International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 260-269 www.ijaem.net ISSN: 2395-5252

Performance of the Flat Slab with Column Head and Drops

[1]Er.Zeel A.Patel, [2]Mr.Nirmal S.Mehta, [3]Mr. Arjun Butala.
[1,2]Post-Graduate Student,[2]Professor of Structural Engineering,[3]HOD of Civil Engineering
[1]Department of Structural Engineering,
[1]U.V.Patel College of Engineering and Technology, Mehsana,India

Date of Submission: 05-07-2023 Date of Acceptance: 15-07-2023

ABSTRACT: A flat slab is a two-way reinforced concrete slab system. They experience both lateral and vertical loads. Instead of vertical loads, lateral loads brought on by earthquakes and wind drive design decisions. It's possible that structures built to withstand a vertical load will not be able to withstand lateral loads. Frame constructions such as conventional RC frames and flat slab frames are used in these distinct building styles. The construction method that achieves a system where a slab is supported by beams and columns uses a conventional RC frame structure. Without the use of a beam, the load is a transferred to the concrete column and beam. When compared to traditional RC Frame buildings, using flat slab structures has significant benefits in terms of architectural freedom, space utilization, formwork simplicity, and speed of construction. It is a best option for creating in-situ concrete frame buildings is to use thin flat slabs that range in thickness from 5 to 9 meters.

I. INTRODUCTION

A flat slab is a two-way reinforced concrete slab system. It is transferred directly to the supporting concrete columns, beams, and girders. They experience lateral as well as vertical loads, and the design is dictated more by earthquake and wind loads than by vertical loads. It's possible that lateral loads cannot be supported by a structure that was built to withstand vertical loads. Multi-story structures should be made for both commercial and residential use in a way that allows them to support greater weight than is necessary for safety. A concrete column provides direct support for a reinforced concrete slab that makes up a flat slab.

Large industrial constructions, parking garages, ramps, warehouses, tall buildings, and hotels are the main uses for flat slabs. These slabs are employed when a beam is not needed and when less formwork is needed for the structure.

The weight is carried directly to the supporting concrete column and load-bearing wall, also known as a drop panel, in a flat slab, which is a one- or two-way slab system that is used. Drop panels serve as beams on the support and it is increase theshear capacity andvertical loads.

The best option for creating in-situ concrete frame buildings is to use thin flat slabs that range in thickness from 5 to 9 metres. Usually, parking decks (areas), commercial buildings, and hotels employ these slabs.

A panel is the area of a flat slab that is enclosed on each of its four sides by the centre line of an adjustment column. Furthermore, it has a reduced story height as well as superb lighting and ventilation.

Components of Flat slab

- Drop
- Column Head
- Panel

center-to-centre line connecting two neighbouring columns is known as a panel in flat slab construction.

a) No drop and No column head

when the load on the slab is relatively lighter and the slab span is smaller.

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 260-269 www.ijaem.net ISSN: 2395-5252

b) With drop and with column head

When large shear force develop in the slab, slab is strengthened by thickening it around the column.

1. Drop

It is supported by the column and is a piece of the slab. The Drop could be between 25% and 50% thicker than the remainder of the slab.

Plan Dimension	42 × 42 m
Floor to Floor Height	3 m
Bottom height of the floor	3 m
Thickness of Slab	0.200 m
Thickness of drop	400
Grade of concrete	M 30
Grade of concrete Drop	M 30
Density of concrete	25 kN/m^3
Grade of steel	Fe 500
Panel Size	6m × 6m
Live load	3 kN/m^2
Floor finish	1
Column Size	600 × 600 mm

2. Column Head

Below the slab, the supporting column's diameter is raised; this area of the column, wherethe diameter is increased, is known as the column head

3. Panel

The space between the shape of the column head.

II. Flat slab are constructed by following three ways

1. The slab is supported on column.
2. The slab is strengthened by providing flared column head also known as capital.
3. The Slab is additionally strengthen by thickening its around the column known as drop.

III. MODELING OF WORK

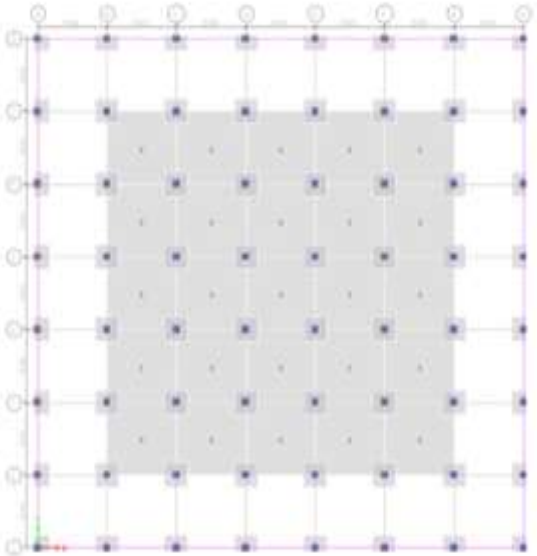
Design Parameter In this study it will be taken different models of flat slab in with drop, without drop and Column head Respectively and with fully, half and partially tapered. The building hight is 30 m. And the building is Totally framed structure building.

In result, will be discussed about Diaphragm drifts, Maximum storey Displacement, Maximum story Drift, beam reactions

THREE TYPES OF FLAT SLAB IN DIFFERENT MODELS

Case i: Flat slab with drop in three model are under like Internal Panel, External Panel,

1. Internal Panel with Drop :

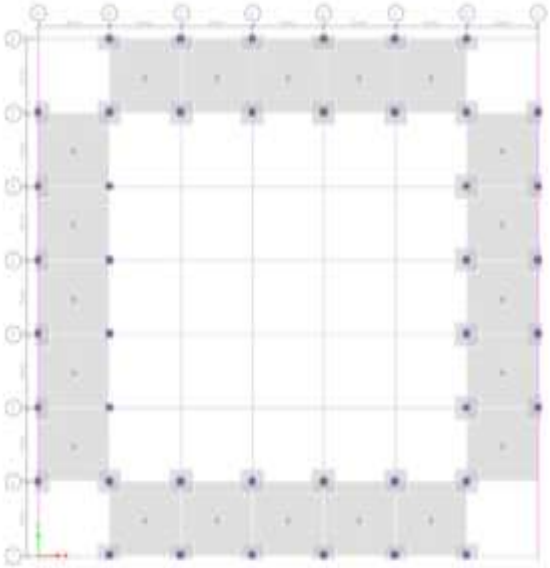


International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 260-269 www.ijaem.net ISSN: 2395-5252

Result comes from software:

Maximum Storey displacement	9.67
Maximum Storey drift	0.500
Storey Shear	2604.96
Coloum beam reaction	488.43

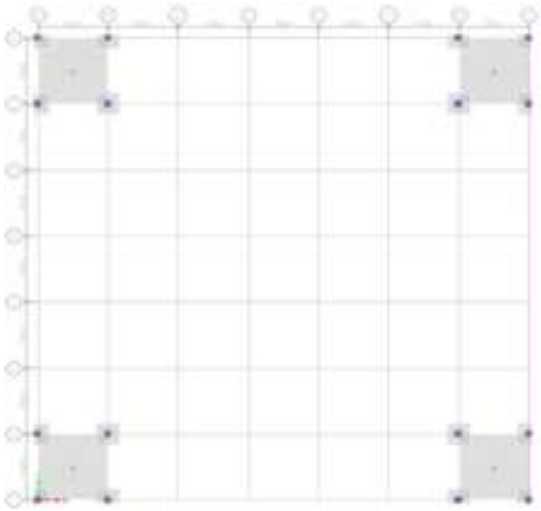
2. External Panel With Drop



Result comes from software:

Maximum Storey displacement	6.769
Maximum Storey drift	0.350
Storey Shear	1823.42
Coloum beam reaction	205.14

3. Courner Panel with Drop:

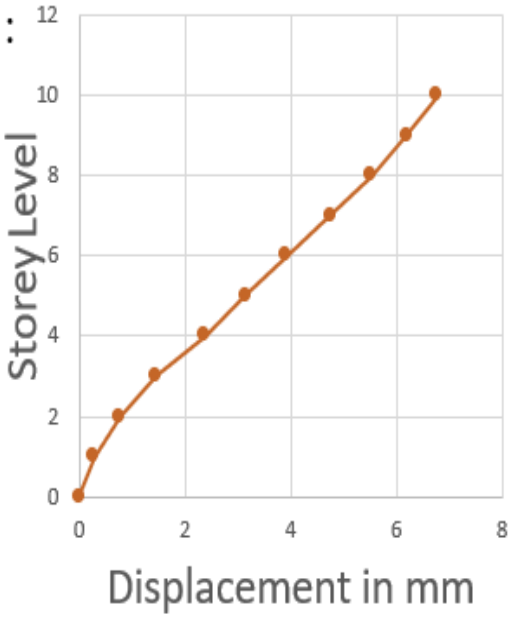


Result comes from software:

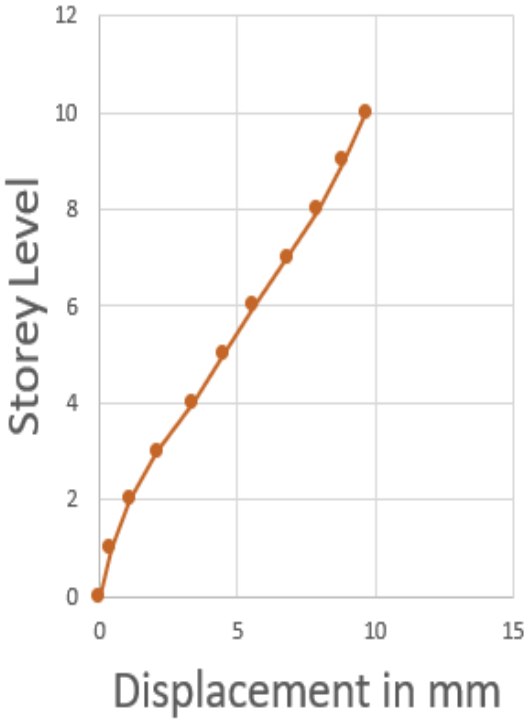
Maximum Storey displacement	5.31
Maximum Storey drift	0.275
Storey Shear	1432.72
Coloum beam reaction	268.63

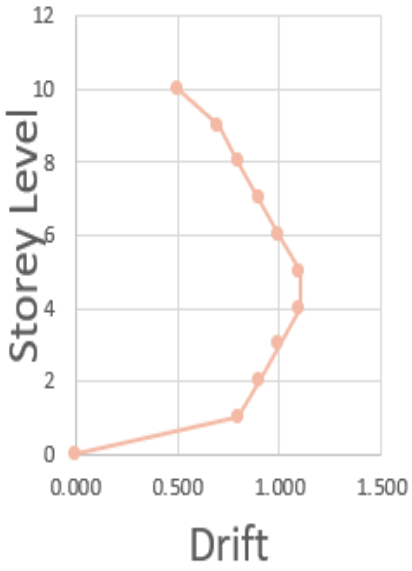
International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 260-269 www.ijaem.net ISSN: 2395-5252

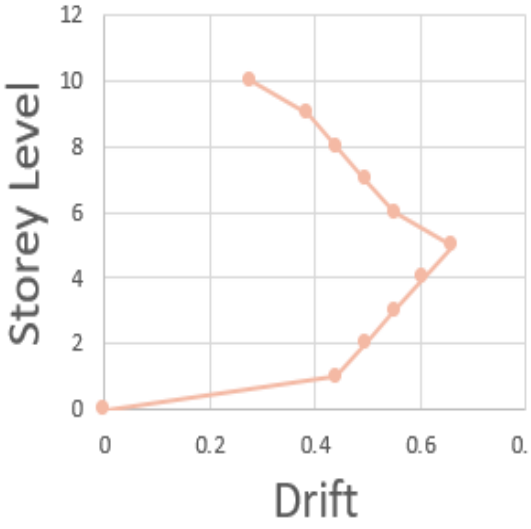
Internal Panel with Drop



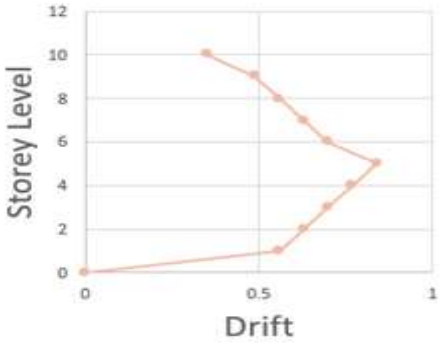
External Panel With Drop



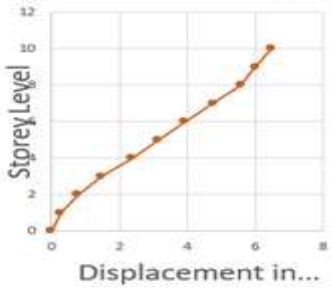




International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 260-269 www.ijaem.net ISSN: 2395-5252

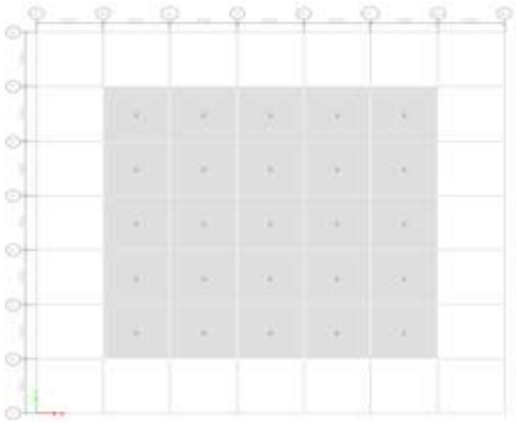


Corner Panel with Drop:



Case ii: Flat slab with-out drop in three model are under like Internal Panel, External Panel,

Modelling for Internal panel with-out drop



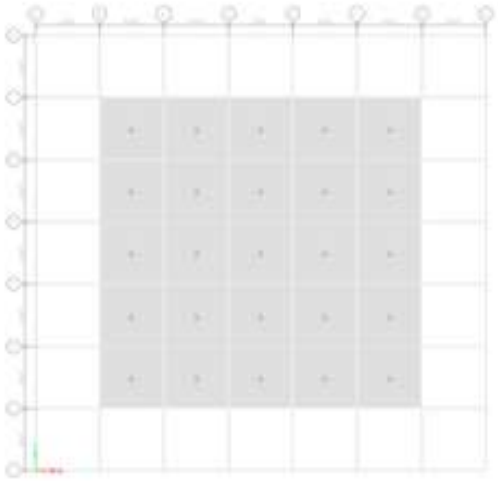
Parameters

Total Height	30	m
Thickness of Slab	0.200	M
Live load	3	Kn/m^3
Column size	600 x 600	mm
Panel Size	6 x 6	m

Maximum Storey displacement	13.05
Maximum Storey drift	0.675
Storey Shear	1432.72
Colosum beam reaction	488.43

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 260-269 www.ijaem.net ISSN: 2395-5252

Modelling for External panel without drop

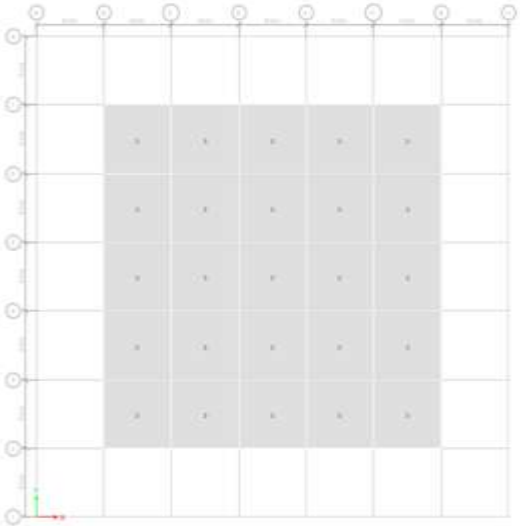


Parameters

Total Height	30	m
Thickness of Slab	0.200	M
Live load	3	Kn/m^3
Column size	600 x 600	mm
Panel Size	6 x 6	m

Maximum Storey displacement	9.13
Maximum Storey drift	0.774
Storey Shear	1002.91
Coloum beam reaction	205.14

Modelling for Corner panel without drop



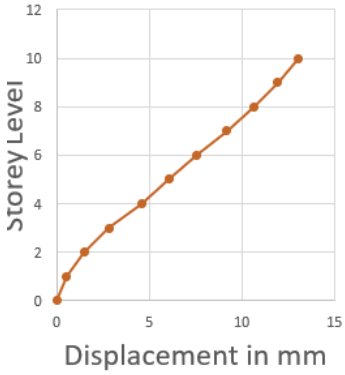
Parameters

Total Height	30	m
Thickness of Slab	0.200	M
Live load	3	Kn/m^3
Column size	600 x 600	mm
Panel Size	6 x 6	m

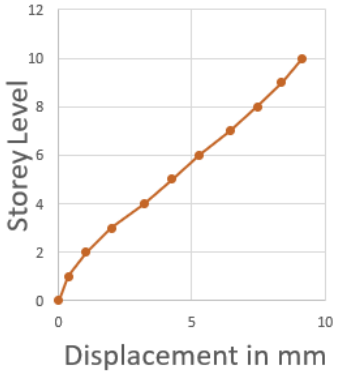
Maximum Storey displacement	7.17
Maximum Storey drift	1.183
Storey Shear	788.00
Coloum beam reaction	161.18

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 260-269 www.ijaem.net ISSN: 2395-5252

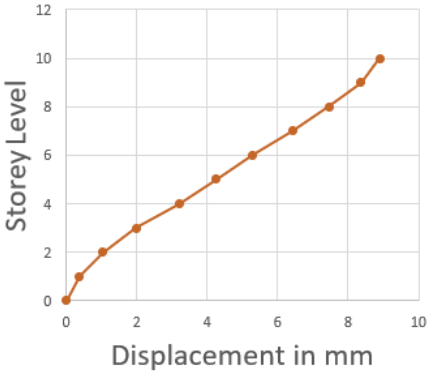
Internal panel without drop

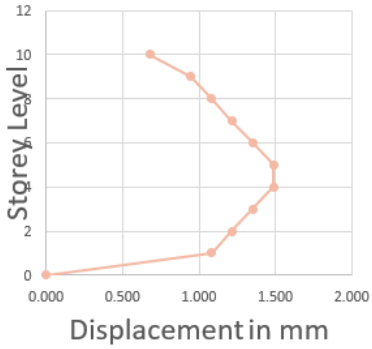


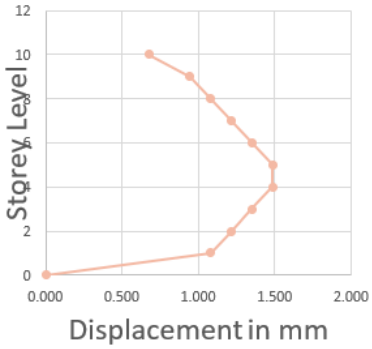
External Panel without drop

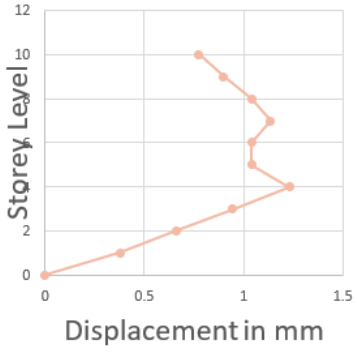


Coroner Panel without drop



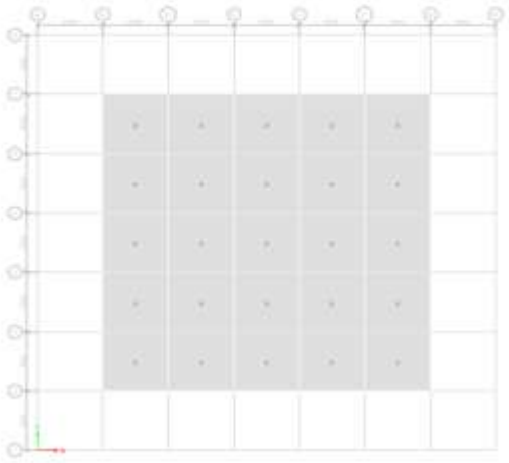






Case iii: Flat slab with-out drop and column Head in three models are under like Internal Panel, External Panel.

- Modelling for Internal panel With column Head



Parameters

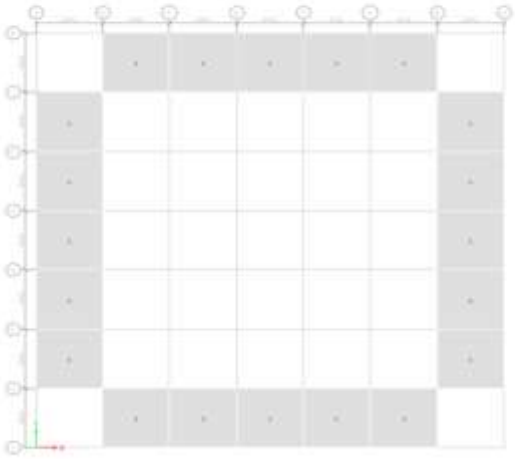
Total Height	30	m
Thickness of Slab	0.200	M
Live load	3	Kn/m^3
Column size	600 x 600	mm
Panel Size	6 x 6	m

Maximum Storey displacement	11.12
Maximum Storey drift	0.943
Storey Shear	1953.72
Coloum beam reaction	415.16

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 260-269 www.ijaem.net ISSN: 2395-5252

External Panel with column Head

- Modelling for External panel With column head

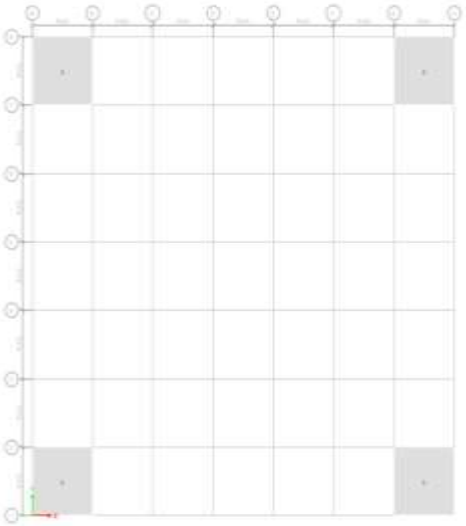


Parameters

Total Height	30	m
Thickness of Slab	0.200	M
Live load	3	Kn/m^3
Column size	600 x 600	mm
Panel Size	6 x 6	m

Maximum Storey displacement	7.78
Maximum Storey drift	0.660
Storey Shear	1367.60
Coloum beam reaction	290.61

Modelling for Corner panel with column Head

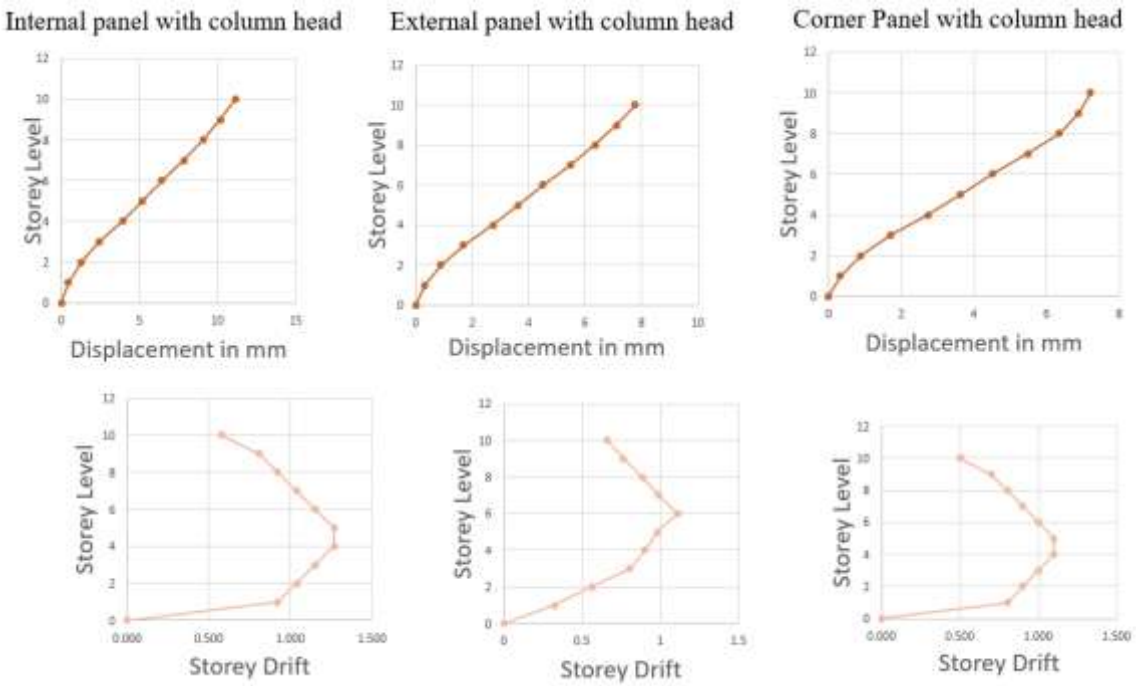


Parameters

Total Height	30	m
Thickness of Slab	0.200	M
Live load	3	Kn/m^3
Column size	600 x 600	mm
Panel Size	6 x 6	m

Maximum Storey displacement	6.11
Maximum Storey drift	1.008
Storey Shear	1074.54
Coloum beam reaction	228.34

International Journal of Advances in Engineering and Management (IJAEM)
Volume 5, Issue 7 July 2023, pp: 260-269 www.ijaem.net ISSN: 2395-5252



IV. CONCLUSION

The viability of adopting a three different types of internal panels with drop, without drop, and column head to enhance the effectiveness of structure liability and to reduce story displacement, Storey drift, and storey shear were investigated in this work, because, these types of flat slab panels are strategically placed in a building structure to control story displacement, Storey drift, and storey shear and mitigate against a major seismic and wind event. To reduce the large shear force and negative bending moment in flat slab with drop and column head

Grid slabs will have less displacement from flat slab systems. The building are less floor vibrations, building displacement and better occupancy comfort in wind.

The investigation of seismic and wind response of multi-storey, symmetric plan system building installed with drop and column head responding in the inelastic range of behavior has led to the following conclusion:

- High tolerance to deform.
- Easy to design and detail.
- Grid slabs have less displacement compared to flat slab systems

REFERENCES

[1]. IS 4998 (Part 1) (1992), Criteria for design of reinforced concrete chimneys
[2]. IS 456 (2000), Code of Practice for Plain and Reinforced Concrete
[3]. IS 800 (2007), Code of Practice for use of Structural Steel in General Building Construction
[4]. Ahmed, M. M., Sajib, E. H., & Barua, S. (2020). Seismic Performance Evaluation for Flat Slabs under Different Types of Soil Condition by Response Spectrum Method. Recent Trends in Civil Engineering & Technology, 10(2), 23–29.
[5]. Aslam, A. S., Zahoor, D. H., & Ismail, S. S. (2016). COMPARITIVE STUDY OF FLAT SLAB STRUCTURE BASED ON IS-1893 : 2002 AND Anjuman-I-Islam ' s Kalsekar Technical Campus Anjuman-I-Islam ' s Kalsekar Technical Campus Department of Civil Engineering, (2).
[6]. Rath, S. R., Sethy, S. K., & Dubey, M. K. (2019). Review Paper on Post-Tensioned Flat Slab with Drop Panels and Its Comparison with Conventional Slab. International Journal of Research in Advent Technology,
[7]. Agrawal, M., & Sen, D. (2020). Seismic Analysis of High Rise Building with Flat Slab Using ETABS, 3073–3081.
[8]. Yousuf, M. N. M., &Shelar, S. V. (2020). Comparative Analysis and Design of Flat and Grid Slab System with Conventional Slab System. Journal of Emerging Technologies and Innovative Research

(JETIR), 7(7), 1110–1125. https://doi.org/10.35629/5252-040516891698

[9]. Technology, A. (2016). Analysis and Design of Flat Slab. International Journal of Latest Trends in Engineering & Technology, 7(1), 105–112. https://doi.org/10.21172/1.71.018

[10]. Giri, M., &Jamle, S. (2019). a Review on Response Spectrum Analysis Over Flat Slab- Shear Wall Interface, (May), 5173–5177.