IJCRT.ORG ISSN : 2320-2882
INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

"Comparative Analysis of Flat slab and Grid slab"

[1]Sayli D. Madavi,[2]Prof. Sushant M. Gajbhiye,

[1]PG Student, Department of Structural Engineering, Guru Nanak Institute of Technology of Nagpur, Maharashtra, India
[2]Assistant Prof. Department of Civil Engineering Guru Nanak Institute of Technology of Nagpur, Maharashtra, India

***Abstract*:** In this current worldwide developing industry era and fastly growing population, construction of tall buildings is the only solution. In construction of tall buildings every component of structure is important. like columns beams and mainly the slab systems. nowadays various types of slab designs use to construct buildings to obtained good view aspects depends on conditions. slab is the most important component of the building, so in this study the flat slab and grid slab system is analyzed for a same geometry of two building model's and model are analyzed by using Etabs software. for different parameters like shear force, bending moment, deflection. the results were obtained in the form of graphs.

***Key Word*- Flat slab system, Grid slab system, axial load, shear force, Bending moment and deflection.**

INTRODUCTION

In this modern developing industrial era we can see the huge construction activities taking place in all over the world. Human being needs better lifestyle the main requirement of human is shelter. Due to increase in population development of buildings and structures is necessity. Hence there will be the shortage of land space. So the construction of tall structures is the solution to overcome this problem there are several modification techniques use to make work faster and economical. In recent years, many tall buildings structures have been constructed and many more are being planned in the world. Construction of tall buildings requires long time span but now day 'skilled man power and modern techniques are used to construct tall buildings and structures. So the load of tall building is important factor which should be keeping in mind while constructing the building and structures. This load of building are reduces due to reducing the load coming on different components of buildings like columns, beams, wall and slab. Like other components floor(slab) is very important structural element. The study of floor system gives the different types of slab design which can be useful in building construction. Slabs are very common and important structural element, it is horizontal structure component. Slabs are constructed to provide flat surface to the structures like building, bridges and any other structures.

In this study comparison has been done between flat slab system and grid slab system. Etabs software is used to design building floors structure.

METHODOLOGY

A commercial building of G+20 stories with floor to floor height 3.5m having same area of each floor slab. The slab is subjected to dead loading and live loading has been considered. To perform the design and analysis Etabs-2018 software has been considered. The study is done on square geometry of slabs and required data is considered as per IS codes. Floor slabs are modeled as element of structure is analysis the deflection, axial force, shear force and bending moment. all parameters are calculated for flat and grid slab system.

CONSIDERING IS CODE

Sr. No.	Load	Codes
1	Dead load	IS 875:1987 (Part 1)
2	Live load	IS 875:1987 (Part 2)
3	Earthquake load	IS 1893:2016 (Part 1)
4	Slab design	IS 456:2000

According to IS 1893:2016 the load combinations using in this research are as follows.

1. 1.5DL+1.5LL
2. 1.5DL+1.5LL+1.5EQX
3. 1.5DL+1.5LL-1.5EQX
4. 1.5DL+1.5LL+1.5EQY
5. 1.5DL+1.5LL-1.5EQY
6. 1.5DL+1.5LL+1.5WL
7. 1.5DL+1.5LL-1.5WL
8. 1.2DL+1.2LL+1.2EQX
9. 1.2DL+1.2LL-1.2EQX
10. 1.2DL+1.2LL+1.2EQY
11. 1.2DL+1.2LL-1.2EQY
12. 1.2DL+1.2LL+1.2WL
13. 1.2DL+1.2LL-1.2WL
14. 0.9DL+1.5EQX
15. 0.9DL-1.5EQX
16. 0.9DL+1.5EQY
17. 0.9DL-1.5EQY
18. 0.9DL+1.5WL
19. 0.9DL-1.5WL

Building description

S. NO.	SPECIFICATION	DIFFERENT TYPES OF SLAB SYSTEM		
		Conventional slab	**Flat slab**	**Grid slab**
1	Plan dimension	32m x 32m	32m x32m	32m x32m
2	Length of grid in X-direction	8m	8m	8m
3	Length of grid in Y-direction	8m	8m	8m
4	Floor to floor height	3.5m	3.5m	3.5m
5	No. of stories	20	20	20
6	Slab thickness	0.3m	0.3m	0.1m
7	Size of beam	0.25m x 0.7m	0.25m x 0.7m	0.25m x 0.7m
8	Size of column	1m x 1m	1m x 1m	1m x 1m
9	Size of grid	-	-	2m x 2m
10	Spacing of grid	-	-	2m
12	Grade of concrete	M-40	M-40	M-40
13	Grade of reinforcement	Fe-500	Fe-500	Fe-500

Modelling

A building models of flat slab floor and grid slab floor is designed in Etabs software to obtained reactions coming on floor slab of the building structure. the floor slab is of plan regular geometry with same column and beam sizes.

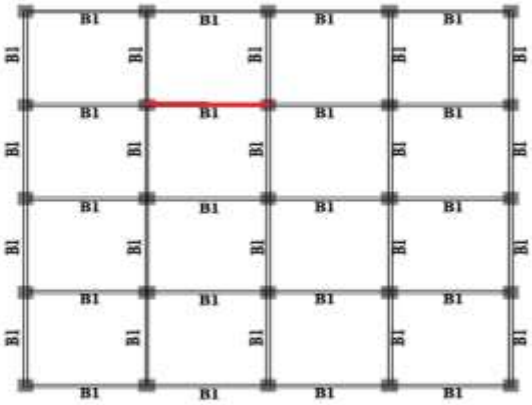


Fig 1: Beam location

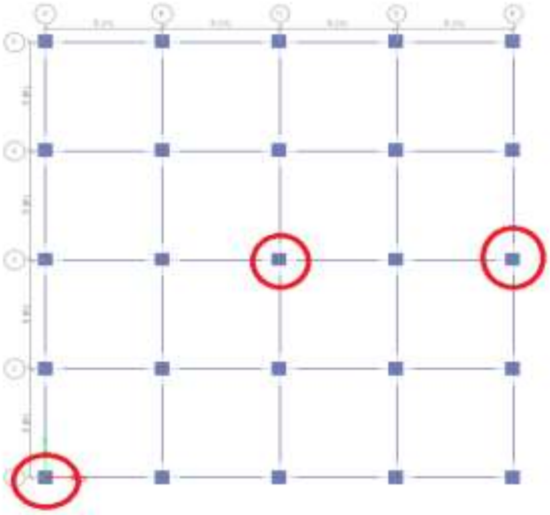


Fig 2: Column location

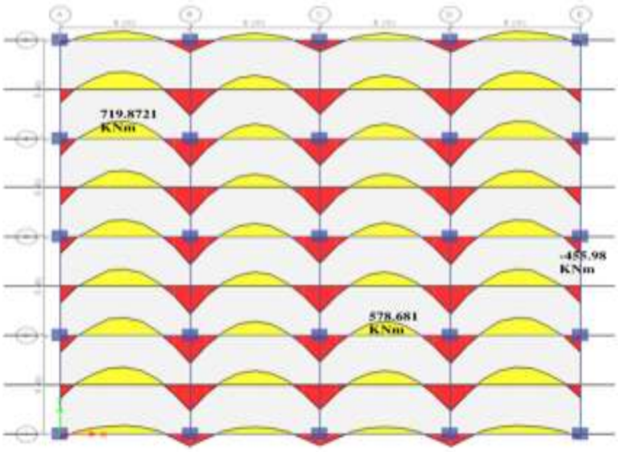


Fig 3: Moment on Flat slab (strip A)

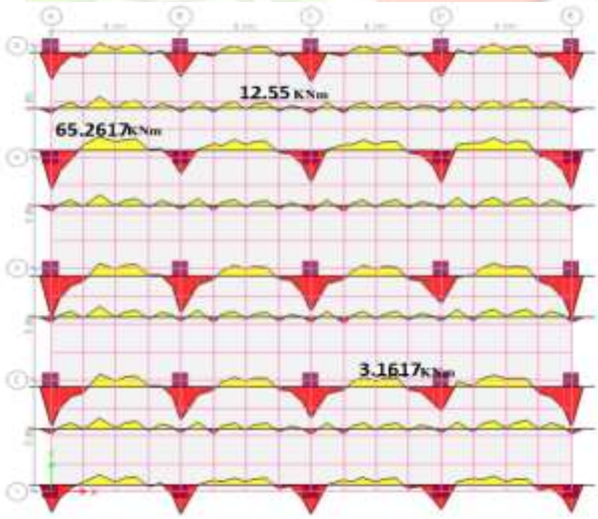


Fig 4: Moment on grid slab (strip A)

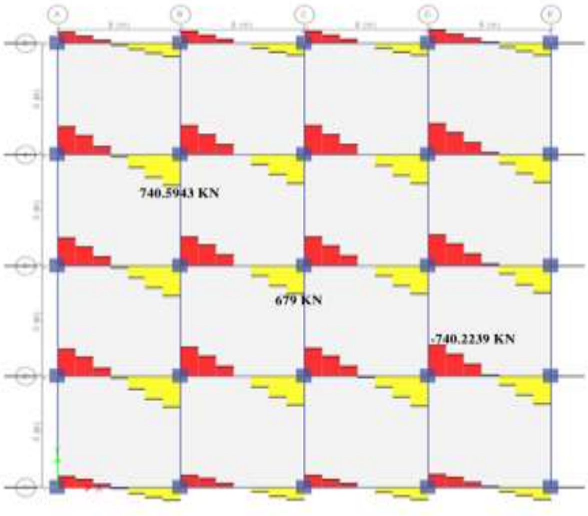


Fig 5: Shear force on flat slab (strip A)

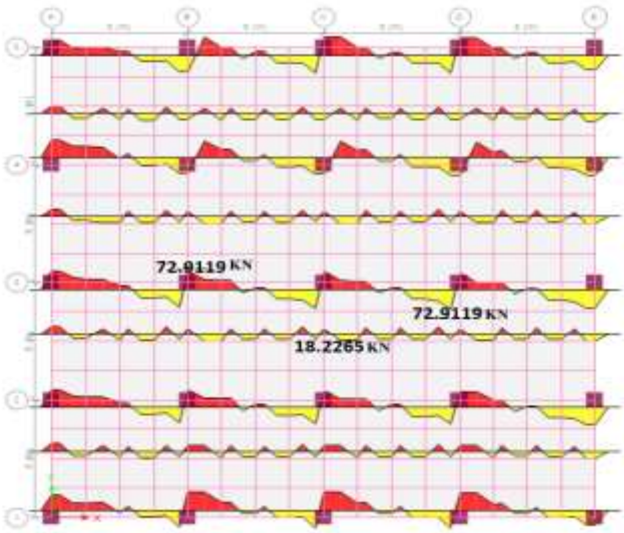
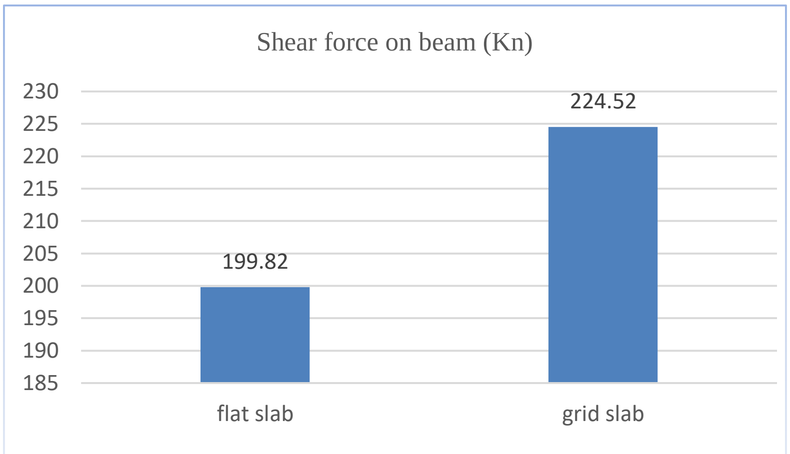


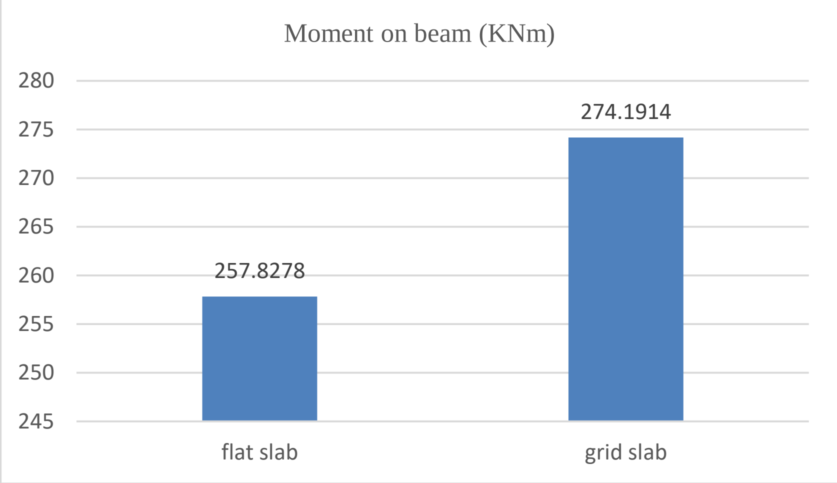
Fig 6: Shear force on grid slab (strip A)

RESULTS AND OBSERVATION

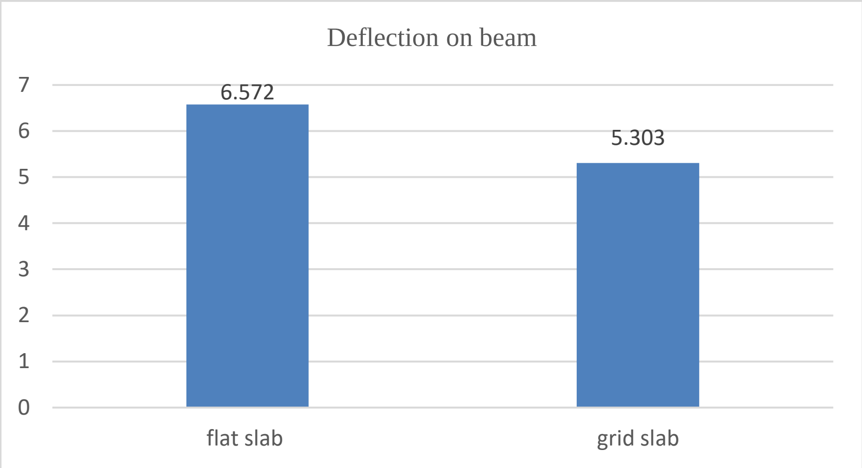
Shear force, bending moment and deflection comparison on selected beam as shown in (fig 1) of flat slab and grid slab



Graph 1: Shear force on beam



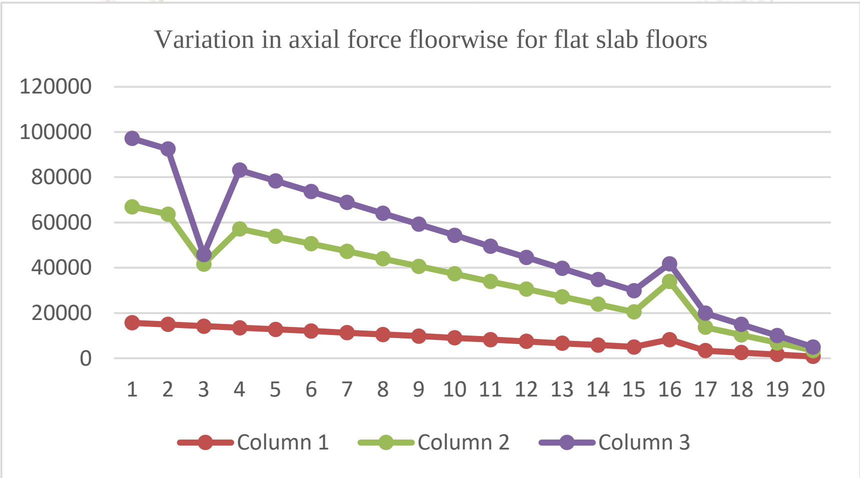
Graph 2: moment on beam



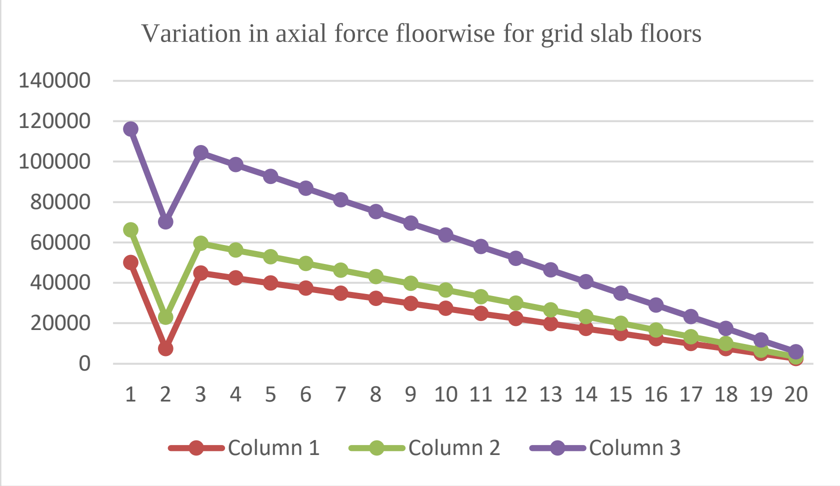
Graph 3: deflection on beam

- On the basis of software results it is observed that shear force is minimum on flat slab and maximum on grid slab shown in (graph1).
- Bending moment is minimum on flat slab beam and maximum on grid slab beam.
- Deflection is observed maximum on flat slab and minimum on grid slab beam.

Comparison of axial load variation floor wise in column 1,2,3 as shown in (fig 2)



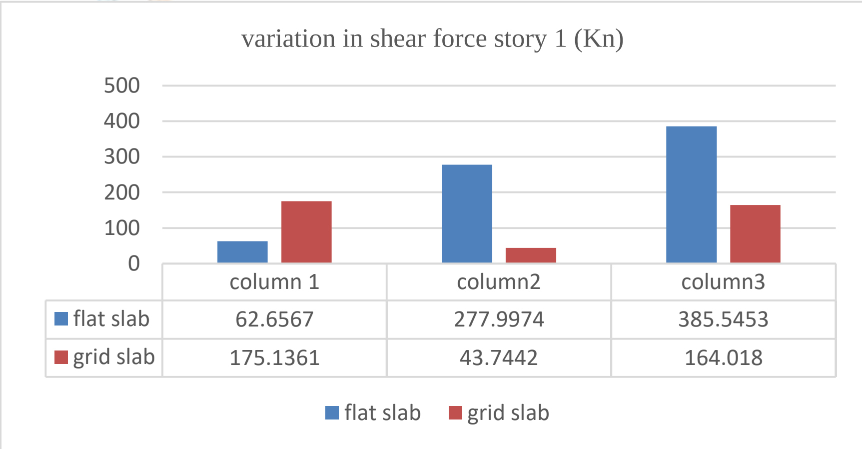
Graph 4: variation in axial load on flat slab



Graph 5: variation axial force on grid slab

- From the above graphs it is observed that the axial load is gradually decreases from ground floor to top floor.

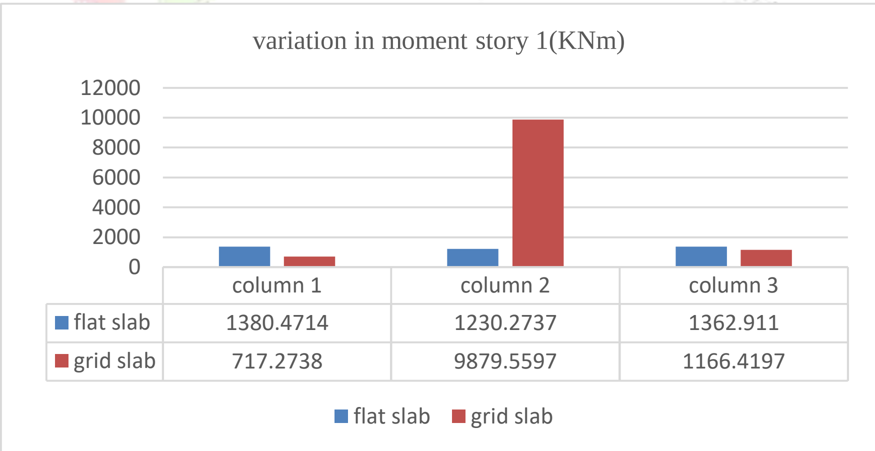
Comparison of shear force on story 1 of flat slab and grid slab for column 1,2,3



Graph 6: variation in shear force column 1,2,3

From above graph it is observed shear force is maximum on column 3 for flat slab and on column 1 for grid slab. minimum on column 1 for flat slab and column 2 for grid slab.

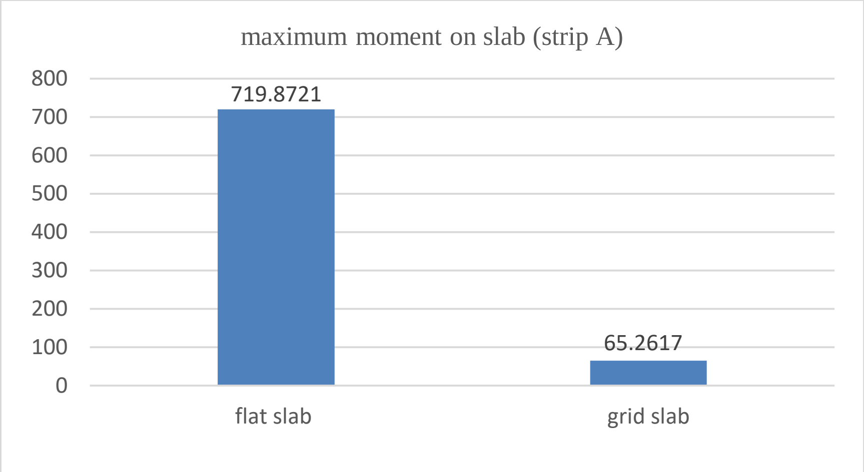
Comparison of moment on story 1 of flat slab and grid slab for column 1,2,3.



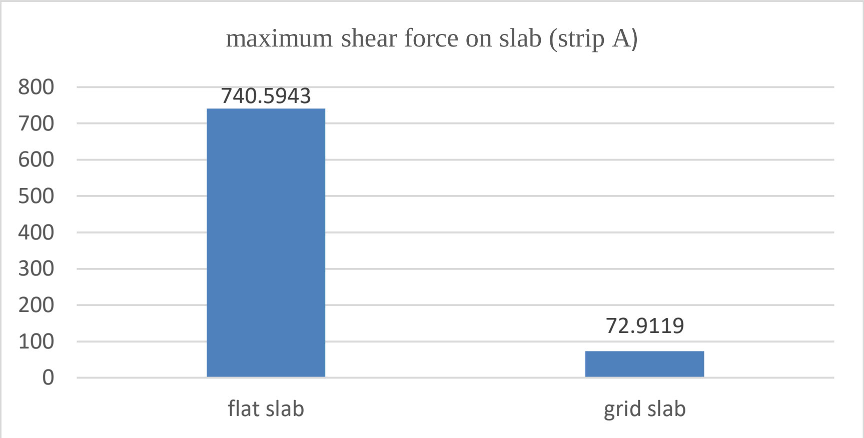
Graph 7: variation in moment column 1,2,3

From the above graph it is observed that moment is maximum on column 1 for flat slab and on column 2 for grid slab.

Comparison of maximum moment value and maximum shear force value of flat slab and grid slab.



Graph 8: maximum moment on slab (strip A)



Graph 9: maximum shear force on slab (strip A)

- Analysis results of flat slab and grid slab as shown in above figures (fig 3 and fig 4), shear force obtained on strip A and strip B.
- Value of forces and moment for strip A and strip B are same due to regular plan geometry of the floors slab. hence only strip A results are shown in results.
- from the above graph it is observed that maximum moment is obtained on flat slab system and minimum on grid slab system.
- maximum shear force is generated on flat slab and minimum on grid slab system.

CONCLUSION:

The behavior of floors slab system for same geometry is analyzed and studied. parameters like axial load, shear force, bending moment and deflection were investigated. the results and observation are shown in graphs.

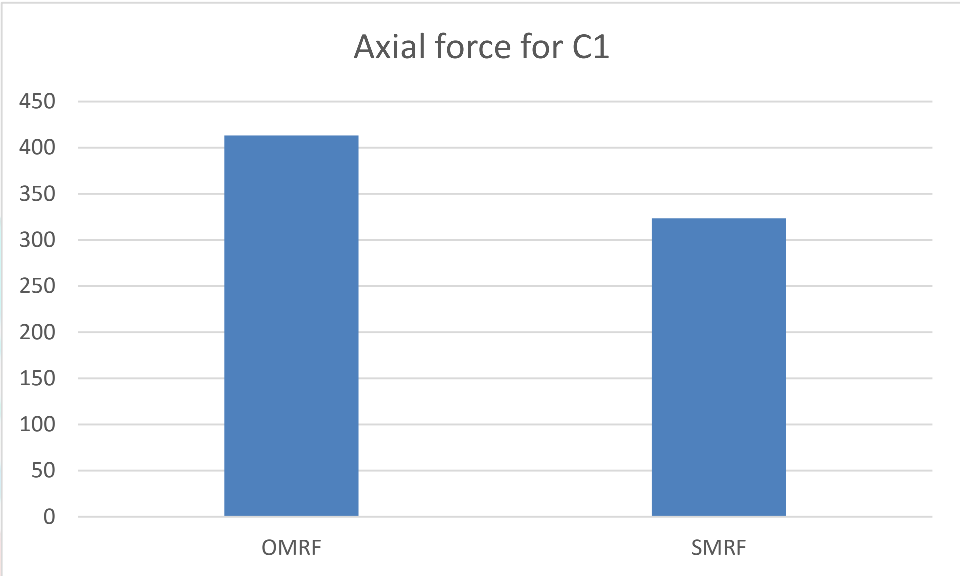
- The shear force value and bending moment value is maximum on flat slab and minimum on grid slab system.

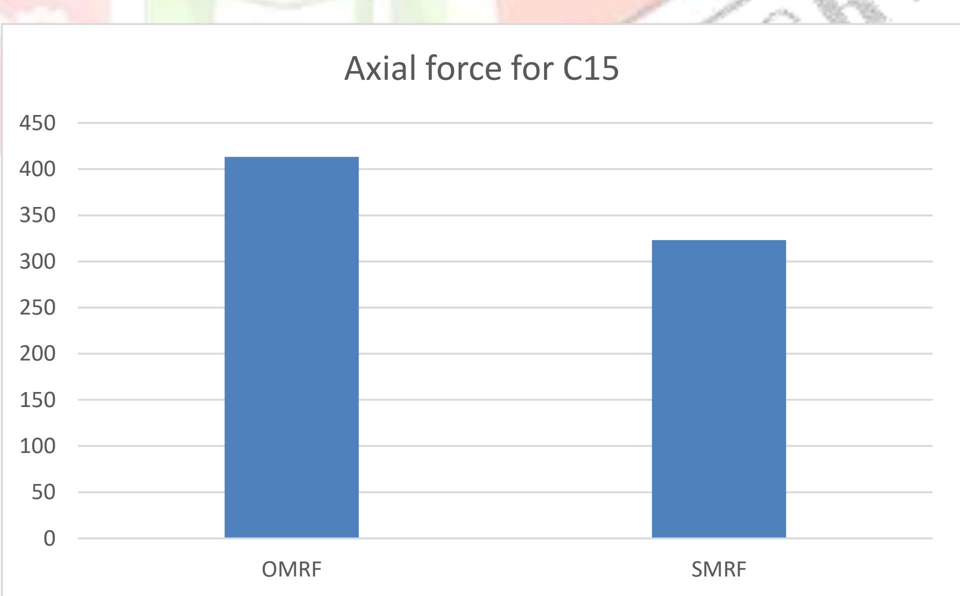
REFERANCES

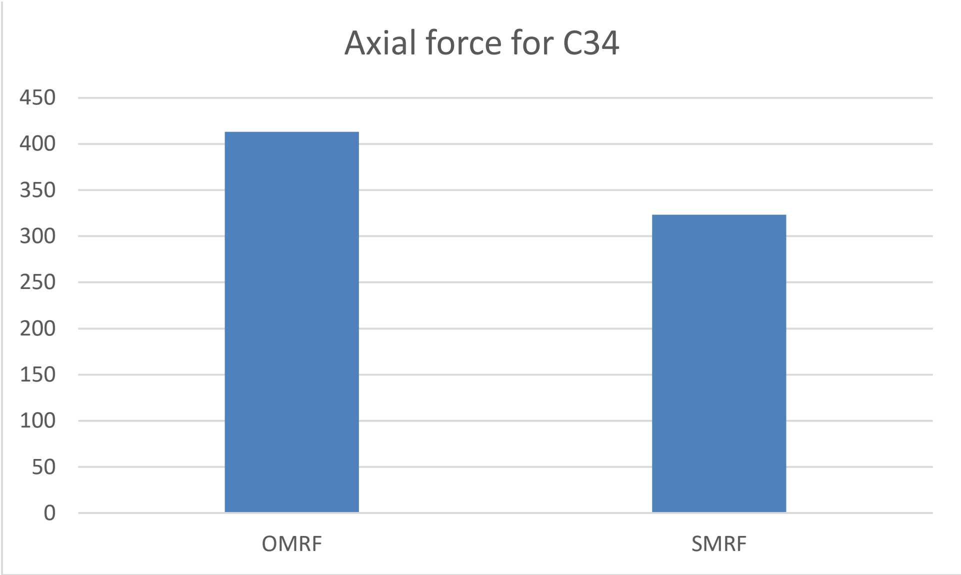
1. Mohan H.S, Kavan M.R, (2015) ‘Comparative Study of Flat Slab and Conventional Slab Structure Using ETabs for Different Earthquake Zones of India’
2. Ms. Priyanka Chandanshive, Prof. Sandeep Gaikwad,(2019),worked on ‘Comparative Analysis and Design of Flat Slab and Grid Slab In Multistoreyed Building Under Seismic Condition’
3. SumitPahwa, Vivek Tiwari, MadhaviPrajapati, Ms.(2014),worked on ‘Comparative Analysis and Design of Flat Slab with Old Traditional Two way Slab’
4. M. AltugErberik, Amr S. Elnashai [2004] focused ‘on the derivation of fragility curves using medium rise flat slab buildings with masonry infill walls’
5. A.B.Climent [2012] investigated about the ‘Effective Width of Reinforced Concrete Flat Slab Structures Subjected to Seismic Loading on the Basis of Dynamic Shaking Table Tests’
6. K. S. Patil [2013] studied about ‘Optimum Design of Reinforced Concrete Flat Slab with Drop Panel According to the Indian code (IS 456-2000) is presented’.
7. Sathawane [2012] studied about the ‘Most Economical Slab between Flat Slab with Drop, Flat Slab without Drop and Grid Slab’.
8. K. S. Sable [2012]studied about ‘Analyzed Seismic Behavior of Building for Different Heights to see What changes are Going to Occur if the Height of Conventional Building and Flat Slab Building Changes’.

Maximum Axial load for columns

Column	OMRF	SMRF
C1	12254.3821	12119.2998
C15	37500.8715	29997.8266
C34	24777.3066	23457.4358

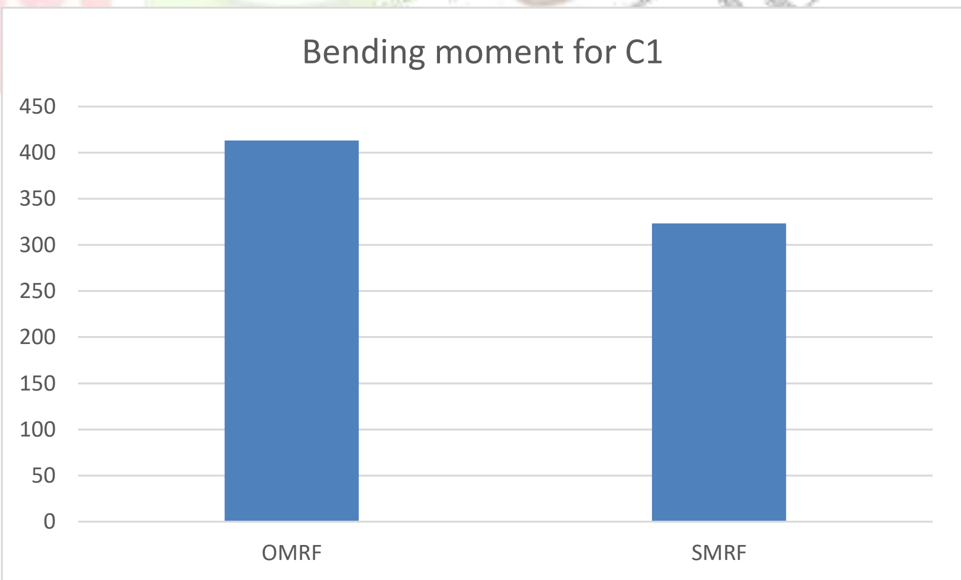


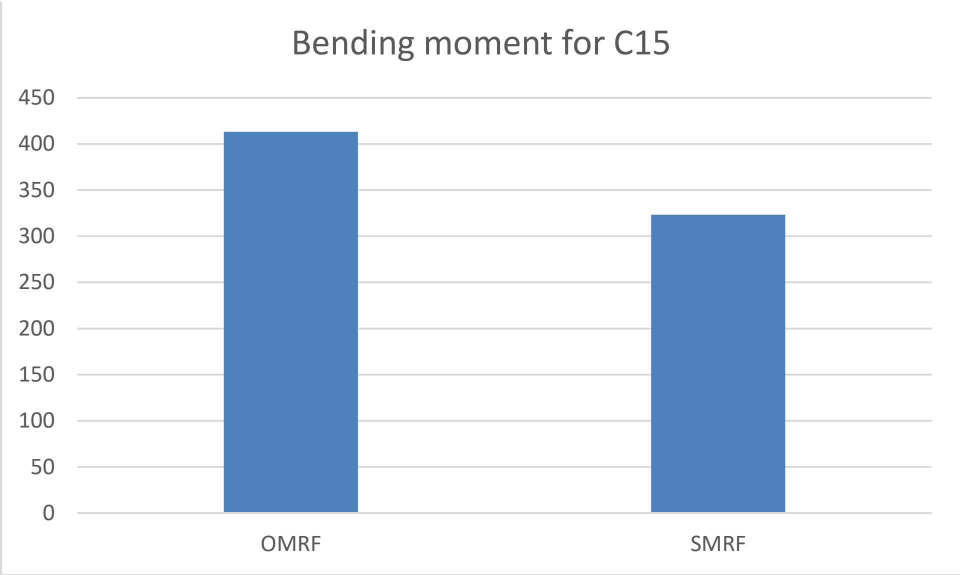


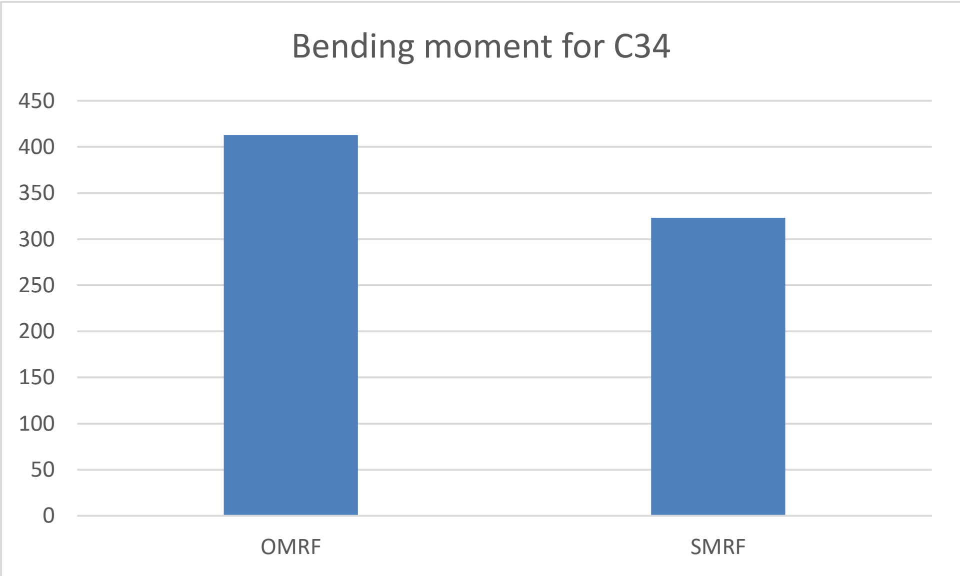


Maximum bending moment for column

Column	OMRF	SMRF
C1	603.6184	348.4752
C15	1238.0338	741.9344
C34	1054.4706	500.833

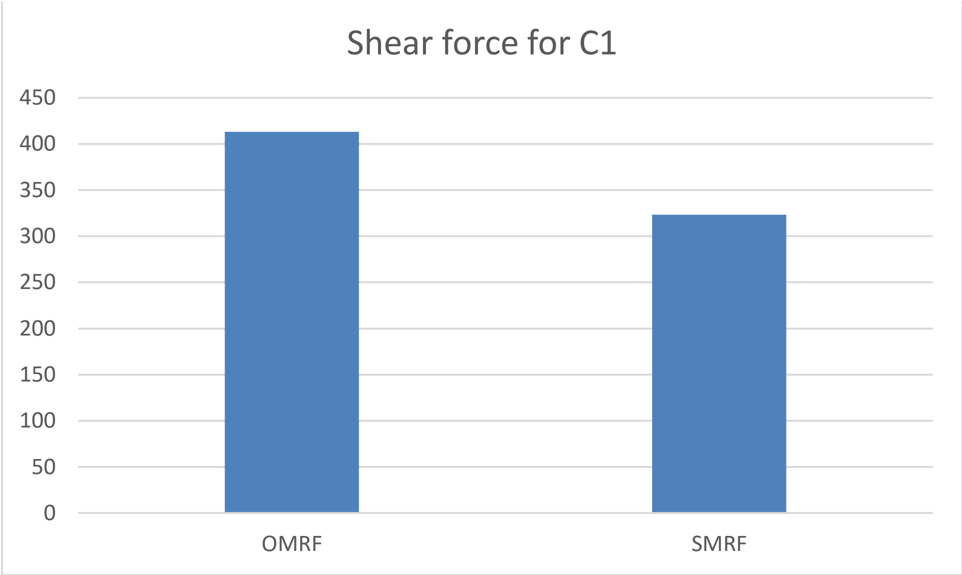




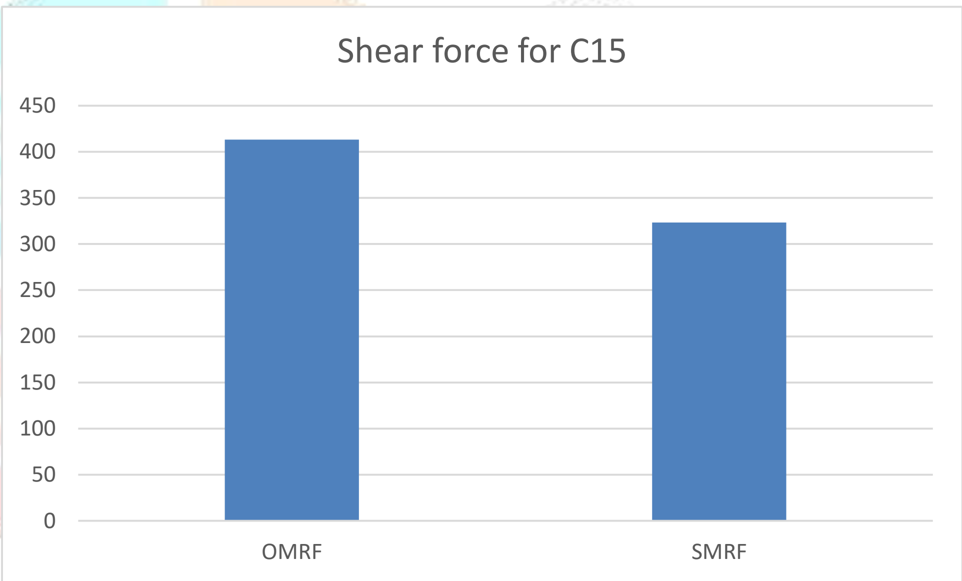


Maximum shear force on column

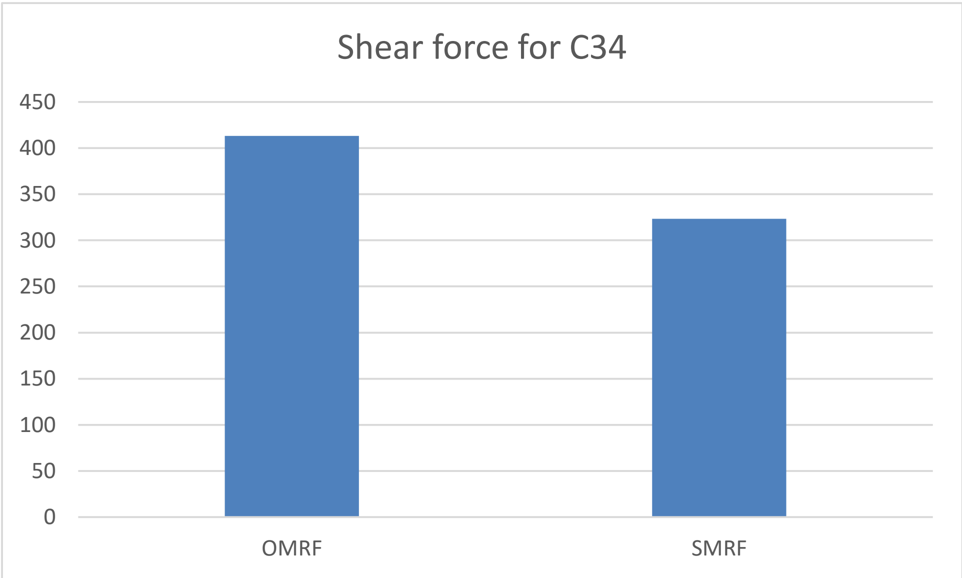
Column	OMRF	SMRF
C1	215.578	123.3286
C15	569.7504	341.4913
C34	413.1269	323.2079



Shear force for C1
450
400
350
300
250
200
150
100
50
0
OMRF
SMRF



Shear force for C15
450
400
350
300
250
200
150
100
50
0
OMRF
SMRF



Shear force for C34
450
400
350
300
250
200
150
100
50
0
OMRF
SMRF

Base shear on OMRF and SMRF structure

OMRF	SMRF
12771	7663