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Study and Analysis of Post Tension Flat Slab for Different Tendon Layouts

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Abstract: The main purpose of this paper is to study of post tension flat slab and study of their various tendon profiles. In this paper the analysis of various different tendon layouts with different sizes is done. In this paper different sizes of slab is considered and analysis is done with the help of SAFE software. With help of analysis we know the deflection of PT slab for different layouts. In this paper tendon layouts are as banded tendons in main direction, banded tendons in both directions, distributed tendons in both directions, banded and distributed tendons in both directions are considered with different sizes. This paper also includes PT strip stress diagram and layouts.
Keywords: Post tension slab, banded tendons, tendon layout.

I. INTRODUCTION

In this fast-paced and competitive world, building sector is at the apex of the growth of any country. Multi storey and high-rise buildings are admired by every human being. Traditionally the construction of a building is done by RCC but in present world, construction of high rise and multi storey buildings is done by post-tensioning. In RCC, the economic expenditure is very high in commercial and institutional buildings because of more material required in construction and hence, post tensioned building proves to be more economic and durable. Post-Tensioned building saves quantity of steel and concrete as compared to RCC and increases clear span in rooms. All post-tension slab construction has long been popular for medium to high rise building such as office buildings, hospitals, residential buildings, university, and parking buildings. The term pre-stressing (transfer) is used to describe the process of introducing the internal force (or stress) in to a concrete element during the construction process in order to counteract the external load applied when the structure is put in to use. These internal forces are applied by tensioning high-strength steel, which can be done after the concrete is placed. When a concrete floor slab is subjected to forces, it flexes and bends. These forces are a result of gravity pulling down on the slab while additional weight is applied to the top of the slab. The bending and flexing creates high tensile forces that can cause the concrete floor slab to crack. Adding post-tensioned reinforcement instead of rebar alone combines the action of reinforcing the tension zones with the advantages of compressing the concrete slab. Now optimum efficiency is obtained because the post-tensioned reinforcement is located in the tension zones, the concrete is compressed, and the post-tensioned reinforcement is creating an uplift force in the middle of the spans where it is needed the most.

II. DEFINITION

1) *Tendon:* The complete assembly consisting of anchorage and prestressing steel with shearing when required. The tendon imparts pretressing force to the concrete.
2) *Bonded Tendon:* Tendons which are bonded to the concrete through grouting or other approved means, and therefore are not free to move relative to the concrete.
3) *Unbonded Tendon:* Tendons in which the prestressing steel is permanently free to move relative to the concrete to which they are applying their prestressing forces.

III. ANALYSIS OF POST TENSION FLAT SLAB

Following are the flat post tension slab layout models in safe software and analysis of different sizes of different tendon layout is done and maximum deflection is find out for this tendon layout. The figure include layout plan, tendon layout, PT strip stress diagram and deflection diagram with their values.

1) 8m x 8m size of post tension slab panel.
2) 5m x 5m size of post tension slab panel.
3) 4m x 4m size of post tension slab panel.
4) 3m x 3m size of post tension slab panel.

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A. 8m X 8m span

Following are the flat post tension slab models in safe software for 8m x 8m size and shape.

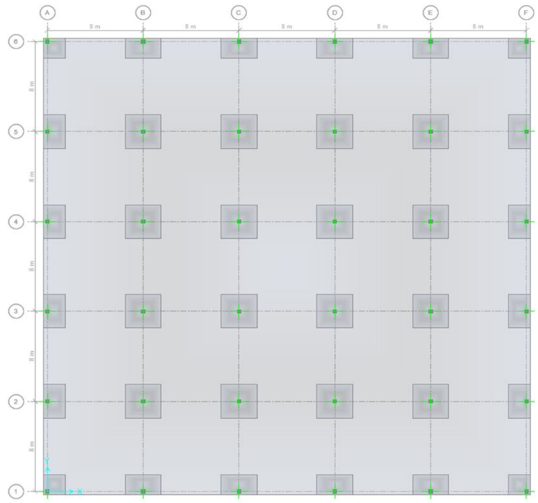

Fig. 1.1 8m x 8m layout

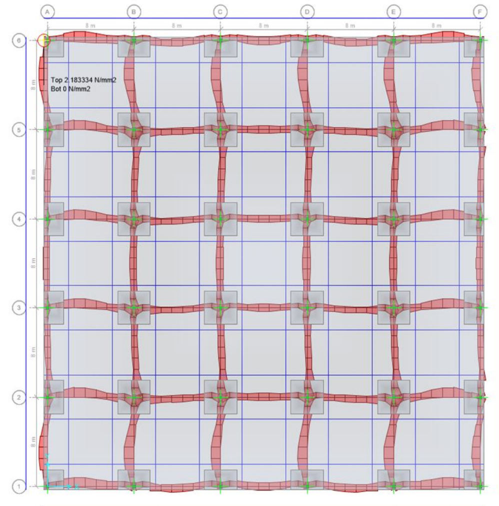

Fig. 1.2 PT strip stress diagram

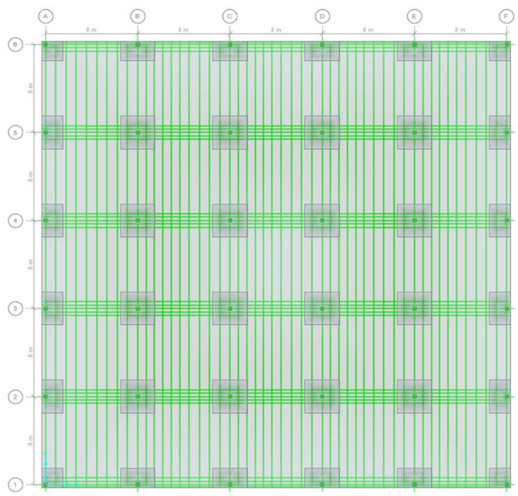

Fig. 1.3 Banded and distributed tendon

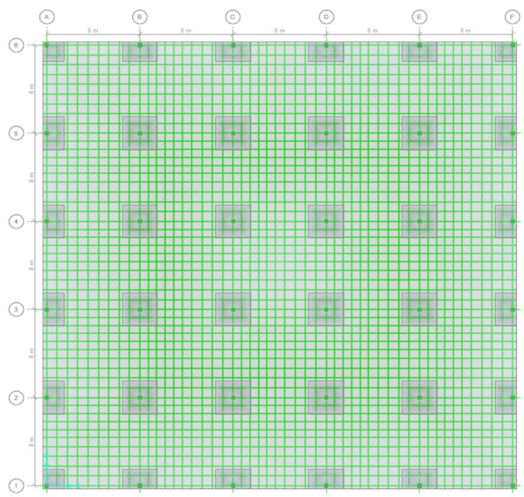

Fig. 1.4 Distributed and distributed tendon

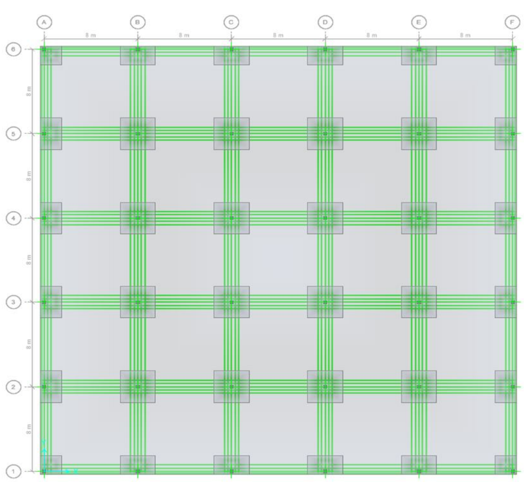

Fig. 1.5 Banded and banded tendon

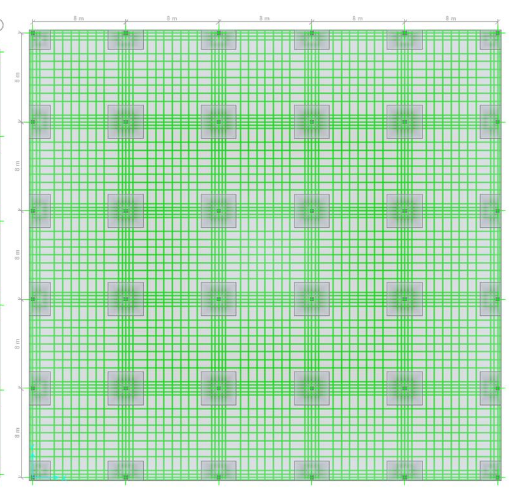

Fig. 1.6 Banded and distributed tendon

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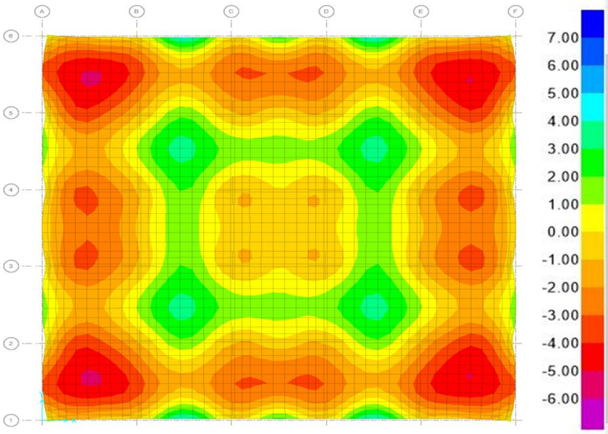

Fig. 1.7 Deflection diagram at Transfer
For Banded and Distributed layout
Max. Deflection : 5.14 mm

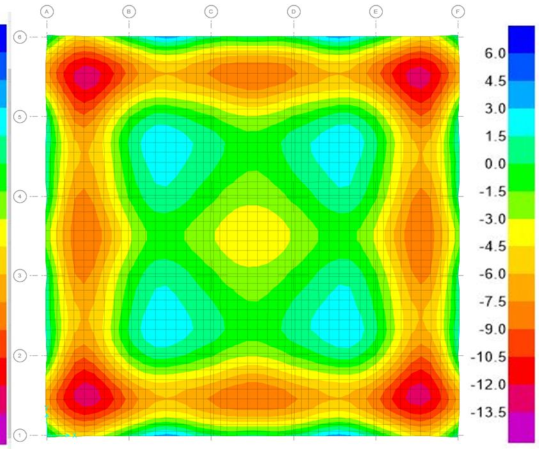

Fig.1.8 Deflection diagram at Final
For Banded and Distributed layout
Max. Deflection : 12.78 mm

Similarly the maximum deflection for other tendon layouts is as given below,
For distributed and distributed tendon layout (Fig. 1.5) at transfer is 4.23mm and at final is 11.40mm.
For banded and banded tendon layout (Fig. 1.6) at transfer is 5.25mm and at final is 12.89mm.
For banded and distributed tendon layout (Fig. 1.7) at transfer is 6.53mm and at final is 14.04mm.

B. 5m x 5m span

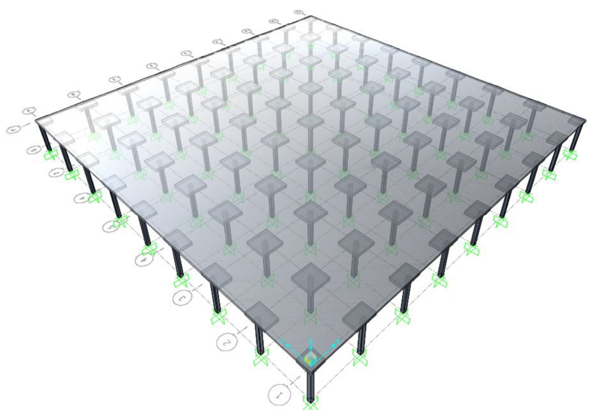

Fig.2.1 5m x 5m layout

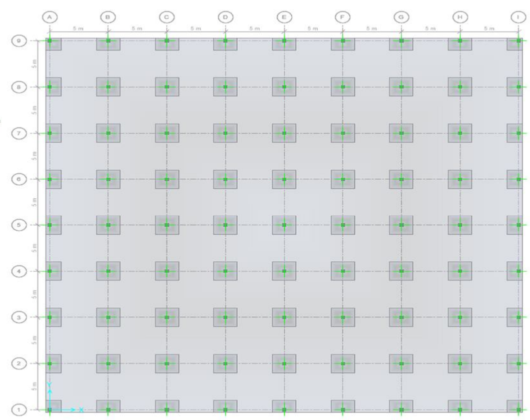

Fig. 2.2 5m x 5m layout plan

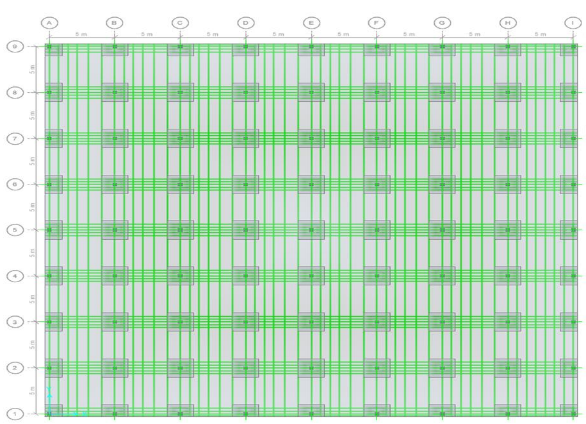

Fig. 2.3 Banded and distributed tendon

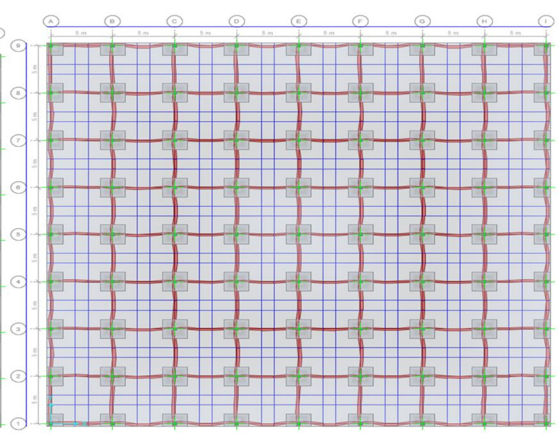

Fig. 2.4 PT strip stress diagram

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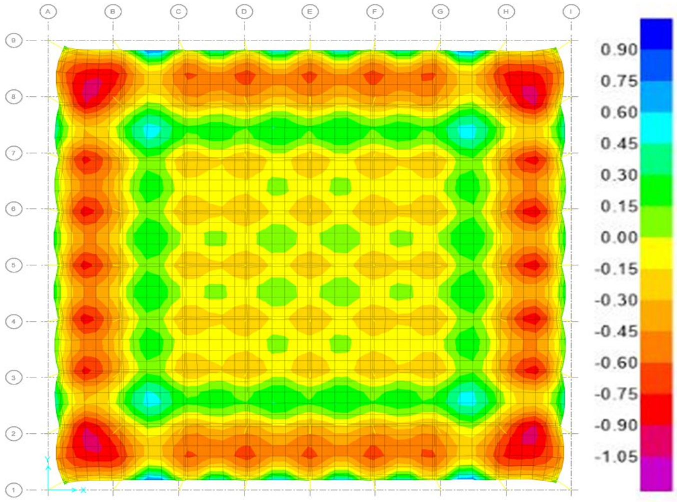

Fig. 2.5 Deflection diagram at Transfer
Max. Deflection : 0.96 mm

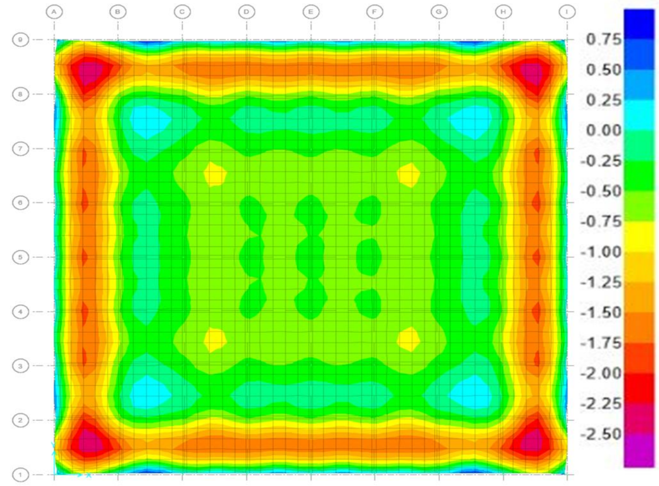

Fig. 2.6 Deflection diagram at Final
Max. Deflection : 2.46 mm

C. 4m x 4m span

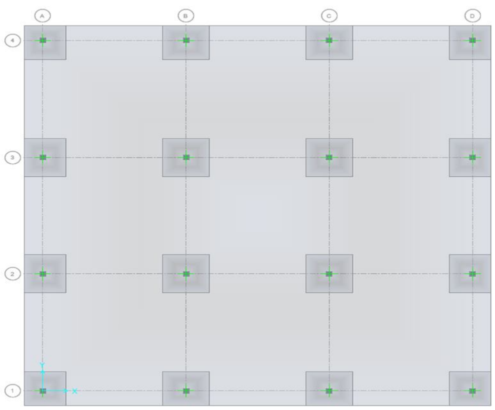

Fig. 3.1 4m x 4m layout plan

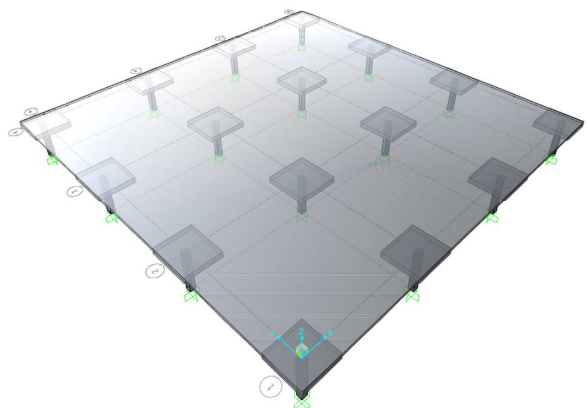

Fig. 3.2 4m x 4m layout

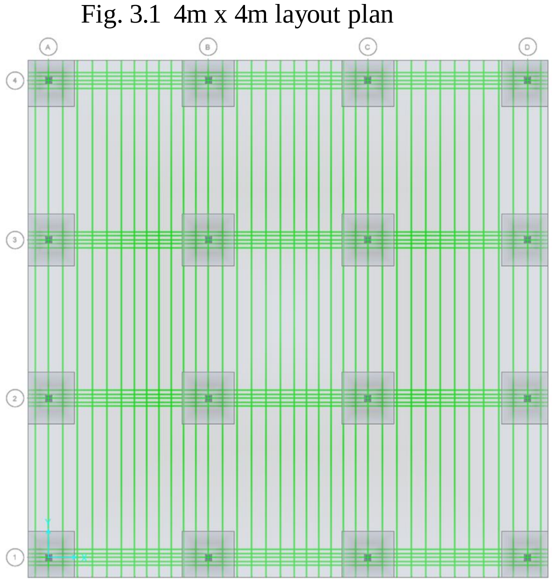

Fig.3.3 Banded and distributed tendon

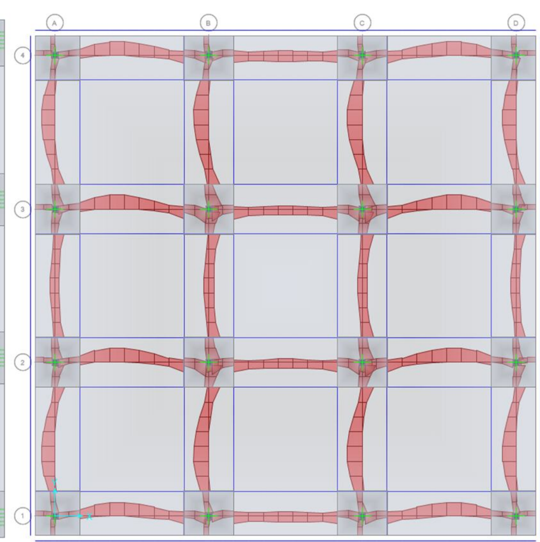

Fig. 3.4 PT strip stress diagram

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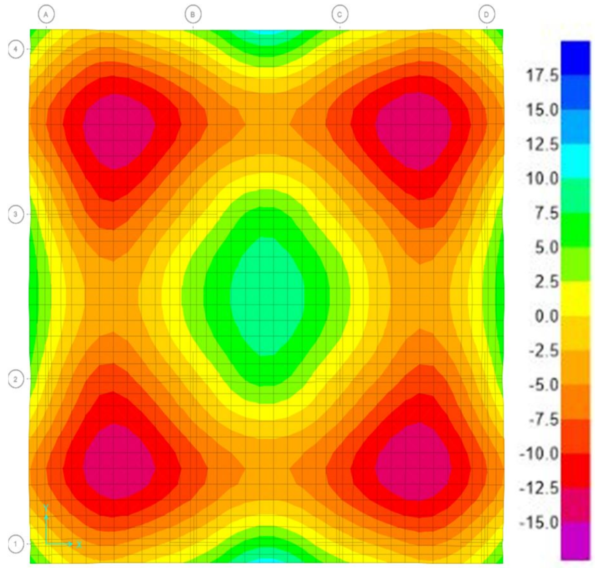

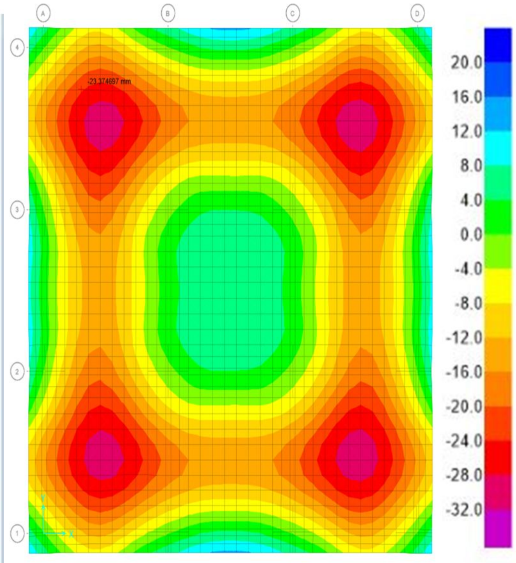

Fig. 3.5 Deflection diagram at Transfer
Max. Deflection : 14.70 mm

Fig. 3.6 Deflection diagram at Final
Max. Deflection : 30.35 mm

D. 3m x 3m span

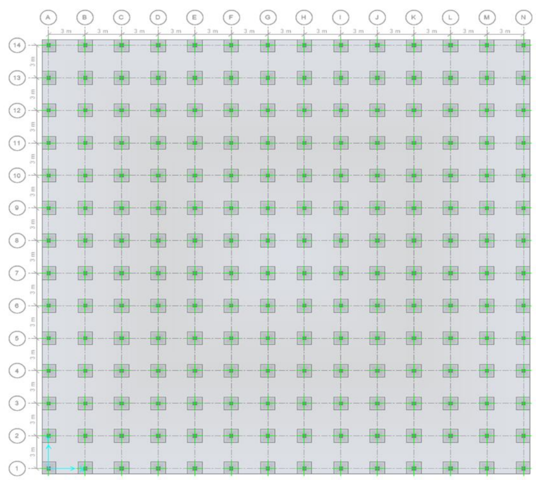

Fig. 4.1 3m x 3m layout plan

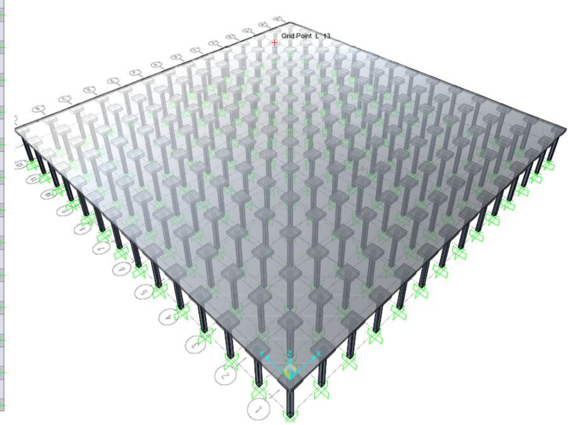

Fig. 4.2 3m x 3m layout

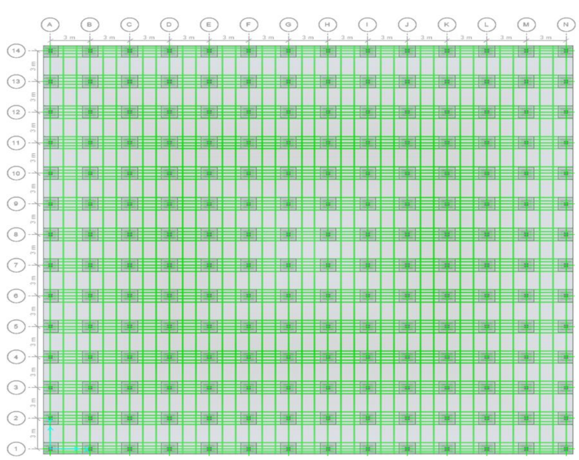

Fig.4.3 Banded and distributed tendon

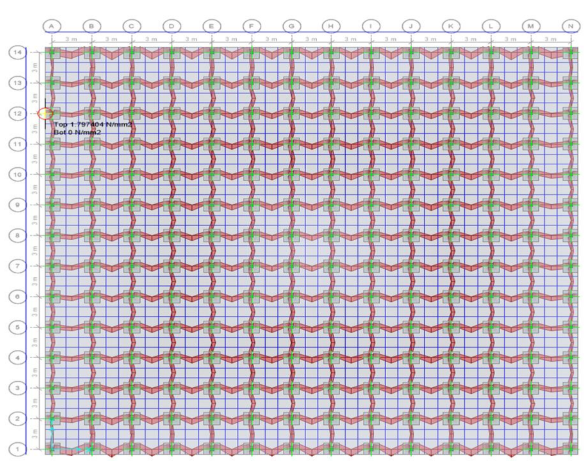

Fig. 4.4 PT strip stress diagram

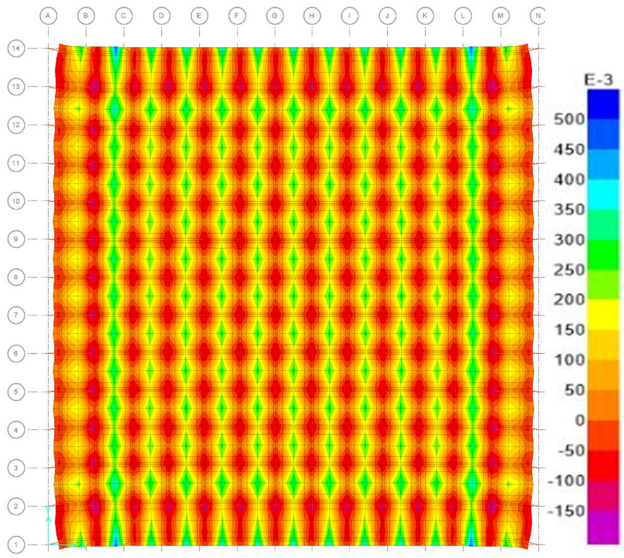

Fig. 4.5 Deflection diagram at transfer
Max. Deflection : 0.13 mm

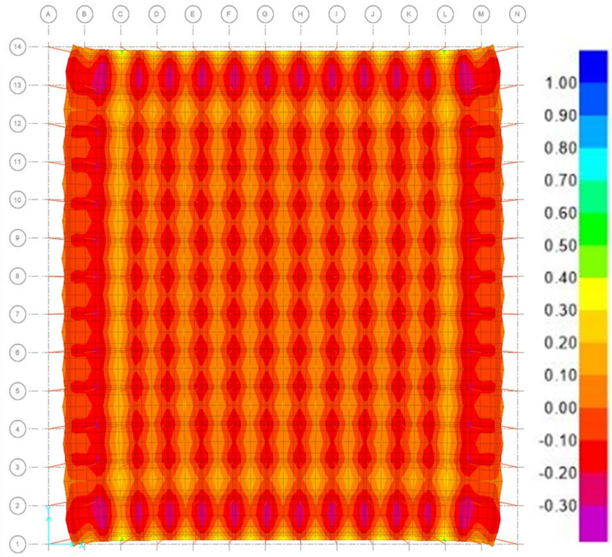

Fig. 4.6 Deflection diagram at final
Max. Deflection : 0.27 mm

IV. CONCLUSION

From the above proposed project work study of post tension flat slab and study of different tendon layouts is done. Also analysis of different tendon layouts is done. Here compare the results of deflection of different tendons for transfer and final stage is done. After analysis we get result at transfer stage deflection is minimum and at final stage deflection is maximum. The results for different span is given as below,

A. For 8m x 8m deflection for final is 148% increases than transfer.
B. For 5m x 5m deflection for final is 156% increases than transfer.
C. For 4m x 4m deflection for final is 106% increases than transfer.
D. For 3m x 3m deflection for final is 107% increases than transfer.

V. ACKNOWLEDGEMENT

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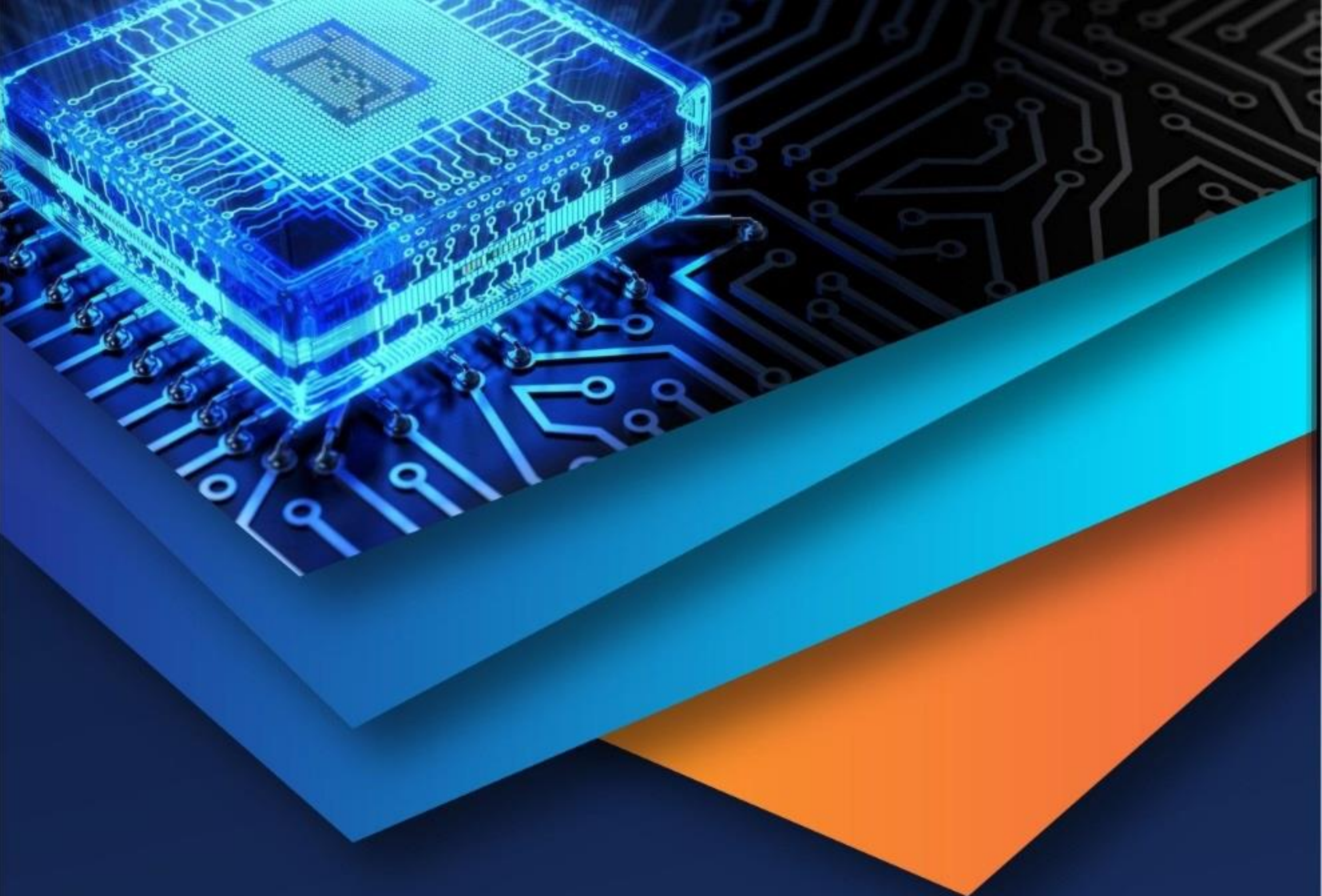
REFERENCES

[1] Boskey Vishal Bahoria and Dhananjay K. Parbat, "Analysis and Design of RCC and Post-Tensioned Flat Slabs Considering Seismic Effect", IACSIT, Vol. 5, 2013.
[2] Harshal Deshpande, Radhika Joshi, Prashant Bangar, "Design Considerations for Reinforced Concrete Flat Slab Floor System", IJSER, Vol.5, Issue. 2, 2014.
[3] Iosif Torok, Attila Puskas, Jacint Virag Science Direct, "Post-Tensioned Flat slabs with Unbonded Tendons for Public Buildings", Science Direct, 2019.
[4] Karim Farouk, Tamer Elafandy, Magdy Abdelmosen and Amr Nafie, "Evaluation Of Post-Tensioned Concrete Slabs Behavior Using Different Tendons Schemes", 2018.
[5] Maulik G. Kakadiya, "A Research on Comparison of R.C.C and Post Tensioned Flat Slab with or Without Drop Using Software", Vol. 2, Issue. 2, 2016.
[6] Rahul P. Kikani, "A Comparative Review On Behavioural Aspect Of Post- Tensioning Voided Flat Slab With Other Slab Systems", 2017.
[7] Rafal Szydlowski, Barbara Labuzek, et al., " Post-Tensioned Concrete Long-Span Slabs in Projects of Modern Building Construction", MSAE, 2017.
[8] Rahul Singh, Amarjeet Chauhan, et al., "Post-Tensioned Building Analysis and Design – A Case Study", IARJSET, Vol. 5, Issue. 3, 2018.
[9] U. Prawatwong, C.H. Tandian, et al., "Seismic Performance Of Post–Tensioned Interior Slab-Column Connections With And Without Drop Panel", 2008.
[10] V.G.Kiran Kumar, N. Lokeshwar Reddy, et al., "Design and Analysis of a Commercial Complex by Using Post Tension Method", Vol.1, Issue. 11, 2014.
[11] I.S. 1343-2012 : Code of practice for pre-stressed concrete.



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