

PARKING SPACES AND SYSTEMATIC ARRANGEMENT FOR DIFFERENT TYPES OF USER PARKING

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ABSTRACT- a systematic study of the parking characteristics and demand and regulatory measures that are possible for controlling .the challenging ones being car parking which we confront almost every day. Besides the problem of space for cars moving on the road, greater is the problem of space for a parked vehicle considering that private vehicles remain parked for most of their time. While residential projects still escape with designated parking, the real problem lie with commercial spaces many a time which is overcome by taking extra open spaces to park. Multi-level Parking systems for sometime have provided relief since they come with a number of advantages – optimal utilisation of space, lower maintenance and operational cost, lower construction cost, secure and environment-friendly nature, comfortable for the drivers, cost saving for builders by saving height or depth. Car Parking Systems are much in vogue a method of automatically parking and retrieving cars that typically use a system of pallets and lifts and signalling devices for retrieval. Parking is of great help to a traffic engineer as well a town planner.

Index –parking ,level, types of user,driver,signals device ,space

INTRODUCTION

Every user owner would wish to park the the car as closely as possible to his destination so as to minimise his walking. The growing population of India has created many problems – one of the challenging ones being car parking which we confront almost every day. Besides the problem of space for cars moving on the road, greater is the problem of space for a parked vehicle considering that private vehicles remain parked for most of their time. Roads are being built for cars to ply but are we also giving the vehicles enough space to park?. Parking is one of the major problems that is created by the increasing road track. It is an impact of transport development. The availability of less space in urban areas has increased the demand for parking space especially in areas like Central business district. This result in a great demand for parking space in the area where as the activities are concentrated. With the growing population of motor vehicles .the problem of parking has assumed serious proportions.

Desirable parking space standards for different land use.

S.NO	LAND USE	PARKING SPACE STANDARD
1	Residential , detached , Semi-detached row houses; Plot area upto 100sq.m Plots area from 101to200 sq.m Plots area from 201to300sq.m Plots area from 301to 500sq.m Plots area from 501to1000sq.m	No private or community parking space is required. Only community parking space is required. Only community parking space is required. Minimum one-third of the open area should be earmarked for parking. Minimum one-fourth of the open area should be earmarked for parking
2	offices	One space for every 70 sq.m of floor area.

3	Industrial premises	One space for upto 200 sq.m of initial floor area.additional space at the rate of one for every subsequent 200sq.mof fraction thereof.
4	Shops and markets	One space for every 80sq.m of floor area .
5	Restaurants	One space for every 10 seat
6	Theatres and cinemas	One space for every 20 seat
7	Hotels and motels. Five and four-star hotels Three-starr hotels Two-star hotels motels	One space for every 4 guest rooms. One space for every 8 guest rooms. One space for every 10 guest rooms One space for each guest room.
8	hospitals	One space for every 10 beds

Parking studies-Before taking any measures for the betterment of conditions, data regarding availability of parking space, extent of its usage and parking demand is essential. It is also required to estimate the parking fares also. Parking surveys are intended to provide all these information. Since the duration of parking varies with different vehicles, several statistics are used to access the parking need

Parking statistics

1. **Parking accumulation** It is defined as the number of vehicles parked at a given instant of time. Normally this is expressed by accumulation curve. Accumulation curve is the graph obtained by plotting the number of bays occupied with respect to time.
2. **Parking volume** Parking volume is the total number of vehicles parked at a given duration of time. This does not account for repetition of vehicles.
3. **Parking load** Parking load gives the area under the accumulation curve. It can also be obtained by simply multiplying the number of vehicles occupying the parking area at each time interval with the time interval. It is expressed as vehicle hours.
4. **Average parking duration** It is the ratio of total vehicle hours to the number of vehicles parked.
5. **Parking turnover** It is the ratio of number of vehicles parked in duration to the number of parking bays. This can be expressed as number of vehicles per bay per time duration.
6. **Parking index** Parking index is also called occupancy or efficiency. It is defined as the ratio of number of bays occupied in time duration to the total space available. It gives an aggregate measure of how effectively the parking space is utilized. Parking index can be found out as follows

$$\text{Parking index} = \text{parking load} / \text{parking capacity} \times 100$$

Effects of parking

Parking has some effects like congestion, accidents, pollution, obstruction to fire-fighting operations etc.

1. **Congestion** Parking takes considerable street space leading to the lowering of the road capacity. Hence, speed will be reduced, journey time and delay will also subsequently increase. The operational cost of the vehicle increases leading to great economical loss to the community.
2. **Accidents** Careless maneuvering of parking and unparking leads to accidents which are referred to as parking accidents. Common type of parking accidents occur while driving out a car from the

parking area, careless opening of the doors of parked cars, and while bringing in the vehicle to the parking lot for parking.

3. Environmental pollution They also cause pollution to the environment because stopping and starting of vehicles while parking and unparking results in noise and fumes. They also affect the aesthetic beauty of the buildings because a car parked at every available space creates a feeling that building rises from a plinth of cars.

4. Obstruction to firefighting operations Parked vehicles may obstruct the movement of firefighting vehicles. Sometimes they block access to hydrants and access to buildings.

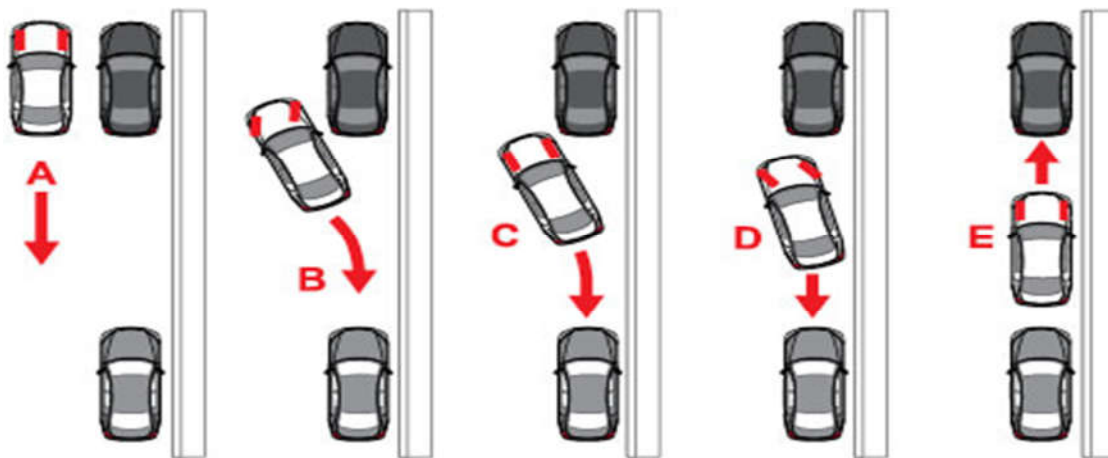
1. Common methods of on street parking

- Parallele parking
- 30 °angle parking
- 45° angle parking
- 60° angle parking
- Right angle parking

On street parking means the vehicles are parked on the sides of the street itself. This will be usually controlled by government agencies itself. Common types of on-street parking are as listed below. As per IRC the standard dimensions of a car is taken as 5×2.5 m and that for a truck is 3.75×7.5 m.

3. Parallel parking

The vehicles are parked along the length of the road. Here there is no backward movement involved while parking or unparking the vehicle. Hence, it is the most safest parking from the accident perspective. However, it consumes the maximum curb length and therefore only a minimum number of vehicles can be parked for a given kerbed length. This method of parking produces least obstruction to the on-going track on the road since least road width is used.



4. 30 parking

In thirty degree parking, the vehicles are parked at 30 with respect to the road alignment. In this case, more vehicles can be parked compared to parallel parking. Also there is better maneuverability. Delay caused to the track is also minimum in this type of parking.

5. 45 parking

As the angle of parking increases, more number of vehicles can be parked. Hence compared to parallel parking and thirty degree parking, more number of vehicles can be accommodated in this type of parking.

6. 60 parking

The vehicles are parked at 60 to the direction of road. More number of vehicles can be accommodated in this parking type.

7. Right angle parking

In right angle parking or 90 parking, the vehicles are parked perpendicular to the direction of the road. Although it consumes maximum width kerbed length required is very little. In this type of parking, the vehicles need complex maneuvering and this may cause severe accidents. This arrangement causes obstruction to the road track particularly if the road width is less. However, it can accommodate maximum number of vehicles for a given kerbed length.

1.6 Multiple Level Car Parking

It is a building (or part there hereof) which is designed specifically to be for Automobile Parking and where there are a number of floors or levels on which parking takes place.

Is essentially a Stacked Car Park

“Multilevel Car Park” – Term Originated in UK, in US it is called a “Parking Structure” Types

1. Manually operated (non mechanized-with ramps)
2. Mechanized (Classified in different type based on technology)
 - Mini
 - Puzzle
 - Tower

In order to accommodate the large volume of vehicles, small cities and towns must develop their infrastructure. One solution may be a multi-level car parking system to maximize car parking capacity by utilizing vertical space, rather than expand horizontally. With land in metros and ‘a’ grade cities becoming scarce and dearer, and plots getting smaller, conventional parking is proving infeasible.

Salient Features

- Dynamic peak hour management to configure the system in line with the demand pattern. Intelligent buffering system offering zero wait time for the public.
- Flexible, scalable and modular design to accommodate wide range of layout and capacities and offers seamless capacity addition.
- Simple design by the way of electrical push pulls mechanism with direct drives.
- Use of electrical drives to optimize power consumption.
- Intelligent emergency management system via. manual override option.

Advantages

- Space effective – space savings upwards of 70 percent.
- Freeing the space at ground level for better commercial use.
- Reduced total cost of ownership.
- Environmental friendly as ramps are avoided.
- Higher throughput and faster operations (capability to handle 40 to 60 cars an hour)

Commercial vehicle loading and unloading space standards

S.NO	Description	Loading and unloading space standards
1	All kind of development exception ware houses and	One breth for intial 500-1500

	godowns.	sq.m of floor area.additional berths at the rate of one for every subsequent 1000sq/m or part thereof.
2	For warehouses and godowns.	Two berths for initial 500to1500sq.m.of floor area.additional berths at the rate of one for every subsequent 500sq.m or part thereof.

2. Off street parking

Off street parking means vehicles are parked off the street itself. This will be usually controlled by commercial agencies itself.

Types of off-street

- Surface car parks
- Multi-storey car parks
- Mechanical car parks
- Underground car parks

1.7 Necessity of MLCPS

1.7.1 Optimal utilization of space

Mechanical car parking system is a method of parking and retrieving cars by using pallets and lifts. It thus removes the need for lengthy drive ways and ramps, accommodating maximum cars in minimum space.

1.7.2 Can be constructed on minimum available space

MLCPS is flexible enough to solve varied parking problems. It can be sited above or below the ground or a combination of both and designed to accommodate any number of cars.

1.7.3 Lower construction cost

MLCPS are cost effective in terms of construction cost. MLCPS are delivered pre-fabricated which are assembled on site. As the system is operated automatically, added expenses of underground parking such as building structure, providing lighting and security are avoided.

1.7.4 Low maintenance and operational cost

Operating cost is low since mechanical car parking systems requires less energy to run. There is no need for energy intensive ventilating systems as the cars are not being driven inside the parking lot. Cladding can be specially selected to match the building's facade.

1.7.5 Safety of vehicle

MLCPS provide complete safety to a vehicle as parked cars are not accessible to anyone else. Damages or a dent to the car is avoided while parking through narrow drive ways.

1.7.6 Environment friendly

Environmentally, mechanized car parking has much to offer. One of the greatest benefits related to conventional underground or open space parking, is the saving of ground space. Outdoor space saved can be put to good use with gardens and landscaping or additional buildings. It also significantly reduces noise and other pollutants.

1.7.7 Benefit to a driver

Car driving now can become a pleasant experience. Mechanical car parking systems makes parking

easier and less stressful as the driver does not have to drive through the entire parking lot looking for a place to park, nor do they have to attend the car when it is parked, thus saving a lot of time. Difficulty in parking in a tight corner is also eliminated.

1.7.8 Benefit to builder

By using MLCPS, floor area and the volume of the stilt/ garage can be used much more efficiently. It reduces the space needed to park the same number of cars or allow car parking where previously there would have been no room. This in turn means more financial gains by saving precious real estate space.

METHODOLOGY

2.1 Data collection methodology

The most common parking surveys conducted are in-out survey, fixed period sampling and license plate method of survey.

2.1.1 In-out survey

In this survey, the occupancy count in the selected parking lot is taken at the beginning. Then the number of vehicles that enter the parking lot for a particular time interval is counted. The number of vehicles that leave the parking lot is also taken. The final occupancy in the parking lot is also taken. Here the labor required is very less. Only one person may be enough. But we won't get any data regarding the time duration for which a particular vehicle used that parking lot. Parking duration and turn over is not obtained. Hence we cannot estimate the parking fare from this survey.

2.1.2 Fixed period sampling

This is almost similar to in-out survey. All vehicles are counted at the beginning of the survey. Then after a fixed time interval that may vary between 15 minutes to 1 hour, the count is again taken. Here there are chances of missing the number of vehicles that were parked for a short duration.

2.1.3 License plate method of survey

This results in the most accurate and realistic data. In this case of survey, every parking stall is monitored at a continuous interval of 15 minutes or so and the license plate number is noted down. This will give the data regarding the duration for which a particular vehicle was using the parking bay. This will help in calculating the fare because fare is estimated based on the duration for which the vehicle was parked. If the time interval is shorter, then there are less chances of missing short-term parkers. But this method is very labor intensive.

Parking Analysis?

A Parking Analysis is a study to determine that the total parking demand for a particular use, per the may have a Site Plan showing all tenant spaces and Zoning Ordinance Section 20.90.060 and Table 20-190, does not exceed the total supply of available parking spaces on a subject site. A Parking Analysis parking analyses that were 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 property owner or leasing agent, the Examples of changes that may increase or intensify the parking demand can include a

retail/commercial use change to a restaurant, or a new tenant with is more intensive uses in an industrial center.

Parking Analysis Required?

A Parking Analysis is required when a new building development is proposed on a site. A Parking Analysis is also commonly required during the review of tenant improvements for Plan Check in the Building Division where a more intensive use(s) is proposed that may increase the parking demand. In these cases, there is a need to verify the adequacy of existing on-site parking and Development Services staff will notify the applicant that a detailed Parking Analysis is required. Uses that typically require a more detailed Parking Analysis include (but are not limited to): restaurants, bars, coffee shops, health studios, vehicle repair shops, churches, and industrial use. Simpler parking summaries can prepared on many other type of development proposals.

Parking Analysis?

A detailed Parking Analysis submittal typically consist of:

A Site Plan of the legal property (a recorded parcel/lot) identifying where the proposed project is located, and showing all existing uses/tenant spaces and all existing parking space locations.

A Parking Analysis Form or spreadsheet matrix (available from the City and signed by the property owner or owner's represent that

1. Names all existing/proposed uses and lists each tenant space address
2. Lists eighty-five percent (85%) of each tenant's total building square footage
3. Lists the parking requirements (per the Zoning Code requirements) for each existing and proposed tenant
4. Lists dining and seating counts for all restaurant, bar, and coffee shop uses
5. Lists an accurate total number of all existing parking spaces on-site
6. Provides the total difference (if any) between the number of parking spaces required versus the number of parking spaces that are existing on-site.

CONCLUSIONS

- The solution for the parking requirements is the multi-level car parking system to maximize car parking capacity by utilizing vertical space, rather than expanding horizontally.
- The most popular choice in terms of technology preferred is automated (lift based) selected by nearly 70% of the users. From Case Study Of PARI we can Conclude that: Auto Car Parking System reduces parking and retrieval time.
- Saves time spend in searching for empty parking slots and time spend is searching the parked car. Retrieval on average is 2 to 3 minutes.
- Parking System improves financial viability of commercial and residential developments.
- Parking System provides car parking solutions accommodating maximum cars in minimum space.
- Auto Car Parking System is environment friendly. As the car engines are shut during the automatic parking process there is no pollution.

References:

- [1]. Hamada R.H.AI-Absi,Patrick Sebastian ,”Vision-Based Automated Parking System ”in 10th International Conference on Information science,2010
- [2] Sarfraz nawaz, Christos Efstratiou, Celia Mascolo,“Parksense: A smartphone based sensing system foron street parking” in Cambridge university
- [3] B. K. Konstantinos Domdouzis and C. Anuba., “An experimental study of the effects of different medium on the performance of rfid system,” vol. 21. Advanced Engineering Informatics, 2011.
- [4.]Hitendra.G.Wasnik,Optimal Automatic Car Parking System for Indian Environment, Indian Streams Reserach Journal Vol.1,Issue.X/Nov; 11pp.1-4, ISSN:-2230-7850
- [5].AnumitaRoychowdhury,Sarojini Nagar Parking Report,Delhi..
- [6].Kamrul Hassan, Md. Mustafizur Rahman, Multi-Level Automatic Car Parking With IR Card Security System, International Journal of Scientific & Engineering Research Volume 3, Issue 12, December-2012 1 ISSN 2229-5518.
- [7].Mrs.Priyanka. Kolhar,OffstreetParking Management Plan for Dharwad City, Karnataka, India,Journal of Engineering Research and Studies E-ISSN0976-7916.
- [8].SantheeshG,Intelligent Parking lot Management System-Implementation Challenges,CDAC.
- [9].MeghnaShivastava&Prof.Dr.Sanjay Gupta, Planning For MLCP Facilities in Metropolitan City of Delhi.
- [10].Prof.Madhuri K. Rathi, Mr.Darshan V Patel Department of Civil Engineering, Pune University, India.