

# A COMPARITIVE INVESTIGATION AND DESIGN OF BUILDING COMPONENTS BY USING STAAD PRO, ANALYSIS

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## ABSTRACT

*One of the major problems facing by the INDIAN country is rapid growth of population which restricted the availability of the land. Moreover, even the available houses are let out at abnormal rent Charges. Hence an apartment building is proposed in this project. As per we know the strength of the building or apartment is fully depends upon the structures. For knowing about the structures, we should undergo on site investigation. This project we are going to study about the structural elements, on ongoing construction of G+4 Building located at Santha Peta, Nellore- 524004. The analysis of structural element was done by using the software analyzing as well as IS-456:2000 CODE of practice for reinforced cement concrete. Subsequently we are going to consider one outer column for design by using STAAD pro software and comparing of reinforcement details which is provided at site. After having design, the result & conclusion were made in this project. The project is to develop independent and creative thinking fundamental, theoretical knowledge. We obtain during the course of the study practical application of field. So that, we have the ability to learn about the design, on site construction of structures.*

**Key words:** G+4 Building, STAAD pro software, Reinforcement detailing.

## 1. INTRODUCTION

Now a days due to the over population in the urban cities and high cost of the land, there is a need to accommodate in multi-storey building. The determination of general shape specific dimension and size is known as structure analysis, so that it will perform the function for it create and will safely withstand the influences which will act on throughout its useful life. The entire process of structural planning and designing requires not only imaginations and calculations, but also science knowledge of structural engineering decide knowledge of particle aspect, such bye-laws and design codes, backed by sample experience and judgment. In this project we are going to consider one outer column for design by using STAAD pro software and comparing of reinforcement details which is provided at site. After having design, the result & conclusion were made in this project.

## 2. OBJECTIVE

The objectives of the project are mentioned below:

- To Draft the column Layout using AutoCAD.
- Analysis and Design of column on STAD Pro 2023.

## 3. ROLE OF AUTO CAD

AutoCAD is a commercial software application for 2D and 3D computer aided design and drafting for various fields in engineering like civil, mechanical, electrical, automation, architecture etc. It was first launched in 1982 by Autodesk, Inc.

AutoCAD Architecture allows designers to draw 3D objects such as walls, doors and windows, with more intelligent data associated with them rather than simple objects. The data can be programmed to represent products sold in the building industry, or it can be extracted into a file for pricing material estimation etc. In this project AutoCAD has been used extensively for drafting the column layout. Use of AutoCAD has drastically reduced the drafting time when done manually thus saving time which can be used in other productive work.

#### **4. ROLE OF STAAD PRO**

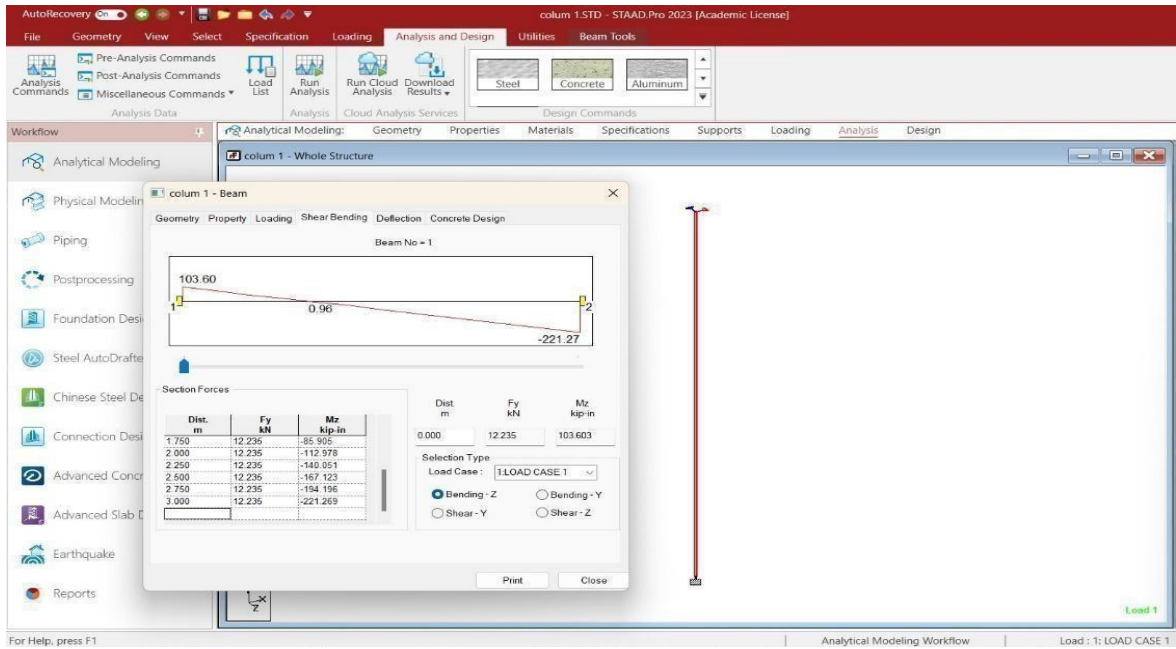
STAAD Pro has a very user-friendly interface and very useful for designing complex structures and analyzing them. STAAD Pro is a design and structural analysis program developed by Research Engineers International, CA. It was acquired by Bentley Systems in 2005. STAAD pro allows designers and structural engineers to design and analyze virtually any type of structure through its very flexible modelling environment, fluent data collection and advanced features. STAAD pro supports over 70 international codes including IS456:2000 15800:2007 and over 20 US codes in more than 7 languages. STAAD Pro also has the design feature which enables engineers to calculate the various design data including the reinforcement in case of concrete design. This feature also corrects the designers in case of any mistake and rectify it. It is also useful in cost estimation as it also gives the various quantities of steel, reinforcement and concrete take off thereby reducing the load of cost estimation from the engineer.

#### **5. METHODOLOGY**

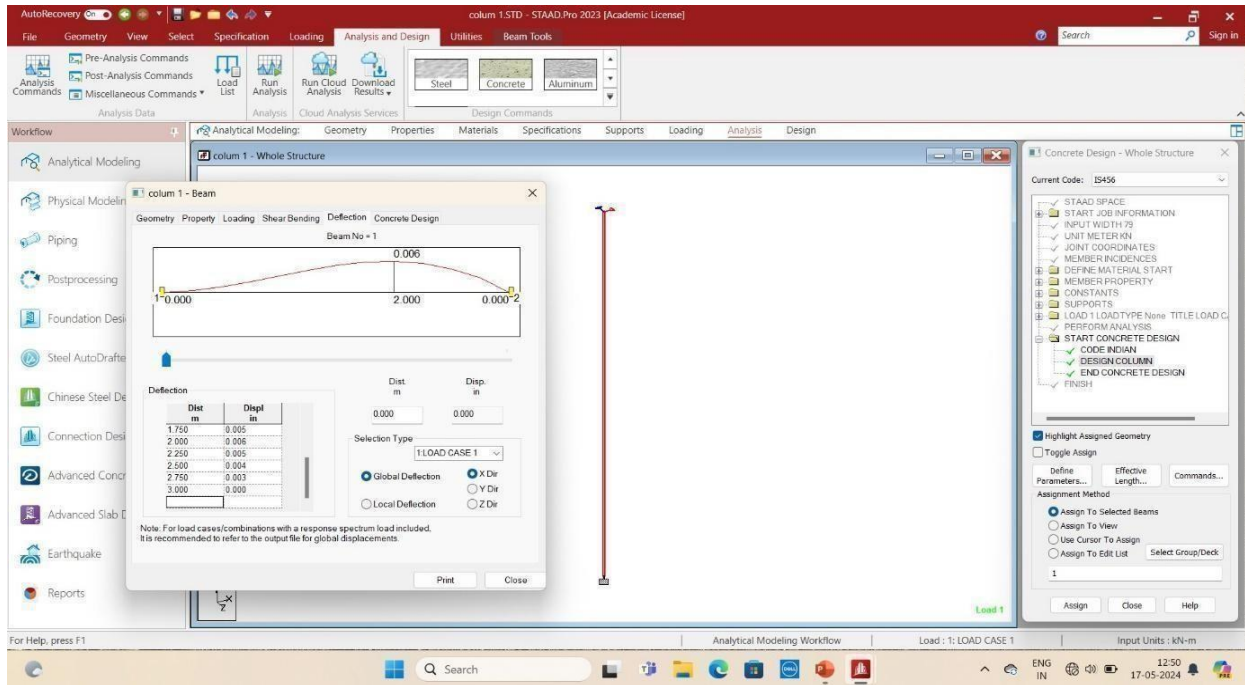
1. Observation of work execution.
2. Construction of column work.
3. Preparation of column layout using AUTOCAD.
3. Analysis of the column using STAAD PRO.
4. Design and results of column.
5. Conclusion.

#### **6. RESULTS & DISCUSSIONS**

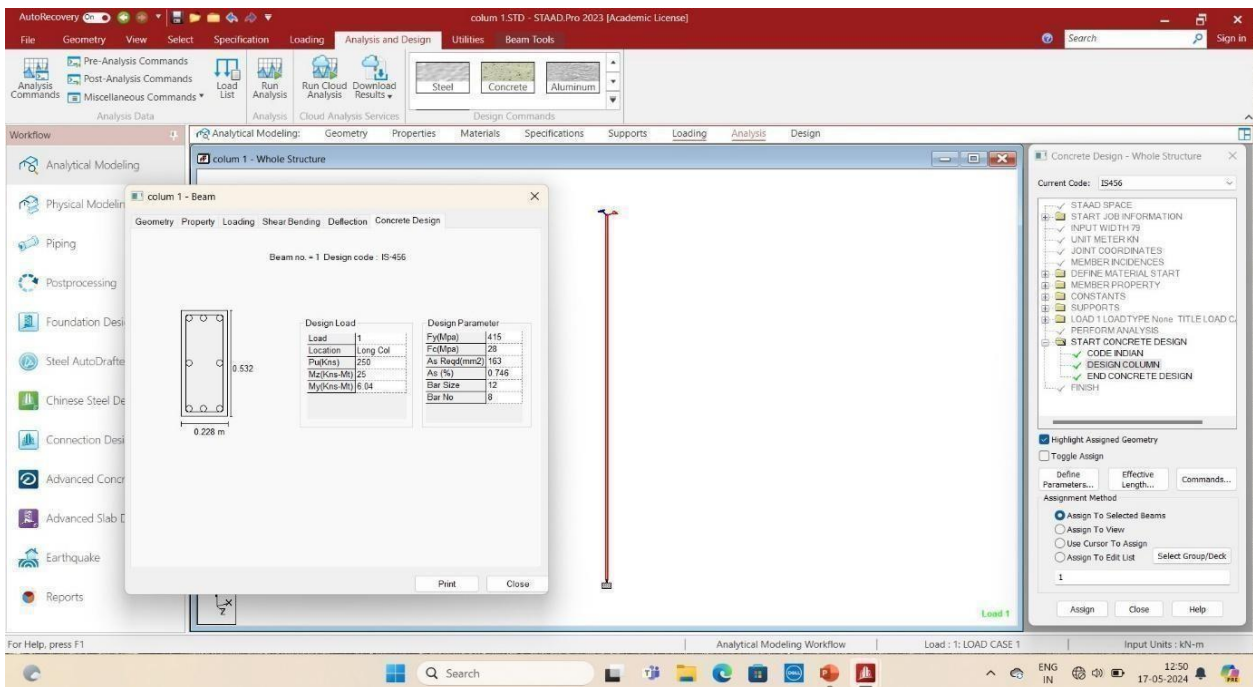
**First column results:**



Shear Bearing

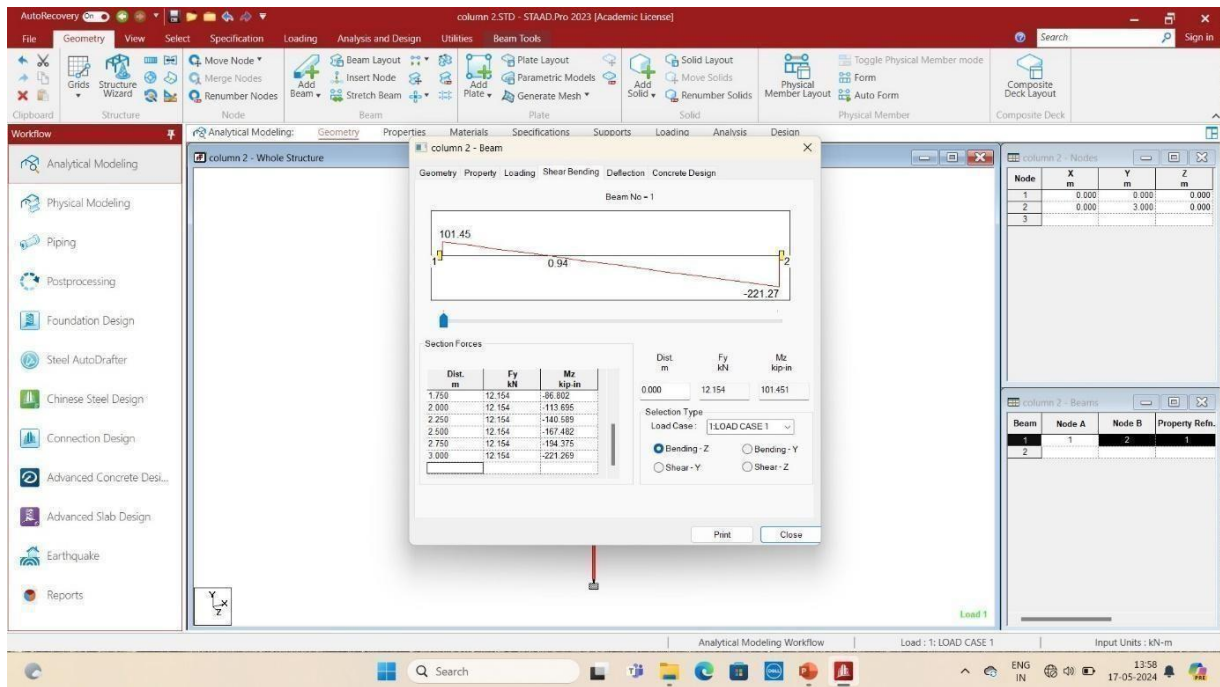


Deflection

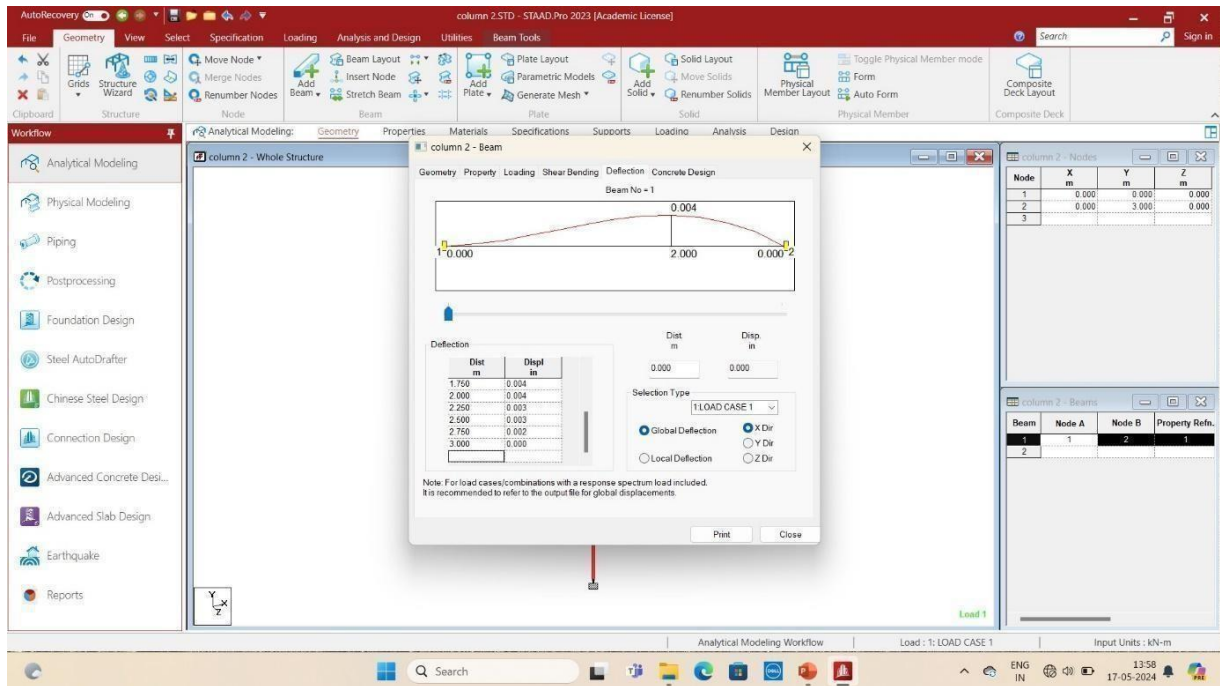


Concrete design

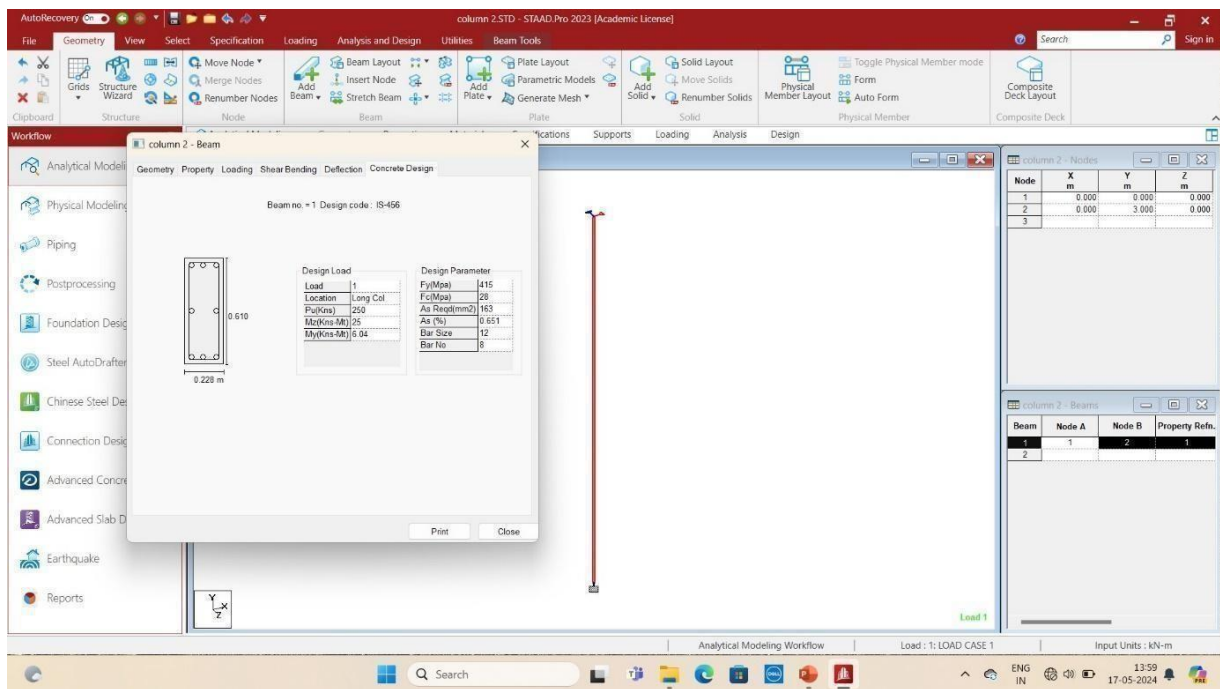
**Second Column results:**



**Shear bending**

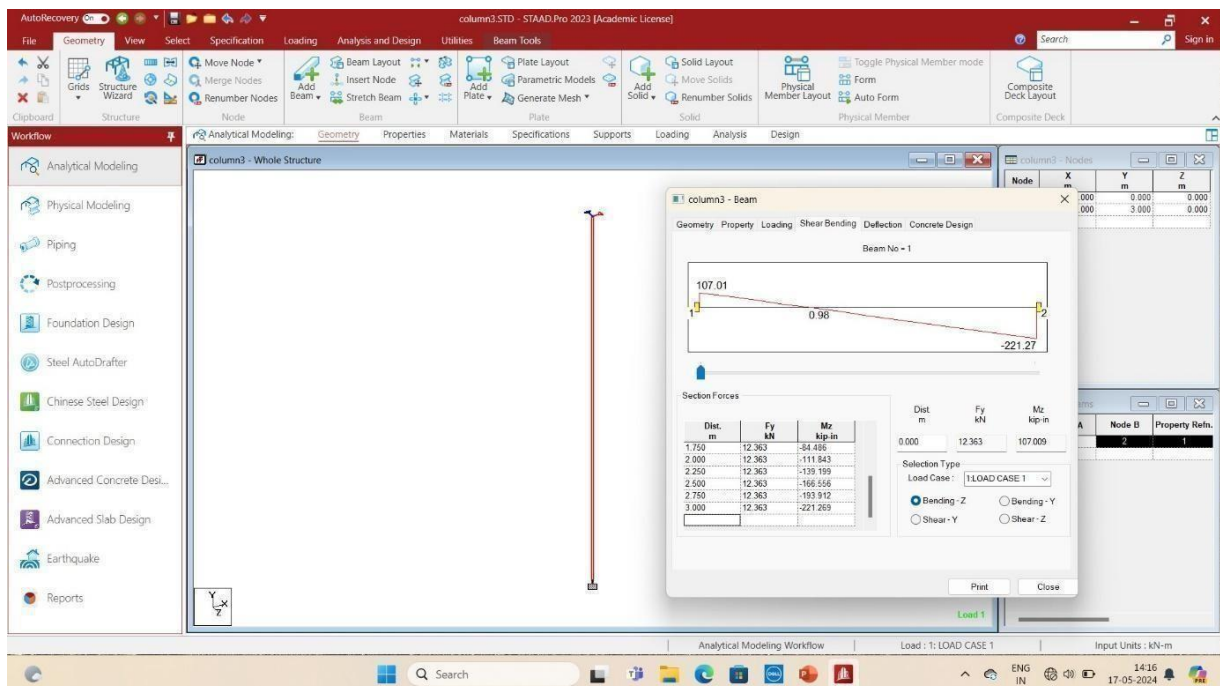


**Deflection**

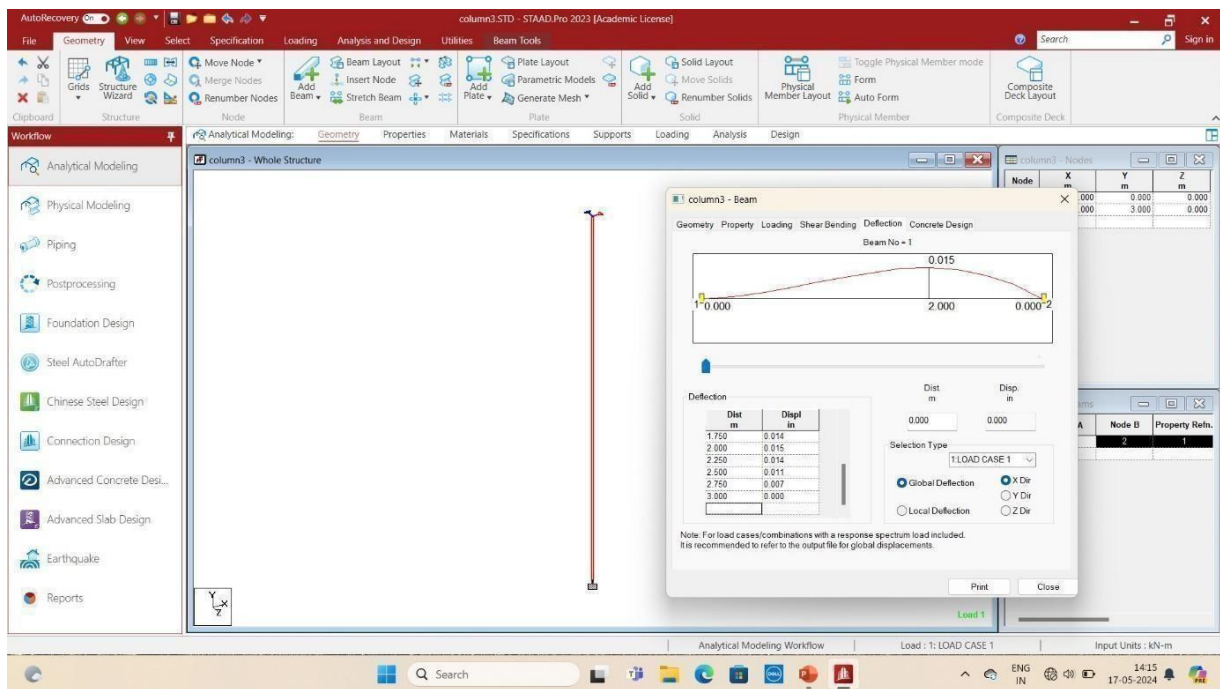


Concrete design

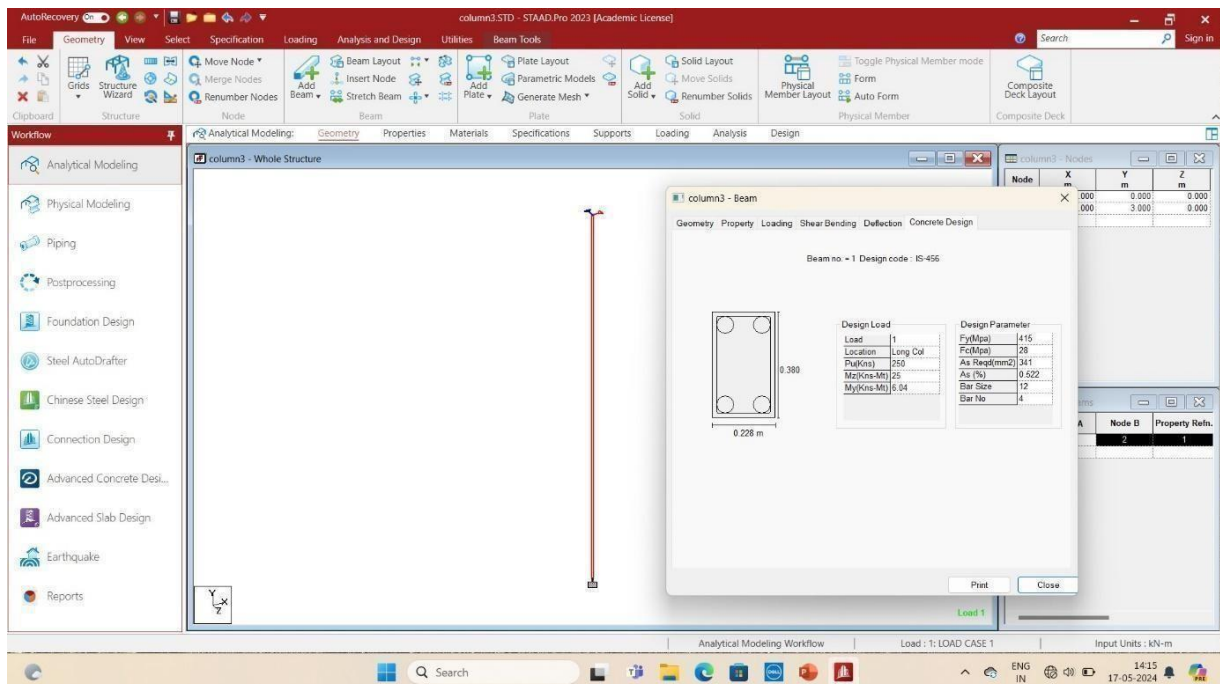
Third column results:



Shear bending

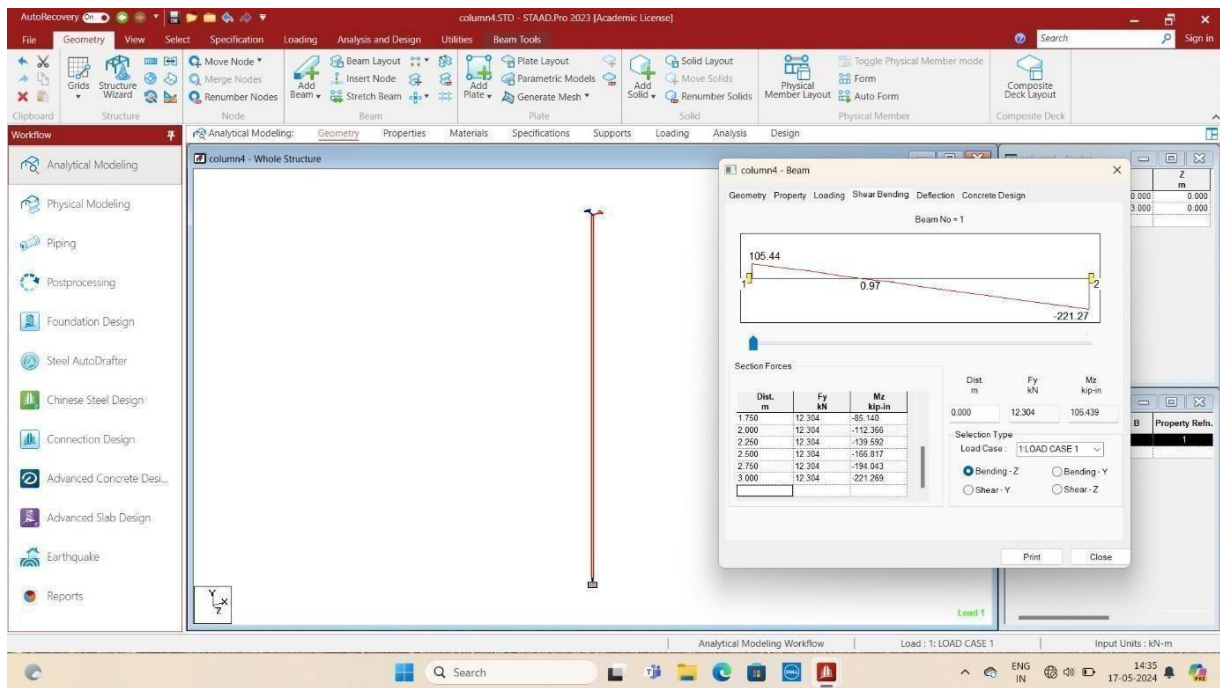


**Deflection**

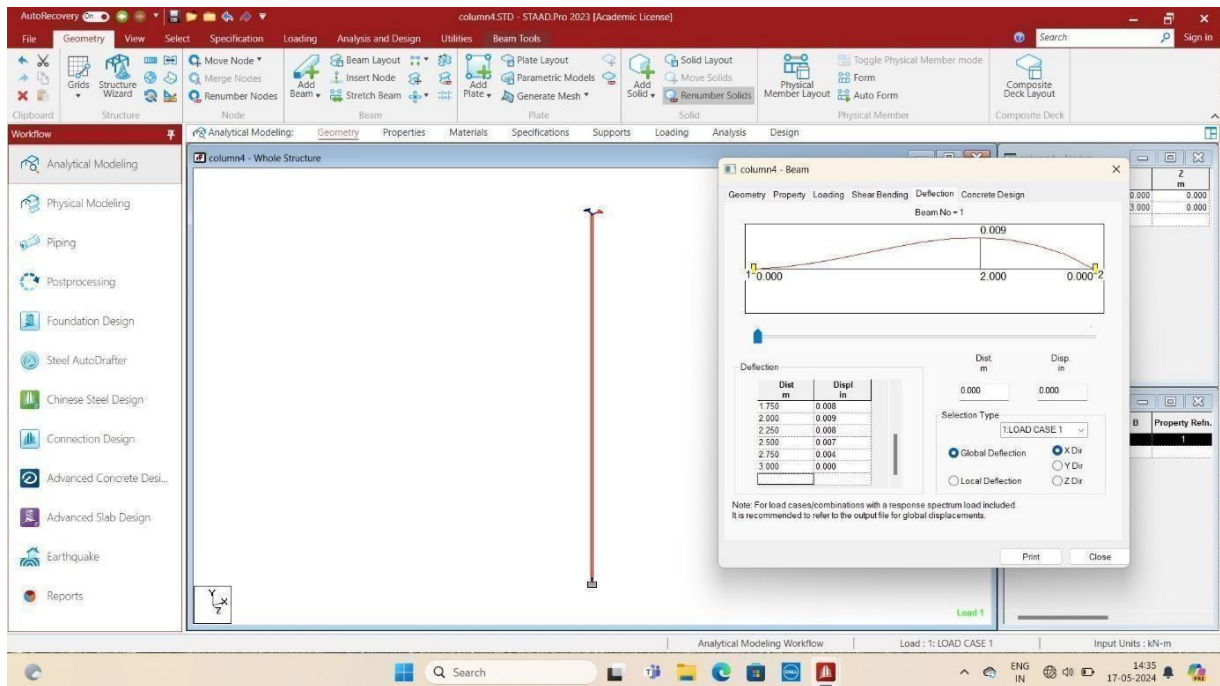


**Concrete design**

**Fourth column results:**

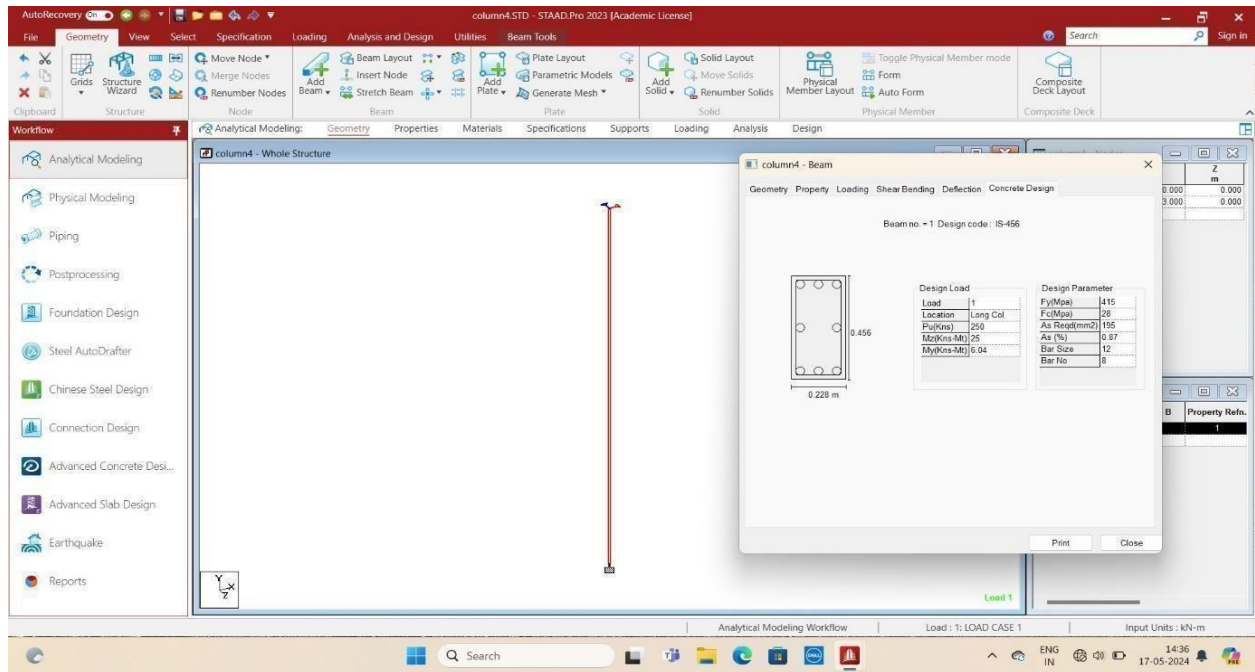


**Shear bending**



**Deflection**





### Concrete design

#### 7. COMPARISON OF COLUMN REINFORCEMENT DETAILS

COLUMNS	Reinforcement Details Provided at site	Reinforcement Details given by STAAD PRO
1 <sup>st</sup> Column C1, C2, C5, C6, C8, C11, C12, C13, C14	Main bars: 8 Nos.@16Φbars Stirrups: 8Φ @178mm c/c	Main bars: 8 Nos.@12Φbars Stirrups: 8Φ @190mm c/c
2 <sup>nd</sup> Column C3, C4, C9, C10	Main bars: 12Nos.@20Φbars Stirrups: 8Φ @178mm c/c	Main bars: 8Nos.@12Φbars Stirrups: 8Φ @190mm c/c
3 <sup>rd</sup> Column C15	Main bars: 6 Nos.@16Φbars Stirrups: 8Φ @152mm c/c	Main bars: 4 Nos.@12Φbars Stirrups: 8Φ @190mmc/c
4 <sup>th</sup> Column C7, C16	Main bars: 6 Nos.@16Φbars Stirrups: 8Φ @152mm c/c	Main bars: 8 Nos.@12Φbars Stirrups: 8Φ @190mmc/c

## 8. CONCLUSION

This project includes the layout of column using AutoCAD, Analysis and Design using STAAD PRO. The analysis and design of the columns has been completed using STAAD pro. The results include the various forces acting on member. Also using the software, we got the concrete take-off as well as the weight of the various reinforcement bars thus easing the load. In this project steel require by STAAD PRO software is less than manual, that is provided at site. Details of the member can be obtained using STAAD PRO. The results getting by STAAD is little bit less than manual analysis. While manual calculations provide a conservative and safe design, STAAD Pro's optimized designs achieve the same safety standards with less reinforcement, resulting in cost savings and material efficiency. However, it is essential to validate software generated designs with engineering judgment and experience, particularly for unique or complex structural condition.

## 9. FUTURE SCOPE

In the future, STAAD Pro will make how engineers design columns for buildings. Advanced technology will empower engineers to create columns that are not only stronger but also more cost-effective. Collaboration will be seamless, as STAAD Pro integrates with other software, making it easier for engineers to work together and share their ideas. Imagine a world where computers learn from past projects to automatically generate optimized designs tailored to each building's unique requirements. This means faster design processes and more efficient use of resources. STAAD Pro will act like a smart assistant, using artificial intelligence and machine learning to continually improve its design capabilities. Moreover, these advancements will enhance safety and durability, ensuring that buildings are not just functional but also resilient against various challenges. Engineers will find their work more enjoyable and creative, as they leverage technology to push the boundaries of what's possible in architecture and construction.

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