TRAFFIC SURVEYING

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Abstract:
The safe and time efficient movement of the people and goods is dependent on Traffic flow, which is directly connected to the traffic characteristics. The three main parameters of a traffic flow are volume, speed and density. In the absence of effective planning and traffic management of the city, the current road infrastructure cannot cater the future needs of the city. Pedestrian and vehicle volumes have increased significantly in the last decade due to the change of the economics of the middle-class families. Traffic flow is studied by manual methods. For better understanding of the present status of traffic flow at the junction, traffic survey is conducted. With the help of the data collection, an attempt had been made to understand the traffic patterns during different time periods. Traffic control at that junction is also dependent on the traffic flow characteristics. Hence the results from the present study are helpful in controlling the traffic at the intersection and also in suggesting some of the remedial measures to improve the traffic safety in the region. Traffic Engineering therefore deals with the applications of scientific principles, tools, techniques and findings for safe, rapid, convenient and economic movement of people and goods.

I.INTRODUCTION

Traffic engineering is that branch of engineering which deals with the improvement of traffic performance of road networks and terminals. This is achieved by systematic traffic studies, scientific analysis and engineering applications. The method includes planning and geometric design on one hand and includes planning and control on the other. The road traffic is composed of various categories of vehicular traffic and the pedestrian traffic. Each category of vehicular traffic has two components, the human element as the driver and his machines as vehicles. Traffic engineering has also to be recognized and governed by social and physical sciences. The profession of traffic engineering as known today has evolved with the advent of motor vehicle. During the last few decades significant advances have been made in many phases of the profession. Advanced study and training facilities have been made available at several universities and institution notably in the U.S.A. Traffic engineering has now been recognized as an essential tool in the improvement of traffic operations in metropolitan cities like Mumbai, Delhi, Kolkata and Madras.

II.DEFINITION

Institution of Traffic Engineers, U.S.A. defines, "Traffic engineering is that phase of engineering which deals with planning and geometric design of streets, highways, abutting lands, and with traffic operations thereon, as their use is related to the safe, convenient and economic transportation of persons and goods''.

Professor Ress Blunden of California University has proposed a modified 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 persons and goods".

III.SCOPE OF TRAFFIC ENGINEERING

The basic object of traffic engineering is to achieve efficient free and rapid flow of traffic, with least number of traffic accidents. Factual studies of traffic operations provide the foundation for developing methods for improvement in general and for solving specific problems.

The study of traffic engineering may be divided into seven major sections, which are:

i. Traffic characteristics
ii. Traffic studies and analysis
iii. Traffic operation-control and regulation
iv. Planning and analysis
v. Geometric design

Study of traffic characteristics is the most essential prerequisite for any improvement of traffic facilities. The traffic characteristics are quite complex with the various types of road users in the roads moving with different motives. The human psychology is to be given particular attention. The study of vehicular characteristics is an essential part. Apart from these the various studies to be carried out on the actual traffic include speed, volume, capacity, travel, patterns, origin and destination, traffic flow characteristics; parking and accidents studies.

Various aspects that are covered under traffic operations are regulations, control and the warrants for application of controls. Regulations may be in the form of laws and limit etc. Installation of traffic control devices like signs, signals and islands are most common means to regulate and control the traffic. Actual adoption of traffic management measures, such as traffic regulations and control need adequate attention.

Traffic planning is a separate phase for major highways like express-ways, arterial roads, mass transit facilities, and parking facilities. All the aspects such as cross section and surface details, sight distance requirement, horizontal and vertical alignment, monocurve areas and intersections and parking facilities are to be suitably designed for better performance.

IV. TRAFFIC CHARACTERISTICS

Road user characteristics:

The human element is involved an all actions of the road users either as pedestrian, cyclist, cart driver or motorist. The physical, mental characteristics of human beings affect their ability to operate motor vehicle safety or to service as a pedestrian. Hence it is important to the traffic engineer to study the characteristics and limitations of the road users.

The various factors which affect road user characteristics may broadly classified under four heads:

i. Physical
ii. Mental
iii. Psychological and
iv. Environmental

V. LITERATURE REVIEW

1. **Golias (2003)** examined the influence of taxi behavior on urban traffic conditions. Using computer simulation and the Taxi Equivalence Factor (TEF), a concept similar to the passenger car equivalents for heavy vehicles, the impacts of taxi traffic on the capacity, and delays at urban road sections is quantified. The taxi equivalence factor is based either on capacity or on delay. Simulated and field data were used to derive TEF and sensitivity analysis is carried out in relation to a variety of traffic parameters. The findings suggest that the most important factor influencing the TEF related to traffic conditions is the number of traffic lanes. In particular, increase in vehicle travel time increases for one lane roadways in the presence of taxis may exceed those corresponding for two lane road by up to about 40%. An increase in the v/c ratio from 0.8 to 1.0 causes increases in the delay-based TEF values that may reach up to about 90%. The TEF decreases again, indicating that as the system becomes saturated, the effect of taxis on traffic decreases

2. **Lum K.M, Fan H.S.L, Lam (1998)** observed traffic volume and travel time data at a number of arterial roads in Singapore to analyse the speed-flow relationships for radial and ring arterial roads. The general speed-flow model incorporating "minimum delay perintersection" and "frequency of intersections per kilometer", as model parameters, reflects better speed-flow characteristics of traffic on arterial roads.

3. **Maitra (1999)** proposed 10 levels of services with 9 in a stable flow zone (conventional LOS A to E region) and one representing the unstable flow (presently LOS F), as a means of quantifying congestion on urban roads. They estimated capacity values of study locations on urban roads as 3,500 and 4,500 PCU per hour for road widths of 7.0 and 10.3 m respectively in one direction.

4. **Marwah and Bhuvanesh (2000)** suggested level of service classification for urban heterogeneous traffic. They considered journey speed of cars, journey speed of motorised two wheelers, concentration, and road occupancy to define LOS.

5. **Parker (1996)** observed that knowledge of traffic composition plays an important role in determining capacity. It was found that the percentage of heavy goods vehicles (HGVs) within traffic stream has a major effect on capacity due to length, limited maneuverability, lower desired speed and engine power to weight ratio. As the presence of HGV's in the traffic stream increases, the capacity reduces in term of throughout of vehicle per hour

6. **Ramanayya (1988)** developed a computer simulation model relating average speeds of the traffic stream, the traffic volume and composition of traffic stream. The model could recognize eight different categories of vehicles in the stream and it could be run for any combination of slow and fast moving vehicles. Traffic

stream models, relating speed of vehicle type with flow and percentage of slow moving vehicles, were developed for each vehicle type. The models, so derived are given in the following equations.

7. **Satyanarayana (2012)** studied the effect of traffic volume, its composition and stream speed on passenger car equivalents . Method proposed by Chandra is used for developing the PCU factors and found that For two axle trucks PCU values are found to increase with an increase in compositional share of respective vehicle types in the traffic stream. The PCU of two wheelers practically remains unaffected by its compositional share in the traffic stream. Compositional share of 2W at different locations were observed in the range of 31.69% to 34.23% whereas increase in PCU values are 1.1% only and it may be attributed due to high maneuverability. In 25 slow moving traffic PCU values of bullock carts are increasing with the decreasing in the compositional share in the stream.

8. **Tanaboriboon and Aryal (1990)** studied the effect of vehicle size on capacity of multilane highway in Thailand. All vehicles moving on the road were classified in to three major categories; small, medium and large. Headway was observed for different combinations of leading and trailing vehicles and the basic capacity was determined by considering the reciprocal of the average minimum time headway adopted by small vehicle. Medium sized vehicles were not found to have affected the lane capacity in any way, but the presence of large vehicle, had an adverse impact on the traffic stream. The average headway was found to have increased with an increase in the percentage of large vehicles in stream. This in turn, led to reduction in capacity of the traffic lane.

VI.TRAFFIC VOLUME STUDIES

Traffic volume is the number of vehicles crossing a section of road per unit at any selected period. Traffic volume is used as a quantity measure of flow; the commonly used units are vehicles per day and vehicles per hour. A complete traffic study may include the classified volume study by recordingthe volume of various types and classes of traffic, the distribution by direction and turning movements and the distribution of different lanes per unit time. The objects and uses of traffic volume studies are given below:

a. Traffic volume is generally accepted as a true measure of the relative importance of roads and in deciding the priority for improvement and expansion.
b. Traffic volume study is used in planning, traffic operations and control of existing facilities and also for planning and designing the new facilities.
c. This study is used in the analysis of the traffic patterns and trends.
d. Classified volume study is useful in structural design of pavements, in geometric design and in computing roadway capacity.
e. Volume distribution study is used in planning one way streets and other regulatory measures.
f. Turning movement study is used in the design of intersections, in planning signals timings, channelization and other control devices.
g. Pedestrian traffic volume study is used for planning sidewalks, cross walks, subways and pedestrian signals.

There are variations in traffic flow from time to time. Hourly traffic volume varies considerably during the peak hourly volume may be much higher than average week and there are variations with season. Hence if a true picture is to be obtained, the hourly traffic volume should be known along with the patterns of hourly, daily and seasonal variations. In classified traffic volume study, the traffic is truck, passenger cars, cycles, and pedestrian is found separately. The direction of each class of traffic flow is also noted. At intersections the traffic flow in each direction of flow including turning movements are recorded.

Counting of traffic volume

Traffic volume counts may be done by mechanical counters or manually.

Mechanical counters

These may be either fixed type or portable type. The mechanical counter can automatically record the total number of vehicles crossing a section of the road in a desired period. The working may be by the effect of impulses or stimuli caused by traffic movements on a pneumatic hose placed across the roadway or by using any other type of sensor. Traffic count is recorded by electrically operated counters and recorders capable of recording the impulses. The impulses caused by vehicles of light weight may not be enough in some cases to actuate the counter. Also, it is not possible to easily record pedestrian traffic by this method. Other methods of working the mechanical detector are by photo electric cells, magnetic detector and radar detections. The main advantage of mechanical counter is that it can work throughout the day and night for the desired period. Recording the total hourly volume, this may not be practical in manual counting. The main drawbacks of the mechanical counter are that it is not possible to get the traffic volumes of various classes of traffic in the stream and the details of turning movement.

Manual counts

This method employs a field to record team to record traffic volume on the prescribed record sheets. By this method it is

possible to obtain data which cannot be collected by mechanical counts were the loading conditions or numbers of occupants are required. However, it is possible to have manual count for all the 24 hours of the day and on all days round the techniques in order to cut down the manual hours involved in taking complete counts. First the fluctuationsof traffic are observed. Then by selecting typical short count periods, 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. This is very commonly adopted due to the specific advantages over other methods

Presentation of traffic volume data

The data collected during the traffic volume studies are sorted out and are presented inany of the following forms depending upon the requirements.

a. Annual average daily traffic of the total traffic as well as classified traffic is calculated. This helps in deciding the relative importance of a route and in the different classes to one class such as passenger car, different vehicle classes to one class such that passenger are used
b. Trend charts showing volume trends over period of years are prepared. These data are useful for planning future expansion, design and regulation.
c. Variation charts showing hourly, daily and seasonal variations are also prepared. These help in deciding facilities and regulation needed during peak traffic periods
d. Traffic flow maps along the routes are drawn. These help to find the traffic volume distribution at glance.
e. Volume flow diagrams at intersections either drawn to a certain scale or indicating traffic volume are prepared, thus showing the details of crossing and turning traffic. These data are needed for intersection design.

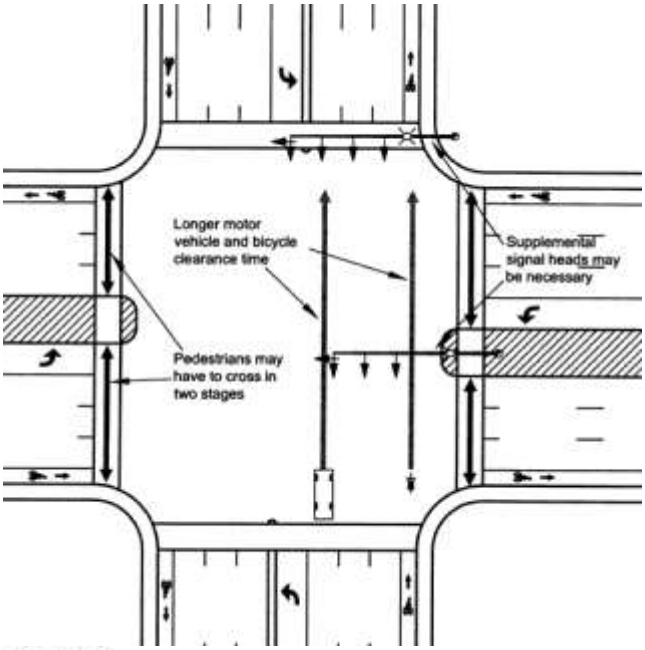

Fig. Traffic flow at intersection

f. Thirteen highest hourly volume of the design hourly volume is found from the plot between hourly volume and the number of hours in a year that the traffic volume is exceeded. The 30th highest hourly volume is the hourly volume that will be exceeded only 29 times in a year and all other hourly volumes of the year will be less than this value. The highest or peak hourly volume of the year will be too high that it will not be economical to design the facilities according to this volume. The annual average hourly volume found from AADT will not be sufficient during considerable period of a year. The high facilities designed with capacity for 30th highest hourly traffic volume is the assumed year is found to be satisfactory from both facility and economic considerations. This is because the cost will be less when compared to the peak hourly volume and hence reasonable. There will be congestion only during 29 hours in the year. Thus, the thirtieth highest hourly volume is generally taken as the hourly volume for design.

Hourly traffic volumes

At Vashind (Khativli Naka):-

MORNING (11am TO 12pm)

VEHICLE	LEFT SIDE	RIGHT SIDE	TOTAL
BUS & TRUCK	01	03	04
AUTO-RIKSHAW	102	135	237
BIKE(TWO-WHEELER)	232	304	536
CAR(FOUR-WHEELER)	28	83	111
OTHER VEHICLES	00	00	02

CYCLES TRACTOR	01	01	
TOTAL	364	526	890

AFTERNOON (2pm TO 3pm)

VEHICLE	LEFT SIDE	RIGHT SIDE	TOTAL
BUS & TRUCK	01	01	02
AUTO-RIKSHAW	55	87	142
BIKE(TWO-WHEELER)	205	260	465
CAR(FOUR-WHEELER)	14	29	43
OTHER VEHICLES CYCLES TRACTOR	02 01	00 00	03
TOTAL	278	377	655

EVENING (6pm TO 7pm)

VEHICLE	LEFT SIDE	RIGHT SIDE	TOTAL
BUS & TRUCK	01	02	03
AUTO-RIKSHAW	72	102	174
BIKE(TWO-WHEELER)	222	295	517
CAR(FOUR-WHEELER)	27	38	65
OTHER VEHICLES CYCLES TRACTOR	02 00	01 01	04
TOTAL	324	439	763

VII.SPEED STUDIES

Speed studies

The actual speed of the vehicles over a particular route may fluctuate widely depending upon several factors such as geometric features, traffic conditions, time, place, environment and driver. Travel time is the reciprocal of speed and is a simple measure of how well a road network is operating.

Spot speed is the instantaneous speed of a vehicle at a specific section or location. Average speed is the average of the spot speeds of all vehicles passing a given point on the highway.

There are two definitions for the average of a series of spot speed measurements which are; space-mean speed and time-mean speed. Space-mean speed represents the average speed of vehicles in a certain road length at any time. This is obtained from the observed travel time of the vehicles over a relatively long stretch of the road. Space-mean speed is calculated from:

$$Vs.=3.6\ d1n$$

$$\sum t1 \quad (t=1)$$

Where,

Vs. = space-mean speed, km/h

d- length of the road, considered, m

n - Number of individual vehicle observation

t1 – observed travel time (sec) for its vehicle to travel

Distance d in meter

The average travel time of all the vehicles is obtained from the reciprocal of space-mean speed. Time-mean speed represents the speed distribution of vehicles at a point on the roadway and it is the average of instantaneous speeds of observed vehicles at the spot.

The space-mean speed is slightly lower than the time-mean speed under typical speed conditions on rural highways. Running speed is the average speed maintained by a vehicle over a particular stretch of a road, while the vehicles is in motion; this is obtained by dividing the distance covered by the time during which the vehicle is actually in motion.

Overall speed or travel speed is the effective speed with which a vehicle traversed a particular route between two terminals this is obtained by dividing the total distance travelled by the total time taken including all delays and stoppage enroot.

Speed studies carried out occasionally give the general trend in speeds. There are two types of speed studies carried out, namely (i) spot speed study, and (ii) speed and delay study.

Spot speed study

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

a. To use in planning traffic control and in traffic regulations.
b. To use in geometric design for redesigning existing highways or for deciding design speed for new facilities.
c. To use in accident studies
d. To study the traffic capacity
e. To decide the speed trends
f. To compare diverse types of drivers and vehicles under specified conditions.

The spot speeds are affected by physical features of the road like pavements width, curve, sight distance, and gradient. Pavement unevenness intersections and road side development. Other factors affecting spot speeds are environmental conditions, enforcement, traffic conditions, driver, vehicle and motive of travel.

There are a number of methods to measure spot speed. The spot speed may be obtained either by finding the running speeds of vehicles over a short distance of less than 50 m or by finding the instantaneous speed while crossing a section, depending upon method used. The spot speeds of a few typical samples of vehicles are found during the sampling periods of the day, days of the week and months of the year.

One of the simplest methods of finding spot speed is by using enoscope which is just a mirror box supported on a tripod stand. In its simplest principle, the observer is stationed on one side of the road and starts a stopwatch when a vehicle crosses that section. An enoscope is placed at a convenient distance of say 30 m. in such a way that the image of the vehicle is seen by the observer when the vehicle crosses the section where the enoscope is fixed.

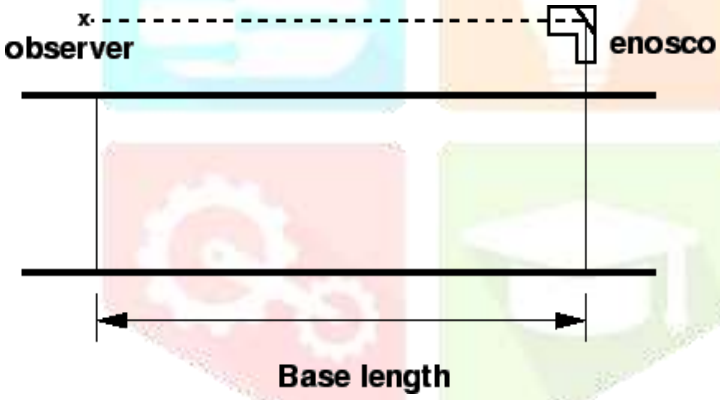

FIG.SPOT SPEED BY ENOSCOPE

Other equipment used for spot speed measurements are graphic recorder, electronic meter, photo electric meter, radar, speed meter and by photographic methods. Of all these methods, the radar speed meter method seems to be the most efficient one as it is capable of measuring the spot speeds.

Speed calculations At a Distance Of 50m in (km/hr)

Speed Calculations Derived by The Given Formula :

VELOCITY = DISTANCE/TIME (in m/sec)

SPEED = VELOCITY × 3.6 (in km/hr)

VIII.ORIGIN AND DESTINATION STUDIES

Origin and destination studies

The origin and destination study is carried out mainly to (i) plan the road network and other facilities for vehicular traffic and (ii) plan the schedule of different modes of transportation for the trip demand of commuters.

The O AND D studies of vehicular traffic determine their number, their origin and destination in each zone under study. The data may also be supplemented by the number of passengers in each vehicles, purpose of each trip, intermediate stops made and reasons etc. origin and destination studies gives information like the actual direction of travel, selection of routes and length of the trip. These studies are most essential in planning new highways facilities and in improving some of the existing systems. As an example there can be a high percentage of through traffic which may be diverted by providing a bypass and thus considerable saving in distance and time can be made. O and D study provides the basic data for determining the desired directions of flow or the desire lines. This is considered to be one of the important traffic studies needed to solve many traffic problems in a zone and the most important study to plan the highway system in a region.

Scientific planning of transportation system and mass transit facilities in cities should be bases on O and D data of passenger trips. Also future traffic needs may be estimated by extrapolating data from O and D study, together with socio economic studies.

The various applications of O and D studies may be summed up as follows:

a. To judge the adequacy of existing routes and to use in planning new network of roads.
b. To plan transportation system and mass transit facilities in cities including routes and schedules of operation.
c. To locate express ways or major routes along the desire lines.
d. To establish preferential routes for various categories of vehicles including bypass.
e. To locate terminals and to plan terminal facilities.
f. To locate new bridges as per traffic demand.
g. To locate intermediate stops of public transport.
h. To establish design standards for the road, bridges, and culverts along the routes.

There are number of methods for collecting the O and D data. Some of the methods commonly adopted are:

a. Road side interview methods, license plate method.
b. Return postcard method, tag on car method and
c. Home interview method

License plate method

The entire area under study is cordoned out and the observers are simultaneously stationed at all points of entry and exit on all the routes leading to and out of the area. Each party at the observation station is given synchronized time pieces and they note the license plate numbers of the vehicle entering and leaving the cordoned area and the time. Separate recording sheets are maintained for each direction of movement for a specified time interval. After collecting the field data major wok remains of the office computations and analysis, by tracking each vehicle number and its time of entering and leaving the cordoned area.

This method is quite easy and quick as far as the fieldwork is concerned. The field organization can also be trained quickly. The method however involves a lot of office computations in tracing the trips through a network of stations. Unless there is a large network of station to take observation along the route of the vehicle, it is not easy to get the information of the routes followed by the vehicle.

Hence a large number of teams are required to take simultaneously observation when alarge area is to be surveyed. However, this method is quite advantageous when the area under consideration is small, like a large intersection or a small business centre.

Return post card method

Prepaid business reply post cards with return address are distributed to the road users at some selected points along the route or the cards are mailed to the owners of the vehicles. The questionnaire to be filled in by the road user is printed on the card, along with a request for cooperation and purpose of the study. The distributing station for the cards may be selected where vehicles have to stop as in case of a toll both.

The method is suitable where the traffic is heavy. The personnel need not be skilled or trained just for distributing the cards. Only a part of road users may return the card promptly after filling in the desired details properly and correctly. If conclusion is drawn in such a cases, it is likely that these may not give a true picture.

Tag on car method

In this method pre-coded card is stuck on the vehicle as it enters the area under study. When the car leaves the cordoned area the other observation are recorded on the tag. This method is useful where the traffic is heavy and moves continuously. But the method gives only information regarding points of entry and exit and the time taken to traverse the area.

Home interview method

A random sample of 0.5 to 10 percent of the population is selected and the residences are visited by the trained personnel who collect the travel data from each member of the house hold. Detailed information regarding the trips made by the members is obtained on the spot. The data collected may be useful either for planning the road network and other roadway facilities for the vehicular traffic or for planning the mass transportation requirements of the passengers. The problem of stopping vehicle and consequent difficulties are avoided together. The present travel needs are clearly known and the analysis is also simple. Additional data including socio-economic and other details may be collected so as to be useful for forecasting traffic and transportation growth.

Work spot interview method

The transportation needs work trips can be planned by collecting O & D data at work spots like the offices, factories, educational institutions, etc. by personnel interviews.

Presentation of O & D data

The data are presents in the following forms:

1. Origin and destination tables are prepared showing number of trips between different zones.
2. Desire lines are plotted which a graphical representation is prepared in almost all O & D surveys.
3. The relative magnitude of the generated traffic and geometrical relationships of the zones involved may be represented by pie charts, in which circles are drawn, the diameter being proportional to the number of trips.
4. Contour lines may be plotted similar to topographic contours. The shape of the contours would indicate the general traffic need of the area.

Traffic flow characteristics and studies

Traffic stream generally has flow and counter flow along a common route, unless the stream is separated into pair of one way flows by proper design or regulation.

The basic traffic man overs the diverting, merging and crossing. Of all these, diverting on the left is the easiest movement causing least problem of the traffic conflicts. This is because the traffic is regulated on the left side. Merging from the left side also does not cause much of conflict. But diverging to the right and merging from the right create conflicts and hazard to the traffic moving in the straight path. Transfer of a vehicle from one traffic lane to the next adjacent traffic lane is called lane change and this involves diverging and merging.

IX.TRAFFIC CAPACITY STUDIES

Before studying details of traffic capacity, it may be worthwhile to define some of the related terms which are often used.

Traffic volume is the number of vehicles moving in a specified direction on a given lane or roadway that pass a given point or cross section during specified unit of time. Traffic volume is expressed as vehicles per hour or vehicles per day.

Traffic density is the number of vehicles occupying a unit length of lane or roadway at a given instant, usually expressed as vehicles per kilometer. Traffic volume is the product of traffic density and traffic speed.

The highest traffic density will occur when the vehicles are practically at a standstill on a given route, and in this case traffic volume will approach zero.

Traffic capacity is the ability of the roadway to accommodate traffic volume. It is expressed as the maximum number of vehicles in a lane or a road that can pass a given point in unit time, usually an hour, i.e., vehicles per hour per lane or roadway. Capacity and volume are measured of traffic flow and have same units. Volume represents an actual rate of flow and responds to variation in traffic demand, while capacity indicates a capability or maximum rate of flow with a certain level of service characteristics that can be carried by a roadway. The capacity of roadway depends on a number of prevailing roadway and traffic conditions.

Basic capacity is the maximum number of passenger cars that can pass a given point on a lane or roadway during one hour under the most nearly ideal roadway and traffic conditions which can possibly be attained. Two roads having the same physical features will have the same basic capacity irrespective of traffic conditions, as they are assumed to be ideal. Thus basic capacity is the theoretical capacity.

Possible capacity is the maximum number of vehicles that can pass a given point on a lane or roadway during one hour under prevailing roadway and traffic conditions. The possible capacity of a road is generally much lower than the basic capacity as the prevailing roadway and traffic conditions are seldom ideal. In a worst case when the prevailing traffic conditions is so bad due to traffic conditions, the traffic may come to standstill, the possible capacity of the road may approach zero.

When the prevailing roadway in traffic conditions approach the ideal conditions, the possible capacity would also approach the basic capacity. Thus the value of possible capacity varies from zero to basic capacity. For the purpose of design, neither basic capacity nor possible capacity can be adopted as they represent two extreme cases of roadway and traffic conditions.

Practical capacity is a maximum number of vehicle that can pass a given point on a lane or roadway during one hour, without traffic density being so great as to cause unreasonable delay, hazardous restrictions to the driver's freedom to manoeuvre under the prevailing roadway and traffic conditions. It is the practical capacity which is of primary interest to the designers who strive to provide adequate highway facilities and hence this is also called design capacity.

Determination of theoretical maximum capacity

An estimate of theoretical maximum or basic capacity of a single lane single lane may be made from the relation:

$$C = \frac{1000\ V}{S}$$

Here, C = capacity of a single lane, vehicle per hour

V = speed, km/h

S = average center to center spacing of vehicles, when they follow

one behind the other as a space or headway, m

Thus the capacity depends upon the speed V and spacing S. the average spacing S between center to center of vehicles is equal to the average length of vehicle plus the rear spacing between the vehicles in the stream. The minimum clear spacing between vehicles is allowed for safe stopping of the rear vehicle in case the vehicle ahead suddenly stops. It is always found that drivers follow the vehicle ahead at a closer gap at a lower speeds and the clear spacing is increased instinctively at higher speeds of traffic stream.

Thus the space gap allowed by the driver of the followed vehicle depends on several factors such as:

a. Speed of the leading and following vehicles.
b. Type and characteristics of two vehicles.
c. Driver characteristics of the following vehicle.
d. Traffic volume to capacity ratio of the road section at the instinct or the level of service.
e. The proportion of vehicle classes in the stream.
f. Road geometrics and
g. Environmental factors.

The assumptions that space gap increases in direct proportion with the speed of vehicle or that of the traffic stream is therefore a very much simplified one and gives only an approximate average value of the space gap between vehicles in the traffic stream. The space gap allowed by the following vehicle in a traffic stream is some time assumed to be equal to the distance travelled during the reaction time of driver, assuming that the braking distances of the lead and the following vehicles are approximately equal.

X.PARKING STUDIES

The demand by automobile users of parking spaces is one of the major problems of highway transportation, especially in metropolitan cities. In industrial, commercial & residential places with multistoried buildings, parking demand is particularly high. Parking studies are useful to evaluate the facilities available.

Various aspects to be investigated during parking studies are:

i. **Parking demands:** The parking demand may be evaluated by different methods. One of the methods is by making cordon counts of the selected area recording accumulation of vehicles during the peak hours by subtracting the outgoing traffic from the traffic volume entering the cordoned area.

One other method is by counting the number of vehicles parked in the area under study during different periods of the day; this method is useful when the parking demand is less than the space available for parking. By noting the registration number of each parked vehicle at any desired time interval (such as 30 min, 1 hour, etc.) it is possible to estimate the duration of parking of each vehicle at the parking area. Another useful method of field study is by interviewing the drivers of parked vehicles, shop owners & other vehicle owners in the locality. This method is very useful when the parking demand in the study is higher than the parking space available.

ii. **Parking characteristics**: The study is directed to note the present parking practices prevalent in the area under consideration & the general problems in parking. In case of kerb parking, it is also necessary to study the parking pattern, interference to smooth, flow of traffic & the accidents involved during parking unparking operations.

iii. **Parking Space Inventory**: The area under study is fully surveyed& a map is prepared showing all places where kerb parking & off-street parking facilities can be provided to meet the parking demands. The traffic engineer has to strike a balance between capacity & parking demands & to design proper facilities for parking.

XI.CONCLUSION

We have studied the traffic volume for a period of 0ne week there were certain difficulties we have faced like pedestrian crossing, highspeed , improper turnout and traffic rules which is most fatal.

As our project is about analyzing and improving traffic system, we have proposed certain things which are as follows:

- Road condition must be improved drastically.
- Signaling system (emergency) must be applied.
- The margine of the road side must be properly planned.
- Drainage system should be evolved.
- Emergency traffic police service should be applied at turning point during peak hour.
- Continuous improvement of road should be done.
- In each year in rainy season complete study of traffic should be done at least once in a year.

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