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Design of Parking Area and Traffic Signal for Moodbidri Town based on Traffic Studies

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ABSTRACT-*The urban growth and transportation development is the major element of the development of any town/city or nation. For better transportation system, better traffic facilities are considered as a prime objective in traffic system by reduction in conjunction and accident. The Moodbidri town, which is developing city but there is no proper parking facilities and traffic congestions were observed during peak hour. In the present study, the parking survey was done to know about the traffic behavior in the town and design of parking facilities were carried out. Also, the major traffic congestion observed near Hanuman Temple junction were national highway crossing city road. Traffic congestion in Moodbidri city roads leads to delay of our time and works. All these heavy traffic in these days is due to the known fact that, number of vehicles are increasing exponentially in Moodbidri town. In our study, the traffic survey was done and peak and nonpeak hour traffic were calculated. The traffic signal was designed at Hanuman Temple junction.*

Key Words: *Traffic signal, parking design, Passenger car unit, traffic volume count*

1.INTRODUCTION

Rapid industrialization, development of technologies, increasing population and the resulting urbanization has conveyed about an unprecedented revolution in the increase of motorized and non-motorized vehicles all over the world. Nowadays, these factors are not only governed in big cities, it is also a big challenge for midsized city or small city.

Traffic analysis is basically the process of intercepting and examining the number of vehicles moving on the road and inferring the pattern of traffic movement. A Traffic survey on the city area of moodbidri has been performed out which comprises calculation of current traffic density and contrast with preceding year data, average velocity of traffic, accident analysis, etc. Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. A Traffic survey on the city area of Moodbidri has been performed out which comprises calculation of current traffic density and contrast with preceding year data, average velocity of traffic, accident analysis, etc. Traffic studies that are usually carried out can be grouped as under:

1. Accident study.
2. Parking study.
3. Speed study.

Traffic volume study.
In traffic flow characteristics.
Traffic capacity study.

1.1 OBJECTIVES

Following are the objectives of our project.

- To study the heavily classified traffic volume.
- To estimate the annual average Dailey traffic, peak hour traffic and to calculate design hourly traffic volume.
- To design the traffic signal based on design passenger car unit.
- To design the parking lot based on the parking studies.
- Identify the black spots and improving the geometric features and other features of road.

2. METHODOLOGY

The major traffic congestion observed near Hanuman Temple junction were national highway crossing city road. Traffic congestion in Moodbidri city roads leads to delay of our time and works. All these heavy traffic in these days is due to the known fact that, number of vehicles are increasing exponentially in Moodbidri town. So in our study we chose location Near Hanuman Temple Junction.

Present Problems On Parking: Parking is a magnet that attracts traffic. More parking, more traffic jams. Congestion and parking are also interrelated since looking for a parking space (called cruising) creates additional delays and impairs local circulation. In central areas of large cities, cruising may account for more than 10% of the local circulation This leads to the lowering of the road capacity.

2.1 Need for Parking Survey

Parking is one of the serious problems that confront the urban planner and the traffic engineer. Before any

measure for the betterment of the condition be formulated basic data pertaining to the availability of parking space, extents of its usage and parking demand are essential. If it is proposed to implement a system of parking charges it will also necessary to know how much to charged and what will be the effect of pricing policy of parking. Parking surveys are intended to supply all this kind of information.

2.2 Off-Street Parking Facilities

Considerations in locating off-street parking facilities

(1) Surface car parks

(2) Multi-storey car parks

(3) Roof parks

(4) Mechanical car parks

(5) Underground car parks

2.2.1 Multi-Storey Car Parks

Surface parks consume too much of the precious land in the heart of the city and are not, therefore, always feasible. One of the alternatives when land is costly is to provide multi-storey car parks. Such facilities have become common and popular in many cities.

Multi-storey car parks are designed for a capacity of about 400 to 500 cars. Larger capacity tends to increase the time for unpacking a car. About five floors is also the upper limit for the same reason.

Some of the desirable standards for designing of the multi-storey car parks are:

(1) Gradient of the ramp: 1 in 10 generally and 1 in 8 for very short ramps.

(2) Clear height between floors: 2.1m

(3) Parking stall dimensions: 2.5m*5 m

(4) Inside radius of Curves: 7 m

(5) Width of traffic lane on ramps and entrances: 3.75 m

(6) Gradient of sloping floors: steeper than 1 in 20

(7) Loading standards: 400 kg/m^2

The arrangement of the floors and the access ramps need careful thought and a large number and alternatives are available. Ramps are preferably made one-way. If two-way should be divided. Simple arrangement is to have level floors and direct floors to floor ramps. Another arrangement could be with parking floors themselves continuously sloping through gain access from one level to another. Horizontal floor separate helical entrance and exit ramps have been found to be efficient.

Fig1: Multy Story Car Parking

2.3 Method Available for Traffic Counts

- Manual methods.
- combination of manual and mechanical methods.
- Automatic devices.
- Moving observer methods.
- Photographic methods.

2.4 Passenger Car Unit

A Passenger Car Unit is a measure of the impact that a mode transport has on traffic variables compared to a single standard passenger car. Urban roads are characterized by mixed traffic conditions, resulting in complex interaction between various kinds of vehicles.

Table1:PCU Factors

Fast vehicle	5%	10% and above
1.Two wheeler Motor Cycle or scooter etc.	0.5	0.75
2.Passenger car, pick-up van	1.0	1.0
3.Auto rickshaw	1.2	2.0
4.Leight commercial vehicle	1.4	2.0
5.Truck or bus	2.2	3.7
6.Aggriculture tractor	4.0	5.0
Slow vehicle		
7.Cycle	0.4	0.5
8.Cycle rickshaw	1.5	2.0
9.Tonga Horse drawn vehicle	1.5	2.0
10.Hand car	2.0	3.0

2.6 Design of Traffic Signal

The use of traffic signals for control of conflicting streams of vehicular and pedestrian traffic is extensive in most of the towns and cities. The first traffic signal is reported to have been used in London as early as in 1868 and was of the semaphore-arm type with red and green lamps for night use.

2.6.1 Technical Aspects of Road Traffic Signals

Steady Red Signal: Traffic facing a steady circular Red Signal shall stop at a clearly marked stop line, before entering the cross-walk on the near side of the intersection or if none, then before entering the intersection and shall remain standing until an indication to proceed.

Steady Amber Signal: The amber interval is a transition interval between termination of related green movement and exhibition of a red indication or between termination of a red indication and commencement of related green movement.

Study Green Signal: All permitted traffic movements, shall be indicated by green arrows. The arrows shall be stencil cut, and pointing in the direction in which traffic movement is permitted. Traffic except pedestrians, facing a Green Arrow, may cautiously enter the intersection only to make the movement indicated by such arrow or arrows shown at the same time.

2.6.2 Design as Per IRC Methods

- The pedestrian green time required for the major and minor roads are calculated based on walking speed of 1.2 m/sec and initial walk time of 7.0 sec. These are the minimum green time required for the vehicular traffic on the minor and major roads respectively.
- The green time required for the vehicular traffic on the major road is increased in proportion to the traffic on the two approach roads.
- The cycle time is calculated after allowing amber time 2.0 sec each.
- The minimum green time required for clearing vehicles arriving during a cycle is determined for each lane of the approach road assuming that the first vehicle will take 6.0 sec and the subsequent vehicles or the PCU of the queue will be cleared at a rate of 2.0 sec. The minimum green time required for the vehicular traffic on any of the approaches is limited to 16 sec.
- The optimum signal cycle time is calculated using Webster's formula. The saturation Flow values may be assumed as 1850, 1890, 1950, 2250 and 2990 PCU per hour for the approach roadway widths (kerb to medium or Centre line) of 3.0, 3.5, 4.0, 4.5, 5.0and 5.5 m. for widths above 5.5m, the saturation flow may be assumed as 525 PCU per hour per meter width. The lost time is calculated from the amber time, inter-green time and the initial delay of 4.0 sec for the first vehicles, on each leg (f) The signal cycle time and the phases may be revised keeping in view the green time required for clearing the vehicles and the optimum cycle length determined it step (d) and (e) above.

3. Results

3.1 Traffic Volume Per Duration of Day Peak and Non Peak Hour

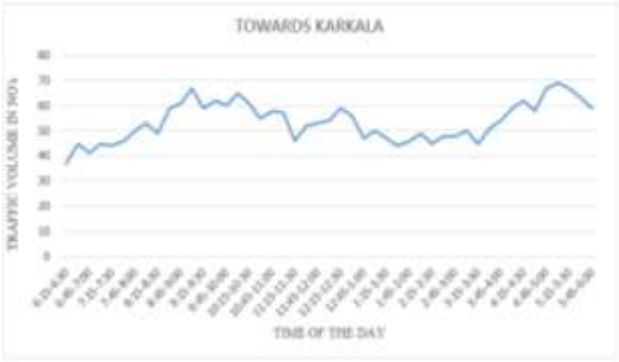

Fig2: Traffic Volume Towards Karkala

Fig3: Traffic Volume Towards Moodbidri

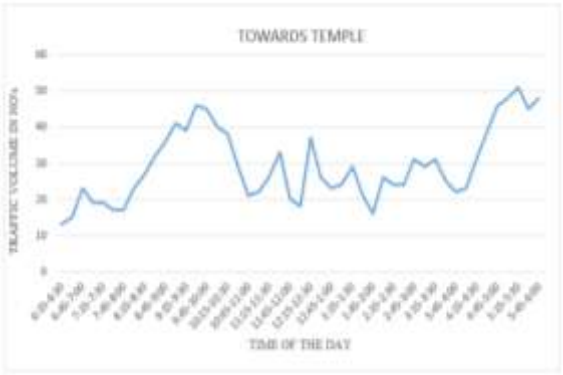

Fig4: Traffic Volume Towards Temple

Fig5: Traffic Volume Towards Theatre

3.2 PCU Values for Per Hour Traffic

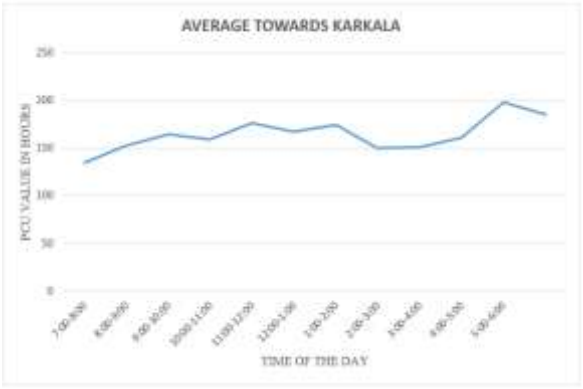

Fig6:

PCU Values for Per Hour Traffic Towards Karkala

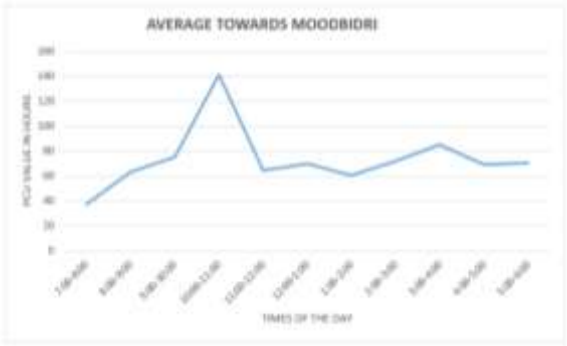

Fig7: PCU Values for Per Hour Traffic Towards Moodbidri.

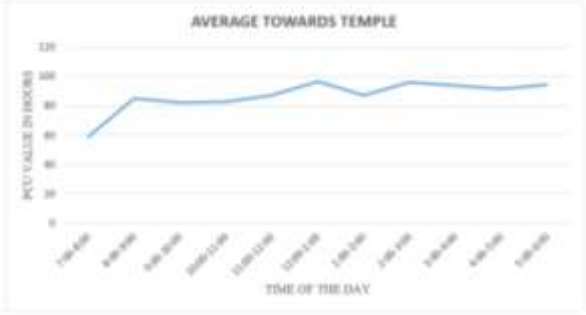

Fig8: PCU Values for Per Hour Traffic Towards Temple

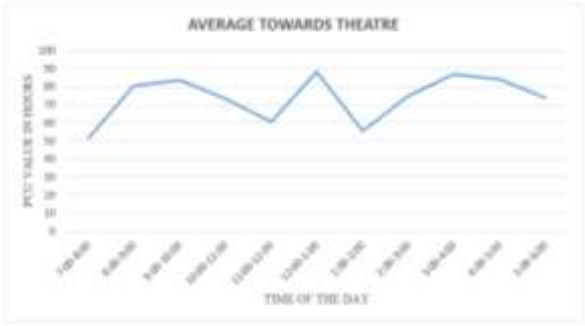

Fig:9 PCU Values for Per Hour Traffic Towards Theatre

3.3 Parking Volume Per Duration of the Day

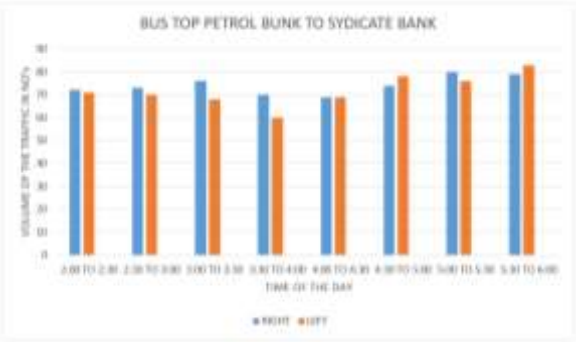

Fig10: Parking Volume Petrol Bunk to Syndicate Bank

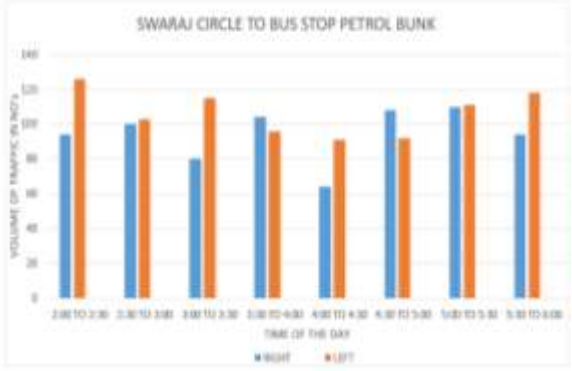

Fig11: Parking Volume Swaraj Circle to Petrol Bunk

Fig12: Parking Volume Syndicate Bank to Bus Stop End

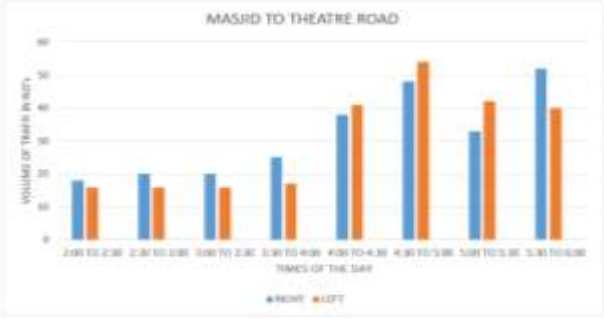

Fig13: Parking Volume Masjid to Theater Road

3.4 Peak Hour Traffic

1. Morning 8:30am to 10:30am.
2. Evening 4:00pm to 6:00pm.

3.5 Traffic Signal Design Using IRC Methods

- Design Traffic Volume On Road – 01 = 198.00 pcu/hr
- Design Traffic Volume On Road – 02 = 96.70 pcu/hr

Step – 01 [Pedestrian Crossing Time]

- Pedestrian Green Time for Road – 01 = (7.75÷1.2) +7 = 13.46 sec
- Pedestrian Green Time for Road – 02 = (6.60÷1.2) +7 = 12.50 sec

Step – 02 [Minimum Green Time for Traffic]

- Minimum Green Time for Vehicles On Road – 01 = 13.46+(198÷96.70)
  = 27.56 sec
- Minimum Green Time for Vehicles On Road – 02 = 13.46 sec

Step – 03 [Revised Green Time for Traffic Signals]

- Adding 2sec each amber time

  ∴ Total cycle time required =

  [(2+27.56+2) + (2+13.46+2)]
  = 49.02 ≅ 50 sec
- Green time road – 01 and road – 02 as 0.94 and 0.04sec respectively.

  ∴ adopt green time for road – 01

  = 27.56+0.94
  = 28.50 ≅ 29.00 sec

  ∴ adopt green time for road – 02

  =13.46+0.04

  = 13.50 ≅ 14.00 sec

Step – 04 [check for clearing the vehicles arrived during green tome]

Vehicle arrives per lane per cycle on road – 01 = (198.00÷50.00) = 3.96 pcu/hr

- Minimum green time required per cycle to clear vehicles on road – 01
  = 6+ (3.96-1) ×1
  = 8.96 < 29.00 sec Adopted

Vehicle arrives per lane per cycle on road – 02 = (96.70÷50.00) = 1.93 pcu/hr

- Minimum green time required per cycle to clear vehicles on road – 02
  = 6+ (1.93-1) ×1

  = 6.93 < 14.00 sec Adopted

Step – 05 [check for optimum signals cycle by "Webster's method"

- Saturation flow for road – 01 of width 7.75m = 525×7.75 = 4068.75 pcu/hr
- Saturation flow for road – 02 of width 6.6m = 525×6.60 = 3465.00 pcu/hr

Optimum signal cycle time = (1.5×L+5) ÷ (1-Y)

Where,

Y = Y1+Y2

Y1 = (normal flow on road – 01 ÷ saturation flow)

= (198 ÷ 4068.75) = 0.0486

Y1 = (normal flow on road - 02 ÷ saturation flow)

= (96.70 ÷ 3465) = 0.0279

Y = 0.0486+0.0279 = 0.077

L = total lost time

= (amber time + inter green time + time lost due to delays of vehicle starts) × 2phase

= (2+2+6) ×2

= 20 sec

∴ Optimum signal cycle time = (1.5×20+5) ÷ (1-0.077)

= 37.92 sec

Cycle time of 50 sec designed earlier is accepted.

Red	Green Phase (sec)	Amber time (sec)	Red phase (sec)	Amber time (sec)	Cycle time (sec)
Road-01	29.00	2.00	17.00	2.00	50.00
Road-02	14.00	2.00	32.00	2.00	5.00

CONCLUSIONS

- Planning of better traffic system of a Moodbidri city. The result gives the statistics of several analyses that is very useful for the traffic planning and management strategies.
- The analysis is not much more sufficient for the planning of a better traffic system of Moodbidri city, but it is a motivation towards the further Study on traffic planning.
- From the observation every 15 minutes we count Number of vehicles in Junction Near Hanuman Temple Moodbidri and it's converted into PCU Number based on IRC106-1990, Traffic is greater than capacity of the road hence that the current road scenario may not satisfy and necessary to widen the road.
- Just like congestion, traffic accident, and environment pollution, the parking problems are the production of the urbanization and motorization.
- By Studying the road traffic of the Moodbidri city we analysed that the major accident cause is collision of vehicles at the Junction. These collisions can be avoided if proper design of signal is done at the Junction, so that the main objective to provide better and safe movement of traffic through signal design at the Junction of the Moodbidri city.

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