

# *A study, analysis & feasibility check of Multilevel Parking in Sector-15, Chandigarh*

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## **ABSTRACT**

Parking in particular is such a sensitive issue that parking policies in many communities often appear to be both conflicting and indecisive. It is roughly estimated that out of 8760 hours in a year the car runs on an average for only 800 hours, leaving 7960 hours when it is parked. So we can say that parking control is, in many towns, the key to proper traffic control. Like any other city, Chandigarh also witnesses congested roads, high traffic and parking problems which are major concerns for any modern city planning. This city was originally designed for a population of 5 lakhs, has far exceeded that limit. Congestion of on-street spaces may give rise to inappropriate parking areas in office and shopping complex during the peak time. An indication of importance of road traffic is the portion of total passengers and goods transport carried by the roads. Wrongly parked vehicles on the road side interfere in normal flow of traffic and may lead to accidents. The situation is only going to worsen when large number of cars is ready to hit the roads by the near future. In order to address parking problems in residential and commercial building spaces, we introduce Vertical/Multi-level car parking system. The studies & surveys have been conducted to identify the problematic parking area of Sector 15, Chandigarh. The area has been divided into four parts and the study is conducted by Cordon count and Patrol method. The parking supplies are compared with parking demand in order to check the feasibility of the multi-level parking. A long lasting solution to tackle the problem have been suggested which shall be useful to the transportation planner and the traffic engineer.

Keywords— parking, multilevel, congestion, vehicles, chandigarh

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## **INTRODUCTION**

Increasing prosperity, change in land use patterns and changes in traffic generating behavior of various social groups causes growth of road traffic ultimately leading to parking problem in urban

areas. Growth of population and motor vehicle coupled with socio-economic development are resulting in quite steep increase in transport demand leading to considerable traffic problems. In the past few years, traffic density on road especially in urban areas has grown by leaps and bound and the well-known fact is that every vehicle requires a parking space at end of trip or at destination.

Although the percentage of motorways in terms of total road length is low, the percentage of vehicle mileage on the motorway is disproportionately high. So, the significant and dramatic increase in demand for parking spaces due to the increase of on the road vehicles in cities and urban areas around the world on one hand and the significant shortage of these parking spaces created a challenging problem for managing these spaces. Despite the fact that most of the modern planned cities provide adequate support and guidance to the drivers about the parking slot selection and effective utilization of parking space, in terms of variable message signs, directional arrows, names of the parking facilities, status, number of available parking spaces, proper entry, exit point of parking, etc. traffic system and drivers face extreme difficulties especially during festival time and in unpredictable situations of traffic congestion.

As per the 2011 census the population of Chandigarh has been recorded to be a little over 10 lakhs which was originally designed for only 5 lakh people, with the rise in population to almost double in past two decades the number of registered vehicles have approached new heights. The severity of the problem can be well ascertained from the above facts and the vehicle data given in the table. Sector 15 comprises of mainly residences, shops, banks, offices, food joints, PG, community center and small offices, with Punjab University being just a few meters away from this sector which attracts a large number of trips from various parts of the city. The widening gap between parking demand and supply has led to haphazard on-street as well as off-street parking, congestion and other attendant problems of reduced traffic capacity.

The present parking supply in the form of surface parking lots is not only inadequate for the ever increasing parking demand, but most of the parking lots are also inconvenient to an extent that discourages the parkers from the intended use of these facilities. The parking duration ranges from about half an hour to 9 hours because of the location of variety of human activities and land use in the sector. In the absence of any restrictions, the long-time parker's have decreased the parking turnover, increasing accumulation and congestion. Multi-level parking lots at strategic places and a rational parking fee are inevitable for solving the problem of finding parking space for the growing number of vehicles. It provides effective maintenance with aircraft type efficiency and reliability at easy and cost-efficient operation. Full exploitation of land usage upto 90% is ensured compared to 67% in other comparable systems.

## **METHODOLOGY**

Sector 15 is situated adjacent to Punjab University and is also linked to PGI and Sector 16. The study of this sector has been divided into four parts. First part is the off and on-street parking at Gopal's block, second, the off and on-street parking at Patel Market. Third is the off and on-street

parking adjacent to Patel market and across the road from the Dominos and fourth is the off-street parking at the Dominos.

Though there are parking lots available in the vicinity the capacity of the parking lot is not sufficient to cater to the present demand and at the same time the location of the parking lot is questionable. In the absence of adequate parking facilities, the vehicles are parked on the side of the street leading to a major bottleneck in the smooth flow of traffic. In addition, high population density, large number of pavement hawkers, sidewalk encroachments, heterogeneous nature of traffic and commercial area development along all the major roadshave compounded the problem of congestion on the main as well as internal roads of these cities.

**Parking usage by patrol:** The purpose of parking usage survey is to obtain data on the extent of usage of parking spaces. This includes the count of parked vehicles at regular intervals through the period, covering both the morning and evening peak period and the parking accumulation and the turnover. The survey can be for off and on both parking. A frequency of ½ hour is considered to be satisfactory for on-street parking and a frequency of 1 hour could be used for off-street parking.

**Cordon count:** Cordon counts will yield information on total accumulation of vehicles within in the study area at different times during the day. The accumulation represents the sum of vehicles parked and on the move in the study area and is the measure of the level of parking demand within the area of required parking facilities. It is expensive due to large manpower requirement.

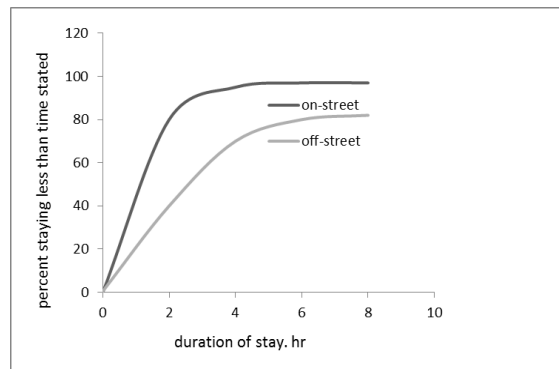
The studies were conducted for normal week days in the sector. The timing of the study was kept from 09:00am to 09:00pm in all the parking areas under study.

**TABLE I :Parking Duration**

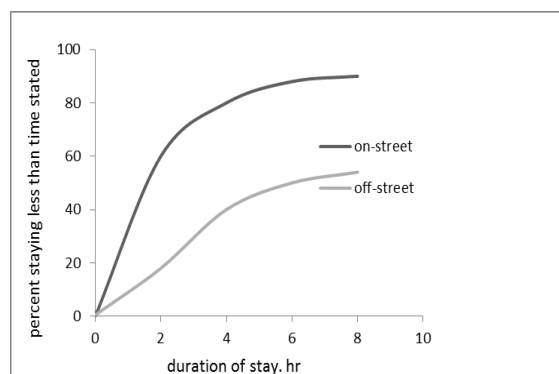
Population ground	Parking Duration (in hr.)			
	Shopping & Business	Work	Other	All purpose
50,000	0.6	3.3	0.9	1.2
50,000-250,000	0.9	3.8	1.1	1.5
250,000-600,000	1.2	4.8	1.4	1.9
5,00,000	1.5	5.2	1.6	2.6

**Fig 1.Cumulative Frequency Curve of (a) On-street and (b) Off-street Parking Durations**

(a)



(b)



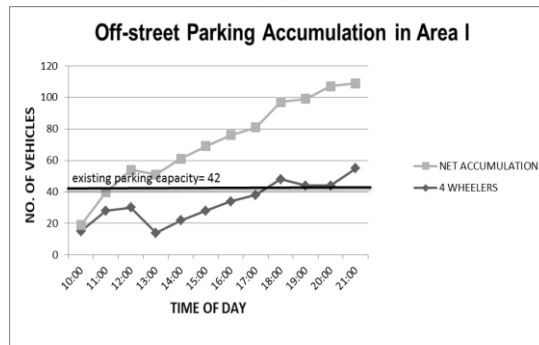
Since there is no planned parking space available within these cities, currently the city traffic police allow parking of passenger vehicles on the side of the road thereby eating away a sizeable portion of motor able road.

The vehicular traffic was divided into various categories so as to have some idea about the characteristics of the split traffic. The categories were as Two-Wheelers (scooters, motorcycles, mopeds) and Four-Wheelers (cars, vans, jeeps). The accumulation data was recorded for each category on the form and respective graphs were provided.

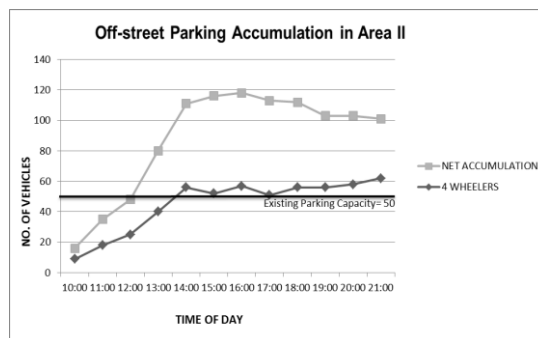
**OBSERVATIONS& DISCUSSION**

As per the analysis shown for future estimation and projection of parking demand at the site, it is observed that the yield at site is about 1.26 per ECS. Vehicle growth rate of 8.6% of past 10 years is considered and the forecasted parking demand for the year 2020at the site comes to about a growth of 1482 vehicles per year with the calculated percentage of 2.88% increase every year for the future 5 years.

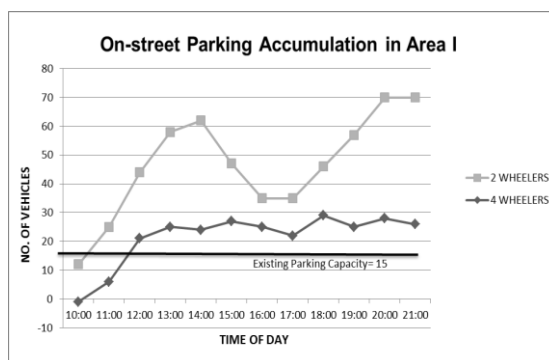
**Fig 2. Off-street Parking Accumulation Graphs**  
(a)



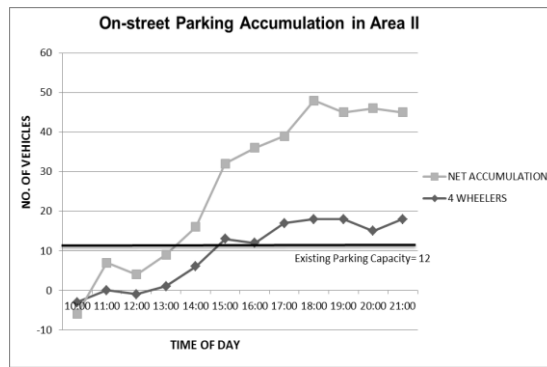
(b)



**Fig 3. On-street Parking Accumulation Graphs**  
(a)



(b)



Considering the current peak parking demand at the site with 490 PCU and the supply of 398 PCU on a particular weekday of sector-15, the availability of parking space is about -23% (i.e.-92 ECS) and the forecasted space availability in the year 2020 and 2025 at the site will be -14% ( i.e. - 105ECS) and -28% ( i.e. -118 ECS) respectively. Thus it clearly shows that there is saturated space at the MLCP in the coming years. The accumulation study already shows congestion in the sub areas of sector 15 and with this rise in the number of vehicles it becomes necessary to provide a direct solution to tackle this problem.

**DATA ANALYSIS & RESULTS**

The existing pattern of parking is at both 90° and 60° angle. Within the area of study i.e. the main market area of sector-15, there are a total of 217 car spaces available. Of these 42 are available in the off-street parking area of area I and 15 in the on-street area; 35 are available in the off-street parking area of area II and 12 in the on-street area; 50 are available in the off-street parking area of area III and 15 in the on-street area and 48 are available in the off-street parking area of area IV. The drawings of all the parking sub areas show clearly the parking capabilities and various potential parking spaces available in sector-15.

**TABLE II :Parking Demand vs. Ultimate Planned Parking Supply**

S.NO.	SUB-AREAS	MAXIMUM DEMAND (PCU)	ULTIMATE PARKING SUPPLY(PCU)	RATIO
1.	Area I	95	82	0.86
2.	Area II	149.5	122.2	0.82
3.	Area III	88.5	63.5	0.72
4.	Area IV	157	130	0.83

It is clear from the above table that the demand is more than the supply in all the four parking sub-areas as the value of ratio is less than one (<1). It can also be inferred that PCU is just going to only increase in further years, hence additional space for accommodating this shortfall should be the

timely concern for traffic engineers and the town planners and having a multi-level car park is one such initiative.

For Area I, the corresponding curves of the accumulation sheet have been provided which clearly gives us the idea of the existing parking spaces and the net accumulation of the vehicles at all the days of a week. It is seen that on Saturday the net accumulation of the off-street parking is maximum as compared to the other days with 109 vehicles. Out of which 55 are four wheelers with existing capacity of only 42. In case of the on-street parking the maximum net accumulation occurs on Monday, and the value is 84 vehicles with 30 four wheelers for the existing capacity of only 15 vehicles.

The peak parking demand of vehicles is 95 PCU, which is 16 percent higher than the theoretical capacity (82 PCU) of parking sub-area. The parking of heavy vehicles in this area is also there and the parking is overloaded in the time period of peak hours. The ratio of ultimate planned parking to peak parking demand is 0.86. The net accumulation at the Off-street parking is 135, with cumulative arrival of 581 vehicles and cumulative departure of 446. The net accumulation at the On-street parking is 84, with cumulative arrival of 945 vehicles and cumulative departure of 861. The arrival of vehicles is more than the departure which clearly shows that congestion has already been built up in this area. The parking accumulation counts to 229 vehicles.

## CONCLUSION

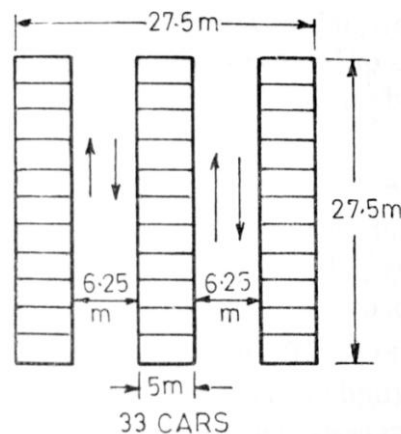
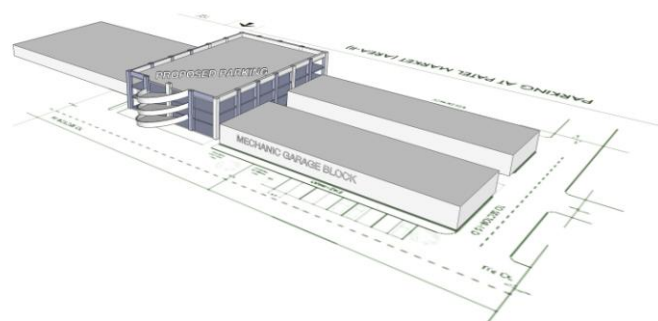
Demand studies suggest that all the parking areas i.e. Area I, II, III and IV of sector 15 are fully packed to their capacities and are in-fact over loaded. At present the supply is in surplus by 142 car spaces. In all the total bays provided are 217 for 1057 vehicles, of which 359 are four wheelers and 688 are two wheelers. As there is no special parking for two wheelers in sector 15, they tend to park in the areas provided for the cars. Hence, the vehicles are more likely to get crowded in every area and leading to congestion.

Accumulation study suggests that there are two peaks. The higher peak attains a value in the evening session (occurring between 5:00pm to 9pm). The lower peak occurs in the lunch session (occurring between 12pm to 2pm). General parking composition states 65 percent two wheelers and 35 percent four wheelers of all the vehicles in sector 15. The parking index is 166.5 for ultimate angle parking. The parking time limits may also be kept to 2 hours duration or even less, as the requirements may be. The installation of parking metres will become essential and will be the main feature.

The parking inventory clearly shows that out of all the four sub-areas, the off street parking area of Area II (Patel Market) and Area III (Opp. Dominos) are the appropriate areas to have a multi-level parking facility as they have the larger area than the others (Area I= 896m<sup>2</sup>; Area II= 1280m<sup>2</sup>; Area III= 1040m<sup>2</sup>; Area IV= 931m<sup>2</sup>)

**Other specifications are as follows:**

A multi-level car parking facility of a capacity of over 200-220 cars can be provided at Area III i.e. the Patel Market, reducing the congestion that takes place at the peak hours. Hence it keeps a smooth flow of the traffic. The gradient of the ramp should be 1:8. The clear height between the floors should be around 2.1m. The no. of floors (including ground floor) are 4. The parking stall dimensions are 2.5m x 5.0m. The width of traffic lane on the ramps and entrances should be of 3.75m with loading standards of 400kg/m<sup>2</sup>. The no. of bays on each floor counts to 55, and 220 in total.

**Fig 4. Parking Layout of the Proposed Parking-lot****Fig 5. The proposed layout****REFERENCES**

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