

DIFFERENT TYPES OF PARKING SPACES AND MULTIPLE LEVEL CAR PARKING¹M.SAI VIKRAM, ²N.AYESHA

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ABSTRACT-

Multi-level parking system has arrive with a figure of reliefs as they come through a number of advantages where as optimal utilization of places, for ease for the drivers because the tension of suffering for parking place is full off, additional safety and environmental accord. The on the increase population in India has produced many troubles one of the demanding ones individual car parking which we face up to almost each and all day.

Moreover the problem of gap for cars moving on the road, larger is the problem of place for a parked vehicle making an allowance for that private vehicles stay behind parked for most of their moment in time. at the same time as residential projects still run away with selected parking, the original problem lie with commercial places several a time which is rise above through collecting more open places to park. Multilevel Parking system for a few time have provided help since they get nearer with a number of advantages in it optimal use of space, lower repairs and prepared cost, lower manufacture cost, secure and environment sociable nature, easy for the drivers, price saving for builders by economy height or deepness. Multiple Level Car Parking System are a good deal in fashion a technique of automatically parking and retrieve cars that classically use a system of pallets and lift and signaling strategy for revival. They offer compensation like safety, saving of place, time and oil space but as well need to have an further and a very detailed consideration of the parking is required, space effortlessness of use and traffic run.

The increasing population in India has produced lots of problems, one of the major demanding ones individual car parking which we meet almost most the day. Moreover the problem of place for cars moving going on the road, larger is the trouble of lack of place for a parked vehicle taking into consideration that private vehicles parked for most of time. Roads are organism build for cars to ply apart from are we

also generous the vehicles sufficient space to park.

Keywords --. Multi-level parking system, optimal utilization of places, signaling strategy for revival, space effortlessness

I. INTRODUCTION**Parking**

In India as we know population has been increasing day by day and creating many problems as one the most challenging creating problem is car parking. We are facing it every day in our life as roads has been decreasing as its size and cars has been increasing day by day, most of people are parking their cars for much time period and it was generating less space on roads. It is been impacting on transportation development as the availability of less space demand has been increased a lot in urban areas and central business areas and major developed.

Parking studies

In these parking studies before taking any moderation for betterment of its condition, data concerning about availability of paring space, its usage and parking demand is needed. It should also require estimating the fares of parking, parking surveys are planned to provide all these information. For an each vehicle there is a difference for parking in vehicles, many statistics are played in this parking need.

Parking statistics

1. Parking accumulation means that the number of vehicles are been parked at a given time period of interval. This is derived by an accumulation curve. Accumulation curve is calculated in graph and its shows some values that are plotted

the number of bays occupied in the given of respect time interval.

2. Parking volume gets the total number of vehicles which are parked in given time span. In this repetition of the vehicles are not been accounted.

3. Under accumulation curve parking load has been given. And it can also been obtained by multiplying the number of vehicles occupying the parking area at an each time of time interval with the given time interval. And it is specified as a vehicle hour's count in it.

4. In these the number of vehicles that are been parked for hours count and by these average duration of parking vehicle are counted by hours time.

5. Parking turnover means that the ratio of vehicles that which are parked for given time interval for parking bays. These can be determining by the number of vehicles that which are parked per day and as by time gap.

6. The total space existing for the duration of time that which has in use by the number of bays. It gives a correct measure of how effectively the parking space is been utilized. Parking index can be found as, and these parking indexes are also said as occupancy and efficiency.

Parking index = parking load/parkingcapacity×100

Types of Parking available

- On-street parking
- Off street parking
- Parallel parking
- 30 degree parking
- 45 degree parking
- 60 degree parking
- Right angle parking
- Multiple Level Car Parking

Salient Features

- In the require pattern a line with system that to set up a dynamic peak hour organization. Intelligent buffering system offering zero wait time for the public.
- Flexible, scalable and modular design to adjust wide range of outline and capacity offers flawless capacity addition to it.

- Simple design by the way of electrical push pulls mechanism with direct drives.
- Use of electrical drives to optimize power consumption.
- Manual override option can be done with the help o intellectual urgent situation managements system.

Advantages

- Space effective – it means that space can be saved up to 70 percent.
- By making free at the space on surface level can be utilized for better development of commercial use.
- It can reduce the total cost of ownership.
- In these environment has a major part and eco friendly ramps are also avoided.
- Superior throughput and quicker operation (capacity to hold 40 to 60 cars an hour).

Necessity of the MLCPS

- Optimal consumption of a space
- Can be constructed on minimum available space
- Lower construction cost
- Low maintenance and operational cost
- Safety of vehicle
- Environment nature
- Benefit to a driver
- Benefit to builder

II. LITERATURE REVIEW

➤ Data collection methodology

In this data collection method the most frequent parking surveys conducted are in-out survey, fixed period sampling and license plate system of survey. Let's get the detail information about these surveys.

➤ In-out survey

In this survey we are leaving to have a conversation about, the engaged number in the selected parking set area is taken at the starting. Whereas in these the number of vehicles entered in a given time period is recorded and the number of vehicles are left also counted then. Totally final entered

vehicles are also noted; here in these the labor requirement is very less. Only one person is enough. But we can't get any correct information about the vehicle of a particular time of a vehicle which is parked in certain time. By this we cannot approximate the price charges and parking period and its total profits.

➤ **Fixed period sampling**

Fixed period sampling is almost common subject to in-out survey and there is a to some extent difference between them all the vehicles which are counted at the starting of survey and then taken after a regular interval of time span between 15min – 1 hour at these time count has been taken. In these there is a possibility of missing the number of vehicles that which has be parked at for a short duration of time.

➤ **License plate method of survey**

In this analysis the results are very common and correct data. In this case of survey, every parking lot area is observed at a continuous interval time of 15 minutes or so and the license plate number can be noted down. By this a particular vehicle data will be recorded at a regular duration of time and data which is using parking bay. This will be helpful to calculating the fare because fare is probable depends on the duration for which the vehicle was parked. If the time interval is lesser, then there is less opportunity of missing little term parking list. But this is method very labor can be concentrated.

➤ **What is a Parking Analysis?**

A Parking Analysis is a study to determine that the total parking demand for a particular use, per they may have a Site Plan showing all resident spaces and Zoning Ordinance Section 20.90.060 and Table 20190, does not go above to the total supply of available parking spaces on a subject site. In a Parking lessons that were we can have a little required for other tenants is required for any project where there is a change of use that increases or intensifies the parking demand. from the belongings owner or leasing agent, these Examples can changes that may increase or strength in parking demand and can also be include a retail/commercial use change to a eating place, or a new renter with is more exhaustive uses in an industrial center.

➤ **When can be Parking Analysis Necessary?**

Parking Analysis will be mandatory when a new structure development is planned in a new site. And the Parking Analysis is also normally required one while for the period of the evaluation of a renter improvement for the Plan verify in the Building Division and wherever as a more intensive utilize is planned in that may increase for change in the parking demand. In these cases, there is a need to check the adequacy of obtainable on-site parking and its Development Services for the staff will be notified that the applicant get a complete Parking

➤ **What is required for Submitting in Parking Analysis?**

A detailed Parking Analysis submittal normally consists of

In a Site Plan of the legal property are identify where the planned project has been sited, and then presentation all the offered uses/tenant spaces and all the offered parking gap locations.

In the Parking Analysis structure or spreadsheet matrix should be presented from the City and signed by the assets of the owner or owners correspond to that site.

1. Names of all the presented/future use and list of each one tenant break the address.
2. List eighty-five percent (85%) of an every one tenant's total building open area copy.
3. Lists that are in the parking necessities of each existing and the future tenant.
4. Lists that are for dining and seating count for all restaurant, bar, and coffee shop use.
5. Lists an accurate total number of all existing parking spaces onsite
6. Provides the total difference (if any) between the numbers of parking spaces required versus the number of parking spaces that are existing onsite.

III. METHODS OF PARKING

METHODS OF PARKING:

➤ **Parking Method**

When a Architect or a Engineer is planning roads; he should take responsibility of that and designs the need of parking

area as per the necessity and the reading of the traffic in that area.

The Parking Method play a important key in the control traffic and stay away from chaotic confused and traffic jam because of no space for a vehicle for parking capacity

On the source of the style of Parking Area, there are two important types in the Parking way those are;

1. On Street Parking means
2. Off Street Parking

In this editorial, we are going to talk about the “Types of Parking in clarity” in which it guide us round out the efficient way to plan Parking areas for Highway, Arterial road, sub-arterial road.



Parking Lot, New York

➤ **On-Street Parking**

As the given name has been itself suggested, “On-street Parking” it mean that the space allotted for parking use at the each sides of the road. For competence in Parking system; these on street Parking has separated into two types which are;

1. Angular Parking
2. Parallel Parking
3. Perpendicular Parking (well-organized Parking Method)

➤ **Angular Parking**

In these vehicles are parked in the direction. It will be a 30 degree otherwise in 45 degree position. The vehicle can be simply reversed back in these parked at these direction. Therefore, prove as an well-organized Parking structure in case of vehicular flow.

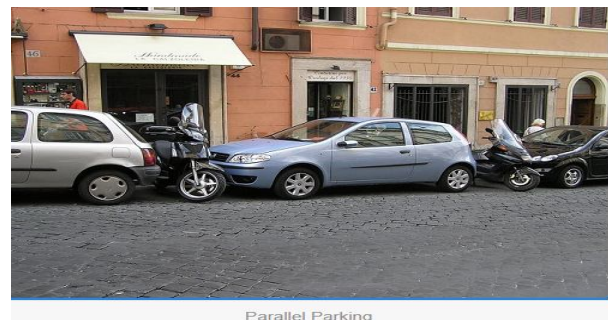


ANGULAR PARKING

The major disadvantage of this “Angular Parking arrangement” is that it needs a large space for parking than necessary for a Parallel Parking. Thus this system is adopted where the space is available in abundance.

➤ **Parallel Parking System**

In this vehicles are parked one back of the each other. The Parking area is planned as per the area essential if Parallel Parking is adopted. It has be survey that these area necessary for Parallel Parking is more lesser than that of which required to an Angular Parking. Thus, large number of vehicles can be arranged in this Parking System. This is the reason; this type of parking system is normally chosen.



Parallel Parking

➤ **Perpendicular Parking**

In this type where vehicle are park in right angle to the lane of street. So it is a resourceful system of Parking



➤ Off Street Parking

As the name says everything, off street parking it means a parking place is designed bordering to the road or in a place or building which is not the division of the road.



Here there are few types of the example in off street parking they are listed down;

- In Parking a lot
- Where in Bypass highway
- Multistory structure Garage
- Parking Lanes

➤ Headroom

The suggested basic clear length of headroom, measured normal to surface, for where vehicle is 2.10 meter. Extra clearances are normally required at changes in slope such as at ramps. The floor to floor length is taken as 3.3meters, which assure the minimum height which is optional for a headroom adding deduction made for signage, lights, and exposure to air, barrier control and much other possible projection.

➤ Parking direction

Insertion bays in an angle of less than 90 degree it is expediency for drivers since it facilitate starting point and ending point. These in the mode of improve 'dynamic and turnover capacity' of the passageway. Though, there is a disadvantage is that better floor area per car is needed. at this point parking position is in 90degree. walkway thickness is noted as 6.0meters. Car park layout: This configuration consists of 10 spans of 8.4 meter in X-direction and 6 spans of 5.5 meter in Y-direction. The on the whole length of the

building is about 13.2meter. The plan of structure measured as 84meter x 33meters. As the width is much added, therefore a development joint is provided after 5 spans in X-direction, i.e. at 42meter which is shown in below figure-2.

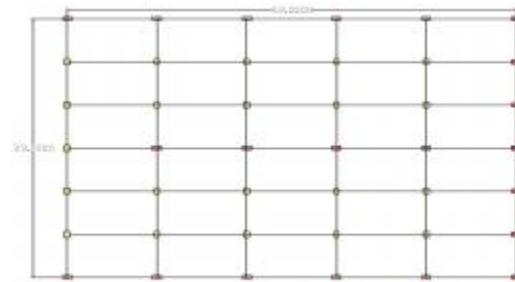


Fig 2. Shows grid (expansion joint)

➤ Design in order

The construction is planned in fulfillment to the Indian Standard 1893 (Part I): 2002 (Indian Code of Criteria for Earthquake Resistant Design of Structures). Story height is measured as 3.3meter and for each and every one floors as well as the ground story.

The buildings are to be set at the foundation. The floors of each and every building take steps as rigid diaphragms, and are analyze and planned by using ETABS v9.7.4 software for the new Amravati city (i.e. Zone III). The objects grade are considered as M25 for concrete and Fe415 for steel. And the Live load is as 6 kiloNewton/m² and load of floor finish 2.4 kN/m².

Width of slab is designed as per section 23.2.1 of IS 456: 2000 and as well size of beam and column are determined by using criterion as per IS 13920: 1993. The sizes of columns are set aside (450 x 650)mm.

More the columns are shortened above next storey. The size of columns on top of second storey for all in-between columns is taken as (450 x 600)mm and that designed for columns the length of the margin is taken as (400 x 550)mm. Methods of seismic analysis of composition areas;

1. Static Analysis
2. Dynamic Analysis.

Criterion of Dynamic analysis used intended for normal buildings are IS 1893 (Part 1): 2002: article 7.8.1 (a).

- 1) For Zone IV and V, the tallness of building be supposed to be larger than 40 meter.
- 2) For Zone II and III, the height of building must be greater than 90 m.

In this learning, the greatest height of building is less than 90 meter in zone III. According to section 7.8.1(a), in dynamic analysis it is not necessary in this study. Hence, Static analysis was prepared. Corresponding static analysis financial records for the dynamics of structure in a simplest one-it require smaller amount computational efforts and is based on formula given in the code of apply. First, the design support shear is compute for the complete building, and it is then dispersed along the elevation of the building.

The sideways forces at every floor levels therefore obtain are spread to each lateral load resisting fundamentals.

As per an article 6.3.1.2 of IS 1893(Part1): 2002 Load mixture is;

- 1) 1.5 (DL + LL)
- 2) 1.2 (DL + IL + EQX)
- 3) 1.2 (DL + IL + EQY)
- 4) 1.5 (DL + EQX)
- 5) 1.5 (DL + EQY)
- 6) 0.9DL + 1.5EQX
- 7) 0.9DL + 1.5EQY

Usual Time era: $T_a = (0.09 \cdot h) / \sqrt{d}$

In X-direction, $T_x = (0.09 \cdot 13.2) / \sqrt{42} = 0.1833 \text{ sec.}$

In Y-direction, $T_y = (0.09 \cdot 13.2) / \sqrt{33} = 0.2068 \text{ sec.}$

Meaning Factor: $I = 1.0$ (as per IS 1893 (Part 1): 2002, section 6.4.2)

Reply Reduction Factor: $R = 5.0$ (as per IS 1893 (Part 1): 2002, article 6.4.2)

Soil Type = medium

Zone Factor: $Z = 0.16$ Proportions of columns and beams are determined after dissimilar trials and appropriate curtailments are finished.

The various results in storey flow and dislocation were record for columns with certain elements and without curtailments. The access ramp is also planned separately but not discuss in this document.

Parking is the do something of stopping and disengages of a vehicles and leave-taking it vacant. Parking on one or equally sides of a road is often acceptable, though now and then with boundaries. Several buildings contain parking services for utilize of the building user. Country and home government have it system for plan and utilize of parking space.

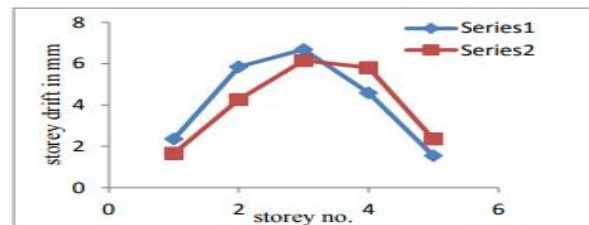
IV. RESULTS AND DISCUSSIONS

❖ Story drift:

The story drift in any story as a result of the minimum fixed style lateral force, with partial ratio of one.0, shall not exceed zero.004 times the story height, i.e. $0.004 \times 3.3 = 13.2\text{mm.}$ (For 2nd, 3rd,4th and 5th storey) $0.004 \times 2.0 = 8\text{mm}$

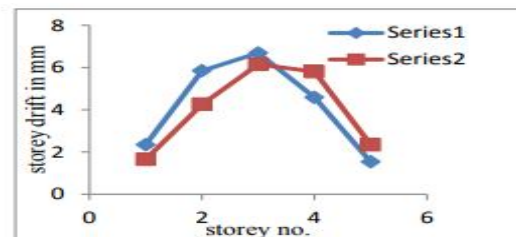
(For 1st storey)

Maximum story drift in X-direction for columns with curtailment is 5.098mm (series 1) and for columns without curtailment is 4.64mm. (Series 2)



Fig(3): Graph showing max storey drift in X-direction

Maximum story drift in Y-direction for columns with curtailment is 6.68mm (series1) and for columns without curtailment is 6.15mm (series 2) which are well within permissible limit.



Fig(4): Graph showing max storey drift in Y-direction

2.) Displacement: maximum permissible displacement according to clause 7.11.1 of IS 1893 (Part 1): 2002;

$$\begin{aligned}
 &= 0.004 \times \text{Total height} \\
 &= 0.004 \times 13.2 \\
 &= 0.0528 \text{ m} \\
 &= 52.8 \text{ mm}
 \end{aligned}$$

Maximum displacement in X-direction for columns with curtailment is 22.6mm and for columns without curtailment is 21.7mm which are well within permissible. Maximum displacement in Y-direction for columns with curtailment is 30.1mm and for columns without curtailment is 29mm which are well within permissible limit.

From the on top of results it's over that; one.) the utmost level drifts each in X-direction and Y-direction are at intervals permissible limit in each the cases i.e. in columns with and while not curtailment. 2.) The utmost displacement each in X-direction and Y-direction is at intervals permissible limit in

columns with curtailment moreover as in columns while not curtailment.

A multi-storey automotive park (also known as parking garage, parking structure, parking ramp, parkade, parking building, parking deck or indoor parking) could be a building designed for automotive parking and wherever there are a variety of floors or levels on that parking takes place. It's basically an internal, stacked automobile parking space.

Comprehensive approach these days, multi-storey car park construction is characterized by AN increasing demand for experience, and for shut cooperation amongst the member of the expansion team. With its specialized ability and integrated approach to project management Haitsma Beton ensures, throughout the development mechanical phenomenon from preliminary discussions all the thanks to completion, that this demand is met. As a building partner, we start consultations with the consumer within the initial part. We tend to conjointly give recommendation concerning routing and safety, with economical traffic management and smart ventilation as prime priorities.

We tend to use clever solutions to wear down any issue which will happen. Additionally, we tend to be versatile once it involves assembly and transport, in order that the complete construction method will proceed unrestrained. Further, our periodic reports give insight into the progress, quality and prices of your project.

Made-to-order – and reasonable victimization TT-slabs change Haitsma Beton to ensure a wonderful price/quality quantitative relation for your car park. With these components, we tend to be ready to understand durable however lightweight constructions in a very versatile manner, despite style. Further, the speedy assembly of those commonplace slabs ensures that the development methods are short in length.

- ❖ Lighting
- ❖ Management Practice
- ❖ Parking Areas or Decks
- ❖ Vehicular Access
- ❖ Pedestrian Access
- ❖ Signage
- ❖ Surveillance and CCTV
- ❖ Engineering – Structure
- ❖ Engineering – Mechanical and Electrical

PHASE 1

a. Market survey throughout this era detail market survey has been done to be told accessible parking systems and their utility conjointly their literatures of various forms of parking systems and its distinction between are determined. b. issues in existing systems the issues relating to the prevailing system are found like, difficult programming, High budgets, impossible style, high finish robots, etc. c. abstract style. Taking drawback statement from on top of and learning the basic engineering ideas varied ideas relating to trendy parking system area unit ready and amongst those best ideas style has been hand-picked for additional phases.

PHASE 2

a. Modelling in CATIA.

Putting the concepts on the modelling computer code for mental image of the image and creating it additional and additional compatible so there'll be less complexness in coming up with

b. Material choice and procurement.

In this part material choice is completed and conjointly its procurement as per want the size square measure taken from CATIA model.

c. Fabrication

This section includes fabrication of epitome within the workshop from the procured material and making ready the epitome model from the code model.

d. Assembly & Testing

This section embody Assembly of all the sub components, additionally the arrangement of the motor and its wiring is finished, all finishing operations like grinding, trimming, painting is finished here. Testing section includes testing of the example model beneath real atmosphere.

V. CONCLUSIONS

As per area of land in municipal city and other superior categorize cities becoming in short supply and dearer and plots are getting lesser conformist for parking is prove infeasible. Then the solution for the parking necessities is the multilevel car parking system to take the full advantage of car parking capacity by utilize vertical space, rather than growing horizontally. The most familiar choice in term of technology favored is automated (lift base) which can be chosen by nearly 70percent of the users.

From Case Study of PARI we can be able to finalize that:

- Auto Car Parking System which reduce parking and recovery time. And saves the time which has expend in pointed for vacant parking slots and time spend is searchings the parked car. Reclamation on normal is 2 to 3 minutes.
- Auto Car Parking System is one the atmosphere friendly. As the car engines are close up for the duration of the automatic parking process by these there is no pollution.
- Auto Car Parking System is cost effective in terms of maintenance over the conventional parking systems.
- Auto Car Parking System provide car parking solution willing to help most cars in smallest amount space.
- Auto Car Parking System develops economic feasibility of commercial and residential development.

Vertical Car Parking model has been planned; for all the parts in it were manufactured and assemble and examined successfully. Analysis of the model have been done and improved with the scaling of 1: 9 meant for life dimension model Such as SUV's like Fortuner. As the life cycle model involves proper design and advanced methods are to be used to meet the requirements of the customers.

.VI. SCOPE FOR FUTURE STUDIES

1. The platform can also be prepared with safety sensor guide the association of vehicle in the platform.
2. It can be completely automatic by integrate it with a panel board, such with the purpose of at whatever time a particular number is called on the panel board, the individual platform be supposed to become visible at the ground level.
3. This profession can also be made by extra secured by providing each platform a exact password, as a result that only when a exacting password is typed the platform is retrieve.

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