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Traffic Flow Analysis from Navale flyover to Bramha Hotel

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Abstract

The aim of Traffic engineering is to encourage safe, proper and Time efficient flow of people and goods on roadways which are dependent on traffic guidelines. Volume, speed and density are three main constants of traffic flow. This current study is on traffic volume study from Navale bridge to Brahma hotel in Narhe area of Pune city. Due to increase in economic condition of people, amount of traffic also increased significantly in last decade. In this study attention is given on traffic volume and different analysis is carried out. For better understanding of traffic flow, at identified junctions traffic survey is carried out. With the help of data collected, it is very easy to understand the traffic pattern during weekdays and weekends at different time period. Hence analysis in traffic will be easy to control the traffic flow and also to suggest some management measure to enhance traffic movement in Sinhgad road and Narhe region.

Keywords— Traffic congestion, Peak Hour Factor, Level of Service, Traffic Signs, Manual method, Average annual daily traffic, ADT, PCU

I. INTRODUCTION

Traffic is the movement of people and goods from one location to another. The movement typically occurs along a specific facility or pathway that can be called as guide. It may be a physical guide way, as in the case of a railroad, or it may be a designated route, marked either electronically as in air travel or geographically as in the marine industry. Modes of transportation, can be broadly characterized as road, rail, air, and maritime.

Traffic evolves because of a need to move people and goods from one location to another. One of the principal challenges in traffic control is to accommodate the traffic in a safe and efficient way. Efficiency can be thought of as a measure of movement levels relative to the objectives for a particular transportation system and the finances required for its operation. For example, a railroad can be thought of as efficient if it can accommodate the travel requirements of its customers at the least cost. It will be thought of as inefficient if an alternative (e.g., a trucking service) can also meet customer needs but at a lower cost.

Safety, the management of traffic to reduce or eliminate accidents, is the other critical reason for traffic control. An airline pilot needs to be warned of high winds at the destination airport just as an automobile driver needs to be warned of a dangerous curve or intersection ahead. Traffic control has as its principal objective to manage the movement of people and goods as efficiently and safely as possible. In road traffic, intersections with traffic lights (i.e., green, amber, and red indications) will

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often add a separate lane with a lighted green arrow to allow left turns with no opposing traffic. This frequently results in longer non green periods at the intersection, causing an increased delay and a reduction in efficiency and mobility. Traffic control system will always have to satisfy the conflicting goals of safety and mobility. For these elaborate operational procedures, rules and laws, and physical devices (e.g., signs, markings, and lights) are few of the components of any traffic control system.

The traffic control system is main part of the transportation engineering and the efficient traffic system is need in the developing country. In transportation the main problem in large cities (urban) is the traffic congestion and wastage of the valuable time in working days. New technologies help monitor and manage traffic flow, reduce congestion, provide alternate routes to travellers with due safety, enhance productivity, and save lives, time and money. Intelligent transportation systems provide the tools for skilled transportation professionals to collect, analyse, and archive data about the performance of the system during the hours of peak use.

II. ELEMENTS OF TRAFFIC CONTROL SYSTEM

A. *Traffic Sign*

1) ***Introduction***: The colour and shape of a traffic sign communicates important information about the sign's message. In poor visibility conditions, such as heavy fog, you may be able to make out only the shape of a sign. As you approach a sign and while still distant, you may see the colour long before you can read the message or see the symbol, giving you some advance information.

2) ***Sign Colours***: Red used with white conveys stop, yield, do not, and no. Stop signs, yield signs, do not enter or wrong way signs, the circle and slash in a no turn sign, and the restrictions in a parking sign are examples. Black used with white conveys regulatory information. Speed limit, do not pass, no turns are examples where the operation is regulated by law and the black and white sign would be found. Yellow used with black conveys a warning. Curve ahead, stop ahead, overhead clearances, slippery when wet, are all examples. specialized class of warning signs uses a strong yellow/green colour with black to advice of school zone activities and other pedestrian activities. Green and white, blue and white, and brown and white signs are used to provide helpful information. The green sign is used to provide destination types of information, while the blue sign is used to inform regarding motorist services. The brown sign is used to advise of historical or cultural interests that might exist in the area. Orange and black and pink and black signs are used to advise and warn in construction (orange) and incident (pink) areas. They are used with black and white signs that convey regulations that might exist only because of the construction effort or the incident.

3) ***Types of signs***: Traffic sign is the component of traffic control system. There are three types such as Regulatory signs, Warning sings, Guide sign.

4) ***Regulatory signs:*** Regulatory sign inform you of the low; you must obey their instruction.

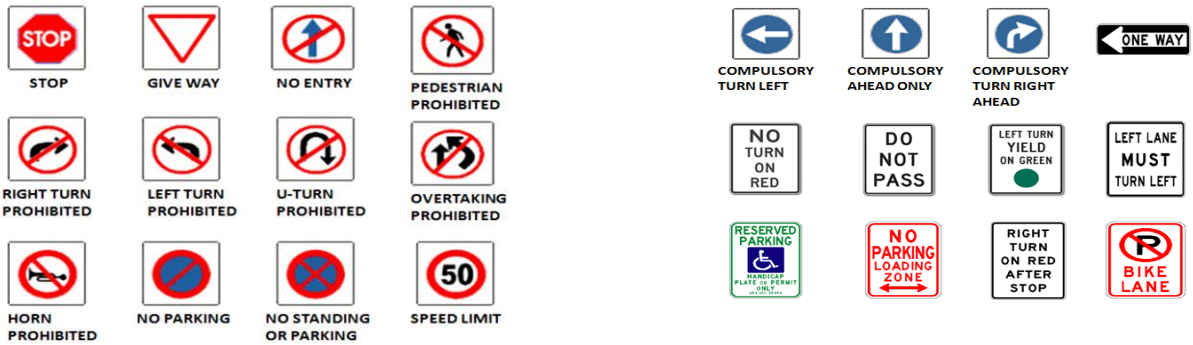

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Figure 1: Regulatory signs

Figure 2: Regulatory signs

5) ***Warning signs:*** Warning signs alert you to possible hazards ahead.

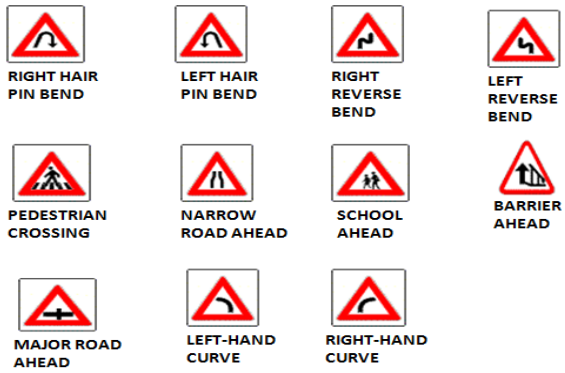

Figure 3: Warning signs

Figure 4: Warning signs

6) **Guide signs**: Guide sign inform the driver of situation ahead that may require extra care.

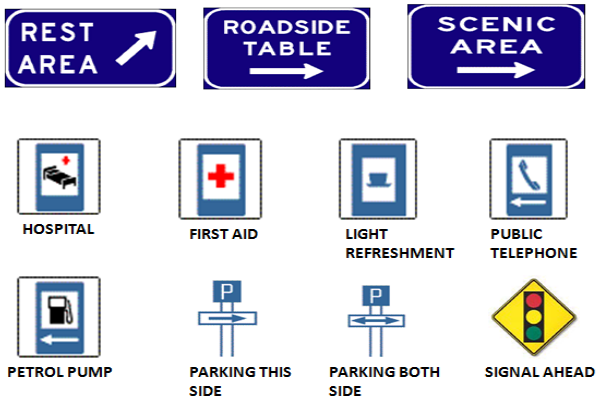

Figure 5: Guide signs

B. Traffic Signal

1) ***Introduction:*** Traffic signals are one of the most effective and flexible active control devices of traffic and are widely used in most of the cities worldwide. The conflicts arising from movements of traffic in different directions are addressed by time sharing principle. The advantages of traffic signals include an orderly movement of traffic, an increased capacity of the intersection and require only simple geometric design. However, the disadvantages of the signalized intersection are large stopped delays, and complexity in the design and implementation. This chapter discusses various design principles of traffic signal such as phase design, cycle length design, and green splitting. The concept of saturation flow, capacity, and lost times are also presented. First, some definitions and notations are given followed by various steps in design starting from phase design.

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2) ***Common Definitions and Notations****:* The common definitions and notations which are used to understand the signal design are as follows.

i. ***Cycle:*** A signal cycle is one complete rotation through all of the indication provided.

ii. ***Cycle length****:* Cycle length is the time in seconds that it takes a signal to complete one full cycle of indications. It indicates the time interval between the starting of green for one approach till the next time the green starts. It is denoted by C.

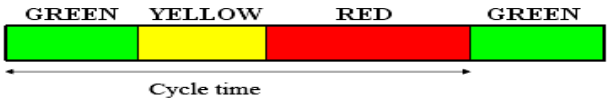

Figure 6: Traffic Signal Colours

iii. ***Interval****:* Thus, it indicates the change from one stage to another. There are two types of intervals - *change interval* and *clearance interval*. Change interval is also called the yellow time indicates the interval between the green and red signal indications for an approach. Clearance interval is also called all red and is provided after each yellow interval indicating a period during which all signal faces show red and is used for clearing off the vehicles in the intersection.

iv. ***Green interval****:* It is the green indication for a particular movement or set of movements and is denoted by Gi. This is the actual duration the green light of a traffic signal is turned on.

v. ***Red interval****:* It is the red indication for a particular movement or set of movements and is denoted by Ri. This is the actual duration the red light of a traffic signal is turned on.

vi. ***Phase****:* A phase is the green interval plus the change and clearance intervals that follow it. Thus, during green interval, non-conflicting movements are assigned into each phase. It allows a set of movements to flow and safely halt the flow before the phase of another set of movements start.

vii. ***Lost time****:* It indicates the time during which the intersection is not effectively utilized for any movement. For example, when the signal for an approach turns from red to green, the driver of the vehicle which is in the front of the queue will take some time to perceive the signal (usually called as reaction time) and some time will be lost before vehicle actually moves and gains speed.

viii. ***Effective green time****:* Effective green time is the actual green time available for the vehicle to the cross intersection. It is sum of actual green time plus yellow minus lost time. the lost time is the sum of start-up loss time and clearance loss time.

Effective green time = actual green time + amber time – lost time.

ix. ***Saturation flow****:* The equivalent hourly rate at which vehicles can traverse an intersection approach under prevailing condition, assuming a constant green indication at all time and no loss time in vehicle per hour or vehicle per hour per lane

Saturation flow is given by, S = 3600/h. Where, S is the saturation flow rate h is the saturation headway

x. ***Density****:* Density is defined as number of vehicles occupying a given length of lane or road. It is denoted by K , and it is expressed as (vhe/km)

Density = rate of flow / average travel speed.

xi. ***Saturation headway***: The average headway between vehicles occurring after the fourth vehicle in the queue and continuing until the last vehicle in the initial queue clear the intersection.

3) ***Annual average daily traffic****:* Annual average daily traffic, is a measure used primarily in transportation planning, transportation engineering and retail location selection. Traditionally, it is the total volume of vehicle traffic of a highway or road for a year divided by 365 days. AADT is a simple,

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but useful, measurement of how busy the road is. Newer advances from GPS traffic data providers are now providing AADT counts by side of the road, by day of week and by time of day.

Formula: [No of vehicle throughout a year / 365] …. vech/day

4) ***Average daily traffic****:* Average daily traffic or ADT, and sometimes also mean daily traffic, is the average number of vehicles two-way passing a specific point in a 24-hour period, normally measured throughout a year. ADT is not as highly referred to as the engineering standard of AADT which is the standard measurement for vehicle traffic load on a section of road, and the basis for most decisions regarding transportation planning, or to the environmental hazards of pollution related to road transport. ADT is the most basic unit used for traffic monitoring and forecasting. It provides an aggregated measure of traffic volume. In combination with other traffic data items, it is used for determining the dimensions or function of proposed roadways, particularly roads of low and moderate traffic volumes.

Formula: [No of vehicle throughout a week / 7] ….vech/day

III. METHODOLOGY

For carrying out this project we have finished the work in a certain manner in which we tried to cover all the aspects of traffic survey and road profile survey. Then, accordingly we selected the area from Navale Flyover to Brahma Hotel and we suggested some solutions considering the overall situation of that place.

The methodology adopted for completion of this project is shown below:

A. Site selection

Figure 7: google map View of selected site

B. Manual Counting Method

This method employs a field team to record traffic volume on the prescribed record sheets. By this method it is possible to obtain data which is not be collected by mechanical counters, such as vehicle classification, turning movements and counts where the loading condition or number of occupants are required. But it is not practicable to have manual count for all the 24 hours of the day. Hence it is necessary to resort to statically sampling techniques in order to cut down the manual hours involved in talking complete counts, First the fluctuation of traffic volume during the hours of day and the daily

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variations are observed. Then by selecting typical short count period, the traffic volume study is made by manual counting. Then by statistical analysis the peak hourly traffic volumes as well as the average daily traffic volumes are calculated.

There are two methods of manual counting:

1) ***Direct Method****:* Data is counted by using hand tally and manual counters/enumerators.

• **Advantages**: By this method traffic volume as well as vehicle classification and turning proportions can be obtained. Data can be used immediately after collection.

• **Disadvantages**: This method is not practicable for long duration count and when flow is high. Error is common especially when volume is high. Count cannot be cross checked. Count cannot be done in bad weather.

2) ***Indirect Method****:* In this method, data is collected using video camera. Video is captured for long time and data is collected later by rewinding.

• **Advantages**: Besides traffic volume, several traffic parameters can be obtained from recorded film. Data can be cross checked and quality can be ensured. This method is applicable when volume is high. It is suitable for non-lane-based traffic operation.

• **Disadvantages**: A suitable elevated place is required for filming operation. Data cannot be used immediately after collection. Data must be manually transcript of recorded film. These 8 processes are time consuming and tedious. Because of limitation of capacity of film, it is not suitable for long duration counts. Quality of video recorded on film is dependent on intensity of light and this method is not suitable in overcast days.

IV. RESULTS

I. Manual counting at Goel- ganga chowk

Time	Date	Two-wheeler	Three-wheeler	Four-wheeler	Truck/Bus
8.30 am To 10.30 am And 5.30 pm To 7.30 pm	4/11/19	23132	1390	5130	912
	5/11/19	22380	1498	5041	847
	6/11/19	22342	1363	5178	966
	7/11/19	23162	1365	5090	918
	8/11/19	23367	1306	4752	920
	9/11/19	22268	1410	5446	943
	10/11/19	22334	1440	5392	1012

Table No. 1 Manual Count Data at Goel Ganga Chowk

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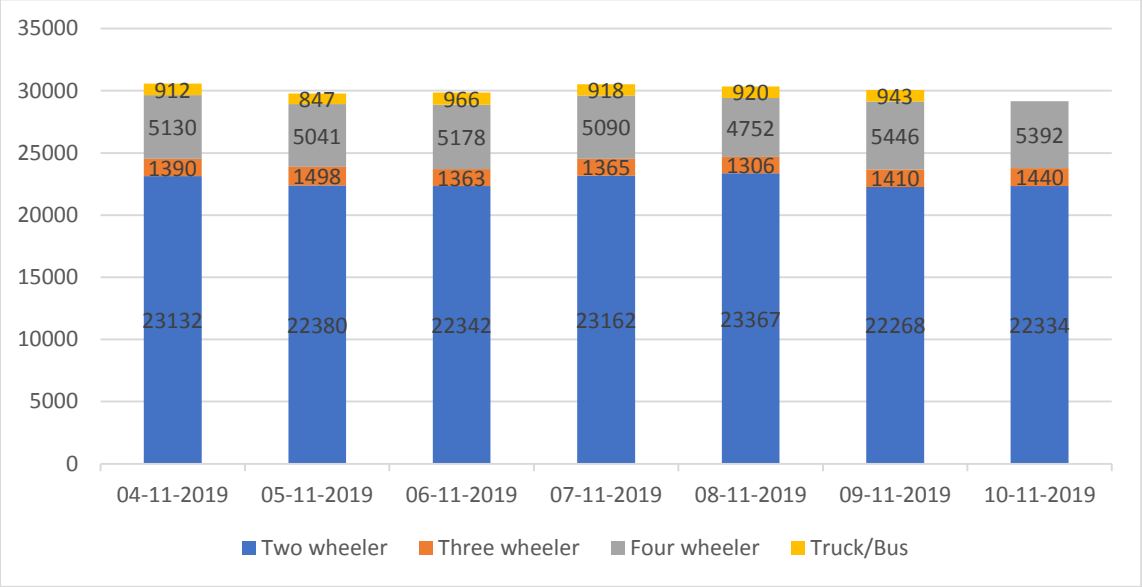

Graph No. 1 Manual Count Data at Goel Ganga Chowk

II. Manual counting at Wadgaon bridge

Time	Date	Two-wheeler	Three-wheeler	Four-wheeler	Truck/Bus
8.30 am To 10.30 am And 5.30 pm To 7.30 pm	24/2/20	25171	2033	6501	1449
	25/2/20	23308	2104	6250	1176
	26/2/20	23044	2150	6180	1183
	27/2/20	23456	1878	5036	1012
	28/2/20	23876	1877	5474	960
	29/2/20	20431	1667	5729	995
	1/3/20	22896	1536	5605	916

Table No. 2 Manual Count Data at Wadgaon Bridge

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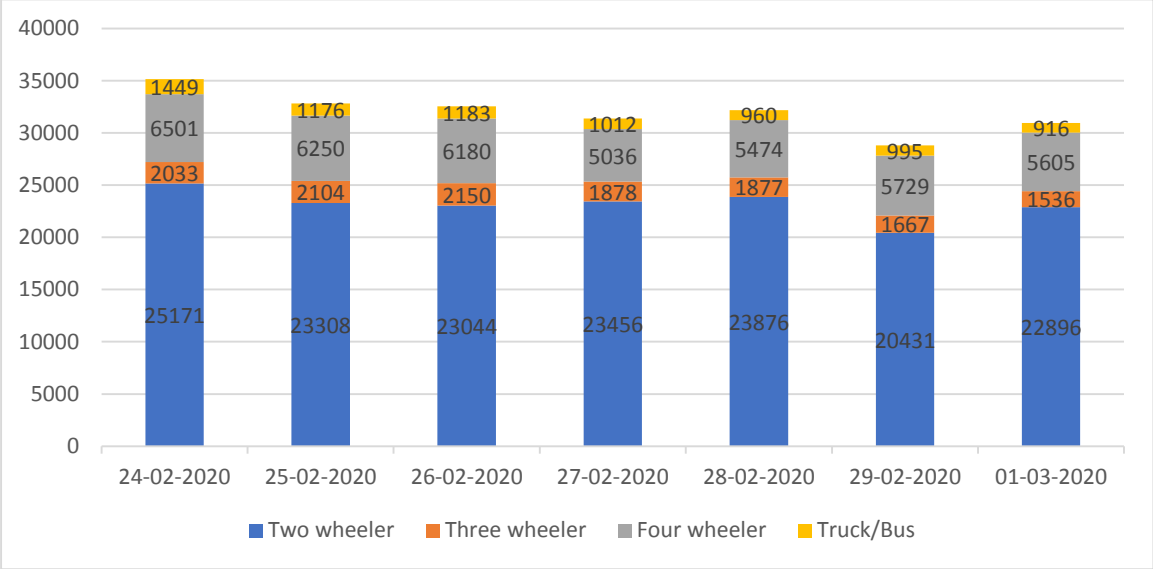

Graph No. 2 Manual Count Data at Wadgaon Bridge

A. PCU calculations for Goel Ganga Chowk data

Sr. No	Day and Time	PCU/2-Hr
1	Monday Morning 8:30-10:30	10037
2	Monday Evening 5:30-7:30	10784
3	Tuesday Morning 8:30-10:30	8338
4	Tuesday Evening 5:30-7:30	10625
5	Wednesday Morning 8:30-10:30	10177
6	Wednesday Evening 5:30-7:30	10433
7	Thursday Morning 8:30-10:30	9938
8	Thursday Evening 5:30-7:30	10852
9	Friday Morning 8:30-10:30	9717
10	Friday Evening 5:30-7:30	10784
11	Saturday Morning 8:30-10:30	9621
12	Saturday Evening 5:30-7:30	11198
13	Sunday Morning 8:30-10:30	9431
14	Sunday Evening 5:30-7:30	11573

B. PCU calculations for Wadgaon bridge data

Sr. No	Day and Time	PCU/2-Hr
1	Monday Morning 8:30-10:30	12524
2	Monday Evening 5:30-7:30	12943
3	Tuesday Morning 8:30-10:30	11500
4	Tuesday Evening 5:30-7:30	12007
5	Wednesday Morning 8:30-10:30	10640
6	Wednesday Evening 5:30-7:30	12078

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7	Thursday Morning 8:30-10:30	10203
8	Thursday Evening 5:30-7:30	11476
9	Friday Morning 8:30-10:30	10869
10	Friday Evening 5:30-7:30	11300
11	Saturday Morning 8:30-10:30	10102
12	Saturday Evening 5:30-7:30	11551
13	Sunday Morning 8:30-10:30	9490
14	Sunday Evening 5:30-7:30	11847

C. Average Daily Traffic

At Goel Ganga Chowk, ADT = No. of vehicles through a week/ 7
= 30329.14

At Wadgaon bridge, ADT =No. of vehicles through a week/7
= 32314

D. Annual Average Working Day Traffic

At Goel Ganga Chowk, AAWT = No. of vehicles in a working day/ 5
= 30211.8

At Wadgaon bridge, AAWT = No. of vehicles in a working day/ 5
= 32824

E. Annual Average Weekend Day Traffic

At Goel Ganga Chowk AAWT =No. of vehicles in a weekend days/ 2
= 30623

At Wadgaon bridge, AAWT = No. of vehicles in a weekend days/2
= 31038

F. PCU/Lane/hr.

At Goel Ganga Chowk =964.41/hr

At Wadgaon bridge, AAWT =1078/hr

V. CONCLUSION

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From the results it is concluded that the traffic intensity is more and this being the one of the prime junctions on Sinhgad Road so it is essential to give any remedial solutions to this problem to reduce the traffic flow at Wadgaon Bridge and Navale Bridge.

- Level of Service is "C" (from Flow curve & LOS for Segment).
- Average Daily Traffic is 30,330 and 32,314 No. of Vehicles at Goel Ganga & Wadgaon Bridge Resp.
- Dependency on Public transports should be increase, this will make decrease in number of personal vehicles.
- Non-Motorized Transport should be implemented on Road from Wadgaon Bridge to Brahma Hotel to Increase LOS (Level of Service)
- Use of smart traffic control and signalling systems by use of traffic volume sensor
- Road widening can be done where there is enough space available

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