

Parking Facility Design for Major Corridor of Urban Area: A Case Study of Ahmedabad City

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Abstract- Rapid Growth in vehicles population has enormous strain in all million plus cities. Due to high vehicles ownership and poor transport facilities specially in the cities where the population between 1 to 2 million. The demand for parking has increase in alarming proportion in Central Business District (CBD) areas and other work or activity centers of the cities. This study focused on parking demand by collection of parking data, such as parking demand, parking accumulation, rate of turnover, to check the feasibility of paid parking service as well as its response on the mode shift of the two wheeler parkers. Feasibility of pay and park facility on busy street “Maninagar”, have been studied in this research work. The detail license plate surveying method and fixed period sampling method are used for analysis of survey data. This study also includes the In-Out survey or personal interview of people using the on-street parking at these two busy streets. In the study, On-street parking demand is very high in the study area on Maninagar for most part of day, but turnover is very poor, which reflects over occupancy of prime urban space for longer duration. All two streets having high commercial potential and high traffic flow.

Keywords- Parking accumulation, Parking demand, Off street parking

I. INTRODUCTION

In simple language parking is a particular space consume by the vehicle at the time of when vehicles are in not action. Parking is the act of stopping and disengaging a vehicle and leaving it unoccupied. it include indoor and outdoor private property belonging to a house, the side of the road. Parking is the space at which a vehicle can stop and park at the time when vehicles are non functional.

Parking is the most essential part of the transportation engineering. Transportation without parking is just like Humans without oxygen. Parking areas are an important component of many transportation facilities such as safety rest areas, park and ride lots, and viewpoints. The parking area is often the first thing users see upon entering the facility, creating an important first impression. The optimum design for a parking area is not necessary one that provides the maximum number of parking spaces. It is the one that

provides safe pedestrian and vehicular circulation, with ample stall and aisle widths, adequate turning radii, reasonable gradients, a pleasing appearance, visual access for law enforcement surveillance, provision for handling and treating storm water runoff, fits the site, is easy to maintain, and is in close proximity to the facility it serve. Parking is not only space of vehicles but the parking is safe, secured and convenient space for vehicles. Parking lots can be seen almost everywhere, from shopping centers to offices buildings to schools/collages to government and commercial buildings. Parking makes any particular building or any space function able because without parking facility, not single building or spaces fulfill its function.

According to data from Ahmadabad RTO average increase in automobile (2w and 4w) in particular year is near to 4.5 to 6%. Total population of Ahmadabad according to last censuses is near to 62 lac +, so near to 25000 + vehicle avg. increases every year. So basically increase in population will directly affect the number of vehicles. So we have to adjust for park this extra number of vehicles in same land.

Aim of the study:

The main aim of this study is to provide a Community Parking for two wheelers and cars and utilise that space to park maximum number of vehicle with safety, easiness and comfort and solve the problem of road side parking at study area.

Objective of the study:

The objectives of the study are as below:-

1. To assess the parking characteristics including parking duration and accumulation.
2. To assess the willingness of the commuters to pay for the off-street parking fee based on willingness to pay survey.
3. Improvement in parking condition for community.

Need of the study:

One of the needs of community parking is our population which is rapidly increasing day by day and with that vehicles per houses or vehicles per families are also increases day by day that additional amount of vehicles directly increase road side parking there by traffic problem will be become more crucial. As FSI is increase day by day it's also demands for more parking spaces. We have to utilise maximum at available land for parking, so road side parking is not practicable option for parking at now and in future. That's why need of Community Parking generates. These road side parked vehicles not only consume the valuable road width but it also results into feeling unsafe and inconvenient to drivers and pedestrian also feel unsafe while crossing the road or walking at road side.

II. LITERATURE REVIEW

- Off-street Parking Management Plan for Dharwad City, Karnataka Mrs Priyanka Kolhar et.al. (June 2012) studied to problems with current parking practices with the parking accumulation and supply survey in Dharwad. The demand for parking has increased in alarming proportion in Central Business District (CBD) areas and other work/activity centers of the cities. The Specific parking management strategies such as short term, medium term and long term. The study of parking duration analysis suggests that short duration parking is high. Hence, parking turn-over is high causing congestion on the streets. To reduce this, heavy parking fee is to be levied on the short duration parking vehicles. To solve the parking problems immediately short-term solution can be adopted with congestion pricing as, operation and maintenance cost is very much less for on-street parking management rather than off-street and even IRR is high in on-street parking. But, based on the future parking demand in the study areas long term management plan is preferred.
- Study on Parking Needs at Intersections – Case of surat T.P.Scheme Bhasker V. Bhatt (July 2014) studied Parking needs at intersections of developed T. P. Schemes of Surat under the Gujarat Town Planning and Urban Development Act, 1976. Land use and width of road along with existing parking facilities have an impact where the act has no specific provisions. In general, road space consumed by parked vehicles varies from 0.1% to 2.46% in surveyed intersections having different land use of T. P. Schemes of Surat. However, for land use having 30%-40% commercial and residential each, the observed parking on road space was 2.46% and 2.60% respectively. Standing and parked vehicles obstruct the flow of traffic consuming valuable road space. Present practice of designing of intersections using Indian Road Congress as well as The Gujarat Town Planning and Urban Development Act, 1976 provide no guideline for parking land allocation at such locations.
- Parking Management Blueprints For Rajkot-Solution To Urban Transport Problems Meet k Hingrajia and Pratik D Vagadia (sept 2015) studied the most vehicles are parked for very short durations during the peak hours because of trading areas. The area is also linked different important destinations of trading and commercial centers so traffic flow is obstructed because of existing on street parking facilities. Results in delay and waste of time occur for long trips. To prevent these delays and to best utilize space available in the area multistory parking or Roof parking are the solutions.
- Examination Of On-Street Parking & Traffic Congestion Problems In Lokoja Olowosegun Adebola and Koffi Ayadu Edwin (2014) studied that Parking and traffic congestion is synonymous to each other because failure to meet parking demand of people in a city lead to on-street parking that results to traffic congestion. Traffic congestion is a condition on road networks that occurs as use increases, and is characterized by slower speeds, longer trip times, and increased vehicular queuing. Norman and Wesley (2008) identified a number of ways by which on-street parking could be of importance. These are
 - 1) Higher efficiency: Users of the downtowns consistently select on-street parking spaces over off-street surface lots and garage parking. The on-street spaces experience the most use and the highest turnover.
 - 2) Better land use: Using the curbside for parking saves considerable amounts of land from life as an off-street surface parking lot. Medium-sized town centers can save an average of more than two acres of land by providing street parking. This efficiency can allow for much higher-density commercial development than the center to rely solely on off-street surface lots.

III. STUDY AREA DETAILS

This is the Ahmedabad Municipal Corporation open plot at Uttamnagar, Maninagar.

Geographical Location of Parking Area
AMC plot, Beside Mihir tower,

Near Anant Society and Uttamnagar garden,
Ahmadabad -380008

Co-ordinates of AMC plot are:-
 22° 59' 29.97" N and 72° 36' 13.37" E



Figure 1: Image Of Amc Open Plot



Figure 2: Google Earth Image Of Open Amc Plot

Total periphery of plot is 210 mt. and total area of plot according to the AMC plan data sheet is 2329.875 sq. mt. and total area of plot according to Google Earth is 2330 sq. mt.

This area facing very high parking problem due to which the very high amount of vehicles were parked on road which directly increase traffic problem at this area. Due to parking pattern drivers feel congested while the driving their vehicles and pedestrian while crossing the road. This type of parking patterns results into delaying traveling time. Due to this rough parking pattern it's directly increase the accident rate.

Some of the flats and apartment surround study area even does not have enough parking spaces to park vehicles of their residents so no question for visitor parking generates. These road side parked vehicles not only consume the valuable road width but it also results into feeling unsafe and inconvenient to drivers and pedestrian also feel unsafe while crossing the road or walking at road side.

Parking problems in study area:-



Figure 3: Most Crucial Traffic Problem At Rambaug, Ahmedabad



Figure 4: On Street Parking At Uttamnagar, Ahmedabad

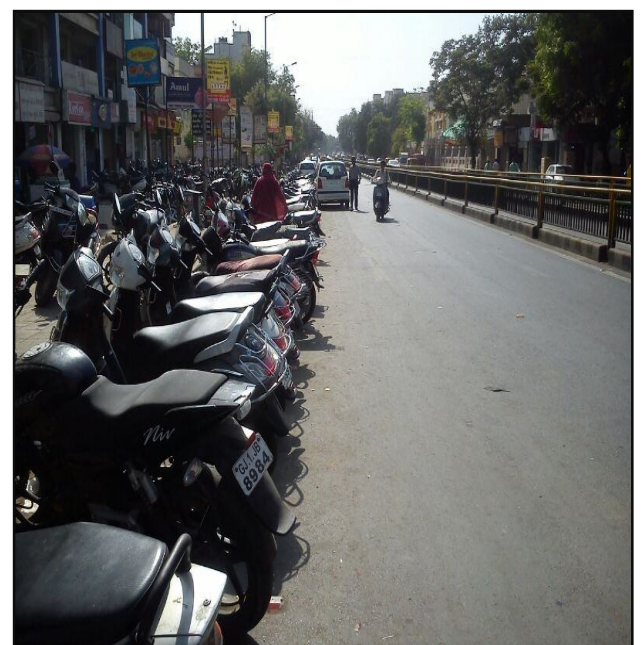


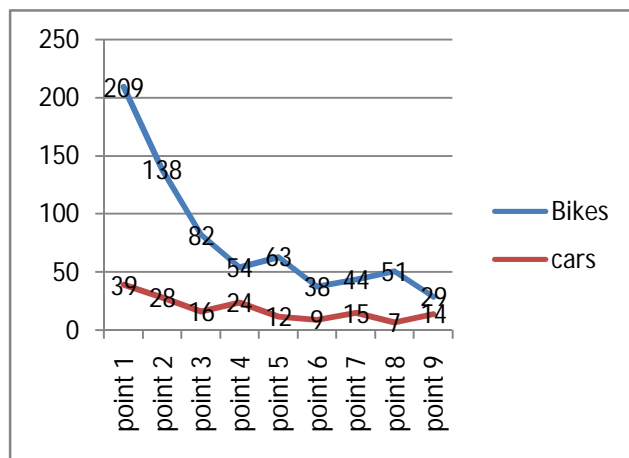
Figure 5: On Street Parking At Jawahar Chowk, Ahmedabad

IV. DATA COLLECTION

The data collected of total number of vehicles parked during peak hours is tabulated as below:

Table 1: Vehicles Parked At Different Points Respected To Their Peak Hour

Location Number	Two Wheelers	Four Wheelers	% Two Wheelers	% Four Wheelers
1	209	39	84.27	15.73
2	138	28	83.13	16.87
3	82	16	83.67	16.33
4	54	24	69.23	30.76
5	63	12	84.0	16.0
6	38	9	81.25	18.75
7	44	15	74.57	25.42
8	51	7	87.93	12.07
9	29	14	67.44	32.56
Total	708	164	81.12	18.88



GRAPH 1: Showing Total Peak Vehicles To Points

Delay time survey:-

In this survey delayed time due to the road side parked vehicles were find out for different routes.

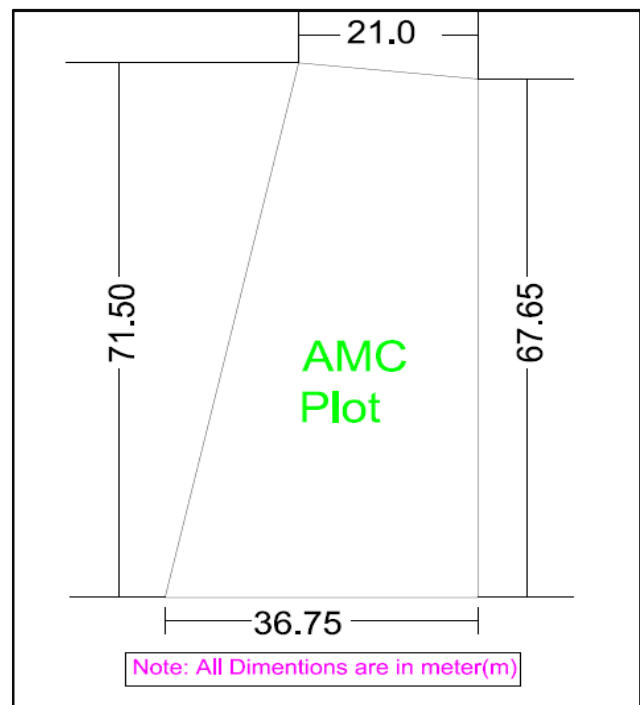
Route	Time (No Traffic)	Time (Normal Traffic)	Time (High Traffic)	Delay In Minutes
Maninagar-Bheravnath	3 min 54 sec	5 min 29 sec	9 min 53 sec	4 min 24 sec
Maninagar-Kankariya	6 min 18 sec	9 min 27 sec	15 min 15 sec	5 min 48 sec
Maninagar-S.P.School	5 min 33 sec	7 min 49 sec	12 min 44 sec	4 min 55 sec
Maninagar-Rambaug	4 min 14 sec	7 min 29 sec	11 min 51 sec	4 min 22 sec
L.G.Hospital-	6 min	9 min	17 min	7 min

Uttamnagar	07 sec	58 sec	18 sec	20 sec
Uttamnagar-Bheravnath	5 min 16 sec	8 min 11 sec	14 min 54 sec	6 min 43 sec

V. DESIGN OF PARKING PLOT

Design Points

- Community parking zone which we design is capable of parking of 370 bikes and 34 cars.
- Total area for parking which available is 2329.875 sq.mt.
- This community parking has one entry and one exit.
- Angle of parking is 77°
- Dimension of stall size of bikes = 2.1 mt. * 1.2 mt.
- Dimension of cars = 3.75mt. * 1.7 mt.
- Width of main road = 4.0mt.
- Width of internal road = 1.8mt.
- Rate per hour per bike is 3 rs.
- Rate per hour per car is 8 rs.



Drawing 1: (CADD DRAWING OF AMC PLOT)

Now, let us design parking plot for 80% for Bikes and 20% for Cars

Total number of Bikes = (708 * 0.80) = **567 Bikes**

Total number of cars = (164 * 0.20) = **33 cars**

Total area required for bikes = 567 * (2.1 * 1.2) = 1429 sq.mt.

Total area required for cars = 33 * (3.75 * 1.7) = 210 sq.mt.

Total area of CPZ for parking only = 1429 + 210 = **1639 sq.mt.**

Total area for driveway = 630 sq.mt. (Maximum)

Total area for whole CPZ = $1639 + 630 = 2269$ sq.mt.
2269 sq.mt is less than the available area (2330 sq.mt)

Revenue Calculation

Now here Community Parking Zone has capacity of **567 Bikes** and **33 Cars** according to case: 1 so charge taken from Bike per hour is 3 RS and from Car is 8 RS.

Total revenue collected from Bikes per hour assuming full capacity

$$= 567 * 3 \text{ RS} = 1701 \text{ RS}$$

Total revenue collected from Cars per hour assuming full capacity

$$= 33 * 8 \text{ RS} = 264 \text{ RS}$$

Total Revenue = $1701 + 264 = 1965$ RS/hour

Total Revenue collected per day = $1965 \text{ RS} * 12 = 23580$

RS/day

Taking 65% full condition of CPZ so,

Total Revenue collected per day = $0.65 * 23580 = 15327$

RS/day

Total Revenue collected per month = $21660 * 30 = 459810$

RS/month

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VI. CONCLUSION

With the phenomenal increase in personalized motor vehicles, one of the major problems confronted by the motorists is the acute shortage of parking space. The demand for parking has increased in alarming proportion in Central Business District (CBD) areas and other work/activity centers of the cities. The provision of off-street parking and their effective use emerges as the most viable initiative in the cities. On the basis of the present study conducted in Maninagar the following conclusions have been drawn:

1. Based on the analysis of the accumulation pattern it was found that the maximum accumulation in the morning occurs between 12 noon to 2 PM and between 5 PM to 8 PM in the evening.
2. The study of parking duration analysis suggests that short duration parking is high. Hence, parking turn-over is high causing congestion on the streets. To reduce this, heavy parking fee is to be levied on the short duration parking vehicles.
3. Parking adequacy analysis suggests that majority of parking lots has already crossed their capacity and some are about to cross the capacity.
4. Newly designed off street parking plot will help in reducing the load of vehicles parked on streets and also earns revenue to municipality.

REFERENCES