

PARKING DESIGN FOR A HOSPITAL

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ABSTRACT

Parking is the major problem which impact on the Transportation development by increasing the road traffic in urban areas like Malls, shops, Central Business areas which shows the great Economical Impact on Traffic. To gather the parking information on parking supply and it's use the parking inventories have been initiated and intended which includes in observation of the number of Parking spaces available and the time spent for the vehicles and the type of parking facility. Parking is an important consideration for all cities. Adequate parking supply is needed incites to encourage retail and commercial activities and to satisfy residential and visitor demands. Well designed and balanced parking controls can maximize the efficiency of road space, allowing clients to visit business, customers to visit retail establishments and residents to improve their mobility while undertaking economic and social activities. The main objective of this study is to evaluate the existing parking facilities in the study area and suggest the appropriate measures required. Registration plate method is used to measure the on-street parking characteristics which is known as License Plate Method and parker's interview survey is used to determine the trip purpose, duration of stay and for Off Street, Condition of facility and Waiting time in queue are noted. IRC-SP: 12 guidelines are followed to calculate off street Parking. The study area is evaluated and recommendation are made to reduce the impact of parking either by improving the off-street facilities or diverting the on-street parking on major to nearby local streets. The goal in designing off-street parking facilities is to maximize the number of spaces provided, while allowing vehicles to park with only one distinct makeover Parking surveys are intended to supply all kind of survey data information to determine the Parking load, Efficiency.

Keywords:*License Plate Method, Mobility, Parking Inventories, Registration Plate Method, Street Parking*

I INTRODUCTION

As per IRC the standard dimensions of a car are taken as 5.0×2.5 meters and that for a two-wheeler is 0.8×2.5 meters.

- Parking statistics: 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 this information. Since the duration of parking varies with different vehicles, several statistics are used to access the parking need. The following parking statistics are normally important.

- **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.
- **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. The actual volume of vehicles entered in the area is recorded.
- **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.
- **Average parking duration:** It is the ratio of total vehicle hours to the number of vehicles parked.

$$\text{Parking Duration} = \frac{\text{Parking Load}}{\text{Parking Volume}}$$

- **Parking turnover:** It is the ratio of number of vehicles parked in a duration to the Number of parking bays available. This can be expressed as number of vehicles per bay per time duration.

$$\text{Parking TurnOver} = \frac{\text{Parking Volume}}{\text{No. Of Bays Available}}$$

- **Parking Index:** Parking index is also called occupancy or efficiency. It is defined as the ratio of number of bays occupied in a 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.

$$\text{Parking Index} = \frac{\text{Parking Load}}{\text{Parking Capacity}} * 100$$

II DATA COLLECTION & ANALYSIS

Parking surveys are conducted to collect the above said parking statistics. The most common parking surveys conducted are in-out survey and license plate method of survey.

2.1 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 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. we won't get any data regarding the time duration for which a vehicle used that parking lot. Parking duration and turnover is not obtained. 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.

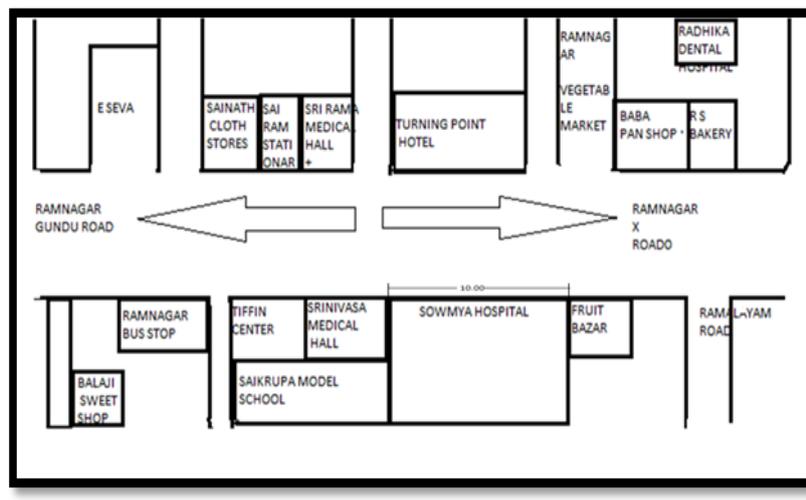


Fig 2.1: Parking Survey was conducted at Sowmya Hospital, Ramnagar, Hyderabad, Data was recorded and analysed with in-out survey and license plate method of survey

Table: The Parking Survey data collected from Sowmya Hospital, Ramnagar, Hyderabad for Three Hours duration

Sowmya Hospital, Ramnagar, Hyderabad					
S.No	Time	Two-Wheeler	Three-Wheeler	Four-Wheeler	Other (Cycle)
1	10:00 AM	8	0	0	0
2	10:00 - 10:15 AM	13	0	0	0
3	10:15 - 10:30 AM	14	1	0	0
4	10:30 - 10:45 AM	12	0	0	0
5	10:45 - 11:00 AM	11	0	0	0
6	11:00 - 11:15 AM	9	0	0	0
7	11:15 - 11:30 AM	10	0	0	0
8	11:30 - 11:45 AM	10	0	0	0
9	11:45 - 12:00 PM	11	0	0	0
10	12:00 - 12:15 PM	8	0	0	0
11	12:15 - 12:30 PM	7	0	0	0
12	12:30 - 12:45 PM	8	0	0	0
13	12:45 - 1:00 PM	9	0	0	0
	Total Number of Vehicles	122	1	0	0

From an In-Out Survey conducted for a parking area consisting of 12 bays, the initial count was found to be 8.

Table: The Number of Vehicles coming in and out of the parking lot for Time Interval of 15 Minutes is as shown in the below Table.

Sowmya Hospital, Ramnagar, Hyderabad			
S.No	Time (Minutes)	In	Out
1	15	5	3
2	30	4	7
3	45	5	6
4	60	5	3
5	75	1	2
6	90	3	1
7	105	1	2
8	120	3	5
9	135	2	4
10	150	3	0
11	165	1	3
12	180	4	4

Calculation:

- Accumulation can be found out as initial count plus number of vehicles that entered the parking lot till that time minus the number of vehicles that just exited for that time interval. For the first-time interval of 15 Minutes, accumulation can be found as

$$\text{Accumulation} = \text{Initial count} + (\text{In} - \text{Out})$$

$$\text{Accumulation} = 8 + (5-3) = 10$$

- Occupancy or Parking Index is given by equation for the first-time interval of five minutes,

$$\text{Occupancy or Parking Index} = \frac{\text{Accumulation}}{\text{No. Of Bays}} * 100$$

$$\text{Parking Index} = \frac{10}{12} * 100 = 83.3 \%$$

The Occupancy for the remaining time slot is similarity calculated and is tabulated. Average occupancy is the average of the occupancy values for each time interval. Thus, it is the average of all values and the value is 56.90%

- Parking Load is obtained by multiplying accumulation with the Time Interval. For the first-TimeInterval,

$$\text{Parking Load} = \text{Accumulation} * \text{time Interval}$$

$$\text{Parking Load} = 10 * 15 = 150 \text{ Vehicles minutes}$$

- Total Parking load is the summation of all values which is equal to 1200 vehicles minutes or 20 vehicles hours.

Table: overall calculation showing accumulation, occupancy, parking load

Sowmya Hospital, Ramnagar, Hyderabad							
S.No	Time (Minutes)	In	Out	Accumulation	Occupancy	Parking Load Per Minute	Parking Load Per Hour
1	15	5	3	10	83.3	150	2.5
2	30	4	7	7	58.3	105	1.75
3	45	5	6	6	50	90	1.5
4	60	5	3	8	66.6	120	2
5	75	1	2	7	58.3	105	1.75
6	90	3	1	8	75	135	2.25
7	105	1	2	8	66.6	120	2
8	120	3	5	6	50	60	1
9	135	2	4	4	33.3	60	1
10	150	3	0	7	58.3	105	1.75
11	165	1	3	5	41.6	75	1.25
12	180	4	4	5	41.6	75	1.25
Total Volume				81	682.9	1200	20
Average				6.75	56.90	100	1.66

2.2 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 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.

Table: The Parking Survey data collected for License Plate Method at SOWMYA HOSPITAL, Ramnagar, Hyderabad for Three Hour Duration

SOWMYA HOSPITAL, RAMNAGAR													
No of Bays	Time Interval (10:00 AM to 1:00 PM)												TURN OVER
	0-15 min	15-30 min	30-45 min	45-60 min	60-75 min	75-90 min	90-105 min	105-120 min	120-135 min	135-190 min	190-165 min	165-180 min	
1	0	5073	5073	0	1102	1102	0	0	1653	1653	1681	0	4
2	7680	7680	0	3793	6321	6321	7712	7712	7712	0	0	1963	5
3	3793	1316	1703	1703	0	4901	4901	8331	8331	8331	6556	6556	6
4	1316	1703	1236	1236	2203	2203	1321	1892	0	1113	1113	0	7
5	0	9967	9967	9967	1889	1889	1992	1992	9013	4541	4404	4404	6
6	6786	6786	2586	2586	0	3222	3222	9906	3626	0	1109	1888	7
7	2586	0	5445	5445	5445	5445	0	2880	9309	1245	1245	0	5
8	1316	9067	8296	8296	8296	0	4404	4404	4404	1660	3306	3306	6
9	1360	1360	0	0	1660	1660	8824	8824	6330	6330	6330	1213	5
10	6885	0	0	0	8809	8809	1129	1129	0	7343	1553	0	5
11	2737	8755	8755	8755	1666	1770	7381	7381	7381	0	0	9111	6
12	1384	0	0	0	9444	9444	2015	3651	3651	9800	9800	9922	6
ACCUMULATION	10	9	8	8	10	11	10	11	10	9	10	8	68
OCCUPANCY	0.83	0.75	0.67	0.67	0.83	0.92	0.83	0.92	0.83	0.75	0.83	0.67	5.67

The parking survey data collected for a parking space lot by license Plate method to find the Average Occupancy, Average Turn Over, Parking Load, Parking Capacity and Efficiency of the Parking Lot.

Calculation:

- Accumulation for a time interval is the total of number of vehicles in the bays 1 to 15 for that time interval. If a vehicle occupied that bay for Time Interval, then the Accumulation for time interval of 15 minutes = 10
- Occupancy or Parking Index is given by equation for the first-time interval of five minutes,

$$\text{Occupancy or Parking Index} = \frac{\text{Accumulation}}{\text{No of Bays}}$$

$$\text{Time interval of 15 minutes Parking Index} = \frac{10}{12} = 0.83$$

- Average occupancy is the average of the occupancy values for each time interval. Thus, it is the average of all values is 73,

$$\text{AverageOccupancy} = \frac{(0.83 + 0.75 + 0.67 + 0.67 + 0.83 + 0.92 + 0.83 + 0.92 + 0.83 + 0.75 + 0.83 + 0.67)}{12} * 100$$

$$\text{AverageOccupancy} = \frac{8.81}{12} * 100 = 73 \%$$

- Turnover is computed as the number of vehicles present in that bay for that hour. For the First bay, it is counted as 1 as one vehicle is present through the bay for certain time interval, similarly, for the second bay, one vehicle is present through the bay for certain time interval. This is being tabulated in column 5 of the table.

$$\text{Average Turn Over} = \frac{\text{Sum of Turn over}}{\text{Total number of bays}}$$

$$\text{Average Turn over} = \frac{68}{12} = 5.7$$

- Parking Volume = Sum of the turnover in all the bay
 Parking Volume = 68 vehicles

- Average duration is the average time for which the parking lot was used by the vehicles.
 It can be calculated as

$$\text{Average Duration} = \frac{10 + 9 + 8 + 8 + 10 + 11 + 10 + 11 + 10 + 9 + 10 + 8}{68} * 15$$

$$\text{Average Duration} = \frac{114}{68} * 15 = 25.14 \text{ Minutes / vehicles.}$$

- Parking Capacity = Number of bays * Number of Hours
 Parking Capacity = 12 * 3 = 36 vehicle hours
- Parking Load = Total number of vehicles accumulated at the end of each time interval multiplied Time divided by Hours

$$\text{Parking Load} = \frac{10 + 9 + 8 + 8 + 10 + 11 + 10 + 11 + 10 + 9 + 10 + 8}{180} * 15$$

$$\text{Parking Load} = \frac{114}{180} * 15 = 9.50$$

- Efficiency

$$\text{Efficiency} = \frac{\text{Parking Load}}{\text{Total Number of Bay}}$$

$$\text{Efficiency} = \frac{9.5}{12} = 0.79 = 79 \%$$

1. Parking Design

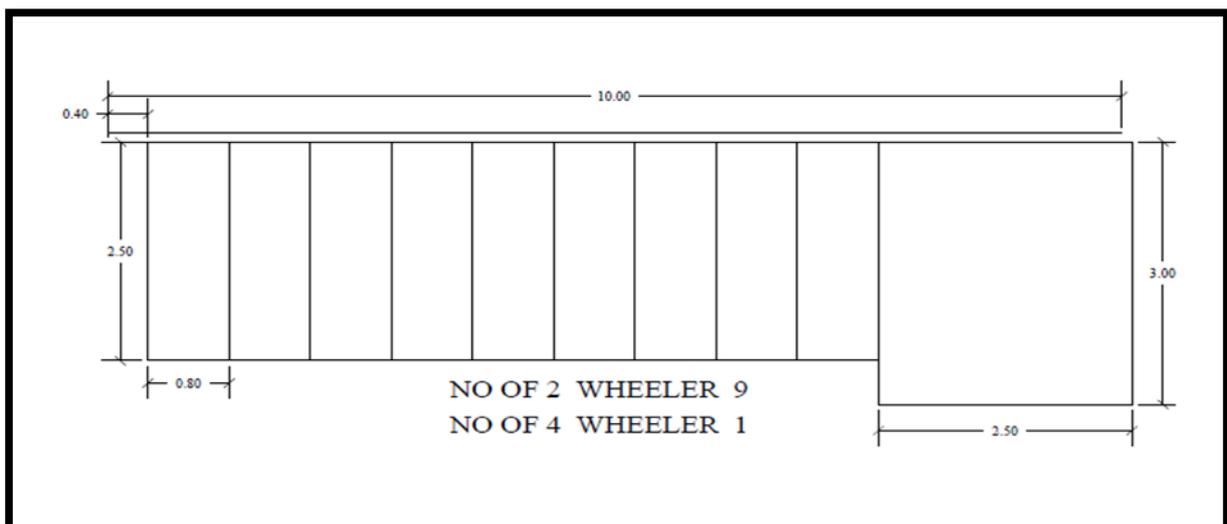


Fig 3.1: Sowmya Hospital Parking at Parallel Parking

The above designs are made per the availability of Parking place at SOWMYA HOSPITAL with the certain area of 10 meters and size of the vehicles per the IRC code the designs are made. Here in the designs the Parallel Parking is advised where the number of Parking slots are more and easy convenient for the Vehicles parkers to park their vehicles.

2. Costing:

Costing for a vehicle is planned is for this survey to regulate the Parking on road side as On-Street Parking. By costing we can determine the Turn over cost on year bases.

Costing for the different types vehicles is determined as follows:

Parking cost for each Two-Wheeler Vehicle for Three Hours = 10/- Rs

Parking cost for each Three-Wheeler Vehicle for Three Hours = 15/- Rs

Parking cost for each Four-Wheeler Vehicle for Three Hours = 20/- Rs

Table: Parking income at Sowmya Hospitals:

Sowmya Hospital		
Type of Vehicles	No of Vehicles	Parking Cost in Rupees
2 Wheelers	122 * 10	1220
3 Wheelers	1 * 15	15
4 Wheelers	0	0
Total Cost for 3 Hours		1235

Total Parking Cost for 3 Hours Duration = 1,235Rs

Total Parking Cost for 12 Hours Duration = 4,940Rs

Total Parking Cost for One Year (12 Hrs/Day) = 1,803,100Rs

III CONCLUSIONS

- Reducing delays, Improvement of the mobility by providing the on-street Parking is the objective that has been accomplished in the study. For the road in the study area, the delay and stuck of traffic jam is estimated.
- The Study area conducted at Sowmya Hospital, Ramnagar, Hyderabad, we have observed a huge traffic flow and less parking place due to this there was occurring the accidents. To prevent the accidents and Traffic jam which are caused by parking we had conducted the survey.
- By the In-Out Method Survey and License Plate Method of survey we have determined the Parking statistics as Accumulation, Parking Volume, Parking Load, Average Parking Duration, Parking Turn Over, Parking Index and estimated the Efficiency.
- We have designed the parking model in various angles which is suitable to the certain area using this design we can control the traffic flow.

- After determining to control the Traffic flow and reduce the accidents we have made an application of Costing implement so there we get a certain huge amount. The total amount is calculated and explained as Turnover Values.
- The amount which is collected for the parking can be used in different ways to control the Traffic Flow and to prevent the accidents caused by the Parking for the further generation for better Parking facilities.

REFERENCES

- [1] L. R Kadiyali. Traffic Engineering and Transportation Planning. Khanna Publishers, New Delhi, 1987.
- [2] <http://trrjournalonline.trb.org/doi/abs/10.3141/2469-08>
- [3] Polak and Axhausen, 1990 Polak, J., Axhausen, K. (1990). Parking search behaviour: a review of current research and prospects, Transport Studies Unit, Working Paper 547, Oxford University.