BUILDING BEHAVIOR OF REINFORCED CONCRETE STRUCTURES WITH VARYING SLAB THICKNESSES UTILIZING STAAD.PRO

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Abstract - The slab systems' stiffness and thickness greatly impact the load distribution, deformation characteristics, and stress development within structural parts, which in turn affect the structural behavior of reinforced concrete (RC) structures. Using STAAD.Pro CONNECT Edition, this research examines how changing the slab thickness affects the behavior of a G+3 reinforced concrete framed structure. Incorporating actual geometric attributes, material characteristics, member sections, support conditions, and gravity loading requirements, a three-dimensional finite element model of a standard RC building with plan dimensions of 12 m × 18 m was created. On Floor 1, there is a slab thickness of 150 mm; on Floor 2, it is 125 mm; and on Roof, it is 100 mm. The analytical model has 399 structural members and 196 nodes. The building was subjected to linear elastic static analysis under three different load scenarios: dead load, living load, and floor/roof load. Displacement at nodes, stress distribution on plates, forces at beam ends, and column load transfer behavior were the metrics used to assess the structural response. The data acquired using STAAD.The flexural stiffness and stress distribution are significantly affected by the slab thickness, as shown by the pros. Under dead load, the roof level with the thinnest 100 mm slab showed the highest vertical displacement of 0.997 mm. The bending stresses were greater in the 100 mm slab as compared to the 125 mm and 150 mm slabs, according to the plate stress contours. Using classical plate theory, which further confirmed the analytical results, we discover that flexural stiffness varies with the cube of slab thickness. Despite a 50% increase in self-weight, the 150 mm slab showed 3.37 times more flexural stiffness than the 100 mm slab. Slab thickness is shown to be an important factor in regulating structural stiffness, deformation, stress behavior, and STAAD, according to the research.An efficient platform for assessing the impact of slab thickness in reinforced concrete structures is provided by Pro.

Important Terms - Constructing using Reinforced Concrete, Thickness of the Slab, STAAD.These terms are related to structural behavior, finite element analysis, IS 456:2000, RCC frame, flexural stiffness, displacement analysis, gravity load analysis, and shell element modeling: Pro CONNECT Edition.

I. INTRODUCTION

Buildings of many types, including homes, businesses, and public institutions, often use reinforced concrete (RC) frames because of the material's exceptional strength, longevity, fire resistance, and adaptability to various architectural styles. Building components like foundations, slabs, columns, and beams all work together to determine how well RC structures operate. Slabs are an integral part of the structural system because they contribute to its overall stiffness and stability and because they carry the loads of gravity to the supporting beams and columns. This means that getting the slab thickness right is crucial for structural economy, serviceability, and sufficient strength. Factors like as span length, loading intensity, the need to manage deflection, and building procedures are often considered when deciding on slab thickness. A thicker slab has better rigidity and less distortion, but it's heavier and more expensive to build. On the other hand, cutting down on slab thickness might save material consumption, but it could lead to more deflection, more bending loads, and worse serviceability. Therefore, in order to create effective reinforced concrete designs, it is crucial to comprehend the connection between slab thickness and structural reaction.

An important tool for assessing the behavior of complicated structural systems, finite element analysis software has emerged alongside computer-based structural analysis approaches. The stand.A popular structural analysis application, Pro lets engineers create 3D models with realistic material and sectional characteristics, test them under various loads, and get precise parameters for how the structure responds. By including the stiffness interaction between various structural components, the program enables the analysis of beams, columns, and shell elements. Flexural rigidity, as determined by the cube of the slab thickness in classical plate theory, has a significant impact on the behavior of reinforced concrete slabs. Thus, a considerable rise in stiffness and decrease in bending stress may be achieved with only a little increase in thickness. A number of factors, including slab thickness, load distribution, beam-column interaction, boundary conditions, and overall structural arrangement, determine the actual structural response of slabs inside a framed structure. To effectively analyze these combined impacts, numerical analysis employing finite element techniques is used. Using both analytical and numerical methods, prior research has examined how various structural characteristics, including member stiffness, loading conditions, and geometric irregularities, impact the behavior of RC frames. Nevertheless, there is a dearth of research that compares the effects of various slab thicknesses using the same reinforced concrete structure model. If we want to know how slab thickness affects structural performance, we need to do a controlled comparison with the same geometry, materials, loads, and support conditions.

This research use STAAD to analyze a building with a G+3 reinforced concrete structure.Using Pro CONNECT Edition, we may study how changing the slab's thickness affects the structure's behavior. At various levels of the structure, three slabs with thicknesses of 150 mm, 125 mm, and 100 mm are allocated, all while preserving the same architectural geometry and material attributes. Column load transfer behavior, displacement, plate stress distribution, and beam forces are used to assess the structural response. The statistical findings derived from STAAD.In order to determine the correlation between slab thickness and structural performance, the results are further explained in terms of traditional flexural stiffness theory. Finding a cost-effective and structurally sound slab thickness arrangement for multi-story RC frame buildings is the primary goal of this research. Secondary objectives include studying the effects of slab thickness variation on the stiffness, stress distribution, and deformation properties of reinforced concrete buildings.

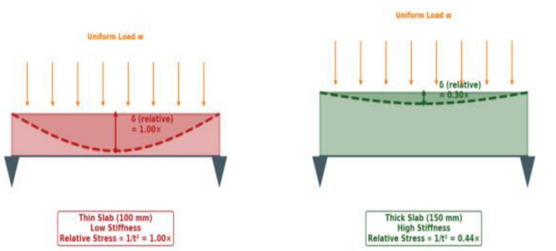

Figure 1. Theoretical Consideration of the Impact of Slab Thickness on Deflection and Bending Stress

II. SURVEY OF RELEVANT LITERATURE

In order to ensure that reinforced concrete (RC) structures are strong, stable, and serviceable under a variety of loading circumstances, structural analysis and design have been the subject of much research. Moment distribution, stiffness methods, classical plate theories, and other simpler analytical techniques formed the basis of traditional structural analysis procedures. However, when used to multi-story reinforced concrete structures, the interaction between beams, columns, slabs, and foundation systems greatly affects structural behavior, making the application of these methodologies more difficult and less dependable than they were for simple structural systems. Accurate modeling of complicated structural systems has been made possible by the advent of numerical analytic techniques and finite element methods, which have revolutionized structural engineering. The use of discrete elements in finite element analysis permits the representation of structural components while taking into account actual material characteristics, boundary conditions, and load interactions. Detailed information on displacement, stress distribution, internal forces, and overall structural response is provided by the approach, which has led to its widespread acceptance for use in reinforced concrete structure analysis. The stand.When it comes to civil engineering, one of the most popular software programs for structural analysis and design is Pro. Reinforced concrete, steel, and composite structures may all be analyzed in the software's three-dimensional modeling environment. It has been used by a number of researchers.Useful for testing how structures with reinforced concrete frames react to lateral loads and gravity. According to the research, STAAD Bending moment, shear force, axial force, displacement, and support reactions are all structural responses that may be accurately predicted using Pro with the right modeling assumptions and loading circumstances.

A key component in regulating deformation and stress development is the distribution of structural stiffness, according to research on reinforced concrete frame analysis. The building's load transmission mechanisms are impacted by the stiffness of its separate structural components. By distributing the weight of the floor's gravitational pull to the beams and columns, slabs play a crucial role in floor stiffness and load distribution. The total structural response is affected by changes to the flexural stiffness of the slab system, which are in turn caused by changes to the slab thickness. A thin plate's flexural stiffness is directly proportional to its thickness squared, as stated in the traditional plate theory put forward by Timoshenko and Woinowsky-Krieger. According to this correlation, the bending stiffness may be significantly increased by only slightly increasing the slab thickness. Under identical loading circumstances, prior research on reinforced concrete slabs has shown that bigger slabs display less bending stresses and lower deflection than thinner slabs. A structure's total gravity load is affected by its thickness, which in turn affects its self-weight. The impact of slab thickness on the performance of reinforced concrete structures has been studied by several scholars. Deflection behavior, fracture formation, vibration characteristics, and stress distribution are all affected by slab thickness, according to parametric research. The flexural stiffness of thinner slabs is lower, leading to more deformation and stress concentration; in contrast, the stiffness and load-carrying capacity of larger slabs are enhanced. In order to strike a balance between structural efficiency and construction economics, these studies emphasize the need of optimizing slab thickness. Also, load transmission methods affect how reinforced concrete structures act. Because the self-weight of structural components is a direct determinant of dead load, variations in slab thickness have a large impact on the reaction to gravity. Conversely, structural analysis software's chosen modeling technique determines how applied loads, including live loads, are conveyed across beam systems. The impact of slab thickness on structural response may be better understood with a firm grasp of these load transmission processes.

Reinforced concrete structure design and assessment are governed by Indian Standard regulations. Strength and serviceability are two of the many factors addressed in IS 456:2000, which is a standard for reinforced concrete design. Dead and imposed loads operating on structures may be determined according to the rules of IS 875. When it comes to material qualities, loading circumstances, and design assumptions, numerical modeling has to adhere to the right code rules for dependable analytical findings, according to researchers. It is common practice in structural engineering research to validate numerical analysis findings using theoretical calculations and simplified analytical approaches. Comparing the created model to traditional theories helps check its correctness, even if finite element-based software offers comprehensive three-dimensional answers. Due to changes in modeling assumptions, structural idealization, and stiffness interaction effects, it is typically assumed that numerical and analytical findings would vary somewhat. It is clear from the literature review that finite element-based analysis is now a viable method for investigating the behavior of reinforced concrete structures. Prior research has mostly concentrated on characteristics related to the design of individual members, seismic behavior, and the overall reaction of the frame. But few studies have compared controlled variations in slab thickness inside the same RC building model under the same stress circumstances, with the same geometry, and the same material attributes. Consequently, this work intends to fill that knowledge gap by conducting a comprehensive 3D analysis of a G+3 reinforced concrete structure utilizing STAAD.Pro CONNECT Edition. The effects of three distinct slab thicknesses on displacement, distribution of plate stresses, forces acting on beams, and column load transfer behavior are examined in the research. A thorough comprehension of the correlation between slab thickness and structural performance is achieved, and the numerical findings are bolstered by theoretical confirmation of slab flexural stiffness.

III. STUDY DESIGN

A. Research Approach

Using linear static analysis and three-dimensional numerical modeling in STAAD.Pro CONNECT Edition, this research examines how variations in slab thickness affect the structural behavior of RC framed buildings. Structure response metrics including plate stress, displacement, beam forces, and column load distribution will be compared over a range of slab thicknesses in this study. The building geometry, material qualities, member dimensions, support conditions, and loading conditions were kept constant while only the slab thickness was altered in a comparative analysis technique. For the first floor, second floor, and roof levels, three different slab thicknesses—150 mm, 125 mm, and 100 mm—were evaluated. The resulting STAAD grid.In order to comprehend the connection between slab stiffness, thickness, and structural performance, the findings of the pro were examined. Techniques include structural modeling, material and sectional property assignment, gravity load application, finite element analysis, post-processing result extraction, and theoretical verification based on classical plate bending principles.

B. Modeling of Structures

The building model was created using STAAD.Pro CONNECT Edition (Version 22.00.00.15), which is designed for use with reinforced concrete frames. The idealized version of the building would have its beams, columns, and slab plate components arranged in a conventional RC moment-resisting frame. With an overall plan size of 12.0 m × 18.0 m, the examined construction stands as a G+3 RC building. In all, there are 399 structural members, 49 columns, 196 nodes, and 3 slab plate areas that make up the model that was built. The interaction between structural parts under gravity loads was taken into account by modeling the beam-column system as a space frame. varying floor levels were given varying thickness values when the slabs were modeled using plate finite elements. A thickness of 150 mm was assumed for the first story slab, 125 mm for the second floor, and 100 mm for the roof. We made cautious to keep all the other structural characteristics the same so that we could compare how the slab thickness changed.

C. The Section Details and Material Characteristics

Reinforced concrete parameters according to conventional RCC construction practice were used to simulate the structural elements. The STAAD database lists concrete as an isotropic material.For the analysis, Pro and the necessary mechanical qualities were assigned. Down below, you can see the material qualities that were used for the investigation.

Property	Value
Concrete Grade	M25
Modulus of Elasticity	21718.5 MPa
Poisson's Ratio	0.17
Material Type	Reinforced Concrete

It was decided that beams and columns would have rectangular sections. A multi-story RC building's realistic load distribution was represented by varying the column diameters according to the floor level, but the beam size was maintained at 350 mm × 350 mm. Following this, you may see the model-assigned slab thickness values.

Floor Level	Plate Reference	Thickness
Floor 1	Plate 400	150 mm
Floor 2	Plate 401	125 mm
Roof	Plate 402	100 mm

Assigned characteristics made STAAD possible.To determine the structural stiffness, self-weight, displacement, and stress distribution for any slab condition, professional calculations are performed.

D. Analysis Method and Loading Conditions

All three types of gravity loads—dead load, living load, and floor/roof loads—were taken into account during the structural study. In STAAD, the self-weight of slab plates, columns, and beams was automatically created.Expertise based on the specified structural dimensions and material density. The structural members' and the slab's self-weight was considered in the dead load scenario. Because slab thickness was the main variable under study, the research immediately took into account the variation in self-weight among 150 mm, 125 mm, and 100 mm slabs. The building's accepted loading requirements dictated the application of live load and floor/roof loads. The STAAD method was used to disperse the loads via the supporting beam system.Power generating for the floor. This study took the following load situations into account:

1. Dead Load (DL) (Load Case 1)

2. Live Load (LL) Consideration

3. Floor/Roof Loads

When evaluating the structure, the following gravity load combinations were taken into account:

$$1.5(DL + LL)$$

We used STAAD's linear elastic static analysis approach to examine the created model.Professional Connect Edition.

E. Analyzing Structural Responses

Using the STAAD data, the RC building's structural performance was assessed.Enhanced post-processing capabilities. By contrasting these factors, we were able to learn how slab thickness change affected the results:

- Distribution of plate stresses as determined using stress contour plots
- The highest point that structural nodes may move vertically
- Forces acting on the ends of beams, such as shear and bending moments
- The distribution of axial stress on the column and its responses to support

The bending stress variation among the three slab thicknesses was identified using the plate stress contours. In order to find out how slab thickness affects structural stiffness, the displacement data were examined. In order to comprehend the load transfer behavior of the whole RC frame system, the forces acting on the beams and the loads on the columns were studied.

F. Confirmation of the Theory

The statistical findings derived from STAAD.Using traditional plate bending theory, the pros were confirmed. The equation was used to determine the flexural stiffness of a slab:

$$D = \frac{Et^3}{12(1 - \nu^2)}$$

D is the flexural stiffness of the slab. Slab thickness (t) = E modulus of elasticity (C) + Poisson's ratio (v)

The correlation between slab thickness and bending stiffness was determined by the theoretical computation. Slab stiffness is directly proportional to thickness cubed, therefore thicker slabs provide far greater resistance to bending deformation.

Slab	Thickness (mm)	Plate Ref	Approx. Max Stress Band (N/mm²)	Relative to 150mm Slab
Floor 1	150	400	≤0.024 – 0.027 (lower bands)	1.00× (reference)
Floor 2	125	401	0.028 – 0.031 (mid bands)	≈1.15×
Roof	100	402	≥0.034 (highest band)	≈1.4× or higher

Table 1. Use STAAD to Estimate Stress Bands and Compare Them.Expert Contour Master

The STAAD was validated and understood via the use of the theoretical stiffness comparison. Advantageous outcomes acquired using displacement analysis and plate stress contours.

IV. FINDINGS AND ANALYSIS

A. Summary of Findings from Structural Analysis

How the STAAD model of a G+3 reinforced concrete structure behaves structurally.The impact of varying slab thickness on the structure's total response was investigated using Pro CONNECT Edition. Three slab thicknesses—150 mm at Floor 1, 125 mm at Floor 2, and 100 mm at Roof—were included in the research. The distribution of stresses on plates, displacements at nodes, forces at beam ends, and variations in axial loads on columns were used to evaluate the structural response. The data acquired using STAAD.Using the same shape, materials, and stress conditions, slabs of varying thicknesses were compared using Pro post-processing. Slab thickness has a substantial effect on structural stiffness and stress behavior, according to the findings of the investigation. Slabs with a greater flexural stiffness showed less deformation and bending stress than thinner slabs. On the other hand, due to less resistance to bending, thinner slabs exhibited more displacement and increased stress concentration. The findings also show that the RC building's load transfer mechanism is in line with the predicted structural behavior, with slab loads being carried to the foundation supports via beams and columns.

B. Stress Behavior in Plates

According to STAAD, this is the distribution of plate stress.To determine how slab thickness affected bending performance, Pro analysis was used. Because the self-weight of each slab is directly related to its thickness, the maximum absolute plate stress contour under Dead Load was taken into account for the purpose of comparison. In comparison to the thicker slabs, the thinner ones acquired much greater stress levels, according to the stress contour data. The 100 mm roof slab had the greatest concentration of stresses, but the 150 mm Floor 1 slab had relatively lower intensities. In terms of stress response, the 125 mm slab was in the middle of the two extremes.

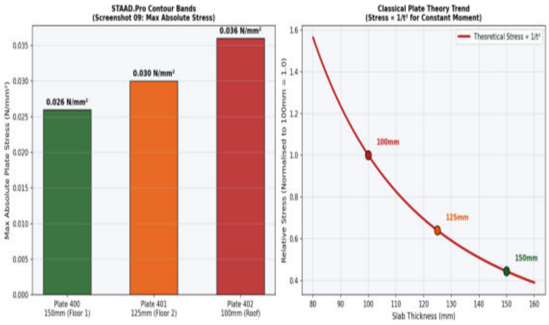

Figure 2. Comparison of STAAD.Pro Contour and Classical Plate Theory with Respect to Maximum Absolute Plate Stress and Slab Thickness (Dead Load)

This action takes place because slab thickness has a significant impact on flexural resistance. The cubic connection between thickness and flexural rigidity means that although increasing slab thickness does increase self-weight, the proportional increase in bending stiffness is far larger. This is the stress variation that STAAD identified.Under gravity stress, bending effects are more noticeable in thinner slabs, as confirmed by Pro. The findings highlight the significance of slab thickness as a determinant of stress distribution and deformation properties in reinforced concrete floor systems.

C. Evaluation of Flexural Stiffness and Its Theoretical Validation

The STAAD-derived stress behavior.Classical plate bending theory was used to confirm Pro. By using the correlation between the elastic characteristics and the thickness of the slab, the flexural rigidity could be determined. Flexural rigidity is found to vary with the cube of slab thickness, according to the theoretical assessment. Thus, bending stiffness is greatly enhanced by even a little increase in slab thickness. In terms of computed stiffness, the 150 mm thick slab has around 3.37 times more flexural stiffness than the 100 mm thick slab. In a similar vein, the 100 mm slab is not quite as rigid as the 125 mm slab. Thicker slabs showed lower stress and displacement values during STAAD, which may be explained by their significantly increased stiffness.Professional evaluation. The comparison shows that adding more self-weight isn't as beneficial to structural rigidity as increasing slab thickness.

Floor Level	Current Thickness	Engineering Basis	Recommendation
Floor 1 (Y=3m)	150 mm	Highest cumulative gravity load; also contributes to overall lateral diaphragm stiffness at the level nearest the base	Retain 150mm; appropriate given tributary load and diaphragm role
Floor 2 (Y=6m)	125 mm	Intermediate load; intermediate stress band confirmed by STAAD.Pro contour	Retain 125mm; well-balanced between economy and stiffness
Roof (Y=9m)	100 mm	Lowest gravity load (no floor live load above), but highest relative stress due to t³ stiffness penalty	Consider 110–120mm if crack-width or long-term creep deflection control becomes governing; 100mm remains adequate for the strength/serviceability margins demonstrated in this study

Table 2. Guidelines for the Recommended Thickness of Floor Slabs

Confirming that the observed variance in slab behavior is mostly controlled by thickness-dependent flexural rigidity, the theoretical findings demonstrate excellent agreement with the numerical analysis.

D. Behavior of Displacement

In order to determine how slab thickness affects structural deformation, the RC building's displacement response was examined. Using STAAD, we calculated the nodal displacement values.A variety of loading scenarios, including dead, live, and floor/roof loads, were used to test the pros. In the higher levels of the structure, where the thinner slab areas are less rigid and more flexible, the largest displacement was noted. Deformation was more pronounced on the 100 mm thick roof slab compared to the thicker slabs on lower floors. The investigation yielded displacement values that were determined to be within acceptable serviceability limits. Nonetheless, it is evident from comparing various slab thicknesses that a thicker slab enhances structural rigidity and decreases deformation.

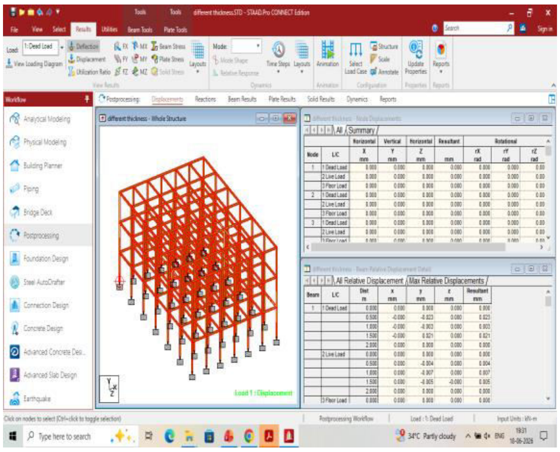

Figure 3. Picture 08: Summary of Node Displacement and Detail of Beam Relative Displacement (Dead Load)

Consistent with theoretical predictions, the measured displacement pattern shows that thicker slabs have better serviceability performance and a stronger resistance to bending.

E. Response of Beam Forces

This is the STAAD-obtained beam force data.In order to comprehend the impact of varying slab thicknesses on sustaining structural components, pro were assessed. Under varying gravity loading conditions, the study included beam end forces, bending moments, and shear forces. The findings demonstrate that, as a consequence of the buildup of gravity loads transmitted from higher floors, beams situated on lower floors undergo greater force effects. While the upper-level beams are subject to a lesser demand from gravity, the lower-level beams supporting thicker slabs have larger self-weight loads. Because of the continuity and rotational restriction given by the RC frame system, the bending moment distribution shows that the highest moments happen around the areas of the beam-column connection. Greater shear forces are concentrated close to the points of support, as one would anticipate from beams that are evenly loaded. Improving load distribution and reducing excessive deformation of the floor system are two benefits of increasing slab stiffness, even if slab thickness affects the amount of gravity loads delivered to beams.

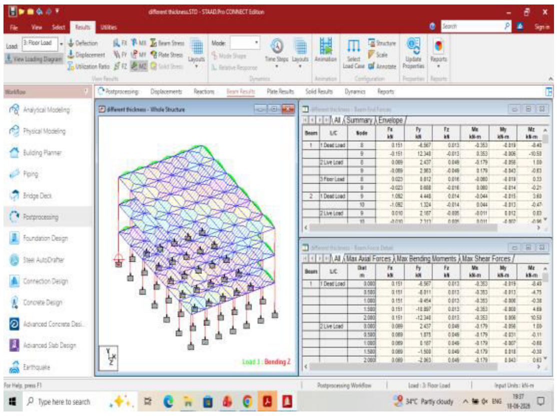

Figure 4. Images 11 and 12 show the beam end forces and force detail for beam 1 on floor 1 in bay X=0-2m.

F. Distribution of Axial Load on Columns

In order to comprehend the process of gravity load transfer from the roof level to the base, the axial load distribution of the columns was examined. This is the STAAD.As loads accumulate from higher levels, the pro findings reveal that column forces grow steadily as one descends the building's stories. Due to their greater tributary areas, interior columns experienced higher axial forces in comparison to edge and corner columns. Columns supporting bigger floor areas experience higher gravity loads, as is typical in structural behavior, and this is reflected in the load distribution pattern. The structural model accurately depicts the anticipated load path of an RC framed structure, as seen by the variance in column axial forces. Lower floors are subject to more cumulative gravity effects due to the thinner slabs at lower levels, whereas higher levels have less self-weight contribution.

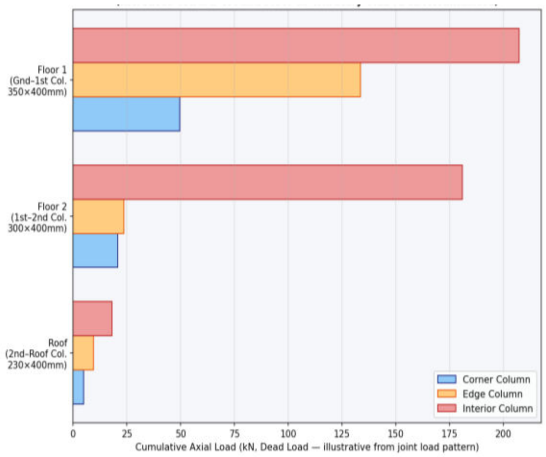

Figure 5. From the Joint Equivalent Load Pattern, we can see the axial load distribution of the column as a function of floor level and column position.

The resulting column load distribution confirms that the designed STAAD is reliable.This model is great, and it gives me faith in the findings when I compare slab thickness.

G. Evaluation of Findings

The numerical analysis findings show that the structural behavior of reinforced concrete structures is greatly affected by the slab thickness. By contrasting 150 mm, 125 mm, and 100 mm slabs, we can see how flexural stiffness, stress distribution, and deformation response are influenced by thickness change. The structural performance is enhanced by the thicker slab due to the fact that the increase in stiffness is much more than the rise in self-weight. In comparison to the thinner slabs, the 150 mm slab shows reduced deformation and improved stress resistance. The results of the STAAD study.The results of the good analyses agree with the conventional plate theory, which proves that the thickness of the slab is a crucial design parameter for managing the efficiency and serviceability of the structure. Finding the sweet spot between structural rigidity, material economy, and safety is possible with well-chosen slab thickness.

Figure 6. The RCC Building with Variegated Slab Thickness: A Dashboard of Important Results

V. CONCLUSION

Employing three-dimensional finite element analysis in STAAD.Pro CONNECT Edition, this research examined the structural behavior of a reinforced concrete (RC) structure with varying slab thicknesses. Studying how different slab thicknesses affected RC-framed building structural response characteristics including plate stress, displacement behavior, beam forces, and load distribution was the main goal of the study. The STAAD software was used to successfully create a 3D analytical model of a G+3 reinforced concrete structure.Using the structural geometry, material qualities, support conditions, loading characteristics, beam and column sections, and other relevant information, one may greatly improve their work. A standard RC frame system with slab plate components of varying thicknesses at various floor levels made up the model. Slab thicknesses of 150 mm for Floor 1, 125 mm for Floor 2, and 100 mm for the Roof were examined in the comparative analysis, with all other structural characteristics held constant.

We used STAAD to get the plate stress analysis.The development of bending stresses is significantly affected by slab thickness, as Pro shown. According to the stress contour data, the 100 mm roof slab was subject to a greater concentration of stress than the 125 mm and 150 mm slabs. Reduced flexural stiffness led to greater bending stress, even though the smaller slab had lower self-weight. The increased resistance to bending deformation in the thicker 150 mm slab resulted in much lower stress levels. Classical plate theory was used to further confirm the influence of slab thickness. Et divided by 1/3[12(1−v2)] is the equation for flexural stiffness.The fact that the slab stiffness grows as the thickness cubes is proven by the equation D = Et^3/[12(1-\nu^2)]D=Et3/[12(1−ν2)]. The 150 mm slab had a flexural stiffness that was around 3.37 times greater than the 100 mm slab, according to the stiffness comparison calculations, although its self-weight only went up by 50%. This proves that the increase in stiffness from raising the slab thickness is far more than the rise in dead load from the same increase in thickness. Results of the STAAD displacement analysis.According to Pro, the building's higher floors, which had the smaller slab thickness, had the most structural deformation. All slab thickness scenarios that were evaluated in the research demonstrated adequate structural performance under the loading circumstances that were analyzed, as the measured displacements stayed below acceptable serviceability limits.

Under dead load circumstances, the supporting beams felt greater internal pressures as a result of the slab's self-weight, according to the beam force assessment. Due to the efficient load distribution provided by the closely spaced beam-column system, the representative beam analysis showed that bending moments and shear forces were within tolerable ranges. That STAAD's FLOOR LOAD mechanism works was also verified by the findings.To minimize the impact of live load on comparing stresses at the plate level, Pro transfers area loads to the grid of supporting beams. The anticipated mechanism for transferring loads due to gravity in the RC frame was shown by the study of column load distribution. Because their tributary areas were bigger, interior columns could withstand greater axial stresses than their edge and corner counterparts. As the stresses from higher levels were transported downward, the cumulative axial force climbed towards the foundation level, proving that the structural model was reliable. Slab thickness was shown to be a significant structural design element impacting deformation behavior, stress distribution, and stiffness in the comparative study. By considerably boosting flexural rigidity with just a proportionate increase in self-weight, the research indicates that a thicker slab improves structural efficiency. Hence, slab thickness may be appropriately selected according to structural need to enhance performance while minimizing material consumption. Studies have shown that STAAD.Pro CONNECT Edition is a great tool for analyzing reinforced concrete structures with different structural properties. An effective method for assessing the implications of slab thickness that structural engineers may use to make cost- and performance-conscious design choices is the integration of finite element analysis with theoretical verification.

Slab thickness optimization in reinforced concrete buildings can be further enhanced by expanding the scope of this study to include additional parameters like seismic loading, wind loading, nonlinear behavior, cracked-section stiffness, reinforcement detailing, and life-cycle cost evaluation.

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