SEISMIC ANALYSIS OF TRANSFER SLAB STRUCTURE WITH DIFFERENT GEOMETRY

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ABSTRACT: In many metropolitan centers with minimal seismicity, multifunctional buildings with a transfer structure have become popular construction. The reaction behavior of systems with a transfer plate, when subjected to earthquake ground shaking, is investigated in this research. In the context of dynamic rotational-translational coupling, the impacts of load-path discontinuity and transfer plate flexibility are investigated. The seismic analysis of structural systems in tall buildings with diverse structural forms (square, circle, equilateral triangle, and pentagon) in the seismic zone (ii & v) with transfer slab was checked numerically in this thesis. The building under investigation is a 35-story reinforced concrete moment resistant frame constructed for gravity and seismic use following 1893:2016 and analyzed using Etabs 2019 structural analysis tools

1. INTRODUCTION

The transfer slab system is a reinforced concrete structure that makes building construction simpler, more aesthetically versatile, and cost-effective. It eliminates beams, allowing the building's height to be decreased. The transverse rigidity is poor due to the lack of deep beams, causing non-structural sections when earthquake stresses are applied (Lande and Raut, 2015). The transverse slab is a column-supported reinforced concrete slab used when more room is required, such as in a theatre or parking garage. This approach is more adaptable than the traditional method; the Transfer slab with drop and head is a great way to reduce moment while using less slab thickness (Sawant, 2016). Because a floor system plays an essential role in the total cost of the building by lowering the thickness of each structural floor, a post-tensioned floor system was designed to save construction time and costs.

2 Literature Review

Osama O. El-Mahdya, Hala M. Refatb (2022): The seismic performance of tall structures using transfer girders or slabs is investigated in this work. Vertical and lateral loads are often transferred from the top superstructure to the lower substructure using these transfer systems. The reaction spectrum and pushover analysis approach examined two case studies. ETABS computer software was used to conduct the analyses. Transfer girders or transfer slabs are used in the chosen case studies. Each study case has seismic reaction characteristics such as base shear, story shear distribution, bending moment distribution, top displacement, story drift, time period, and response modification factor.

Muchate B. G. 1, Prof. Shaikh A. N.(2020): A transfer floor is a kind of floor that can accommodate both vertical and lateral load resisting systems. A load is transferred to a different beneath the system. The weight is distributed from closely spaced columns to long-span columns on the transfer floor. This paper reported a seismic analysis of a multi-story structure with a transfer floor. The linear response spectrum analysis was used to examine various high-rise building models. The models were studied using the ETABS 2018 structural program for building research. The investigated models have a transfer girder system at different floor levels in a high-rise structure. Four alternative types of ten-story buildings were analyzed in this article, each with a transfer girder at various floor levels, such as the first, second, third, and fourth floors

3 MODELLING PARAMETERS

Building displacement, Storey drifts, Base shear, and Modal Periods are among the characteristics that have yielded findings. For 35-story buildings, the results of the p-delta analysis were obtained.

Model 1: A Square Structure

Model 2: Building an Equilateral Triangle

Model 3: A Circular Structure

Model 4 A pentagon-shaped structure.

Dimensions of Structural Members

S. No.	Specifications	35 story
1	Slab Thickness	115mm
2	Beam dimensions	230x600mm
3	Column dimensions	750x1000mm
4	Grade of concrete	M30
5	Grade of steel	Fe-415
6	Unit weight of concrete	25kN/m^3
7	Live loads (a) Floor load (b) Floor finishes	2kN/m^2 1kN/m^2
10	Importance factor	1.0
11	Seismic zone factor	0.36
12		5

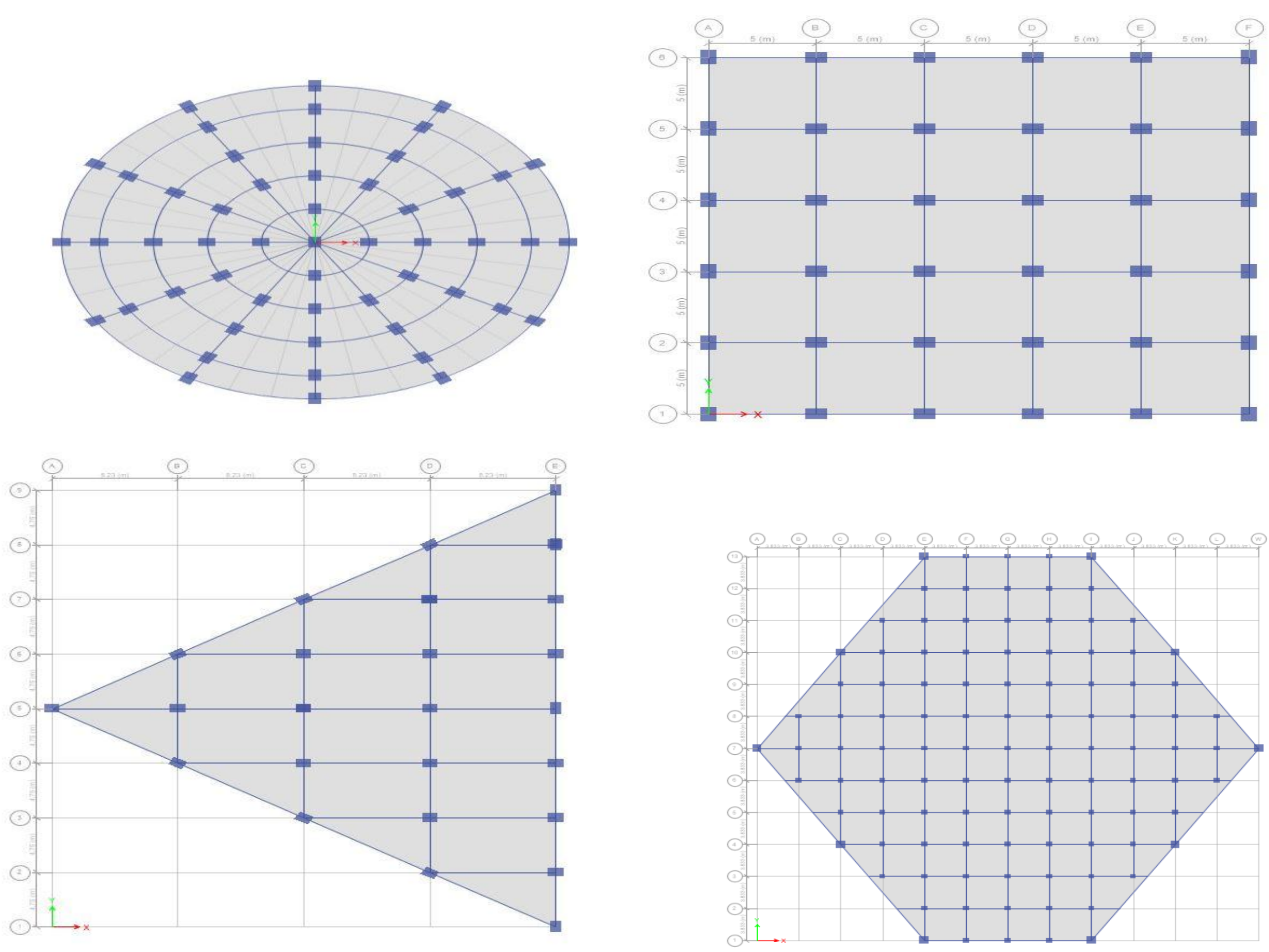
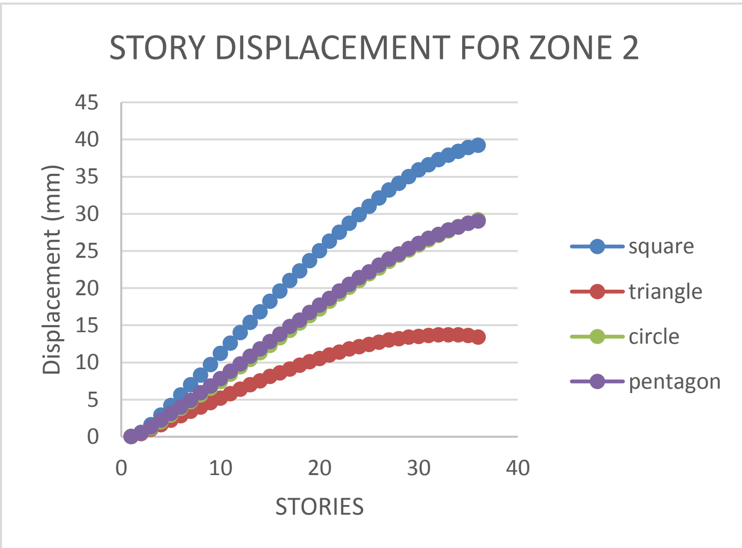
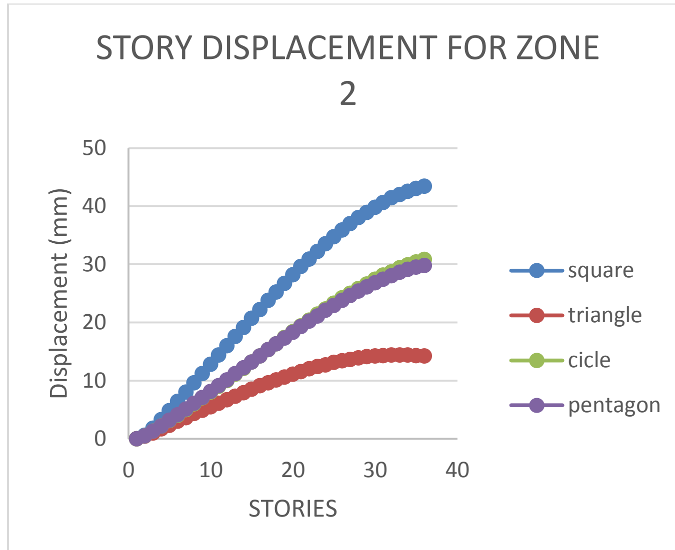
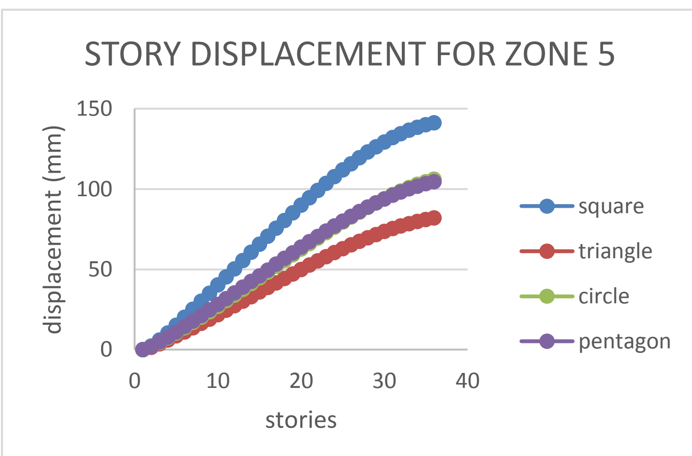


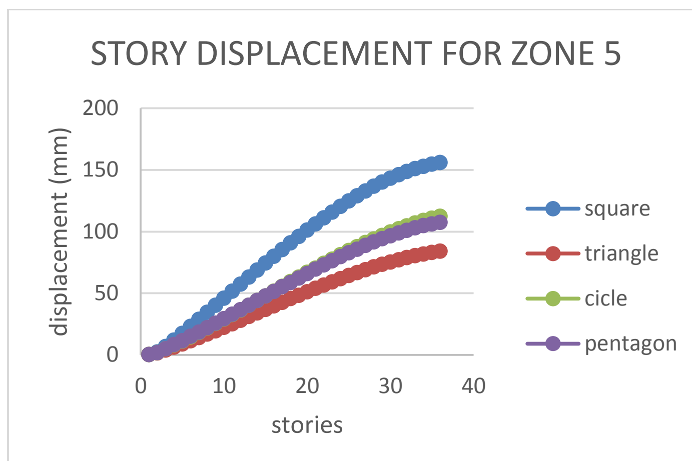
Fig No 1: Typical floor Plan 3D View

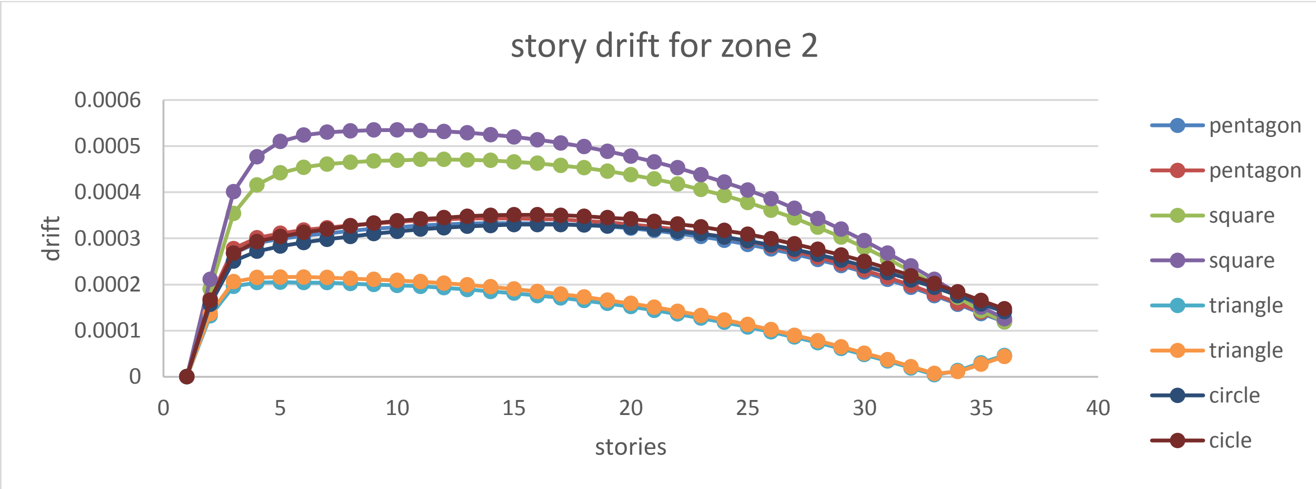
4. ANALYSIS RESULTS







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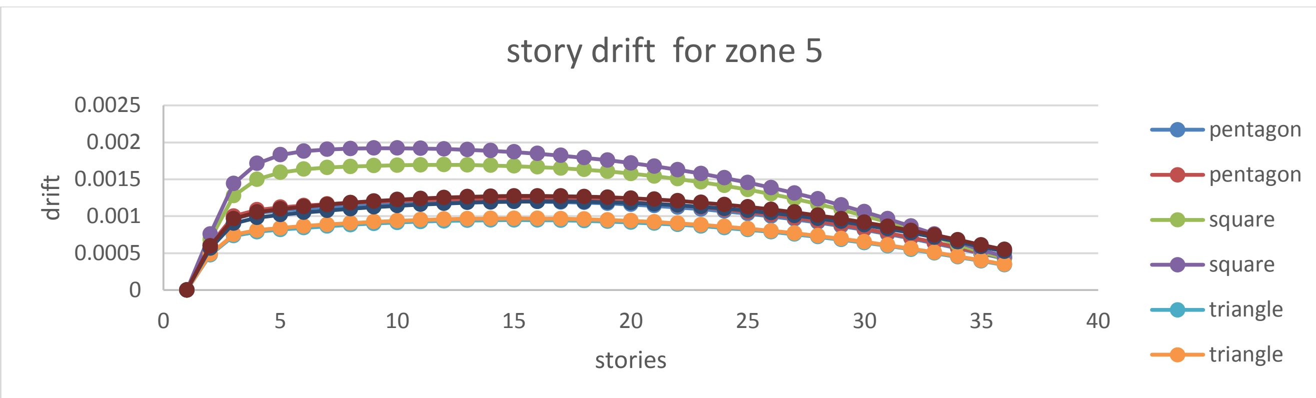
story drift for zone 5
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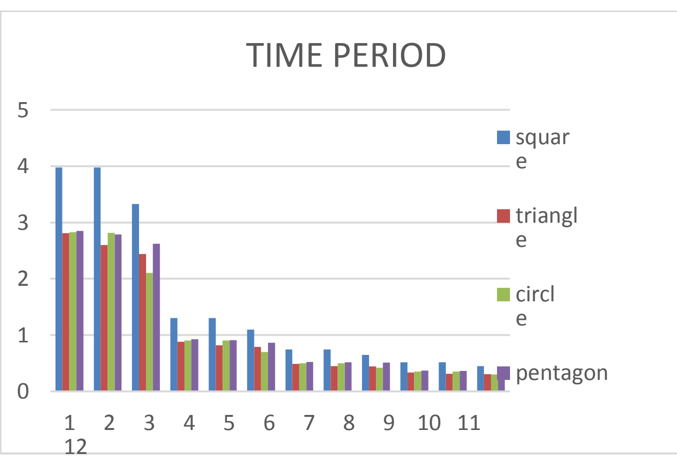
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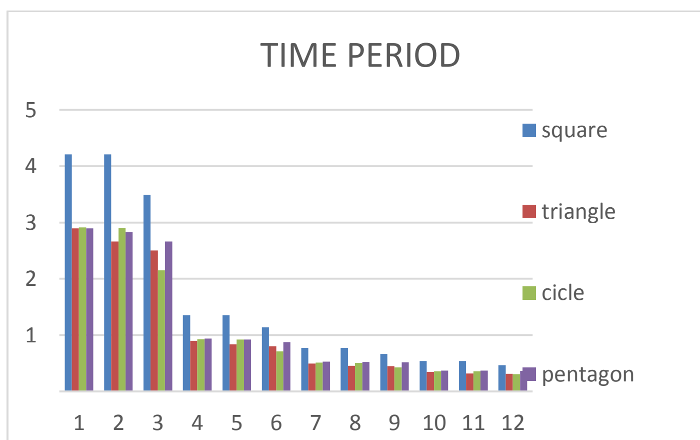
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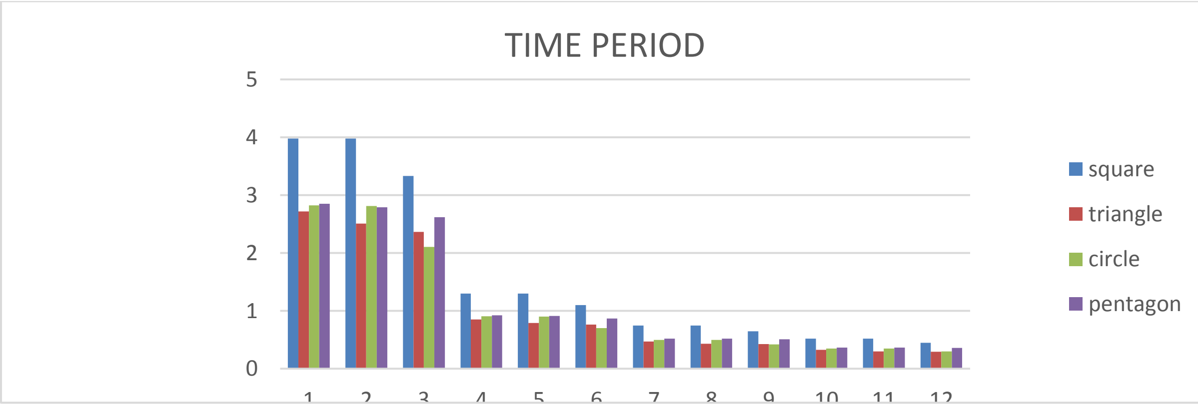

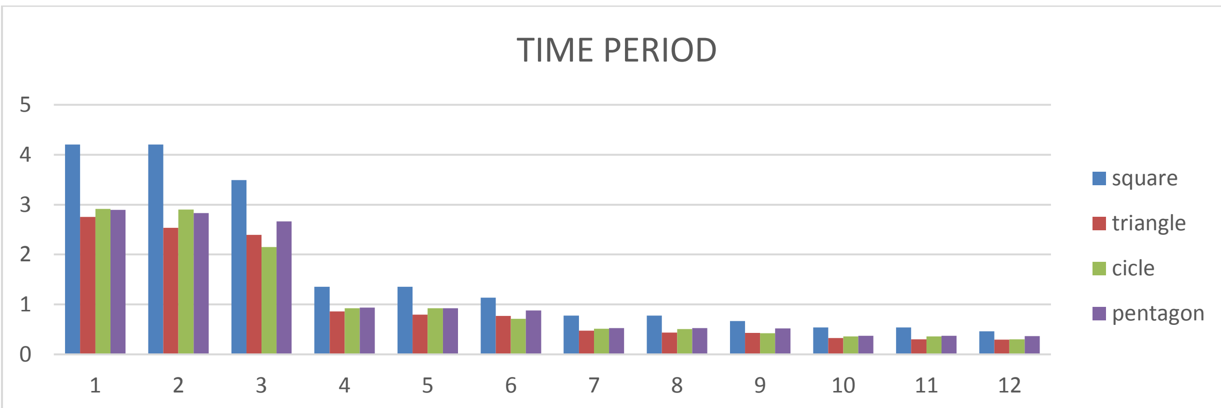

Figure Comparison of the time period for zone v with and without p-delta

5 CONCLUSIONS

- The words "tall building," "high-rise building," and "skyscraper" are all ambiguous when it comes to height or the number of floors. No matter that they all relate to the same kind of building. The two aren't the same height, but there is a slight difference.

- Many factors influence the design of a high-rise structure, including its aesthetics and utility and the needs of municipal planners. The enormous diversity of possible forms in building design and their different interactions with the surrounding buildings make it difficult to come up with clear universal guidelines for choosing

- For high-rise constructions, symmetrical forms are often chosen, however in this instance; triangular shapes were shown to be more rigid than other structures when considering p-delta.

- In comparison to static analysis, the structure's displacement is increased by the second-order impact of p delta analysis

- A second-order moment is taken into account when determining the best form for a triangle for construction purposes based on examining all deflection and drift findings.

- For construction, A triangular structure has a shorter time period than a square or rectangular form because it has a greater stiffness and a smaller mass, which means the time period is more straightforward in a triangle construction

- A pentagon-shaped structure, followed by square and circle structures, yielded the highest value of base shear in the study. And the square and E.Q. triangle shapes have the lowest value. Compared to P-Delta.

- The Story Drift is more prominent than it would be without P-Delta. This is because story drifts are inside the code's boundaries (IS 1893-2002 Part-1).

- P-Delta analysis results in 20% higher displacement than without P-Delta analysis for 35 storeys. As a result, the P-Delta analysis for the design of structural components in R.C. constructions is critical

6. SCOPE FOR FURTHER STUDY

- To investigate the dynamic Wind impacts on tall building frames and the influence of dynamic factors on these effects.

- Different soil interactions affect the seismic behaviour of reinforced concrete framed buildings.

- Shear lag has a considerable impact on the structural efficiency of a high structure; hence it's essential to understand the influence of shear lag.

- To investigate the effect of dynamic factors on tall building frames on dynamic wind speed and direction.

- The impact of a tall building's geometric plan layout may also be examined

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