

Analysis of Behavior of Post Tensioning Slab for Various Framing Under The Influence of Lateral Load : A Review

Yogesh Poptani^{1*}, K. Divya Kotecha², Lokesh Singh³

¹P. G. Scholar, Department of Civil Engineer, R.S.R. College of Engineering and Technology, Bhilai, Chhattisgarh, India

²Assistant Professor, Department of Civil Engineer, R.S.R. College of Engineering and Technology, Bhilai, Chhattisgarh, India

³Professor and Head, Department of Civil Engineer, R.S.R. College of Engineering and Technology, Bhilai, Chhattisgarh, India

ABSTRACT

Looking at modern trend of construction post tensioning system is used in constructions over pre-stressing systems as post tensioning has less losses compared to prestressing and also we can give any shape to tendons in post tensioning. Hence Post Tensioned (PT) tendons are added in flat slab as post tensioning gives superior performance because the PT flat floor systems provide improved crack and deflection control, and allow relatively large span to thickness ratios of the order of 35 to 45 which is less in case of RC up to 30. It also reduces floor to floor height, get lighter structures. Post tensioning also gives construction efficiency, sustainability and durability. But understanding and analysis of flat floor system behavior subjected to lateral forces and/or displacements in areas prone to earthquake, i.e. high seismic zone regions, is matter of concern. It becomes a subject of interest to find the seismic force resisting capacity of such buildings in the presence or absence of Lateral Force Resisting System. For that nonlinear static analysis is used as it is partial and relatively simple intermediate solution to complex problem of predicting force and deformation demands imposed on a structure and its elements due to ground motion. This analysis is an attempt to evaluate the real strength of structure and it is a useful and effective tool for performance-based design. In this study we are presenting review of journals and researches related to analysis of diaphragm.

Keywords : Nonlinear static analysis, PT slab, prestressed concrete, base shear, review, punching shear, deflection

I. INTRODUCTION

Reinforced concrete slabs are broadly utilized as a part of the concrete developments. In basic examination, the torsional solidness of slab is disregarded. At the point when this firmness is considered, the correct hypothesis of bending of flexible plates demonstrates that the contorting minute alleviate around 25 percent. The essential

capacity of floor and rooftop frameworks is to help gravity stacks for example, sections and dividers. Besides, they assume a focal part in the circulation of wind and seismic powers to the vertical components of the sidelong load opposing framework. The impact of the slab boards isn't considered in reinforced concrete basic investigation since architects disregard their commitment in parallel load opposition. For the most part, the development completed is reinforced

concrete with slabs giving the useable floor territory. As they frame a vast piece of basic framework, in this way creators ought to get advantage from their extensive in plane firmness. So in this investigation the reaction of two basically same structures, with and without thought of solidness of slabs were assessed and looked at based on changed auxiliary parameters. Reinforced concrete slabs are generally utilized as a part of the concrete developments. In auxiliary investigation, the torsional firmness of slab is overlooked in like manner.

Despite the fact that there has been a considerable measure of work demonstrated as completely inflexible spaces in reinforced concrete structures running from investigation suspicions to outline proposals – nobody give top to bottom comprehension of the seismic reaction of reinforced concrete (RC) structures commitments identified with slab and past endeavors most firmly identified with the necessities of the present work. A concise audit on slab adaptability and code arrangement of past examinations is exhibited here. This writing survey around adaptability of slab in reinforced concrete structures and some code arrangements will be tended to by zone.

II. LITERATURE SURVEY

Sridhar and Rose (2019) ^[20] author accentuated on structuring a post-tensioned structure utilizing ETABS and SAFE. ETABS represents Extended Three-Dimensional Analysis of structure frameworks. The fundamental reason for this product is to plan the multi-storeyed structure in a precise procedure which will pursue Indian Standard structure codes.

The author venture managed the arrangement of tremor and wind opposition structure where the Minimum sizes of segment and bar gave were C500*500 and B300*500 and later Seismic investigation was finished by utilizing ETABS programming where whole individuals were

passed in the plan. As the structure was posted tensioned one, it demonstrated to be efficient.

Srilaxmi et. al. (2018) ^[22] the author channelized the present days the pre-tensioning and post-tensioning frameworks are prevalently utilized in the significant developments of a structure. The Pre-tensioning and Post-tensioning the two strategies are utilized under the pre-focusing on the procedure. In which has few edges over the standard non-focused on structures like more noteworthy range to profundity proportion, higher minute and shear limit. These techniques were commonly received taking shape of PSC braces, sleepers, Bridges, Slabs in structures, Concrete Pile, Repair and Rehabilitation, Nuclear Forces Plant and so forth

Prakash et. al. (2017) ^[21] the author expressed that Post-tensioned story areas are seen as the most monetarily fruitful improvement for strip shopping centres, office structures, and stopping where ranges outperform 7.5 meters. The favoured post-tensioning structure used is the all-around illustrated 'reinforced' ligament utilizing from 3 to 5 individual pre-stressing strands housed in oval ducting and secured in a level fan-shaped safe grapple castings.

Nethravathi et. al. (2017) ^[9] authors research paper included outcomes on an investigation of the unbonded post-tensioned cast set up stopping floor exposed to different game plans of ligament design dependent on FEM examination. Displaying and investigation of the post-tensioned level plate were finished by utilizing SAFE programming. Proportional loads dependent on link profiles were connected to the level plate as indicated by the ligament format. Structure minutes, administration minutes, hyper-static minutes, transient avoidance, long haul redirection, and punching shear was thought about for the different ligament designs at administration and extreme point of confinement state.

Dobariya et. al. (2017) ^[10] the author investigated a long-range T-shaft with 10-20m range pillar

examination in the fortified and unbonded bar with greatest strain zone link profile. The hypothetical outcomes depended on IS 1343-1980 and ACI-318 base considering the development cost of both the frameworks. The correlation depended on the parameters specifically focuses on avoidance, twisting minute and shear forces.

The outcomes expressed that the prestressed solid pillar with high PT forces (64kN and 42kN) accomplished the most extreme load when contrasted with different shafts under two-point stacking and single point-stacking condition individually. The splits began to show up precisely under the stacking focuses, which unmistakably demonstrated that the bars bombed under flexure.

Jasani and Pandey (2017) [17] the demonstrating of a G+11 story building was finished utilizing Etabs application and investigation was finished by the change of the situation of the exchange brace in plan and furthermore change in the situation of the shear divider. Indeed, even the investigation of the flexural conduct of the shaft which precisely lied on the post-strain move brace and the segment which is upheld the exchange support was considered.

The expository outcomes expressed that on account of exchange brace inside the structure the arrangement of the shear divider on each of the four corners of the structure demonstrated to be useful than giving shear divider on either side of exchange support.

Nishant et. al. (2017) [8] author depicted the utilization of two unique techniques fortified and unbonded method on post-tensioning. Reinforced and unbonded framework in stress, quality, redirection, twisting minute and load adjusting condition with fathom by hypothetical and programming. Fortified and Unbonded pushed and effectively accessible from ACI code examination with IS code. ACI code gives arrangement for the structure of two frameworks reinforced and unbonded framework.

Szydowski and Barbara (2017) [16] the author's paper exhibited the geometry, trademark and redirection of raised pieces, During the sections erection and in two years of their utilizing, the diversion of three larger than usual chunks were checking. Regardless of planned the sections fundamentally bigger and slenderer than the prescribed most extreme estimation of range and length to profundity proportion, the redirection of the chunks is a long way from the farthest point esteem, delegate undertakings of acknowledged and future structures of long-range prestressed pieces.

Mordak et. al. (2016) [1] the authors' examination paper introduced the outcomes acquired from the trial research led on another development pre-focused on post-tensioned street extension situated over a water supply plant under unique field load test in Topola Village in Poland. A few unique tests were directed for the far-reaching assessment of the different solid components of the structure of the extension.

The wide scope of the dynamic test led prompted flexible assessment of the components of the scaffold through the complete investigation offered to ascend to the premise on which the extension qualified for essential administration according to the Poland measures.

Dhamaliya et. al. (2016) [7] authors research paper concentrated on the post-tensioned section with or without a drop and level piece making a parametric investigation of Post-Tensioned Flat chunk with or without a drop and r.c.c level chunk for the distinctive board size. These sorts of the section have been dissected and structured by Etabs and ADAPT_pt@2012 programming, for the diverse range (6m to 10m) which are the most widely recognized traverses utilized in practices.

The outcomes drove on to the end that the divider load was considered on everywhere throughout the floor (KN/m²) for the post-tensioned structure While examination. So there was adaptability to the client to develop a divider any place required

in the event of post-tensioning. The amount of prestressing steel was 4 Kg/m² for the post-tensioned level piece without a drop and 3.2 Kg/m² for a post-tensioned level chunk with the drop. for example, the prestressing steel required for the post-tensioned level piece without drop was more noteworthy.

Paul and Yedu (2016) ^[2] the author assessed the exhibition parameters of the structure where the vertical fortified ligaments were similarly circulated along four sides of the segments. The shopping complex structure arranged in Pattambi was chosen for investigation which lies in seismic zone III. Here corner segments were constrained by giving additional vertical PT forces up to half of its pivotal load limit with most extreme fortification steel up to 4% of the territory. The consequences of the investigation exhibited that increments in Performance point, greatest base shear, reaction decrease factor, pliability factor and over-quality factor can be accomplished by expanding PT steel and PT forces in ligaments.

Szydowski and Magdalena (2016) ^[15] author introduced presents the essential standards of configuration, consequences of disfigurement of the structure during erection got from hypothetical FEM model and estimated just as connected innovation.

The paper presented the consequences of executing prestressed move chunk in the structure. Chunk made over an underground passage bolsters 5 stories. The displayed undertaking was the first to wander of this sort in the venture workshop of authors. Consequences of estimations of diversion during the development of the structure show slight deviations from anticipated qualities. Qualities were determined, anyway in straightforward models utilizing a substitute load strategy, it was hard to anticipate exact consistence. The estimations of redirection in the last observed phase of execution, in any case, exhibited that forced conditions met with a specific hold. The most extreme range/profundity proportion for

post-tensioned bars conveying 5 stories was 17.6. This was higher in examination with detailed comparable acknowledge. It was accomplished by four-advance prestressing and abnormal state of base compressive loads.

Mathur et. al. (2015) ^[12] the study presented the investigation displayed pre-focused on cement anchoring devices affecting colossally to the structural designing choices. It includes the different procedure of prestressed solid which help us especially in understanding the instrument of the working framework and different devices are accessible to perform for structures called mooring gadgets, Further the structures by prestressing are increasingly dependable, solid and decreased in size when contrasted with RCC. Consequently, utilizing anchoring devices better solid structures can be made. Additionally, the pre-stress shaft can take more loads that are taken by the RCC pillar. It is one of the basic strategies for securing the shaft at a less expensive rate.

Ahmed et. al. (2014) ^[19] the author completed a definite investigation as versatility, malleability, vitality scattering and so forth with the target behind the test was to create rules for precast structure in locales of a tremor zone.

The outcomes introduced that even though the vitality dispersed was low the malleability of PCB example was superior to MCB example, the leftover disfigurement of PCB example was pretty much nothing, the harm level of PCB examples was light than MCB example. In PCB examples there was just a fundamental break among shaft and segment and there were little shear splits in the bar. This implied on the parts of decreasing shear splits the PT ligament was more viable than level fortifications in the pillar.

Boskey et. al. (2013) ^[4] the author here considered a contextual analysis for the use of structure technique a place of business (G+4) four cases with various floor frameworks. The amounts of fortifying steel, prestressing steel, concrete required for the piece, shaft and segment was

determined for the equivalent and were exhibited in unthinkable structure. Alongside this, the all-out expense of the structure per square meter was found and correlation of all the four cases concerning cost was finished.

Tanyeri and J.P. Moehle (2012) [3] the author directed a three-dimensional quake reproduction test on a full-scale, four-story, prestressed solid structure utilizing the E-Defense shaking table office. The seismic forces opposing arrangement of the test building included two post-tensioned (PT) outlines in a single heading and two unbonded PT precast dividers the other way. The test building was exposed to a few quake ground movements, going from usefulness level to close crumple. The conduct of the divider heading of the structure under a few ground movements was recreated utilizing nonlinear reaction history examination of reasonable basic building models, and the 2D reenactment outcomes were contrasted and the test outcomes. Directed logical recreations were in great connection with the test results for the significant building parameters with certain disparities.

III.CONCLUSION

The researchers have endeavored to discover the variety in stability which happens because of diaphragm, following are the results of writing survey:

- ✓ Determine that casing with diaphragm demonstrates less moment generation of the structure.
- ✓ That structure utilizing slabs are more steady.
- ✓ Difference in outline without slab, with slab and PT slab.

IV. REFERENCES

- [1]. Arkadiusz Mordak and Zbigniew Zee Manko (2016) "Effectiveness of Post-tensioned prestressed concrete road bridge realization in the light of research under dynamic loading", "9th International conference, Bridge in Danube Basin" Vol 1, ISSN 3463-4521.
- [2]. Amalu Paul and Yedu Krishnan.M (2016), "Lateral load analysis of Post tensioned and RCC building using Pushover analysis", "International Research Journal of Engineering and Technology (IRJET)", Volume: 03 Issue: 09 | Sep-2016.
- [3]. A.C. Tanyeri & J.P. Moehle (2012), "Seismic Performance and Modeling of Post-Tensioned, Precast Concrete Shear Walls", "15 WCEE LISBOA".
- [4]. Boskey Vishal Bahoria and Dhananjay K. Parbat (2013) "Analysis and Design of RCC and Post-tensioned Flat Slabs Considering Seismic Effect", "IACSIT International Journal of Engineering and Technology", Vol. 5, No. 1.
- [5]. D.Y. Wang, Z.B. Li, W.M. Yan, E.W. Guo, L.Y. Shi (2014), "seismic performance of precast prestressed beam-column concrete connections", "Journal of Beijing University of Technology", Vol 32:10, ISSN 895-900.
- [6]. Gardiner, D.K. Bull , A.J. Carr, (2018) Trends of Internal Forces in Concrete Floor Diaphragms of Multi-storey Structures During Seismic Shaking , World Conference on Earthquake Engineering.
- [7]. Maulik G. Kakadiya, Hitesh K. Dhamaliya (2016) "A Research on Comparison of R.C.C and Post Tensioned Flat Slab with or Without Drop Using Software", "International Journal of reseach and development advances", Volume 2, Issue 2, Print ISSN : 2395-1990, Online ISSN : 2394-4099.
- [8]. Nishant M. Dobariya,, Ankit Agrawal (2017), "Comparative Study Of Bonded & Unbonded Post-Tensioning For Long Span Beam In Building", "International journal of development sciences", Volume 4, Issue 4.
- [9]. Nethravathi S.M and Darshan Prasad (2017), "Analysis and Comparative Study of Unbonded Post-tensioned Cast-In-Place Parking Floor on the

- Effects of Tendon Layout using Safe”, “International Journal of Engineering Research & Science (IJOER)”, Vol-3, Issue-7, pp 34-50.
- [10]. Nishant Dobariya, Ankit Agrawal (2017), “Parametric Study between Bonded & Unbonded Post-Tensioning for Long Span T-Beam in Building”, “IJSRD - International Journal for Scientific Research & Development” Vol. 5, Issue 03, pp 12-17.
- [11]. Pradeep kumar, Shashank dutt (2016), Analysis of a tall structure considering seismic force under rigid frame structure, *Journal of Engineering Research and Application*, ISSN : 2248 9622, Vol. 7, Issue 7, (Part 1) July 2016, pp.29 34.
- [12]. Rahul Mathur, Rashmi Sakalle (2015), Seismic analysis of multi-storey R.C. structure using bracing system and floor diaphragm, *International Journal of engineering sciences & research technology*, ISSN: 2277-9655.
- [13]. Rahul Singh, Amarjeet Chauhan (2018), “Post-Tensioned Building Analysis and Design– A Case Study”, “International Advanced Research Journal in Science, Engineering and Technology”, Vol. 5, Issue 3, pp 25-76.
- [14]. Rahul Choat and Dr.Om Prakash (2017), “Application of post-tensioning in multi-storey buildings”, “International journal scientific research and development”, Vol 5, ISSN: 2277-9655.
- [15]. Rafal Szydowski and Magdalena Szreniawa (2016), “About the Project and Study of Post-tensioned Transfer Beams Under the Five-storey Building in the Centre of Warsaw”, “4th Annual International Conference on Architecture and Civil Engineering (ACE 2016)”.
- [16]. Rafal Szydowski and Barbara Labuzek (2017), “Post-Tensioned Concrete Long-Span Slabs in Projects of Modern Building Construction”, “IOP Conf. Series: Materials Science and Engineering”, Vol 3, ISSN 4562-2132, pp 245.
- [17]. Sujal P Jasani and Pradeep Pandey (2017) “Analysis of post tensioned transfer girder in g+11 story building using fem based software Etabs”, “International Journal of engineering and researches”, Volume 4, Issue 4.
- [18]. Sanjaya Kumar Patro, Sandeep jain (2013), Effect of diaphragm flexibility on seismic response of building structures, *Proceedings of The Eight World Conference on Earthquake Engineering*, pp. 735-742.
- [19]. Saeed Ahmad (2011), effects of economic reforms and openness on structure conduct and performance of agro-based industries in pakistan, *American International Journal of Contemporary Research*, Vol. 1 No. 2; September 2011
- [20]. Shanmathi Sridhar and A. Leema Rose (2019), “Performance Evaluation of Post-Tensioned Concrete Beams with Bonded System”, “International Journal of Innovative Technology and Exploring Engineering (IJITEE)”, ISSN: 2278-3075, Volume-8 Issue-7.
- [21]. V. Prakash, Keshav deskhmukh, ravi tridev and mahalaxmi (2017) The effects of the type of slab on structural system in the multi-storey reinforced concrete buildings, *World Conference on Earthquake Engineering*.
- [22]. Veerat Srilaxmi , K.Manju , M.Vijaya (2018) “a case study on pre-tensioning & post tensioning systems of a prestressed concrete”, “International Journal of Science advances”, Vol.5 Issue.2.

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