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Feasibility study of on-street parking for suitable solution on existing parking issues

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ABSTRACT

The current study is a field work which involves parking study along with parking characteristics for better efficiency of road traffic. For the purpose of the survey, methodology was developed, which in short terms, is as follows: for each parking place by pre-defined parking area can be determined the nature, frequency, and duration of use. During the survey, one or more counters for several times, consistent and walk a predetermined route on foot. Pimpri Chinchwad is developing municipal-corporation. For the purpose of future expansion of the city and betterment of the township the counter recognize site of a parking place on a map and record the vehicular count over the period of the time. If necessary, you can distinguish the category of vehicle parking (free, paid per hour, service subscription). The methodology is appropriate to collect the category of use of the parking place, use of parking spaces on the street, residence time, total number of vehicles in one area during the measurement, localization of parking capacity and relevance of the parking category. The parking provided to the roads in Pimpri Chinchwad area determined whether it is Parallel, Perpendicular, or angle parking (i.e. 30°, 45°, 60°). The cost analysis for the area which is available for the parking is determined and accordingly, the cost is determined for Two Wheeler, Car, Auto, Truck, NMV, etc.

Keywords: PCMC, Parking, Survey, Vehicle.

1. INTRODUCTION

A 'smart city' is an urban region that is highly advanced in terms of overall infrastructure, sustainable real estate, communications and market viability. It is a city where information technology is the principal infrastructure and the basis for providing essential services to residents. Pune is also marching towards a smart city. Pimpri Chinchwad is a relatively newly developed urban area of Pune city. Forty roads were selected among all of the roads of PCMC area on the basis of the high density of parking. Shortage of on-street parking space in the urban central business district (CBD) is the common problem in Indian metropolitan cities. Hence this project promotes a systematic study of parking characteristics, parking demand & controlling measures enabling us to be a better traffic engineer & a town planner. Industrialization in Pimpri area commenced with the establishment of Hindustan Antibiotics Limited in 1956. The establishment of the Maharashtra Industrial Development Corporation (MIDC) in 1961 considerably facilitated the industrial development in the area. The Municipal Council established in 1970, incorporating four village-panchayats in the area. In 1982 the civic body was upgraded to its present status as "Municipal Corporation". Its population has increased from 85,000 in 1971 to 1,730,000 as on today. The city of Pimpri-Chinchwad is predominantly an industrial area, which has developed largely during the last four decades. There are about 4000 industries under the corporation area.

Objectives of the Study

- I. To identify road stretches for survey purpose by reconnaissance
- II. To determine the parking anatomy & pen down existing problems

III. To conduct parking survey which will include parameters such as vehicular count, area utilization, type of vehicle for specific time duration

IV. To suggest suitable solution on existing parking system.

2. CHARACTERISTICS OF SURVEY

2.1 Reconnaissance Survey:

2.1.1 Observation of road stretches

Reconnaissance survey generates the basic but very efficient details about the survey field. The ideal method of this type of survey is Patrol survey. In which overall information about the area is to be covered.

2.1.2 Knowing public problems by discussion

Genuine problems for parking were discussed with the public. The suggestions over problems by their point of view were noted down.

2.1.3 Road selection:

The road selection process distributed among each of group member and overall saturated roads were selected with high vehicular count.

2.2 Parking Survey:

2.2.1 Preparation of survey sheet:

A survey sheet is prepared on the basis of research papers for the tabular and compacted form of the survey data. A questionnaire is also prepared for the detailed information of the road stretches.

2.2.2 Field Survey:

Field survey is the further procedure and the core of the project. The actual work is implemented in this stage of survey. The vehicular count is taken and the total number counted is taken into consideration for the cost and revenue analysis.

2.3. Demand and Supply graph:

Demand of parking space of selected area is calculated on the basis of surrounding population. Supply of the area is calculated after survey is done. A graph is plotted comparing Demand V/s Supply in accordance.

2.3.1 Suitable solutions over existing problems:

A feasible solution is generated in accordance to areas problem. The solutions will be conveyed to PCMC via draft format for reviewing and essential help.

3. CHARACTERISTICS OF PARKING

3.1 Introduction to parking characteristics

There are two types of parking systems: On-street parking method and off-street parking method. On-street parking method is explained.

3.1.1 On-street 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 5m x 2.5 m and that for a truck is 3.75m x 7m.



Figure 1 On-street parking in PCMC

3.2 Types of On-Street Parking

There are three types of parking which are as follows:

- i. Right angle
- ii. Angle parking
- iii. Parallel parking

3.2.1 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.



Figure 2 Right Angle Parking

3.2.2 Angle parking

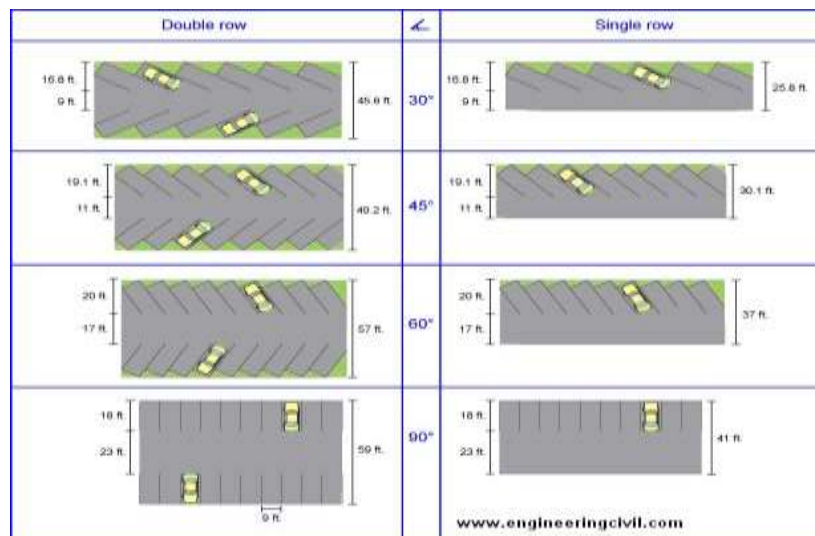


Figure 3 Angle Parking (30° , 45° , 90°)

Angle parking contains 30° , 45° , 60° etc. angles which are explained as below:

- i) 30 degree 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 min in this type of parking.
- ii) 45 degree 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.
- iii) 60 degree parking: The vehicles are parked at 60° to the direction of road. More number of vehicles can be accommodated in this parking type.

3.2.3 Parallel parking

The vehicles are parked along the length of the road. Here there is no backward movement involved while parking or un parking the vehicle. Hence, it is the 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 ongoing track on the road since least road width is used.



Figure 4 Parallel Parking

4. METHODOLOGY

In the present study various surveys and analysis based on the survey is carried out using the parameters given below.

4.1 Reconnaissance Survey

Reconnaissance Survey was conducted in the initial stage of the project. It has three phases as described below.

4.1.1 Observation of Road Stretches:

The road stretches were observed by patrol survey and observations were noted down.

4.1.2 Knowing Public Problems by Discussion:

The problems of the local people in the area of the particular road were discussed and noted down.

4.1.3 Road Selection:

Actual roads were selected and according to length benchmarks were set for that selected road.

4.2 Parking Survey and Tabulation of data

4.2.1 Preparation of Survey Sheet:

A survey sheet was prepared to record the observations observed during the survey. Along with that, it included Location, Date, Day, Benchmark and table for the survey. The table which was used for the purpose of making a record of vehicular count also contained Time period from 7.30 A.M. to 8.30 P.M.

4.2.2 Field Survey:

Actual field survey is done along with the help of Second Year students of Civil Department PCCOE.

4.3 Analysis of the Data

4.3.1 Maximum count of the vehicles:

For a particular road stretch maximum count of vehicles from each category (Two Wheeler, Car, Auto, NMV, Truck etc.)

4.3.2 Suggestion for Type of Parking:

Type of parking recommended according to results and it is categorized into Parallel Parking, Perpendicular Parking, Angle parking (30°, 45°, 60° etc.)

4.4 Equations and Formulae used for Result

The maximum value of Vehicle:

The maximum value is obtained from the values which were filled into survey sheet by using the function MAX in Microsoft Excel.

The function used for Maximum Value is [=MAX (Number of rows)]

Standard Vehicular Area:

Standard Vehicular Area (SVA) is obtained by the multiplication of standard width and length of the vehicle along with the offset. The value of SVA for each category of vehicle is obtained from IS Special Publication 12.

$SVA = \text{Standard Width of Vehicle} \times \text{Standard Length of Vehicle} + \text{Offset}$

Total Area:

Total Area is obtained by summation of multiplication of a Maximum number of Vehicle and SVA.

$\text{Total Area} = [\text{SUM} (\text{Max No} \times \text{SVA})]$

Deductions:

We have observed 40 roads. According to offset and spacing area for each road, we take a standard deduction equation from average offset area or spacing.

$\text{Deduction} = 7/100 \times \text{Length of the road}$

Corrected Length:

Corrected Length is obtained by subtraction of Deductions from the Total length of the road.

$\text{Corrected Length} = \text{Length of road} - \text{Deduction}$

Length reserved:

$\text{Length reserved} = \text{Corrected Length} / \text{percentage of road}$

Where the percentage of the road is taken by $\text{Area of Vehicle} / \text{Total area of the road stretch} \times 100$

Vehicular Capacity

$\text{Vehicular capacity} = \text{Length Reserved} / (\text{Standard width} / \text{Length of Vehicle})$

5. RESULT AND DISCUSSION

Forty roads were selected among all of the roads of PCMC area on the basis of the high density of parking. Data sheets were filled by students and coordinators. On the basis of this data formula which were mentioned above are used. Using above formulae, values for Maximum Value of Vehicle to Vehicular capacity are obtained. Average of all the values are taken into consideration and criteria for angle parking is decided. The results are arranged into the tabular formats. The suggestions are described below in detail. Results are obtained from the data are described above in the methodology. Equations and Formulae used for calculation of results are also mentioned.

5.1 Sample Graphical Presentation

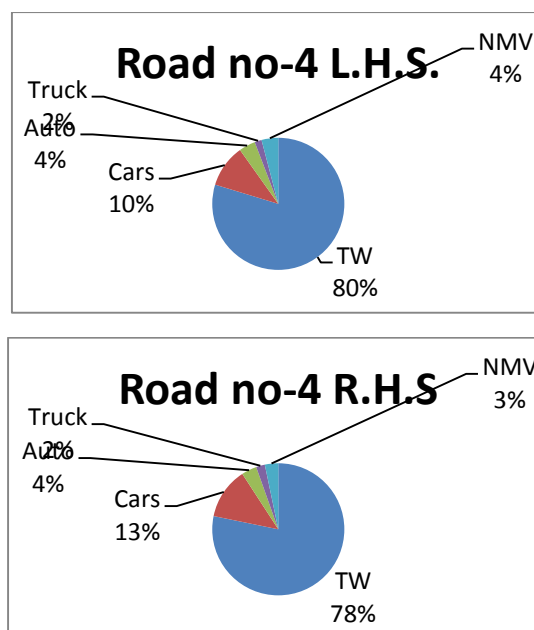


Figure No. 5 Sample graph of Distribution of Vehicles

5.2 Results from the calculations

Type of Parking provide for roads is generally perpendicular for Two Wheelers and parallel for other categories of vehicles. According to Maximum Value of vehicles exceeding the Vehicular Capacity of the road, the angle of parking is determined. Maximum congestions are due to Two Wheelers. Hence the following arrangement is done from the results.

a) 30° Parking:

30° parking is provided in following cases.

The maximum value of Two-wheelers exceeds in the range 1 to 100 than Vehicular capacity.

The maximum value of Cars exceeds in the range 1 to 20 than Vehicular capacity.

The maximum value of Auto exceeds in the range 1 to 25 than Vehicular capacity.

The maximum value of Trucks exceeds in the range 1 to 2 than Vehicular capacity.

The maximum value of NMV exceeds in the range 1 to 5 than Vehicular capacity.

b) 60° Parking:

60° parking is provided in following cases.

The maximum value of Two-wheelers exceeds in the range 100 to 250 than Vehicular capacity.

The maximum value of Cars exceeds in the range 1 to 30 than Vehicular capacity.

The maximum value of Auto exceeds in the range 1 to 30 than Vehicular capacity.

The maximum value of Trucks exceeds in the range 1 to 3 than Vehicular capacity.

The maximum value of NMV exceeds in the range 1 to 8 than Vehicular capacity.

c) 45° Parking:

45° parking is provided in following cases.

The maximum value of Two-wheelers exceeds in the range 250 to 500 than Vehicular capacity.

The maximum value of Cars exceeds in the range 1 to 25 than Vehicular capacity.

The maximum value of Auto exceeds in the range 1 to 35 than Vehicular capacity.

The maximum value of Trucks exceeds in the range 1 to 5 than Vehicular capacity.

The maximum value of NMV exceeds in the range 1 to 10 than Vehicular capacity.

d) Mechanical or Off-street Parking:

Mechanical or Off-street Parking is provided in following cases.

The maximum value of Two wheelers exceeds more than 50.

The maximum value of Cars exceeds more than 25.

The maximum value of Auto exceeds more than 35.

The maximum value of Trucks exceeds more than 5.

The maximum value of NMV exceeds more than 10.

5.3 Roads which are suggested for 30° parking are as follows:

Sr.No.	Road	Road No.
1	Akurdi Chowk to Jai Ganesh Fame	2
2	Akurdi Chowk to Hanuman Statue	3
3	Chapekar Chowk to Lokmanya Hospital	6
4	Chapekar statue to Vitthal rukmini mandir	8
5	Chinchwad Station to Mehta hospital	9
6	Ghadage Baba Chowk to Mahadev Temple	13
7	Jai Hind College to Ramabai Chowk	15
8	Koteswar petrol pump to Pawana bridge	17
9	Morya bakery to Elpro Chowk	20
10	Pawana bridge to Shagun chowk	23
11	Dharmaraj Chowk to Friends Corner	30

5.4 Roads which are suggested for 60° parking are as follows:

Sr.No.	Road	Road No.
1	Alandi Chowk To Gavhane Petrol Pump	4
2	Athvan Chowk to the Postal colony	5
3	Chapekar statue to K Shine Auto Polish	7
4	K P prince to Jai Hind college	18
5	Shivaji Chowk to A1 VadaPav Center	28

5.5 Roads which are suggested for 45° parking are as follows:

Sr.No.	Road	Road No.
1	Chinchwad Station to Ranka Jewellers	10
2	Sai Chowk to PCMC garden	24
3	Shivaji Chowk to Ganga Auto garage	27
4	Saijyoti hospital to Dange Chowk	33

5.6 Roads which are suggested Mechanical or Off-street Parking:

Sr.No.	Road	Road No.
1	Akurdi Railway station to Akurdi Police Chowki	1
2	Dharmaraj Chowk to Gurudwara Chowk	12
3	Kalewadi Chowk to MM Polytech College	16
4	Ambedkar Chowk to Bhondwe circle	31

5.7 Roads which prefers General Parking system:

Perpendicular parking for Two-Wheelers and Parallel parking is provided for vehicles in other categories.

Sr.No.	Road	Road No.
1	Dange Chowk to Bhumkar Chowk	11
2	Jai Hind College to Pavana Bridge	14
3	McDonald's to Kalewadi Chowk	19
4	Nanal hospital to Pimpri Chowk	21
5	Nigdi flyover to Yamunanagar corner	22
6	Gadge maharaj chowk to Arya samaj chowk	25
7	Shivaji Chowk to D-Mart	26
8	Thermax Chowk to Durga Chowk	29
9	Raje Shivchatrapati chowk to MIDC road	34
10	Raje Shivchatrapati chowk to Jijamata flyover	35
11	Orritel hotel to Nisarga Plaza	36
12	Jayashree talkies to Hanuman statue	37
13	Golden care hospital to Bhumkar chowk	38
14	Durga Chowk to Spine road	39
15	Bhakti Shakti to Nigdi Flyover	40

6. CONCLUSION

In the present study based on various surveys and analysis carried out for each road stretch, suitable parking system which can be adopted for these roads is verified. In this work, the vehicular count is taken into consideration along with time, area required for parking and cost revenue for that particular road. The present study highlights a methodology to estimate mode-wise parking demand in a typical commercial area in Indian cities. Various Methods to estimate the demand disaggregated by user groups, their trip purposes, and socio-economic characteristics are also discussed. The Business as Usual versus a sustainable transport scenario has been presented and the pricing strategy that will lead to achieving this strategy is derived. Parking pricing as a key counter-measure towards reducing private vehicle usage and increasing public transport usage has been established. Parking pattern is arranged in a way that each and every vehicle should have its own parking space which is sufficient and convenient.

Fifteen roads need not give any special suggestion for parking system.

Eleven roads are suggested to give 30° parking system.

Five roads are suggested to give 60° parking system.

Four roads are suggested to give 45° parking system.

Four roads are suggested to give mechanical or off-street parking system.

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