COMPARITIVE STUDY OF MULTI STORIED PARKING BUILDING WITH RC FRAME AND RC FLATSLAB WITH INFILL SHEARWALL USING SAP2000.

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Abstract : Parking building are the quite popular in recent times in cities due to growth of commercial activities,industrialization RC parking structure is different from other multistoried building.Beacause in the loading condition different from another building like vehicle load,impact force.Moving load(dynamic load) is acting on slab which can changes at each position.Moving load are consider as per IRC-06 code for four wheelers vehicle.Also consider live load for parking building as per IS 875-Part2. The aim and objective of work is to carry out comparison between RC frame and RC flat slab parking building on the basis of span length of 5mx5m,6mx6m,7mx7m,8mx8m.for reaction ,bending moment ,shear force,ramp effect on structure.In my work analyze the building using sap2000.Flat slab building is not take lateral load so it's must be take shear wall(lateral load resisting system).It is concluded that, For RC frame building column reaction is higher than RC flat slab building.In flat slab system more chances the punching shear for parking building So its must be require shear reinforcement in slab.
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IndexTerms **- Parking buiding, Moving load,Punching shear, Impact factor,Flat slab,RC frame.**

I. INTRODUCTION

Now –a-day there is a increase the number of vehicle in that world after second world war. For any person or cargo moving in vehicle ,a terminal facility is essential both that origin and destination with out disturbing traffic flow otherwise on street such a facility is called parking. In city today not available sufficient space for parking .Parking structures are most if conspicuous solutions to a society a parking challenges Over the years engineers and architects have found a way to create more parking spaces within minimum size of land by the design and construction of multi storey car parks .multi storey car park also known as a parking garage or a parking structure is a building designed for car parking with a number of floors or levels on which parking takes place. Multi level car parking systems are quite popular in recent times in cities which have become population hubs due to growth industrial areas,commercial activities etc. For the present work typical G+3 storey multi level car parking structure with capacity to store 300 cars has been considered with earthqauke zone 3 with medium class soil . In my work parking building analysis and design parking building using sap2000.Flat slab have a small region of compressed concrete.there is excess concrete below the neutral axis of taken into consideration in design.in such situation flat slab with lower consumption of concrete and steel which provides lighte structure. Generally the analysis of flat slab is more complex and also to important to study the behaviour against different forces acting on multi storied parking building like vehicle load,dead load etc.Flat slab is often thickened near to supporting columns to provide adequate strength.

II. .REVIEW OF LITERATURE

In 2017, Kucharovaa,Gabriela Lajcakovaa ,The objective of this paper was paper analyses the dynamic effect of moving load on such structure by numerical way. The computing model of vehicle, computing model of the slab and the method of numerical solution are introduced. The dynamic response of the structure is declared in time domain by graphical and numerical way. It is concluded that The absolute maxima of middle slab vertical dynamic deflections in the interval of speed of vehicle motion 5 – 130 km/h is practically the same for both variants (Variant 1, *w*max = 0.05779 mm, *V* = 25 km/h; Variant 2, *w*max = 0.05980 mm, *V* = 130 km/h). The different is only in the speed at which the extreme occurs. In the case the vehicle enter the slab with lighten springs (Variant 1) the extreme deflection occurs at low speeds, approx. 20 – 30 km/h. In the case the vehicle enter the slab with aggravated(sensible) springs (Variant 2) the extreme deflection occurs at high speeds, *V* =120 km/h. **In 2013, M.E. Shoukry a, Z.I. Mahmoud a, T.M. Hashem a, G.A. Mohamed b** , In this paper analysis the one way and two way slab under acting wheel load by using Egyptian code and finite element analysis method with use software SAP2000.Slab are considered at all edge fixed.and load are apply at center of slabs.The results were compared give by Egyptian code and FEM result.His concluded that , According to Egyptian code ,The analysis using the code recommendations results in moments in the long directions larger than those in the short span in contrary with the results obtained from the elastic structural analysis. According FEM analysis in SAP2000 moments obtained using the code method of analysis have different values than those obtained from the elastic analysis this may be due to The linear distribution of load in the two directions of slabs recommended in the code. 2)The final dispersion of load in the two directions recommended by the code.**In 2001, Hyo-Gyoung Kwak,Jong-Young Song,** This paper develops a simplified to obtain design moments for elastically supported **parking structure slab.**Maintaining uniformly distributed load in the design of building structures.This paper introducing equivalent vehicle load factor which can the vehicle load effect.After choosing a standard design vehicle of 2.4 tonnes to small to medium vehicle in korea Finite element analyse for concentrated load were conducted by influence surfaces and also determine equivalent vehicle load factor which represent ratio of member force under vehicle load and uniformy distributed load.In addition,relation ships between vehicle load

factor and section dimension by regression and to be use to determine design moments for vehicle load Conclusion: A simple but effective design method for parking garage slabs is presented and effect of deflection in the suppoting beams on slab moments were studied. Wheel load effects are dominant for center moment in loag span direction. It was also found that vehicle load effects must be considered in the design of parking garages as in the design of bridges to remove inherent structural defects even if the vehicle weight is relatively small.

1) OBJECTIVES

- To carry out analysis RC frame and RC flat slab parking building for 15 m, 18 m &21 m radius for 28 m to 30 m length span at 5 m,6m,7m,8m interval.
- To analyse the effect of ramp on RC frame and RC flat slab structure
- To carry out comparison between RC frame and RC flat slab in terms such as bending moment,Axial force,column moment.

III. MODELLING OF PARKING BUILDING

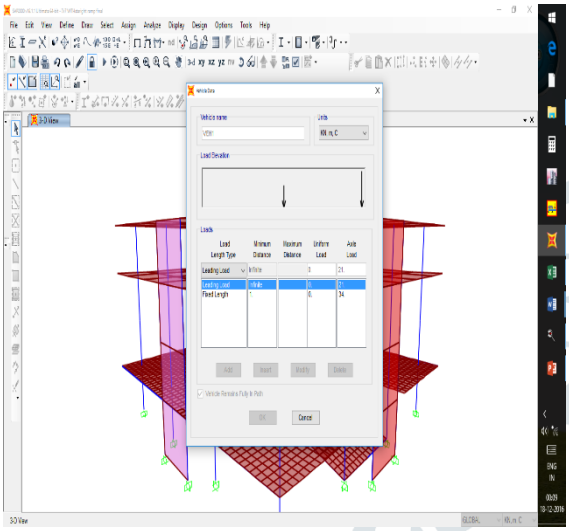


Fig1.Vehicle load apply on slab

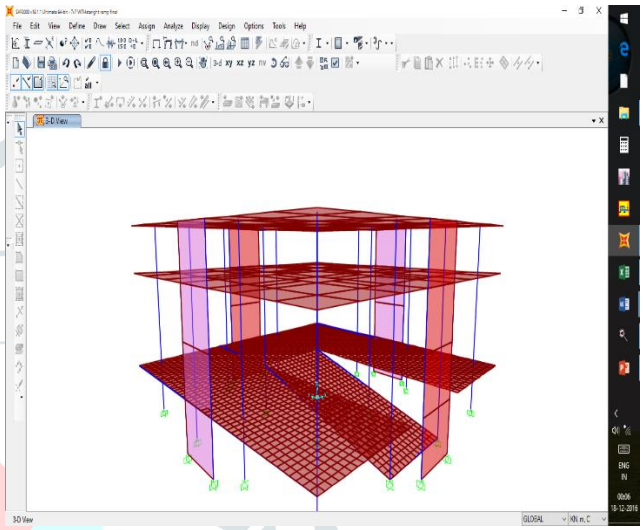


Fig2.Modelling of structure

Earthqauke load :

EQ.X =seismic load at X direction.
EQ.Y = seismic load at Y direction
Zone factor=0.16
Soil type =2(medium soil)
Importance Factor=1
Response reduction factor=5 for RC frame as per IS 1893-2016
Response reduction factor=3 for RC flat slab as per IS 1893-2016

Load combination:

1)1.5(DL±IL)+VL
2)1.2(DL+IL±EQ.X)+VL
3)1.2(DL+IL±EQ.Y)+VL
4)1.5(DL±EQ.X)+VL
4)1.5(DL±EQ.Y)+VL
5)0.9DL±1.5EQ.X+VL
5)0.9DL±1.5EQ.Y+VL
Where VL= Vehicle load

Table :1 Modelling parameter for RC frame and RC flat slab.

Building detail		
	Conventional slab	Flat slab
Column size	900x900	900x900
Beam size	230x600	-
Slab size	250 mm	Column strip =300 mm
		Middle strip = 275 mm
No .of bays	3 No	3 No.
C/c span length	5m,6mx7mx8m	5m,6mx7mx8m
Live load	6.5 KN/m2 Note: As per IS 875 PART2,live load for parking garage=5KN/m2,impact factor consider 0.3that implies =(5+(30% of 5))=6.5 KN/m2	6.5 KN/m2 Note: As per IS 875 PART2,live load for parking garage=5KN/m2,impact factor consider 0.3that implies =(5+(30% of 5))=6.5 KN/m2
Moving load	At Toe 2.1tonne and 3.4 tonne at hill as per IRC-06	At Toe 2.1tonne and 3.4 tonne at hill as per IRC-06
Floor finish load	1.25 KN/m2	1.25 KN/m2
Thickness of shear wall	-	230mm thick
Ramp slab	250 mm	250 mm
Stringer beam	230x600	230x600

IV. . RESULT AND COMPARISON

The results and comparison are in terms of parameters such as Maximum Bending moment, Maximum Shear Force, and Maximum Axial force,mid span moment,support moment,middle strip moment,column strip moment as shown in below tables and related graphs for 5m,6m,7m,8m Span.

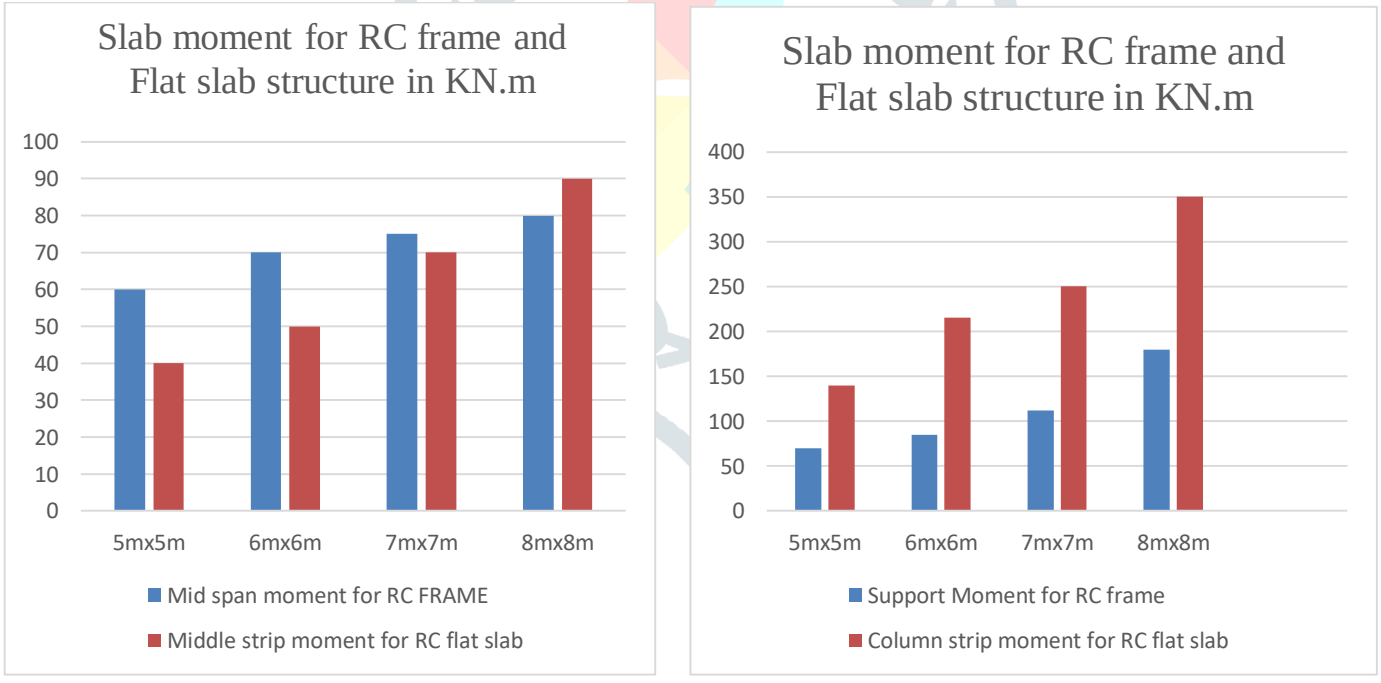
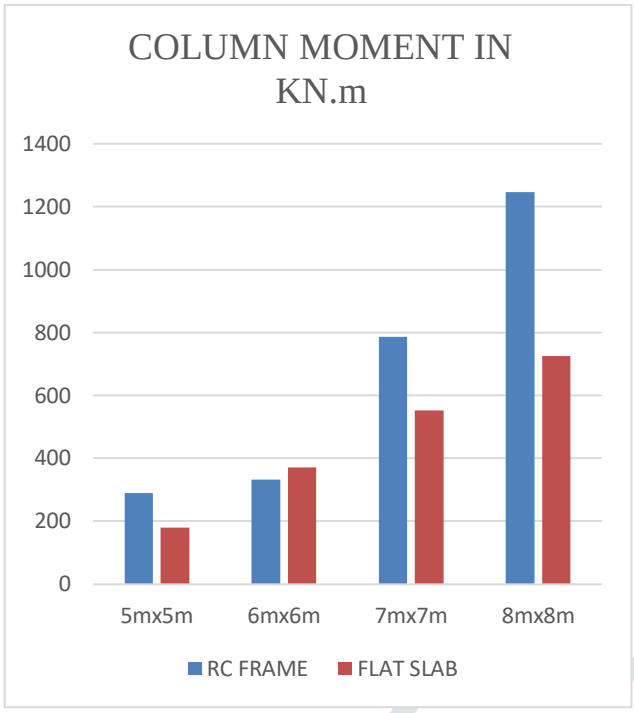


Fig3.Comparison of slab moment for RC frame and RC flat slab



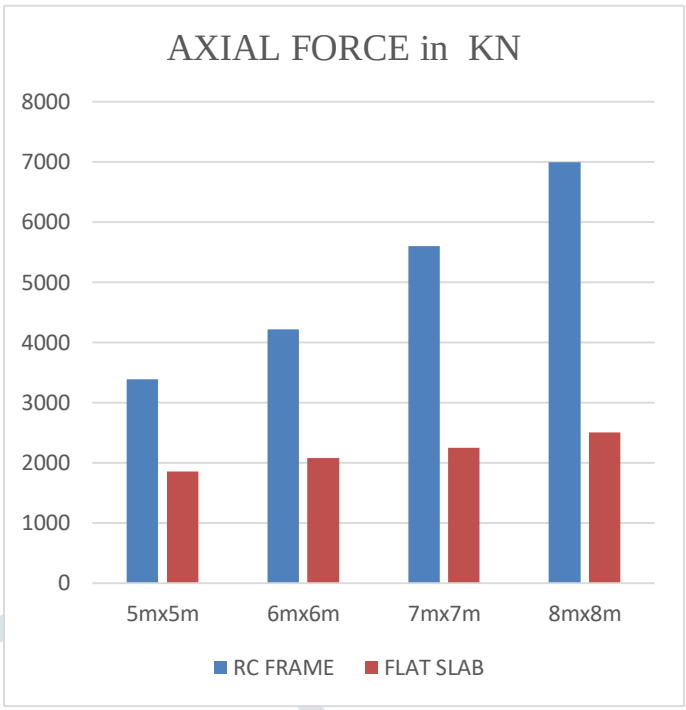


Fig4.Comparison of Column moment and axial force for RC frame and RC flat slab

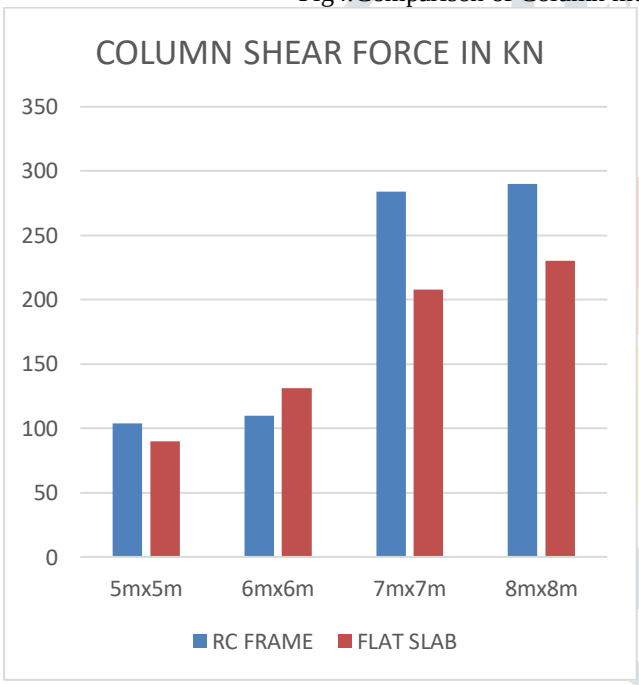


Fig5.Comparison of Column Shear force

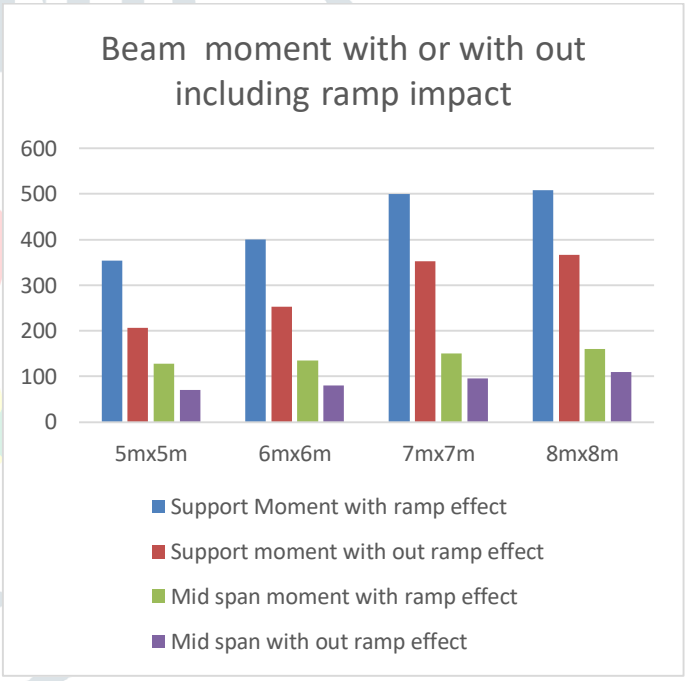


Fig6.Comparison Beam moment with or with out including ramp impact

V. CHECK PUNCHING SHEAR FOR PARKING STRUCTURE

. For 5m span length

Vu=((5x5)-1.15x1.15)x24 = 568.26 KN

$\tau_v = \frac{Vu}{bd} = \frac{568.26 \times 10^3}{2500 \times 250} = 0.90$ N/mm2

$\tau_c = 0.25\sqrt{f}ck = 0.25\sqrt{20} = 1.25$ N/mm2

$\tau_v < \tau_c$ Slab is not safe in punching shear require shear reinforcement

VI. Conclusion

The conclusions are drawn from the results obtained at the end of analysis and comparison for 5 m, 6 m &7 m span length for RC frame and RC flat slab as below:

1)Middle strip moment for flat slab lower than Mid span moment for RC frame for span length 5m,6m,7m.But for 8m span length as vice versa.

2)Column strip moment for flat slab higher than support moment RC frame for each span interval and Column moment for RC frame is higher than flat slab and also Axial force for RC frame is higher than flat slab.

3)Due to ramp effect for parking building bending moment of beam ,axial force,Column moment is increased and For ramp slab apply moving load bending moment of slab,stringer beam is too high.

4)For parking building flat slab used so more chances punching shear when require shear reinforcement in slab. For parking building ,flat slab require more slab thickness like 300 mm with out drop panel. For parking building minimum thickness slab 250 mmfor RC frame .as per IS code two layer slab steel is require.

VII. Acknowledgment

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