Relative Study of Post-Tensioning Structure on a Flat Plate and Flat Slab

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Abstract— The use of post-tensioned concept floors in buildings has increased slightly in recent years. The largest use of its type of construction has been in the United States, and in California, it is the main choice for concrete floors. Post-tension-mounted floors are already in use in countries such as Australia, Hong Kong, Singapore, and Europe. Their use in the UK is now growing rapidly. The increase in urban populations has led to an increase in demand for living space, increasing costs due to being increasing demand for efficient floor systems. This thesis is a comparative study of two different post-pressure slabs, one with a drop flat slab and the other without drop slabs. First, the analysis was performed on the construction of the floor hand using the English code and then the modeling was done on the FEM software. In this model, first, all the properties of the objects and categories are defined, and then the tile frame model is adjusted with the help of a grid.

Keywords: Post-Tension, Deviation, Piercing Scissors

I. INTRODUCTION

The increase in urban populations has led to an increase in demand for living space, resulting in an increase in costs due to the growing demand for efficient floor systems. This standard frame plan for standard reinforced concrete structures is a beam-slab system, but the use of flat-slab and flat-plate systems has become popular. However, the need for large column-free spaces has necessitated the use of robust floor plans. Typical applications include parking and tall buildings, foundation systems, bridges and tanks and residues, industrial roads, dam structures, and atomic waste binding structures. Post-tensioned concrete is one of the types of compressed concrete in which tendon tension occurs immediately after the pouring of the concrete structure. Tenders are enclosed in a protective sleeve that is placed in a channel that is not directly in contact with the concrete but is poured or placed near a concrete structure. At either end of the tendon anchor, it is firmly attached to the adjacent concrete. After the concrete has been poured and repaired, the cords are extended by pulling on the anchors while the ends of the tendon are pressed into the concrete.

A. Learning Support

Office floors with a standard grid size of 10.8x8 m in a multi-story building were considered for flat-plate design, flat-floor, and beam-floor plans. In each case, both the Reinforced Concrete system and the post-tensioned systems were used, with varying construction performance and cost, and safety. Ground systems are designed using three different operating codes: British Standard (BS), American Concrete Institute (ACI), and Indian Standard (IS) standards. From cost analysis, the flat plate is post-tensioned the system provides a cost-effective reduction of approximately 20% and 16.5% for BS and IS standards, respectively in the event of ACI Rates, post-tensioned, and RC Flat slab systems offer 17.7% and 12.5% cost reduction, respectively. Post-tensioning is an effective construction method for tall buildings, heavy loads, and cost-effective considerations. This study develops a fuller understanding of how different levels of reinforcement and compressive strength of concrete contribute to the deviation of the slab system of the two posterior pressures.

II. LITERATURE REVIEW

Boskey Vishal Bahoria and Dhananjay K. Parbat (2013) the post-tensioning the way now the day grows wider, thanks to its use. With pension reductions, one way can create a more economical and secure design. While using this method there are other precautionary measures to be taken regarding the shaving and deviation of the military. The design of a slide with back problems can be done using load balancing and the same framework. Through the use of the office building process, the plot is considered a story. The Office Building Program (G + 4) is considered. The building is built from four sides with different floors Programs. The size of the reinforcing steel, reinforcing steel, concrete is required Slab, beam, and column are calculated the same and presented in tabular form. Along with these complete construction costs per square meter are also available A comparison of all four cases in terms of costs was made.

R. P. Apostolska, G. S. Necevska Cvetanovska, J. P.Cvetanovska3 N. Mircic, (2008) Slat-slab structures have significant advantages traditional slab-beam-column structures due to the design of the free, short space construction time, functional features, and inexpensive structures. Due to to- lack of deep beams and barbering walls, a flat structure system is very important easily adapts to different loads, and then RC framework and file formats the system is at high risk under earthquake incidents. Results from a few reviews the types of construction plans presented in the paper reflect that flat slab a system with some modifications (beam formation at the edge of a building and/or RC walls) can reach a moral level by considering EC8 and possibly think of it as an acceptable risk of earthquakes. Additional adjustments to building materials improve the carrying capacity of the system and increase its durability and durability, improve the seismic nature of the stone formation process. Selected results from the analysis are presented in the paper.

Pradip S. Lande1, Aniket B. Raut, [7] (2015) the system of flat plates has always existed Was adopted in many buildings taking advantage of the height is of the land to meet conservation and construction needs. The exhibition of flat slab RC buildings has several advantages over a typical column structure. Still, the structural efficiency of the flat plate construction is hampered by its alleged low performance under land load. Although flat-slab systems are widely used in earthquake lovely regions of the earth, unfortunately, earthquakes have proved that the construction form is at high risk of injury and failure, where it can be

rebuilt well explained. Therefore, a careful analysis of the slab structure is important. The current study conducted a parametric investigation to identify earthquake response plans flat slab with shear walls d) flat slab with drop panel. e) General structure above systems is read on two different floors found in zone v. and was analyzed using version ETABS Nonlinear 9.7.3. Line dynamic analysis e.g., response rate analysis is performed in the system to obtain earthquake character.

Y. H. Luo and A. J. Durrani, [1] (March 1, 1995) in the analysis of flat structures with gravity and subsequent loading, the same operating range is used internally and external column connection. The connection of the system link connection is obvious showed a way to pass the moment in an internal connection for clarity is different from the one connected externally. Active slide width and durability external communication are therefore very different from internal communication. Recognition of this fact is essential for accurately predicting lateral travel times and imbalances with flat-slab structures. It's the same an announcement is made for the pole model of the outer column connection slabs. Based on testing the results of 41 external connections, gained temporary storage capacity a combination of torsional force on the slide edge and flexural force of the marble assignment forms the front of the column. Test results also show a file for true torsional strength of spandrel beam or slab edge of external contact has been much larger than the theoretical volume calculated as an independent beam. An equivalent pole model is proposed with an external connection that provides a better performance forecast of uneven time in contact and lateral pull of the flat slab properties.

M.G.Sahab, A.F.Ashour, V.V.Toropov, [2] (February 2005) reinforced concrete structures are following the British Exercise Code (BS8110) introduced. The objective function is the total cost of the building including the cost of floors, columns, and foundations. The cost of each building feature includes building materials and materials for reinforcement, concrete, and form. The structure is modeled and analyzed using the same independent method. The efficiency process is managed at three different levels. In the first level, that's fine Column format is available for a complete search. In the second level, you use a hybrid Optimization algorithm, column size limit, and slide size the composition of each column is available. In this hybrid algorithm, a genetic algorithm is used for international search, followed by the selected type of Hook and Jeeves method. We third level, a complete search to find the correct number again is reinforcing size bars for reinforced concrete joints. Three eligible costs solid reinforced concrete structures are also shown to have good results as well standard construction processes are compared.

Jong-Wha, Bai, [3] (2006) the effectiveness of seismic retrofitting to improve earthquake performance by testing five-story reinforced concrete (RC) a flat building in the center of the United States. In addition, to assess the severity of earthquakes related to job opportunities the magnitude of the earthquake was made. The reaction of the building was predicted using indirect and dynamic ground motion analysis U.S. regional records In addition; two analytical methods for the analysis of the indirect response were compared. The terms of the FEMA 356 (ASCE 2000) were used to evaluate the seismic performance of a story research structure. Two ways of FEMA 356 was used to assess earthquakes: global standard and number of members used three levels of performance (Quick Living, Health Safety and Wrap Prevention). In addition to these limitations, shear drift punctuation limits were also present it is intended to build a flood-prone area so that it does not collapse. Based on the results of the earthquake test, there are three ways to recover an application to improve the seismic performance of a building, including the addition of barbecue walls, the addition of RC column jackets, and plastic column closure hinges using metal plates fastened to the outside. Eventually, a strained relationship developed designed for existing and remodeled buildings using several levels of functionality. Weak curves in the reconstructed structure are compared to those in retrofitted structures. At various levels of operation to test for weak curves, FEMA's global drift limits are compared to FEMA-based drift limits member level conditions. In addition, performance levels based on additional quantity limits were also considered and compared to FEMA fluctuations limits.

III. METHODOLOGY AND THE ANALYSIS OF THE PLATES AND SLABS

This study confirmed the effect of post-tensioning to reduce deviation and tighten the balance in the two-way slab. Similarly, various variations have been observed in the construction of a comparable section of reinforced concrete slab using different rules of application. Particularly at low-pressure pressures, the precise impact of portable force on slabs designed after pressure has been observed during the analysis of the numbers of scattered and disconnected joints. Before entering the analysis, the load charge is calculated based on the model provision and combination codes, as the analysis is not required in status mode and our interest is limited to the plate only. After the analysis is completed, the same process is performed on other tiles as the model results are validated again in the same way. On the tension-back slabs, both the front compression and the additional load on the opening act to reduce the solid pressures on the concrete. However, the pressure level is usually not sufficient to prevent all pressure cracks under the live load design on the Serviceability Limit List. Reduced live load, most cracks will not be visible. The post-firm action causes the floor to reach, bend, and rotate. If any of these effects are blocked, second bias results are established. As noted above, secondary effects from abstraction limitations are generally ignored if the bias level does not exceed 2N / mm2 the secondary effects due to the restraint to shortening are usually neglected.

A. Loads and Material property

Name	Type	E MPa	Unit Weight kN/m³	Design Strengths
HYSD415	Rebar	200000	76.9729	Fy=415 MPa, Fu=485 MPa
M35	Concrete	29580.4	24.9926	Fc=35 MPa
Tendon	Tendon	196500.6	76.9729	Fu=1861.58 MPa

Table 1: Summary of Materials Properties

Name	Material	Shape
C 300 X 300	M35	Concrete Rectangular
C 500 X 500	M35	Concrete Rectangular

Table 2: Summary of the Frame section

Story	Label	Load Pattern	Direction	Load kN/m²
Story1	F1	Dead	Gravity	8.6 or 11.25
Story1	F1	Live	Gravity	4

Table 3: Shell Loads Uniform

Name	Type
Dead	Linear Static
Live	Linear Static
PT-FINAL	Linear Static

Table-4: Load Cases Summary

Name	Load Case/Combo	Scale Factor	Type
Load case 1	Dead	1.5	Linear Add
Load case 2	Dead	1.5	Linear Add
	Live	1.5	
Load case 3	Dead	1.5	Linear Add
	PT-FINAL-HP	1	
Load case 4	Dead	1.5	Linear Add
	Live	1.5	
	PT-FINAL-HP	1	
Load case 5	Dead	1	Linear Add
	PT-TRANSFER	1	
Load case 6	Dead	1	Linear Add
	PT-FINAL	1	
Load case 7	Dead	1	Linear Add
	Live	1	
	PT-FINAL	1	

Table 5: Load Combination Summary

IV. COMPARISON OF SLABS

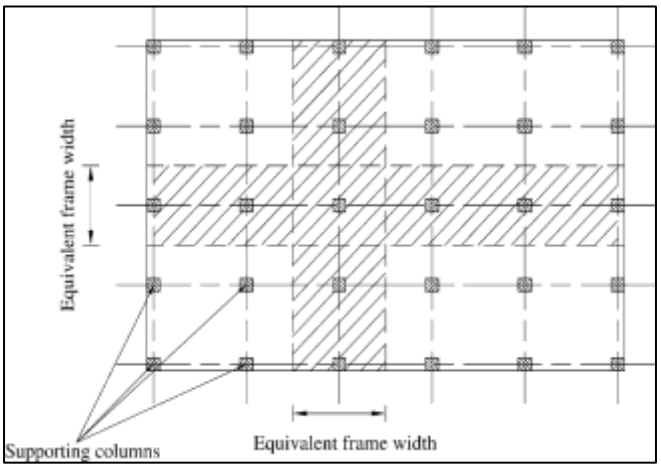

Fig. 1: Plan view of flat plate slab

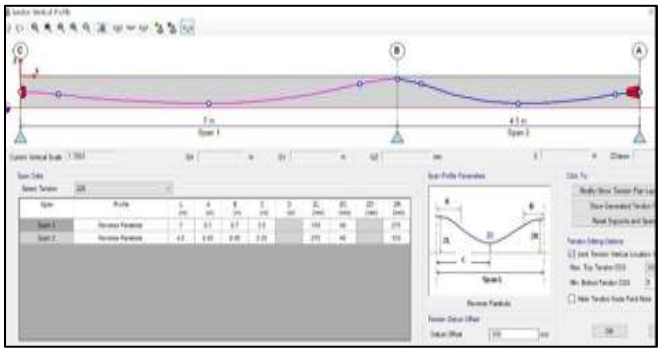

Fig. 2: Tendons profile in a transverse direction from C-A

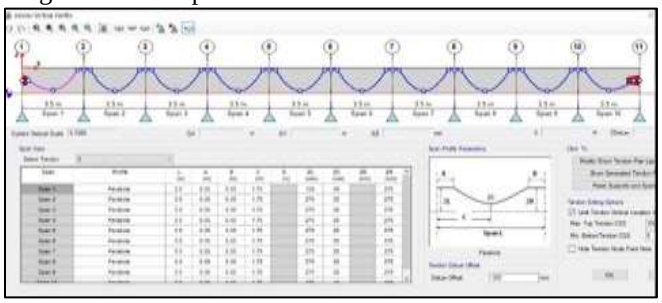

Fig. 3: Tendon profile in longitudinal direction 1-11

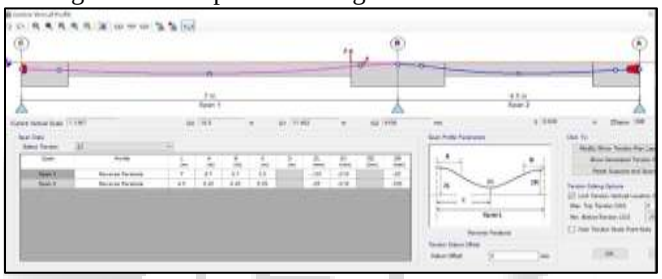

Fig. 4: Transverse direction profile of tendon in flat slab

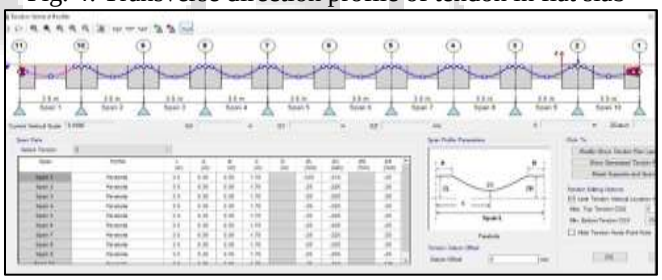

Fig. 4: Longitudinal direction profile of tendon in flat slab

For Etabs modeling, the story number is considered G + 1, as this floor number does not take into account slab comparisons, because in this case seismic load analysis was not performed. Only dead, living and biased load conditions in BS 8110-1997 part -1 are considered. Deviations and Puncture cut-off are calculated and theoretically and analyses are compared and evaluated to confirm.

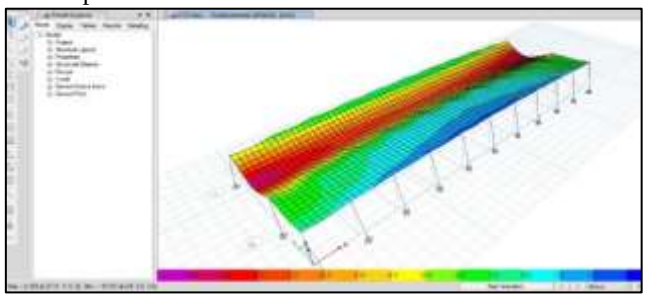

Fig .6: Vertical displacement of slab

Vertical exclusion or deviation of is loading case -4 with significant deviation, as shown in the figure above. According to BS 8110-1997 part-1, the permissible deviation is aperture / 250 ratio or should be less than 20 mm. It exceeds the deviation curve as on this plate.

Fig. 7: Punching shear ratio

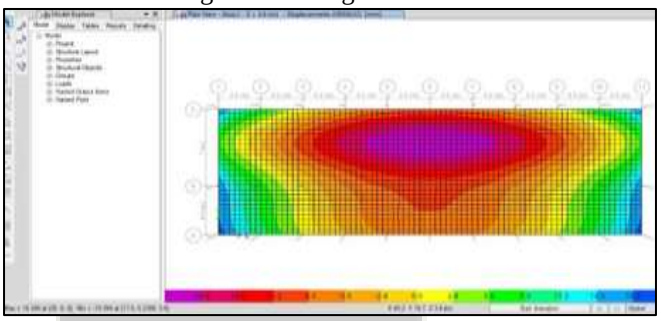

Fig. 8: vertical displacement of flat slab

V. RESULTS AND CONCLUSION

In this article, both plates are compared to understand the difference in the selected parameter. As both plates have a common design process but differ in many aspects such as the number of tendons, the thickness of the plate, the pressure on the tendons in the transmission and function. Modeling in ETABs has a similar floor design process. Our precaution was to examine the usefulness of both slabs, which are commonly used with reinforced concrete structures. Modeling, analysis and design testing were done using the English code BS 8110-1997 part-1 and BS 8110-1985 part-2. In this study, only the parameters were compared between vertical deflection plates and punching shears. In such cases, the floor loads are transferred directly to the column, as the flat plate and the flat plate both provide free beam space and are for aesthetic purposes. This puts the log at greater risk of a gradual collapse in high-rise buildings where a large part of the handle is the backbone of the reinforcement. Therefore, comparisons in this study also showed that the slab was better in terms of terms.

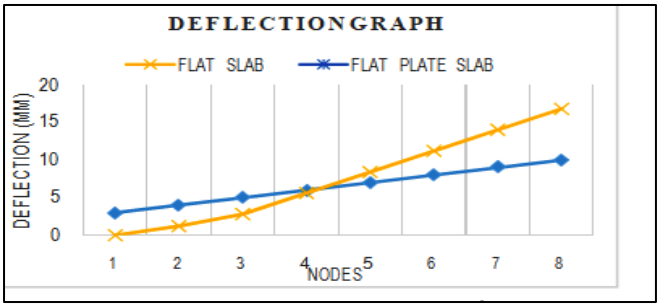

Fig. 9: Deflection graph for slabs

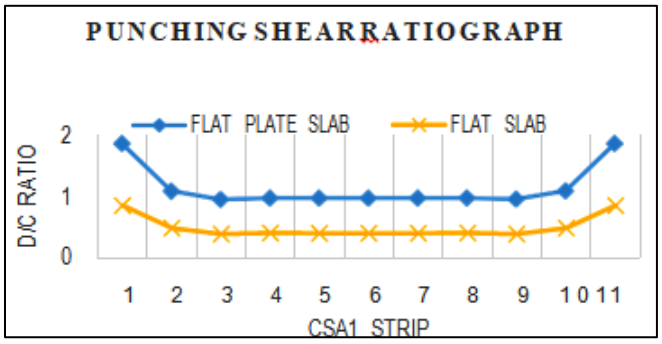

Fig. 10: Punching shear ratio for CSA1 strip columns

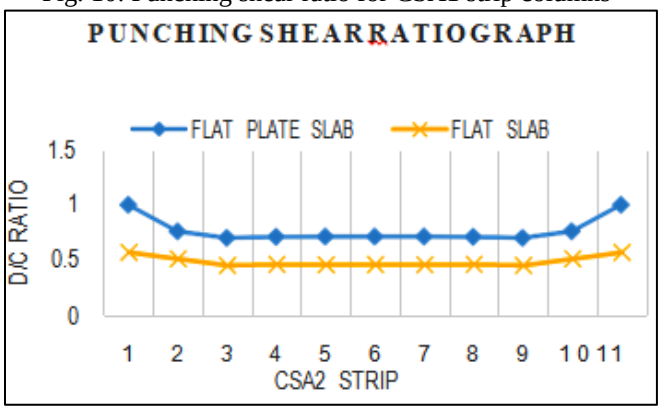

Fig. 11: Punching shear ratio for CSA2 strip columns

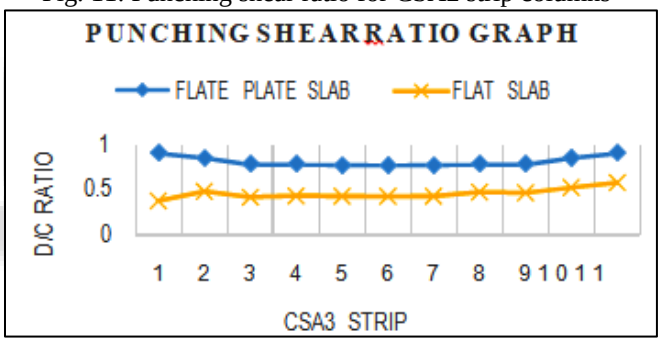

Fig. 12: Punching shear ratio for CSA3 strip columns

A. Conclusion and Discussion

As the above parameter study shows differences in slabs, it can help to understand the behavior of slabs under post-tension. Therefore, the following are the conclusions taken of the post-tensioned flat plate sheet and flat sheet.

1) If the deviation functions on the post-tensioned slab, the flat slab has a greater deviation than the flat slab. This is because the depth of a flat plate is greater than that of a flat plate.
2) Deviation is below the operational determinacy limit, where the opening/depth ratio of a flat plate is less than a flat plate.
3) As with any parameter study with punch cut ratio or the need for each volume (D / C scale) about the fibers, it shows that the flat plate with the post-tension system provides better resistance to piercing error.
4) Furthermore, in a comparative study, it was noted that the effects of piercing were less on a flat plate than on a flat plate with a post-tensioning system.
5) This study shows that the effect of a punch on a flat post-pressure plate decreases to 54% compared to a flat-post-pressure plate

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