

Analysis of Junction and Road User Traffic Data, to reduce the Congestion at Tin Factory Junction

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Abstract -- A bus stand along with the steel structure skywalks designed and recommended at Tin factory junction in Bangalore for the reduction of the traffic by 80%. The skywalk is designed keeping all the norms of the traffic engineering and the structural design. After the survey and the personal investigation for 3 months with the people travelling daily, weekly, monthly in different vehicles we found out that everyone had the same problem of the delay at junction. Tin factory is a junction in Bangalore from where everybody travels to the MNC's, as the junction is the through route to K R Puram, Hoskote, Silk board and Bangalore city. Any delay at the junction causes overall wastage and loss to the capital in general and to the country at large. If a bus stop is provided far from the junction point, the buses directly moving to K R Puram will become free and will be able to pass easily. The buses travelling to Hoskote can stop at 1km away from the junction (bus stop shown in the model) so that the passengers getting down and coming in won't disturb the traffic in any ways. According to survey and conclusion it will also decrease the rate of pedestrian accident and reduce their wastage of time of walking and waiting.

I. INTRODUCTION

Bangalore city is the capital of the state of Karnataka in southern India and is one of the fastest growing cities of the country and also the world. The city is growing in its stature as a 'cosmopolitan' center and is the leading hub of Information Technology. Owing to factors such as favorable climatic condition, commercial and employment, cultural life, etc., the population of the city has been increasing by alarming proportions. Consequently, apart from increased number of public transport vehicles, there has been a tremendous increase in the number of personalized vehicles such as two-wheelers and motorcars. The city growing radially with new towns being constructed has led to high level of traffic which has put the road network under great strain. The government and the concerned agencies such as the Bangalore Development Authority (BDA) have

the task of improving the transportation infrastructure to meet the growth of traffic needs.

➤ Definition:

“Traffic engineering is the science of measuring traffic and travel, the study of the basic laws relating to traffic flow and generation and application of this knowledge to the professional practice of planning, designing and operating traffic systems to achieve safe and efficient movement of people and goods.”

➤ Scope of Traffic Engineering:

The basic object of traffic engineering is to achieve

- Free and rapid flow of traffic.
- Less number of accidents.
- Less delay at intersections.
- Streamline flow of traffic for less journey time.

The study of traffic engineering may be divided in to 7 sections:

- Traffic characteristics
- Traffic studies and analysis
- Traffic operations-control and regulation
- Planning and analysis
- Geometric design
- Administration and management

➤ Passenger Car Units (PCUs):

Different classes of vehicles such as cars, vans, buses, trucks, auto rickshaw, motor cycles, pedal cycles, etc., are found to use the common roadway facilities without segregation on most of the roads in developing countries like India. The flow of the traffic with unrestricted mixing of different classes on the roadways forms the heterogeneous traffic flow or the mixed traffic flow. It is common practice to consider the passenger car as the standard vehicle unit to convert the other vehicles classes and the unit

is called passenger car unit or PCU. It is expressed as PCU per hour or PCU/lane/hour.

Sl. No.	VEHICLE CLASSES	EQUIVALENCY FACTORS
1.	Passenger cars, tempo,	1.0
2.	auto rickshaw,	3.0
3.	agricultural tractor	0.5
4.	Bus, truck	1.5
5.	Motor cycle, scooter	4.0
6.	and pedal cycle	6.0
7.	Cycle rickshaw Horse drawn vehicle	8.0

- Factors Affecting Passenger Car Unit:
 - Vehicles characteristics such as dimensions, power, Transverse and longitudinal gaps.
 - Traffic stream characteristics such as composition mean speed, volume to capacity ratio, etc.
 - Roadway characteristics such as road geometric including gradient, curve, etc., Regulation and control of traffic such as speed limit, one-way traffic, etc.
 - Environment and climatic conditions.

- Traffic Volume Studies:

Traffic volume is the number of vehicles crossing a section of road per unit time at any selected period. The objects and uses of traffic volume studies are given below:

 - Traffic volume is generally accepted as a true measure of the relative importance of roads and in deciding the priority for improvement and expansion.
 - Traffic volume study is used in planning, operation and control of existing facilities.
 - This study is used in the analysis of traffic patterns and trends.
 - Classified volume study is useful in structural design of pavements, in geometric design and in computing roadway capacity.

- Methods of Volume Studies:
 1. Manual method:

Manual counts are typically used when: Small data samples are required.

Automatic equipment's are not available, or the effort and expense of using automated equipment's are not justified.

Manual counts are typically used to gather data about the following:

 - Vehicle classifications
 - Turning movements
 - Direction of travel
 - Pedestrian movements
 - Vehicle occupancy

 2. Automatic Count Method:

The automatic count method provides a means for gathering large amounts of traffic data. Automatic counts are usually taken in 1-hour intervals for each 24-hour period. The counts may extend for a week, month or year. When the counts are recorded for each 24-hour time period, the peak flow period can be identified.

 3. Automatic Count Recording Methods:

Automatic counts are recorded using one of three methods:

 - Portable counters
 - Permanent counters
 - Videotape

 4. Portable Counters:

Portable counting is a form of manual observation. Portable counters serve the same purpose as manual counts but with automatic counting equipment. The period of data collection using this method is usually longer than when using manual counts.

 5. Videotape:

Observers can record count data by videotaping traffic. Traffic volumes can be counted by viewing videotapes recorded with a camera at a collection site. A digital clock in the video image can prove useful in noting time intervals.

➤ Speed Studies:

Speed studies carried out occasionally give the general trend in speeds. There are two types of speed studies carried out,

1. Spot speed study
2. Speed and delay study.

1. Spot Speed Study:

Spot speed study may be useful in any of the following aspects of traffic engineering:

- To use in planning traffic control and in traffic regulations
- To use in geometric design- for redesigning existing roads or for deciding design speed for new facilities.
- To use in accident studies
- To decide the speed trends
- To study the traffic capacity
- To compare diverse types of driver and vehicles under specified condition.

The spot speeds are affected by physical features of the road like pavement width, curve, and sight distance, gradient, pavement uneven intersection and road side developments. Other factors affecting spot speeds are environment conditions (like weather, visibility), enforcement, traffic conditions, driver, vehicle and motto of travel.

There are a number of methods to measure spot speed. The spot speed may be obtained either by finding the running speed of vehicle over a short distance of less than 200m or by finding the instantaneous speed while crossing a section, depending on the method used.

2. Presentation of Spot Speed Data:

- Average speed of vehicles: From the spot speed data of the selected samples, frequency distribution tables are prepared by arranging the data in groups covering various speed ranges and the number of vehicles in such range. The arithmetic mean is taken as the average speed. The table gives the general information of the speed maintain on the section, and also regarding the speed distribution pattern.

- Modal average: a frequency distribution curve of spot speeds is plotted with speed of vehicles or average values of each speed group of vehicles on x axis and the % of vehicles in that group in the y axis. this graph is called speed distribution curve. This curve will have a definite peak value of travel speed across the section and this speed is denoted as modal speed. This speed distribution curve is helpful in determining the speed at which the greatest proportion of vehicles moves, given by the modal speed.

II. LITERATURE REVIEW

- A. Satish C.Sharma,et.al(1996), “ state wide traffic volume studies and precision of AADT estimates”

Investigation in this paper is the statistical precision of annual average daily traffic (AADT) estimates resulting from short period traffic counts (SPTC). A large number of automatic traffic recorder (ATR) sites located on Minnesota’s highway system of the study. The study result suggests that highway agency should put more emphasis on sample site assignment to correct ATR groups than on the durations of count.

- B. A.K.M Abir and Md. Sami Hasnaine(1995), “traffic volume study”

In this work emphasis was given on traffic volume with volume, speed and density and the analysis was carried out through primary traffic flow survey AUST- flyover junction to the shatrasta junction in the Dhaka city. The traffic flow was studied by method of the following conclusion were drawn:

1. Old buses should be replaced by new buses in order to maneuver easily.
2. Separate lane system should be introduced for bicycles.
3. Large container truck should be allowed to use this junction only at the off-peak hours.

- C. Rajiv Ganguly, Ashok Kumar Gupta, et.al(2014),”traffic volume and accident studies on national highway-22 between solan and Shimla, India”

This paper is an attempt to study the basic difference between rigid and flexible pavements based on LCCA, durability, recycling, local performance and

safety features. An observation of the traffic count was conducted at Tuttikandi in Shimla and Chambaghat in Solan and difference in vehicular flow was completed. The process involved making manual count of the vehicles passing by on week days and weekends. Vehicle fleet was characterized as cars, buses, trucks and motor cycles. The study also involved in identifying the black spots which refers to those stretches on Shimla-Solan highway of NH-22 reported with the greatest number of accidents.

The study results suggest suitable remedial measure to prevent such accidents in future including installing various roads furniture like convex mirror, fluorescent sign boards, light poles.

D. Mr. Udit Batra, Mr. Mandar V. Sarode (2013), "Traffic Surveying and Analysis"

In this survey, a traffic survey in specific road sections on Nagpur city has been carried out which included calculation of present traffic density and comparison with previous year data, average velocity of traffic. Manual method of counting was used with the help of video recording. The following conclusions were drawn-

1. Traffic distribution through alternative routes or construction of flyover may ne envisaged.
2. Public transport system needs to be strengthened thereby reducing traffic density.
3. Parking of vehicles should be prohibited on streets.

III. METHODOLOGY

1. Volume Study:

To conduct traffic volume study at the junction, we adopted manual method of counting with the help of video recordings. 3 working days and 2 non-working days were selected to conduct traffic volume study, i.e., Monday, Tuesday, Thursday, Saturday and Sunday. Morning, afternoon and evening peak hours were selected for the study, i.e., 7-10 am, 1-2 pm and 4-7:30 pm.

2. Spot Speed Study:

Speed is an important transportation consideration related to safety, time, comfort, convenience and

economy. Spot speed studies are used to determine the speed distribution of a traffic stream at a specific location. The data gathered in Spot Speed Studies are used to determine the vehicle speed percentiles, which are useful in making speed related decisions. FROM BANGALORE CITY TO HOSKOTEFROM TIN FACTORY TO SILK BOARD to conduct spot speed study, we have selected a working day, i.e., Thursday. 4 routes, i.e., A distance of 150 m was taken on all the routes and the time taken by different vehicles for covering the distance were recorded and speed were calculated. Further, frequency percentile and cumulative frequency percentile were presented in a tabular format and graphs were plotted, accordingly.

3. Pedestrian Survey:

The pedestrian mode consists of travelers along a roadway or pedestrian facility making a journey (or at least part of their journey) on foot. Pedestrians walk at different speeds, depending on their age, their ability, and environmental characteristics (e.g., grades and climate).

Pedestrian survey: Pedestrian survey is conducted during morning, noon and evening peak hours. Two working days and two non-working days were selected to carry out the study i.e. Monday, Tuesday, Saturday, and Sunday. The pedestrian count was collected from 7:00 am to 9:30am in the morning, 1pm to 2pm in noon followed by 4:00 - 8:00 in the evening.

Pedestrians are the major users of any roads. Many of the pedestrians are the regular road users either using vehicle or by walk. We conducted a pedestrian survey asking them about the ease of use of the present bus stop, road, and feasibility of the future in the same condition. And then we put forth our proposals in front of them too. Most of them (around 94% of the road users were convenience and happy with our proposals. They also told us to implement our project as fast as possible.

IV. EXPERIMENTAL INVESTIGATION

Tin factory Junction is the area that is studied. The area caters to considerable local and through amount of traffic especially at peak hours. This junction acts as a link between Hebbal to Chennai, Hebbal to Silk Board, Kr Puram to Market. Manual method of counting has been used to count the traffic volume at the junction with the help of video recordings. The data were taken for 5 days (Monday, Tuesday, Thursday, Saturday and Sunday) from 7-10 am, 1-2 pm and 4-5 pm.

Spot speed study was conducted on Thursday (working day) for 4 routes, i.e., Hebbal to Chennai, Hebbal to Silk Board, Kr Puram to Market. 20 four wheelers, 10 two wheelers, 10 autos and 5 buses were considered for all the routes. Then, time taken by different vehicles to cover the distance was recorded

and speed was calculated. Further details have been tabulated below:

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Time	Number of Pedestrian		STUDENTS	HANDICAP	TOTAL
	ELDERS				
	Gents	Ladies			
7.00-7.30 am	236	113	113		517
7.30-8.00 am	284	103	103		504
8.00-8.30 am	112	125	125	2	311
8.30-9.00 am	206	112	112		402
9.00-9.30 am	212	81	81		385
1.00-1.30 pm	206	23	23	2	255
1.30-2.00 pm	137	46	46		228
4.00-4.30 pm	55	126	126		215
4.30-5.00 pm	65	124	124		126
5.00-5.30 pm	63	95	95	1	186
5.30-6.00 pm	87	15	15		178
6.00-6.30 pm	155	55	55		312
6.30-7.00 pm	126	19	19		241
7.00-7.30 pm	210	10	10		355
7.30-8.00 pm	194	3	3		287
				Total	4502

Manual Survey with People

S.NO	TYPES OF PEDESTRIAN	ORIGIN	DESTINATION	USAGE OF JUNCTION	PURPOSE OF JUNCTION	EASE OF USAGE	RECOMMENDATION FOR BUS STOP	CASE OF DELAY
1	STUDENTS	KR PURAM	SILK BOARD	DAILY	OFFICE	Not at all convenient	100%	No proper Bus stop
2	STUDENTS	TIN FACTORY	KR PURAM	DAILY	SCHOOL	Not at all convenient	100%	No proper Bus stop
3	STUDENTS	MAJESTIC	KOLAR	HOLIDAYS	COLLEGE	Not at all convenient	100%	No proper Bus stop
4	STUDENTS	MAJESTIC	NANDAGUDI	DAILY	COLLEGE	Not at all convenient	100%	No proper Bus stop
5	STUDENTS	MALLUR	KALYANNAGAR	DAILY	COLLEGE	Not at all convenient	100%	No proper Bus stop
6	STUDENTS	MULBAGILU	SARJAPUR	DAILY	COLLEGE	Not at all convenient	100%	No proper Bus stop
7	STUDENTS	HEBBAL	SILKBOARD	DAILY	COLLEGE	Not at all convenient	100%	Heavy Traffic due to buses
8	STUDENTS	KR PURAM	SILK BOARD	Twice a week	COLLEGE	OK	100%	Heavy Traffic due to buses
9	STUDENTS	MAJESTIC	KALYANNAGAR	Twice a week	COLLEGE	Not at all convenient	100%	Heavy Traffic due to buses
10	STUDENTS	MURABAGILU	SARJAPUR	DAILY	SCHOOL	NOT GOOD	100%	No proper Bus stop
11	JOB HOLDERS	ALLAMUDN NAGAR	CV RAMAN NAGAR	DAILY	OFFICE	Not at all convenient	100%	No proper Bus stop
12	JOB HOLDERS	KALYANNAGAR	KR PURAM	DAILY	OFFICE	Not at all convenient	100%	No proper Bus stop
13	JOB HOLDERS	SARJAPUR	SARJAPUR	DAILY	OFFICE	Not at all convenient	100%	No proper Bus stop
14	JOB HOLDERS	KR PURAM	SILK BOARD	DAILY	OFFICE	Not at all convenient	100%	Heavy Traffic due to buses
15	JOB HOLDERS	TIN FACTORY	KR PURAM	DAILY	OFFICE	Not at all convenient	100%	Heavy Traffic due to buses
16	JOB HOLDERS	MAJESTIC	KALYANNAGAR	DAILY	OFFICE	Not at all convenient	100%	Heavy Traffic due to buses
17	JOB HOLDERS	MALLUR	SARJAPUR	DAILY	OFFICE	Not at all convenient	100%	No proper Bus stop
18	DAILY WORKERS	MAJESTIC	SARJAPUR	DAILY	WORKING	Not at all convenient	90%	Traffic due to Pedestrian
19	DAILY WORKERS	MALLUR	SILK BOARD	DAILY	ONCE IN WEEK	not convenient	90%	Traffic due to buses
20	DAILY WORKERS	HEBBAL	KR PURAM	DAILY	ONCE IN WEEK	OK	90%	Heavy Traffic due to buses
21	TRAVELLERS	MURABAGILU	MAJESTIC	once in week	ONCE IN MONTH	OK	90%	Heavy Traffic due to buses
22	TRAVELLERS	ALLAMUDN NAGAR	TIRUPATI	RARE	ONCE IN MONTH	not convenient	80%	Heavy Traffic due to buses
23	TRAVELLERS	HEBBAL	SILKBOARD	RARE	ONLY DURING MEETINGS	not convenient	80%	Traffic
24	TRAVELLERS	HEBBAL	SILK BOARD	depends on requirement	RARE	Not at all convenient	50%	Traffic
25	DRIVERS	KR PURAM	SILK BOARD	DAILY	1 IN WEEK	Not at all convenient	50%	Traffic due to buses
26	DRIVERS	TIN FACTORY	KRPURAM	RARE	RARE	Not at all convenient	70%	Traffic due to Pedestrian

V. RESULT AND DISCUSSION

1. Providing the Bus stop far from the Junction along with the sky walk

At intersection where there is large number of crossing and right turn traffic, there is possibility of Several accidents and delay as there cannot be orderly movements. The main problem occurring there is the buses comes and stop at the junction where the passengers get in and come out of the bus. Because of this the vehicle behind get stuck and are not able to move freely. If we provide the bus stop away from the junction, by proving the extra sky walk, i.e. at 1.3 kms away from the time factory junction, the buses will go and stop there and the other vehicles that need to move can move n through traffic directly. Hence this will reduce the large amount of traffic and reduce the delay (which is 2hrs and more as of now).

2. Advantages of Bus stop:

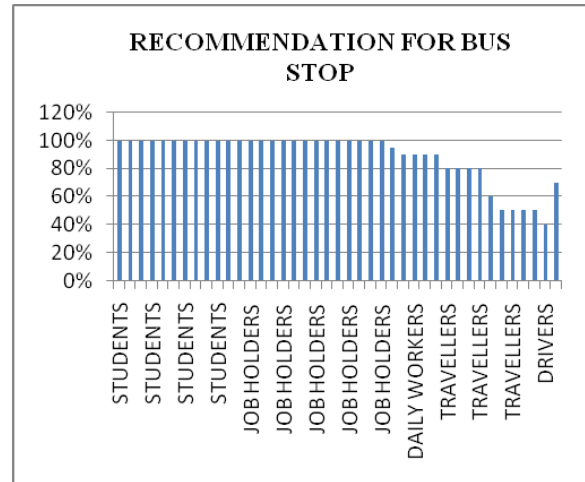
Properly designed Bus stop have the following advantages:

- They provide orderly movement of traffic and increase the traffic handling capacity of most of the intersections at grade.
- They reduce certain types of accidents, notably the right-angled collisions.
- Pedestrians can cross the roads safely at the signalized intersection.
- The passengers getting down the bus and climbing the bus will be comfortable.
- When the bus stop is properly coordinated, there is reasonable speed along the major road traffic.

VI. CONCLUSIONS AND RECOMMENDATIONS

- With the present investigation, the TIN FACTORY to KRPURAM route is found to be the busiest route of all having 58,215 vehicles in PCU for 4 days, followed by TIN FACTORY to SILK BOARD route and TIN FACTORY to HOSKOTE route.
- The major type of vehicle which is dominating this junction are cars followed by two wheelers at the 2nd rank and thereby the Bus.

- If a proper bus stop is provided, the buses will go and stop there, thereby allowing the other vehicles to move easily in the required direction.
- We have also recommended our project paper to the Bangalore east traffic police, and also to the deputy director of Bangalore east. The liked our project and told us that they will get back to us by discussing it with the higher authorities and implement is as fast as possible.



➤ DIMENSIONS of the sky walk designed

- Foot path - 4.4 feet
- Handrail width - 1 feet
- Handrail height - 3.8feet
- Kerb height - 0.7 feet
- Lane width each of 4 meters
- Median - 5 feet
- Road width @ proposed sky walk site - 15.5 meter
- Drainage width @ proposed sky walk site - 1.32 meter
- Sky walk landing site length (Availability)- 28 meter
- Sky walk site landing width(Availability) - 20.5 meter
- Distance to existing bus stand from sky walk landing site - 52 meter
- Road width @ Existing bus stand - 20 meter
- Drainage width @ Existing bus stand - 1.3 meter
- Kerb height for drainage - .3 meter
- Height of flyover @ proposed sky walk site - 7.6 meter

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A Proposed Model Plan for Bus Stand and Also the Sky Walk



TRAFFIC AT TIN FACTORY JUNCTION

