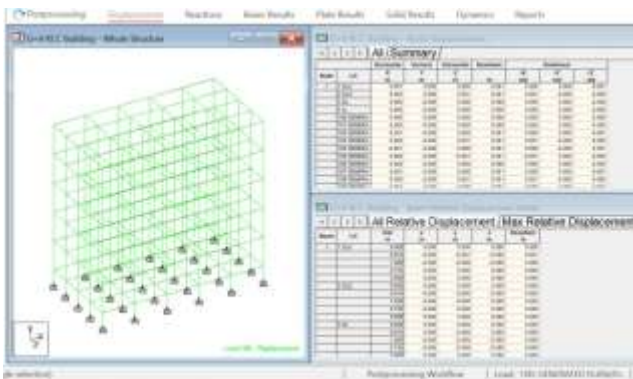


Figure 22: Column Deflection

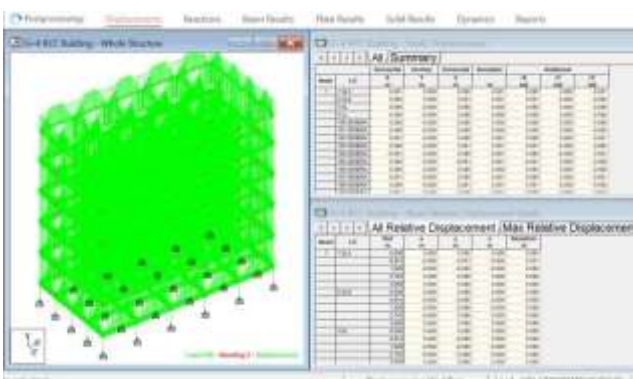


Figure 23: Bending Z

2.18 DESIGN RESULTS

2.18.1 BEAM DESIGN SUMMARY

Table 1: Reinforcement Summary

Section (mm)	Top Reinforcement (mm ²)	Bottom Reinforcement (mm ²)
0	890.51	503.02
914.4	287.67	327.3
1828.8	185.64	185.64
2743.2	291.64	330.89
3657.6	895.93	506.78

Table 2: Provided Reinforcement Details

Section (mm)	Top Reinforcement	Bottom Reinforcement
0	8 × 12 mm (2 layers)	5 × 12 mm (1 layer)
914.4	3 × 12 mm (1 layer)	3 × 12 mm (1 layer)
1828.8	3 × 12 mm (1 layer)	3 × 12 mm (1 layer)
2743.2	3 × 12 mm (1 layer)	3 × 12 mm (1 layer)
3657.6	8 × 12 mm (2 layers)	5 × 12 mm (1 layer)

Table 3: Shear Reinforcement

Location	Shear Force XY (kN)	Result
560.6 mm from start support	+84.48	Provide 2-legged 10 mm stirrups @ 150 mm c/c
560.6 mm from end support	-84.99	Provide 2-legged 10 mm stirrups @ 150 mm c/c

IS-456 - 2000 BEAM DESIGN RESULTS

IS-456 LIMIT STATE DESIGN
BEAM NO. 1 DESIGN RESULTS

H309 Fe500 (Plain) Fe500 (Sec.)
LENGTH: 3657.6 mm SIZE: 300.0 mm X 400.0 mm COVER: 30.0 mm

SUMMARY OF REINF. AREA (Sq. mm)

SECTION	0.0 mm	914.4 mm	1828.8 mm	2743.2 mm	3657.6 mm
TOP REINF.	1044.95 (Sq. mm)	354.42 (Sq. mm)	0.00 (Sq. mm)	270.96 (Sq. mm)	930.58 (Sq. mm)
BOTTOM REINF.	629.60 (Sq. mm)	414.49 (Sq. mm)	185.64 (Sq. mm)	338.98 (Sq. mm)	548.16 (Sq. mm)

SUMMARY OF PROVIDED REINF. AREA

SECTION	0.0 mm	914.4 mm	1828.8 mm	2743.2 mm	3657.6 mm
TOP REINF.	10-12d 2 layer(s)	4-12d 1 layer(s)	2-12d 1 layer(s)	3-12d 1 layer(s)	9-12d 2 layer(s)
BOTTOM REINF.	6-12d 1 layer(s)	4-12d 1 layer(s)	3-12d 1 layer(s)	3-12d 1 layer(s)	5-12d 1 layer(s)

SHEAR REINF. 2-legged 10d @ 150 mm c/c 2-legged 10d @ 150 mm c/c 2-legged 10d @ 150 mm c/c 2-legged 10d @ 150 mm c/c 2-legged 10d @ 150 mm c/c

SHEAR DESIGN RESULTS AT 555.9 mm AWAY FROM START SUPPORT
VY = 89.99 kN Mx = -0.11 kNm
Provide 2 Legged 10d @ 150 mm c/c

SHEAR DESIGN RESULTS AT 555.0 mm AWAY FROM END SUPPORT
VY = -90.42 kN Mx = -0.11 kNm
Provide 2 Legged 10d @ 150 mm c/c

2.18.2 COLUMN DESIGN SUMMARY

Table 4: Parameters of column

Parameter	Value
Concrete Grade	M30
Steel Grade (Main)	Fe500
Steel Grade (Sec.)	Fe500
Length	3291.8 mm
Cross Section	400 × 400 mm
Cover	40 mm
Guiding Load Case	1
End Joint	1
Type	Tension Column

Table 5: Reinforcement Details

Requirement	Value
Required Steel Area	1280 mm ²
Required Concrete Area	158,720 mm ²
Main Reinforcement	12 × 12 mm dia bars (0.85%, 1357.17 mm ²)
Distribution	Equally distributed
Tie Reinforcement	10 mm dia rectangular ties @ 190 mm c/c

Table 6: Section Capacity

Capacity	Value
Axial Load (Puz)	2622.72 kN
Moment (Muz1)	72.01 kN·m
Moment (Muy1)	72.01 kN·m
Interaction Ratio (IR)	0.76 (Cl. 39.6, IS 456:2000)

3. CONCLUSIONS

1. By Using STADD Pro., analysis and design of multistorey building is easier and quick process than manual process.
2. Proposed size of the beam and column can be safely used in the structure.
3. The structure is safe in shear bending and deflection.
4. There is no hazardous effect on the structure due to wind load and seismic load on the structure.
5. The structure we taken is stable and structurally defined using various loads and combination.
6. To know the behavior of the structure by applying various loads like dead load, live load, wind load and seismic load by using staad.pro. And also find out the Shear forces, displacement, bending and reactions of structure.

Table 7: Comparative insights on manual and automatic software design

Aspect	Manual Design	STAAD.Pro Design
Time	Slow, error-prone	Fast, automated
Accuracy	Depends on engineer	High, software-driven
Load Handling	Limited	Comprehensive (dead, live, seismic)
Visualization	2D drawings	3D models + diagrams
Code Compliance	Manual checks	Built-in IS code support

COLUMN

IS 456 - 2000 COLUMN DESIGN RESULTS

IS-456 LIMIT STATE DESIGN
COLUMN NO. 26 DESIGN RESULTS

M30 Fe500 (Main) Fe500 (Sec.)

LENGTH: 3291.8 mm CROSS SECTION: 400.0 mm X 400.0 mm COVER: 40.0 mm

** GUIDING LOAD CASE: 1 END JOINT: 1 TENSION COLUMN

REQD. STEEL AREA : 1280.00 Sq.mm.
REQD. CONCRETE AREA: 158720.00 Sq.mm.
MAIN REINFORCEMENT : Provide 12 - 12 dia. (0.85%, 1357.17 Sq.mm.)
(Equally distributed)
TIE REINFORCEMENT : Provide 10 mm dia. rectangular ties @ 190 mm c/c

SECTION CAPACITY BASED ON REINFORCEMENT REQUIRED (KNS-MET)

Puz : 2622.72 Muz1 : 72.01 Muy1 : 72.01

INTERACTION RATIO: 0.76 (as per Cl. 39.6, IS456:2000)

SECTION CAPACITY BASED ON REINFORCEMENT PROVIDED (KNS-MET)

WORST LOAD CASE: 113
END JOINT: 1 Puz : 2650.62 Muz : 96.87 Muy : 96.87 IR: 0.82

REFERENCES

1. Design and Analysis of Residential Building(G+4), Ibrahim, et.al (April 2019).
2. Planning, Analysis and Design of Residential Building(G+5) By using STAAD Pro, Dunnala Lakshmi Anuja, et.al (2019).
3. A Study on Design of Multi-Storey Residential Building, Mr K. Prabin Kumar, et.al (2018).
4. Analysis and Design of a (G+6) Multi-Storey Building Using STAAD Pro, Deevi Krishna Chaitanya, et.al (January, 2017).
5. R. D. Deshpande, et.al (June, 2017): Analysis, Design and Estimation of Basement+G+2 Residential Building.
6. IS 456-2000, Design of RCC elements
7. IS 1893(part 1): 2002 - for earthquake design
8. IS 875 part1 - dead loads
9. IS 875 part2 - live load
10. SP-16.

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