A TRAFFIC VOLUME STUDY BETWEEN SHYAMOLI BUS STAND TO TECHNICAL INTERSECTION POINT

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A thesis submitted to the Department of Civil Engineering in partial fulfillment for the degree of Bachelor of Science in Civil Engineering

Department of Civil Engineering

Sonargaon University

147/1, Green Road, Dhaka-1215, Bangladesh

Section: (17B+16D)

Semester: Fall 2022

A Traffic Volume Study between Shyamoli Bus Stand to Technical Intersection Point

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DECLARATION

It is hereby declare that, the works presented in this project and thesis has been carried out by us and has not previously been submitted to any other University/Collage/Organization for any academic qualification/Certificate degree.

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Dedicated

To

"Our Parents"

ACKNOWLEDGEMENTS

First of all, we would like to show our highest gratitude to the almighty God for his kindness on us that make it possible for us to complete this study and preparation of the project and thesis.

We would like to express our sincere gratitude to our thesis Supervisor **Tinvi Islam Tisha**, Lecturer, Department of Civil Engineering, Sonargaon University (SU) for her continuous help and guidance in the accomplishment of this work. We are really appreciating her unrestricted personal guidance throughout this study, for beginning out the best of our ability. Her kind supervision, encouragement, assistance and valuable suggestion at all stages of the work made it possible to complete this work.

The research work on "Traffic Volume Study" between Shyamoli Bus Stand to Technical Intersection Point in Dhaka City. It has been conducted in partial fulfillment of the requirements for the degree of Bachelor of Science (BSc) in Civil Engineering. The work is possible for unconditional co-operation of many people.

We would also like to express our heartiest thanks to our faculty members of the University for their Co-operation and dedicated teaching for the achievement of the degree of B.Sc. in Civil Engineering. Co-operation and assistance of all the officers and staffs of Sonargaon University (SU) have also been acknowledged.

Finally, we would like to express our heartfelt thanks to our parents and siblings for their unconditional love, support, encouragement and blessings to complete this course.

ABSTRACT

The Knowledge of traffic volume study is an important basic input required for planning, analysis and operation of roadway systems. Traffic engineering uses engineering methods and techniques to achieve the safe and time efficient movement of people and goods on roadways. 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.

The current work studies traffic characteristics in the city of Dhaka at one selected priority junction. In this work emphasis was given on traffic volume and the analysis was carried out through primary traffic flow at (Shyamoli bus stand to Technical Intersection Point) in Dhaka city. Traffic flow is studied by manual methods.

With the help of the data collection, an attempt had been made to understand the traffic patterns during different time periods. We determine Service Flow Rate and Level of Service, Directional Distribution, Peak Hour Factor (PHF) and Estimate ADT and AADT.

TABLE OF CONTENT

LIST OF FIGURE

LIST OF TABLES

LIST OF ABBREVIATIONS

ADT- Average Daily Traffic

AADT- Annual Average Daily Traffic

DEF- Daily Expansion Factor

HEF- Hourly Expansion Factor

MEF- Monthly Expansion Factor

LOS- Level of Service

PHF- Peak Hour Factor

PCE- Passenger Car Equivalent

PCU- Passenger Car Unit

O-D = Origin – Destination Surveys

PHN = Public Highway Network

UHF = Ultra – High Frequencies

WIM = Weight – In – Motion

CHAPTER 1

INTRODUCTION

1.1 General

Transportation is carrying civilization to a brighter future. Now a day's transportation is one of the most burning issues in every territory of the world. Every country is approaching differently according to their needs and solving their transportations problems within their capabilities. In designing buildings, we need to determine loads coming to the structure to calculate reinforcement to be provided for safe functioning of the structure. Here in transportation volume serves the same purpose.

Traffic volume study is defined as the procedure to determine mainly volume of traffic moving on the roads at a particular section during a particular time. It is measured in vehicle per minute, vehicle per hour and vehicle per day. In order to express the traffic flow on a road per unit time, it is necessary to convert the flow of the different vehicle classes into a standard vehicle class known as passenger car unit. The traffic volume is dynamic and varies during 24 hours of the day. Daily traffic volume varies on different days of a week and different months and seasons of the years.

The present study is aimed studying in research, planning, designing and regulation phases of traffic engineering and are also used in established priorities and schedules of traffic improvements. The traffic engineer must acquire general knowledge of traffic volume characteristics in order to measure and understand the magnitude, composition, and time and route distribution of volume for each area under his jurisdiction, Traffic volume and road way conditions.

1.2 General Objectives of traffic volume study

The purposes of carrying out traffic volume count are designing, improving traffic system, planning, management etc.

The present study is undertaken with the following objectives

- To determine of vehicle composition in traffic stream.
- To determine the service flow rate in PCU/PCE unit.
- To estimate of ADT & AADT based on expansion factor.
- To determine Peak Hour Factor.

a) Design purposes

- Structural and geometric design of pavements, bridge, and other highway facilities.
- Intersection design including minimum turning path, channelization, flaring, traffic control devices, traffic signs, markings, signals based on approach volume.
- Pedestrian volume study is useful for designing sidewalks, pedestrian crossing.

b) Improvement purposes

- To allocate limited maintenance budget rationally, it is important to know the traffic volume carried by a particular roadway section in order to decide the importance of the road and fixing its relative priority.
- In order to improve the roadway operating condition, it is important to know the traffic volume.
  - To examine the existing operating/service condition of a roadway section.
  - To check the need (warrant) traffic control devices.
  - To determine the type of improvement measures need to be taken
  - To measure the effectiveness of a traffic control measure.

c) Planning Purposes

- Accurate information on the amount of traffic on the roads is vital for the planning of both road maintenance and improvement policies
- Traffic volume network analysis helps in deciding/planning if there is need for:
  - Improvement
  - Expansion in terms of construction missing links, by-pass, alternative road etc.

d) Dynamic Traffic Management Purposes

- Up to date and continuous flow/congestion information is essential for optimizing:-
- Traffic signal design and thereby improving junction performance
- Network productivity by providing information to the road user

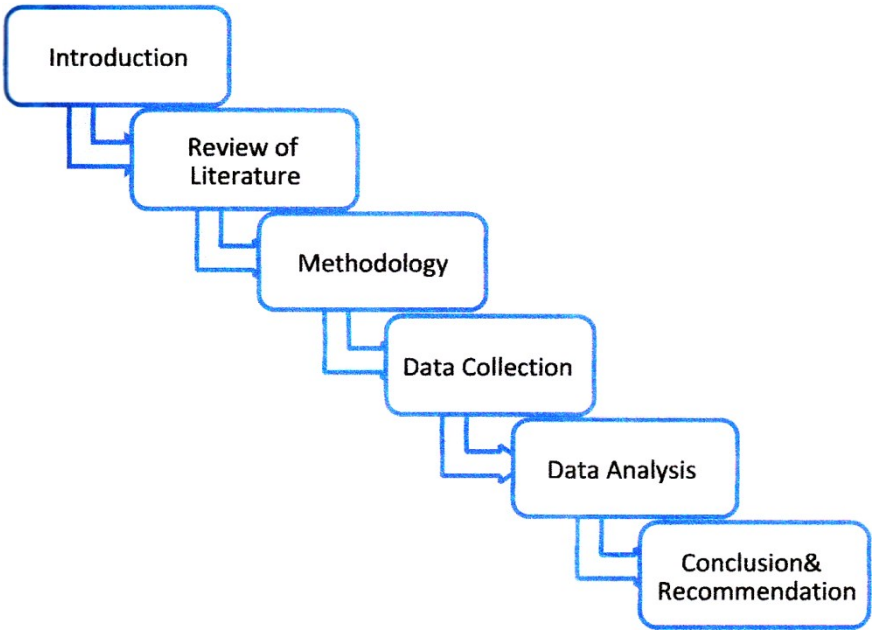
e) Other Purposes

- To establish relative importance of any route or road facility.
- To decide the priority for improvement and expansion of a road and to allot the funds accordingly.
- To plan and design the existing and new facilities of traffic operations.
- To make analysis of traffic pattern and trends on the road.
- To do structural design of pavements and geometrically design of roads by classified traffic volume study.
- To plan one-way street and other regulatory measures by volume distribution study.

1.3 Scope of Traffic Volume Studies

- The study of traffic volume at a particular location is necessary to create the following scopes:
- Magnitudes, classifications and the time and directional split of vehicular flows. Magnitude is represented by volume of traffic. Vehicles are classified into some predefined classes based on vehicle size and capacity. In a two-way road, vehicles moving towards two directions are counted separately to get the proportion. Time and directional split are useful to identify tidal flow.
- Hourly, daily, yearly and seasonal variation of vehicular flows. These variations are needed to establish expansion factors for future use. Using expansion factors, AADT can be calculated from short count.
- Effectiveness of a traffic control measure.
- Proportions of vehicles in traffic stream. Proportion of vehicles indicates whether public or private transport dominates the traffic system. It also indicates the choice of road users.
- To check existing, operating service condition of a roadway section.
- Planning traffic operation and control of existing facility.

1.4 Steps of organizing the report



CHAPTER 2

LITERATURE REVIEW

2.1 General

Traffic volume studies are conducted to determine the number, movements, and classifications of roadway vehicles at a given location. These data can help identify critical flow time periods, determine the influence of large vehicles or pedestrians on vehicular traffic flow, or document traffic volume trends. The traffic engineer must acquire general knowledge of traffic volume characteristics in order to measure and understand the magnitude, composition and time and route distribution of volume for each area under his jurisdiction.

2.2 Traffic Survey

Traffic engineers and planners need information about traffic. They need information to design and manage road and traffic system. They use the information for planning and designing traffic facilities, selecting geometric standards, economic analysis and determination of priorities. They use this to justify warrant of traffic control devices such as signs, traffic signals, pavement markings, school and pedestrian crossings. The also use this information to study the effectiveness of introduced schemes, diagnosing given situations and finding appropriate solutions, forecasting the effects of projected strategies, calibrating and validating traffic models. Transportation system is a dynamic system. Information about traffic must be regularly updated to keep pace with ever-changing transportation system. Data must be collected and analyzed systematically to get representative information. Traffic surveys are the means of obtaining information about traffic. This is a systematic way of collecting data to be used for various traffic engineering purposes.

❖ **Peak hour factor**

Traffic engineers focus on the peak-hour traffic volume in evaluating capacity and other parameters because it represents the most critical time period. And, as any motorist who travels during the morning or evening rush hours knows, it's the period during which traffic volume is at its highest.

The analysis of level of service is based on peak rates of flow occurring within the peak hour because substantial short-term fluctuations typically occur during an hour. Common practice is to use a peak 15-minute rate of flow. Flow rates are usually expressed in vehicles per hour, not vehicles per 15 minutes.

$$\text{PHF} = \frac{\text{Hourly volume}}{\text{Peak rate of flow within the hour}}$$

- If 15-minute periods are used, the PHF as: PHF=V/(4*V15)

❖ **Design Hour Volume**

The directional design hour volume (DDHV) is the one way volume in the predominant direction of travel in the design hour, expressed as a percentage of the two-way DHV. For rural & sub-urban roads, the directional distribution factor (D) ranges from 55 to 80%. A factor of approximately 50% is used for urban highways. Keep in mind that the directional distribution can change during the day. For example, traffic volume heading into the central business district is usually higher than outbound traffic in the morning, but the reverse is true during the afternoon peak hour. In summary, (DDHV) = (ADT) or (AADT)*K*D

2.3 Some Definition

- **Average Daily Traffic (ADT)**

  The volume during a given time period divided by the number of days in that time period and expressed in terms of vpd.

- **Average Annual Daily Traffic (AADT)**

  It is the total yearly volume divided by the number of days in a year and expressed in terms of vpd.

- **Average Weekly Traffic (AWT)**

  Average 24 hour traffic volume occurring on week days for some period less than one year.

- **Annual Weekday Traffic (AAWT)**

  AAWT is the average 24- hour traffic volume occurring on weekdays over a full year, AAWT is computed by dividing the total weekday volume for the whole year by 260. The relation between AAWT & AWT is analogous to that between AADT & ADT. It should be mentioned here that these four volumes are often used in transportation planning & shown in social or economic statistics.

- **PCU (or PCE)**

  Passenger car unit or (passenger car equivalent) is defined as the number of passenger cars displaced by one truck, bus, or RV (recreational vehicle) in a given traffic stream. In order to reflect the different impact or intensity on the roadway due to the different vehicles in term of size, operating characteristics, Passenger car unit or (passenger car equivalent) is applied in the estimation of traffic volume.

- **Volume/flow**

  The total number of vehicles that pass over a given point or section of a lane or roadway during a given time interval is called volume. It is the actual number of vehicle observed or predicted to passing a point during a given interval.

- **Rate of flow**

  The equivalent hourly rate at which vehicles pass over a given point or section of a lane or roadway during a time interval less than 1hr. usually 15 min.

- **Design Hour Volume**

  It is the economic hourly flow of future year, which is used for designing geometric features roadway. It is chosen in such a way that during the design period it should not be exceeded too often or too much.

- **Peak hour factor**

  Traffic engineers focus on the peak-hour traffic volume in evaluating capacity and other parameters because it represents the most critical time period. And, as any motorist who travels during the morning or evening rush hours knows, it's the period during which traffic volume is at its highest. The analysis of level of service is based on peak rates of flow occurring within the peak hour because substantial short-term fluctuations typically occur during an hour. Common practice is to use a peak 15-minute rate of flow. Flow rates are usually expressed in vehicles per hour, not vehicles per 15 minutes.

2.4 Previous work on Traffic Volume Study

The present study is essentially about the importance of traffic volume in traffic engineering of urban and suburban road links, in particular the literature on effect of traffic volume, speed flow Relationships, passenger car equivalents, peak hour factor, flow variations and traffic capacity and level of serviceability (LOS). But there are lots of studies which help to develop and modify the present study. Some of those are mentioned below in brief:

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 factor sand 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 slow moving traffic PCU values of bullock carts are increasing with the decreasing in the compositional share in the stream.

Arkatkar (2011)

Studied the effect of variation of traffic volume, road width, magnitude of upgrade and its length on PCU value; by using traffic-flow simulation model HETEROSIM. Field data collected on traffic flow characteristics are used in calibration and validation of the simulation model. The validated simulation model is then used to derive PCU values for different types of vehicles and it indicate that the model is capable of replicating the heterogeneous traffic flow on mid-block sections of intercity roads, for different roadway conditions, to a satisfactory extent

Basu D, Maitra S.R (2006)

Studied the effect of traffic volume and its composition on Passenger Car Equivalency (PCE). Taking the stream speed as Measure of Equivalence (MOE), a methodology is demonstrated for the estimation of PCE. The reduction in stream speed caused by marginal increment in traffic volume by a vehicle type is compared with that of caused by an old technology car, which is taken as the reference vehicle for the estimation of PCE. The study reveals that PCE is affected by traffic volume and its composition. For all vehicle types, PCE values are found to increase with an increase in traffic volume, but the effect is predominant for heavy vehicles. The PCE of two wheelers practically remains unaffected by its compositional share in the traffic stream.

Currin (2001)

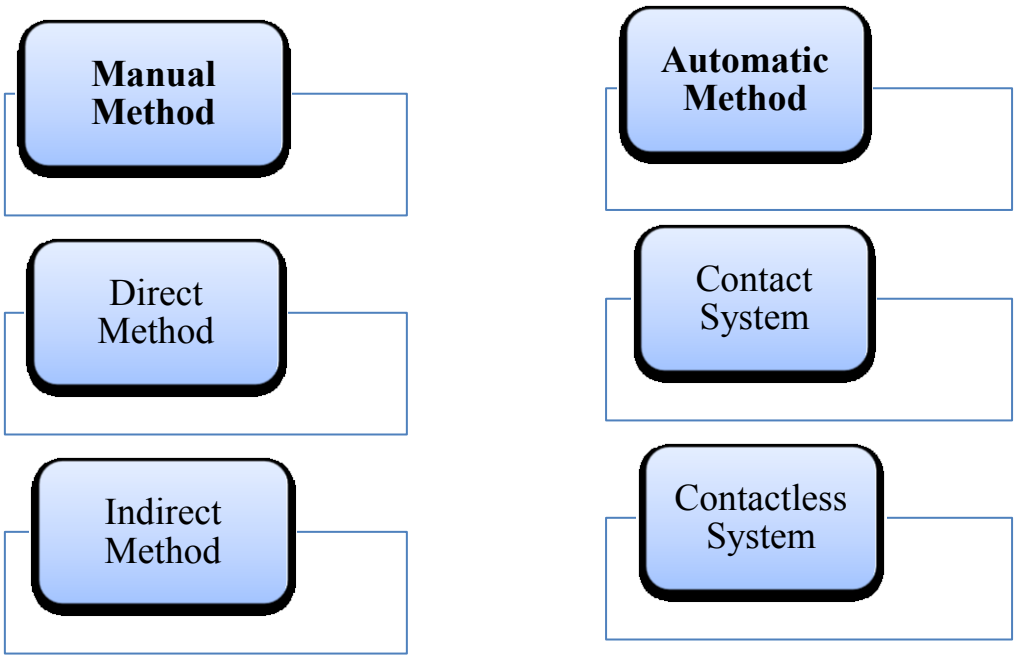
Typical count periods are 15 minutes or 2 hours for peak periods, 4 hours for morning and afternoon peaks, 6 hours for the morning, midday, and afternoon peaks, and 12 hours for daytime periods (Robertson 1994). For example, if you were conducting a 2hour peak period count, eight 15-minute counts would be required.

Chandra, S. and Prasad (1994)

The selection of the study method should be determined using the count period. The count period should be representative of the time of day, day of the month, and month of the year for the study area. For example, counts at a summer resort would not be taken in January. The count period should avoid a special event or compromising weather conditions. Count periods may range from 5 minutes to 1 year.

2.5 Counting Methods

Vehicle counts and classification data provide traffic agencies with valuable information regarding the use and occupancy of roadways. Knowing how many vehicles are using roadways, and at which times, is vital to traffic planning and operations, such as signal timing. Classification data allows agencies to understand how vehicles are using the roadway, such as areas with heavy truck or bus traffic, and plan roadways based on the users. While there are various methods for collecting this data, they differ greatly in collection and accuracy. Here, a comparison of 2 different counts and classification data collection methods:



Two methods are available for conducting traffic volume counts (1) manual & (2) automatic. Manual counts are typically used to gather data for the determination of vehicle classification, turning movements, the direction of travel, pedestrian movements, or vehicle occupancy. Automatic counts are typically used to gather data for the determination of vehicle hourly patterns, daily or seasonal variations & growth trends, or annual traffic estimates.

The selection of the study should be determined using the count period. The count period should be representative of the time of the day, day of the month, & month of the year for the study area. For example, counts at a summer resort would not be taken in January. The count period should avoid a special event or compromising weather conditions (sharma 1994). Count periods may range from 5 minutes to 1 year.

The study methods for short duration counts are described in this chapter in order from least expensive (manual) to most expensive (automatic), assuming the user is starting with no equipment.

2.5.1 Manual counting method

Most applications of manual counts require small sample of data at any given location. Manual counts are sometimes used when the effort & expense of automated equipment are not justified. Manual counts are necessary when automatic equipment is not available. Manual counts are typically used for the periods of less than a day. Normal intervals for a manual counts are 5, 10, or 30 minutes.

Manual count recording methods

Manual counts are recorded using one of three methods: tally sheets, mechanical counting boards, or electronics counting boards.

Tally sheets

Keep tallies of the number of vehicles, buses, and student walking, cycling, etc. Only count people/vehicles entering the school zone in the morning and those leaving the school zone in the afternoon, to eliminate double counting. Feel free to note any unsafe driving or pedestrian behaviors, illegally parked vehicles and any other concerns to active travel under observations. Be discreet, do not draw attention to yourself or chat with passersby and try not to interfere with normal behaviors.

Fig 2.1**:** Mechanical counters

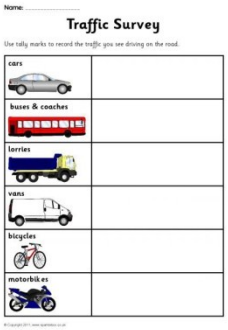


Fig 2.2: Tally sheet

Mechanical counting boards

Mechanical count boards consist of counters mounted on a board that record each direction of travel. Common counts include pedestrian, bicycle, vehicle classification, and traffic volume counts. Typical counters are push button devices with three to five registers. Each button represents a different type of vehicle or pedestrian being counted. A watch or a stopwatch is also necessary with this method to measure the desired count interval.

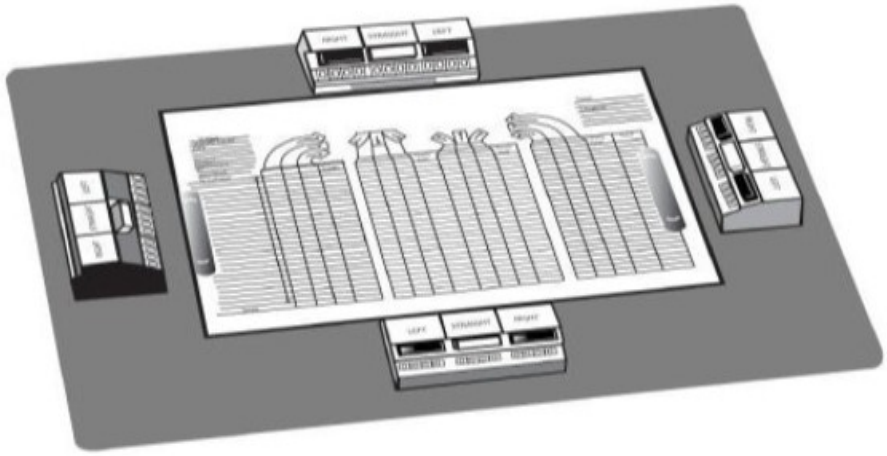


Fig 2.3: Mechanical counting boards

CHAPTER 3

METHODOLOGY

3.1 Counting Methods

Before start calculation or anything it is important to count total vehicle at a section to study traffic volume. There are several ways: among them most suitable are for traffic analysis are two.

a) Manual Counting Method

b) Automatic counting method

a) Manual Counting Method

In this method vehicle are counted manually. 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 variations are observed. Then by selecting typical short count period, the traffic volume study is made by manual counting.

There are two methods of manual counting:

i) 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.
  - Cross-check is not possible.
  - Weather Susceptible.

ii) Indirect Method

Data is collected by 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.
  - This process is 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.
  - This method is not suitable in overcast days.

b) Automatic counting method

In this method, vehicles are counted automatically without any human involvement. 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. The most commonly used detector types are:

I) Pneumatic tubes

These are tubes placed on the top of road surfaces at locations where traffic counting is required. As vehicles pass over the tube, the resulting compression sends a burst of air to an air switch, which can be installed in any type of traffic counting devices.

II) Inductive loops

Inductive loop detector consists of embedded turned wire from which it gets its name. It includes an oscillator, and a cable, which allows signals to pass from the loop to the traffic counting device. The counting device is activated by the change in the magnetic field when a vehicle passes over the loop. Inductive loops are cheap, almost maintenance free and are currently the most widely used equipment for vehicle counting and detection.

III) Weigh-in-Motion Sensor types

A variety of traffic sensors and loops are used world-wide to count, weigh and classify vehicles while in motion, and these are collectively known as Weigh in Motion (WIM) sensor systems. Whereas sensor pads can be used on their own traffic speed and axle weighing equipment, they are trigged by “leading” inductive loops placed before them on the roadbed. This scenario is adopted where axles speed and statistical data are required.

IV) Micro-millimeter wave Radar detectors

Radar detectors actively emits radioactive signals at frequencies ranging from the ultrahigh frequencies (UHF) of 100 MHz, to 100 GHz, and can register vehicular presence and speed depending upon signals returned upon reflection from the vehicle. They are also used to determine vehicular volumes and classifications in both traffic directions. Radar detectors are very little susceptible to adverse weather conditions, and can operate day and night. However, they require comparatively high levels of computing power to analyze the quality of signals.

v) Video Camera

Video image processing systems utilize machine vision technology to detect vehicles and capture details about individual vehicles when necessary. A video processing system usually monitors multiple lanes simultaneously, and therefore it requires high level of computing power. Typically, the operator can interactively set the desired traffic detection points anywhere within the systems view area.

- Advantages

  This method is suitable for long duration or continuous count. It is used as permanent counting station. It does not need manpower and is free from human error. Data is obtained in usable format. It is less expensive as manpower is not needed. Count is not affected by bad weather condition.

- Disadvantages

  It requires strict lane discipline. Non- motorized vehicles are hard to detect by this method. Detailed classification of vehicle is not possible. Accuracy is less than manual method. Installation cost is high.

Fig 3.1: Manual traffic counting in progress

Fig 3.2: Equipment's used for traffic counting

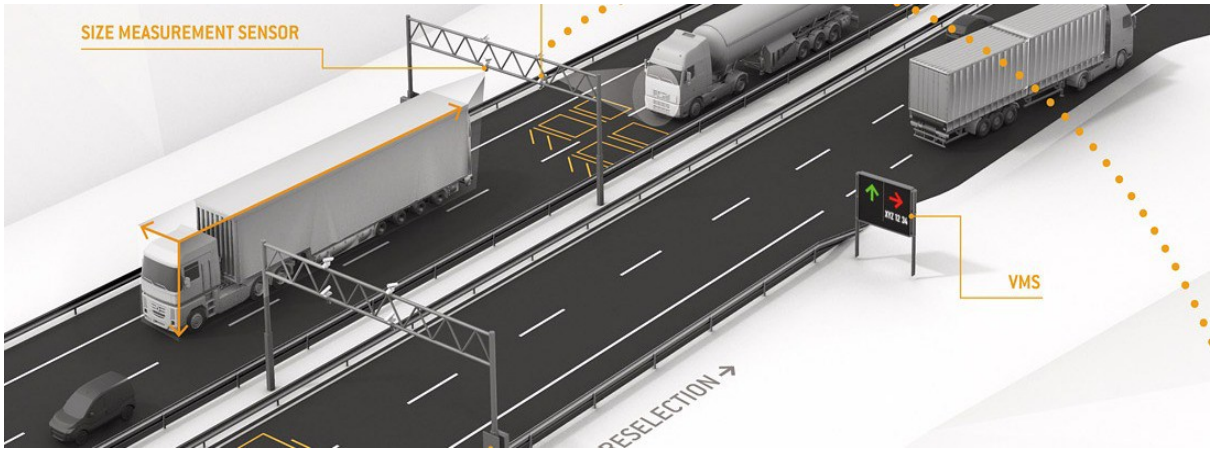


Fig 3.3: High speed Weigh in motion sensor

3.2 Method we have selected

We have selected direct manual counting method.

Reasons

1. Unavailability of instruments.
2. Simplest among all study.

3.3 Counting periods

Vehicles can be counted for any duration. Duration of count depends on the objective of data collection. For traffic control and management or operational studies short duration count at peak period is conducted. For planning and design purpose, long duration count is conducted. For our study purpose we collected volume data for 10 minutes.

3.4.1 Reconnaissance

Reconnaissance is the military term for exploring beyond the area occupied by friendly forces to gain vital information about enemy forces or features of the environment for later analysis and/or dissemination. In the spot, we looked around to get the information of how many types of vehicles on the spot and following this, we decided to distribute our job.

3.4.2 Survey Design/piloting

Before starting survey, we have made a guideline to how we will perform the work. This is called survey design.

3.4.3 Trial Survey

Before starting the main survey, we have made some trial survey. We checked our manual counters whether it works properly or not and fortunately everything was alright.

3.4.4 Adjustment in to survey design

From trial survey we have to adjust the errors with the main survey.

3.4.5 Final Survey

After all, above this process we have to continue the final study.

Pneumatic tubes

Pneumatic tubes are systems that propel cylindrical containers through networks of tubes by compressed air or by partial vacuum. They are used for transporting solid objects, as opposed to conventional pipelines which transport fluids. In the late 19th and early 20th centuries, pneumatic tube networks gained acceptance in offices that needed to transport small, urgent packages, such as mail, other paperwork, or money, over relatively short distances, within a building or, at most, within a city. Some installations became quite complex, but have mostly been superseded. However, they have been further developed in the 21st century in places such as hospitals, to send blood samples and the like to clinical laboratories for analysis.

Fig 3.4: pneumatic tube technology

Microwave radar

This technology can detect moving vehicles and speed. It records count data, speed and simple vehicle classification and is not affected by weather conditions.

Ultrasonic and passive acoustic

These devices emit sound waves to detect vehicles by measuring the time for the signal to return to the device. The ultrasonic sensors are placed over the lane and can be affected by temperature or bad weather.

Video image detection

Video cameras record vehicle numbers, type and speed by means to different video techniques e.g. trip line and tracking. The system can be sensitive to meteorological conditions. The type of variables provided by different type of detectors. A more complete analysis is given in Annex along with summary of advantages/disadvantages of each technology. This study does not detail the factors about the potentials and accuracy of each technology.

Fig 3.5: Signal mounted video camera for traffic volume count

3.4.6 Our Survey Location

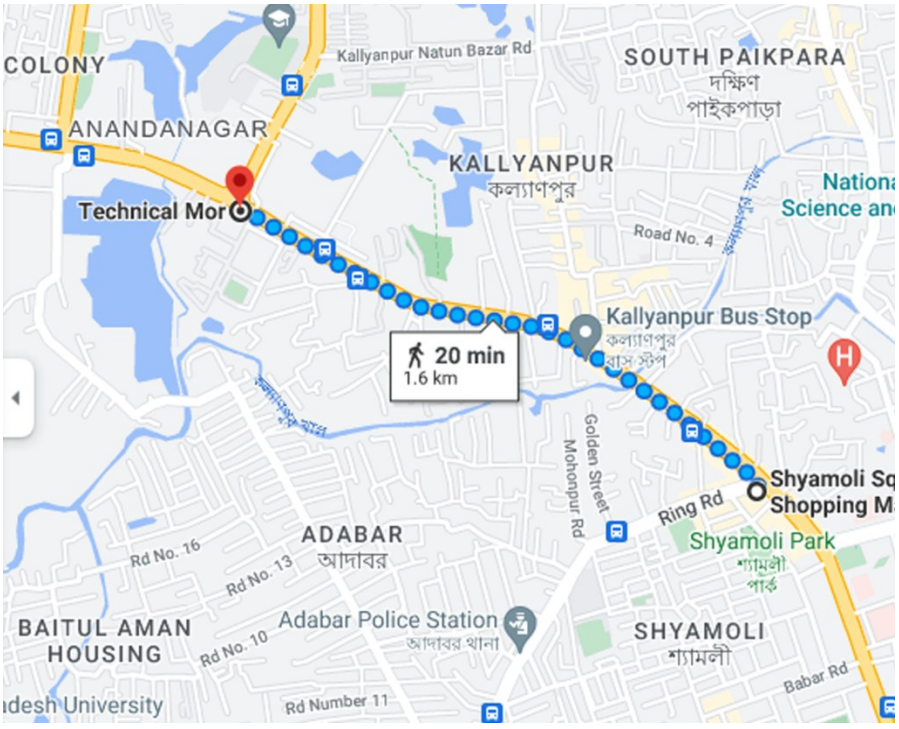


Fig 3.6: Survey location map

3.4.7 Pilot Survey

In the light of the results of the reconnaissance survey, a pilot survey was set out. A pilot survey is a “pre-survey" of the final survey. A pilot survey helped to work out some of the procedural bugs even though it is not likely to add anything new or important to the main survey. Here are some outcomes from the pilot survey: It permitted preliminary testing of the method of a survey that leads to testing a more precise method in the main survey. It leads to changing some processes, dropping some, and developing a new process for volume count and speed study. It provided the enumerators with ideas, approaches, and clues that have not been foreseen in the reconnaissance survey. Such as- place selected for counting traffic volume in the reconnaissance survey did not provide a clear view of the road, which raise the need of selecting a new place for traffic count. TAZS identified in the pilot survey provide a clearer view than before and decrease the chance of error. It permitted a thorough check of the planned survey procedures, giving a chance to evaluate their usefulness for the data. This helped to make needed alterations in the data collecting methods, and therefore, analyze data in the main survey more efficiently. It greatly reduced the number of unanticipated problems. The experience gathered from the pilot survey would help a lot during the final survey

3.5 Counting Method

Amongst the two methods of traffic counting (Manual and Automatic), Manual traffic count has been selected. Required materials for automatic traffic count cannot be obtained from SU. Again, available automatic traffic counting machines were not fully functional. Considering the circumstance, the manual method of traffic count was the best possible option.

3.6 Overview

Following a systematic method of collecting workable data can be collected. A well-defined and disciplined method of survey leads to reliable data for further planning, designing, and decision-making process.

CHAPTER 4

DATA COLLECTION

4.1 General

Following the method describe before data were collected. To accomplish a smooth process of data collection, wholesome knowledge regarding the survey area is required, which will be describe bellow along with the process of data collection.

4.2 Date

Data for traffic volume study were collected from 06 to 11 November 2022.

4.3 Duration

The duration of data collection was 30 minutes, which took place from

1st (9:00am – 9:30am)

2nd (12:30pm – 1:00pm)

3rd (5:30pm – 6:00pm)

4.4 Weather Condition

Sky was bright, it was a sunny Day.

4.5 Location

Location: The location of the traffic volume study was selected to be vehicles from Shyamoli bus stand to Technical Intersection point.

4.6 Observation

Classified vehicle counts i.e. Car, Jeep, Micro, Taxi, 3 Wheeler, Bus, Motorcycle, CNG, and Others. The goal of observation was to count vehicle to determine the volume of traffic along survey road. As a result, vehicles were classified in different categories and they were counted throughout the period.

4.7 Method

The survey was conducted by direct count with a manual method.

4.8 Equipment

Tally Sheet, Stop watch, Clip board etc. For recording data a tabulated tally sheet was prepared which come handy in recording classified vehicle count. Mobile Stop watch was used to measure time.

4.9 Number of Enumerators

There were 5 enumerators in the group. Every enumerator was appointed to count one or more than one category of vehicle.

Fig 4.1: Site picture

View of Shyamoli bus stand to Kallyanpur towards Technical Intersection. Picture captured from Shyamoli bus stand Foot over bridge, Dhaka.

CHAPTER 5

DATA ANALYSIS

5.1 General

Data were collected following the procedure described before and collected data were analyzed afterward.

5.2 Traffic volume count data

Data collected by following the specific process of data collection are presented below:

Site & location: Shyamoli bus stand to Technical intersection

Day- 1

Site & location: Shyamoli bus stand to Technical intersection

Observation: One direction (N to S) classified vehicle count.

Date: 06-11-2022

Time: 9:00 am- 9:30 am

Duration: 30 minutes

Weather condition: hot & sunny day

Data collection table

Table no 5.1: traffic volume count (day- 1)

VEHICLE COMPOSITION							
Vehicle Type	Interval minutes						
	09:00-09:05	09:05-09:10	09:10-09:15	09:15-09:20	09:20-09:25	09:25-09:30	Total
Bus	14	10	4	8	16	10	62
Truck	2	1	0	1	2	0	6
Car & jeep	42	36	30	46	39	44	237
CNG	25	28	10	12	27	29	131
Motor cycle	37	31	16	11	36	41	172
Pick- up	4	3	3	4	5	4	23
Total	124	109	63	82	125	128	631

Day- 1

Site & location: Shyamoli bus stand to Technical intersection

Observation: One direction (N to S) classified vehicle count.

Date: 06-11-2022

Time: 12:30 pm- 1:00 pm

Duration: 30 minutes

Weather condition: hot & sunny day

Data collection table

Table no 5.2: traffic volume count (day- 1)

VEHICLE COMPOSITION							
Vehicle Type	Interval minutes						
	12:30-12:35	12:35-12:40	12:40-12:45	12:45-12:50	12:50-12:55	12:55-01:00	Total
Bus	7	3	6	5	9	11	41
Truck	0	0	1	0	0	2	3
Car & jeep	10	15	12	11	13	9	70
CNG	12	8	16	9	7	11	63
Motor cycle	21	17	28	29	15	34	144
Pick- up	2	4	5	3	3	4	21
Total	52	47	68	57	47	71	342

Day- 1

Site & location: Shyamoli bus stand to Technical intersection

Observation: One direction (N to S) classified vehicle count.

Date: 06-11-2022

Time: 5:30 pm- 6:00 pm

Duration: 30 minutes

Weather condition: a clear sky and light wind

Data collection table

Table no 5.3: traffic volume count (day- 1)

VEHICLE COMPOSITION							
Vehicle Type	Interval minutes						
	05:30-05:35	05:35-05:40	05:40-05:45	05:45-05:50	05:50-05:55	05:55-06:00	Total
Bus	18	13	11	16	10	12	80
Truck	1	2	1	0	1	2	7
Car & jeep	38	23	32	36	39	34	202
CNG	23	18	21	16	19	14	111
Motor cycle	32	26	35	37	23	29	182
Pick- up	4	1	3	3	5	4	20
Total	116	83	103	108	97	95	602

Day- 2

Site & location: Technical intersection to Shyamoli bus stand

Observation: One direction (S to N) classified vehicle count.

Date: 10-11-2022

Time: 9:00 am- 9:30 am

Duration: 30 minutes

Weather condition: hot & sunny day

Data collection table

Table no 5.4: traffic volume count (day- 2)

VEHICLE COMPOSITION							
Vehicle Type	Interval minutes						
	09:00-09:05	09:05-09:10	09:10-09:15	09:15-09:20	09:20-09:25	09:25-09:30	Total
Bus	16	9	11	14	5	8	63
Truck	3	6	7	2	4	6	28
Car & jeep	18	23	31	37	32	29	170
CNG	21	18	15	16	12	22	104
Motor cycle	29	21	26	22	31	39	168
Pick- up	5	5	6	5	5	4	30
Total	92	82	96	96	89	108	563

Day- 2

Site & location: Technical intersection to Shyamoli bus stand

Observation: One direction (S to N) classified vehicle count.

Date: 10-11-2022

Time: 12:30 pm- 1:00 pm

Duration: 30 minutes

Weather condition: hot & sunny day

Data collection table

Table no 5.5: traffic volume count (day- 2)

VEHICLE COMPOSITION							
Vehicle Type	Interval minutes						
	12:30-12:35	12:35-12:40	12:40-12:45	12:45-12:50	12:50-12:55	12:55-01:00	Total
Bus	5	11	8	7	12	5	48
Truck	0	0	2	1	0	2	5
Car & jeep	21	16	18	15	19	17	106
CNG	18	21	16	21	23	17	116
Motor cycle	24	28	21	35	27	21	156
Pick- up	4	3	3	3	3	2	18
Total	72	79	68	82	84	64	449

Day- 2

Site & location: Technical intersection to Shyamoli bus stand

Observation: One direction (S to N) classified vehicle count.

Date: 10-11-2022

Time: 5:30 pm- 6:00 pm

Duration: 30 minutes

Weather condition: a clear sky and light wind

Data collection table

Table no 5.6: traffic volume count (day- 2)

VEHICLE COMPOSITION							
Vehicle Type	Interval minutes						
	05:30-05:35	05:35-05:40	05:40-05:45	05:45-05:50	05:50-05:55	05:55-06:00	Total
Bus	11	18	19	14	12	15	89
Truck	0	2	0	1	2	1	6
Car & jeep	34	21	37	32	30	31	185
CNG	26	18	22	31	14	20	131
Motor cycle	35	37	31	39	35	37	214
Pick- up	4	1	3	2	3	2	15
Total	110	97	112	119	96	106	640

Day- 1

Site & location: Shyamoli bus stand to Technical intersection

Observation: One direction (N to S) classified vehicle count.

Data: 06-11-2022

Time: 9:00 am- 9:30 am

Duration: 30 minutes

Weather condition: hot & sunny day

Data collection table

Table no 5.7: percentage of vehicle observation (day- 1)

Vehicle classification	observation in 30 minutes	Hourly volume	Vehicle %	PCU	Hourly PCU
Bus	62	124	9.8	3	372
Truck	6	12	0.9	3	36
Car & jeep	237	474	37.5	1	474
CNG	131	262	20.7	1	262
Motor cycle	172	344	27.2	0.75	258
Pic- up	23	46	3.6	1	46
Total	631	1262	100		1448

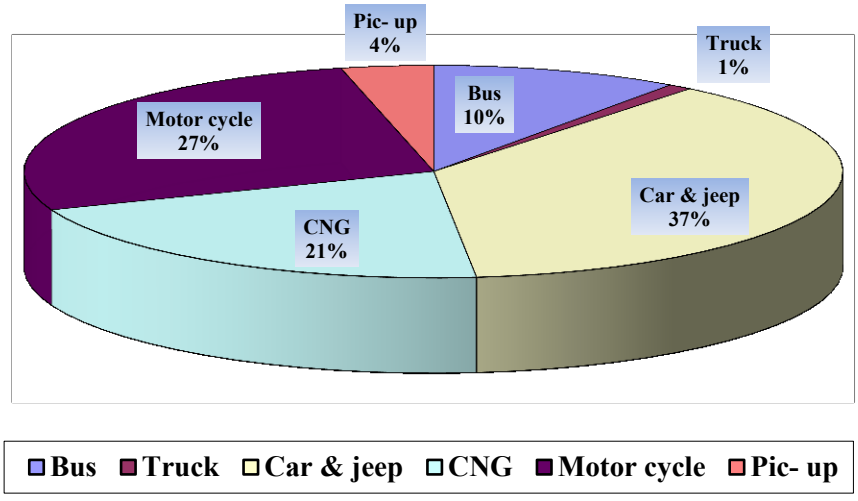


Fig 5.1: Percentage of vehicle composition from Shyamoli bus stand to Technical intersection (day- 1)

Day- 1

Site & location: Shyamoli bus stand to Technical intersection

Observation: One direction (N to S) classified vehicle count.

Data: 06-11-2022

Time: 12:30 pm- 1:00 pm

Duration: 30 minutes

Weather condition: hot & sunny day

Data collection table

Table no 5.8: percentage of vehicle observation (day- 1)

Vehicle classification	observation in 30 minutes	Hourly volume	Vehicle %	PCU	Hourly PCU
Bus	41	82	11.9	3	246
Truck	3	6	0.8	3	18
Car & jeep	70	140	20.4	1	140
CNG	63	126	18.4	1	126
Motor cycle	144	288	42.1	0.75	216
Pic- up	21	42	6.1	1	42
Total	342	684	100		788

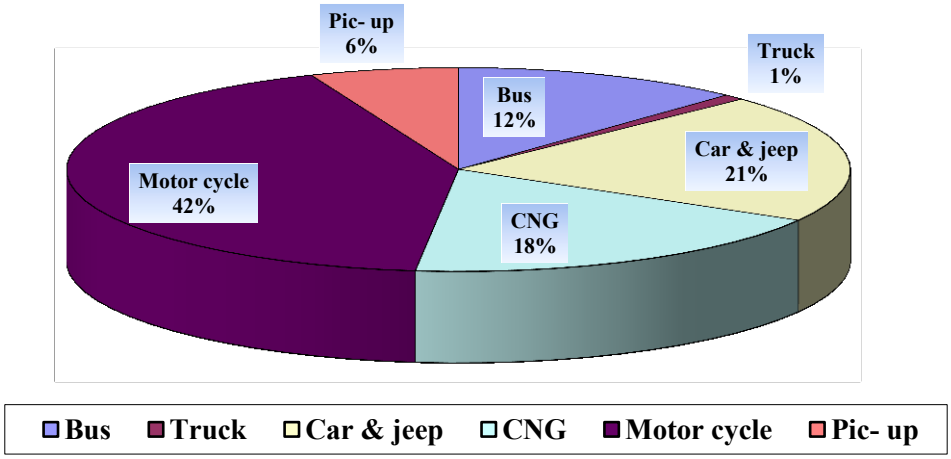


Fig 5.2: Percentage of vehicle composition from Shyamoli bus stand to Technical intersection (day- 1)

Day- 1

Site & location: Shyamoli bus stand to Technical intersection

Observation: One direction (N to S) classified vehicle count.

Data: 06-11-2022

Time: 5:30 pm- 6:00 pm

Duration: 30 minutes

Weather condition: a clear sky and light wind

Data collection table

Table no 5.9: percentage of vehicle observation (day- 1)

Vehicle classification	observation in 30 minutes	Hourly volume	Vehicle %	PCU	Hourly PCU
Bus	80	160	13.2	3	480
Truck	7	14	1.1	3	21
Car & jeep	202	404	33.5	1	404
CNG	111	222	18.4	1	222
Motor cycle	182	364	30.2	0.75	273
Pic- up	20	40	3.3	1	40
Total	602	1204	100		1440

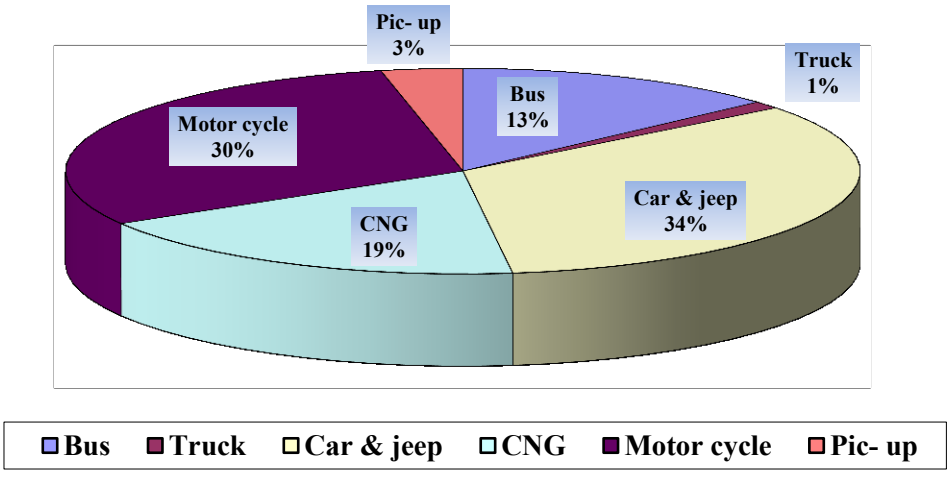


Fig 5.3: Percentage of vehicle composition from Shyamoli bus stand to Technical intersection (day- 1)

Day- 2

Site & location: Technical intersection to Shyamoli bus stand

Observation: One direction (S to N) classified vehicle count.

Data: 10-11-2022

Time: 9:00 am- 9:30 am

Duration: 30 minutes

Weather condition: hot & sunny day

Data collection table

Table no 5.10: percentage of vehicle observation (day- 2)

Vehicle classification	observation in 30 minutes	Hourly volume	Vehicle %	PCU	Hourly PCU
Bus	63	126	11.1	3	378
Truck	28	56	4.9	3	168
Car & jeep	170	340	30.1	1	340
CNG	104	208	18.4	1	208
Motor cycle	168	336	29.8	0.75	252
Pic- up	30	60	5.3	1	60
Total	563	1126	100		1406

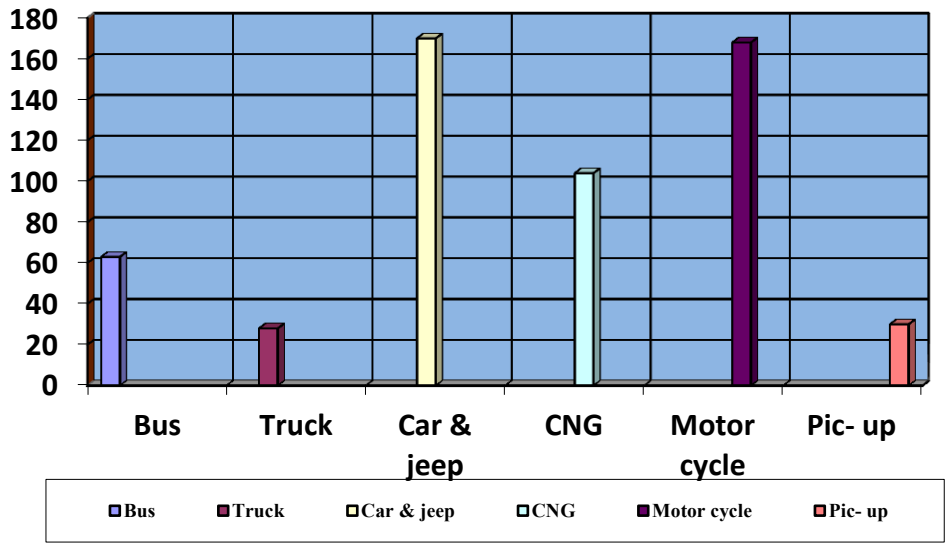


Fig 5.4: Percentage of vehicle composition from Technical intersection to Shyamoli bus stand (day- 2)

Day- 2

Site & location: Technical intersection to Shyamoli bus stand

Observation: One direction (S to N) classified vehicle count.

Data: 10-11-2022

Time: 12:30 pm- 1:00 pm

Duration: 30 minutes

Weather condition: hot & sunny day

Data collection table

Table no 5.11: percentage of vehicle observation (day- 2)

Vehicle classification	observation in 30 minutes	Hourly volume	Vehicle %	PCU	Hourly PCU
Bus	48	96	10.0	3	288
Truck	5	10	1.0	3	30
Car & jeep	106	212	22.1	1	212
CNG	116	232	24.2	1	232
Motor cycle	156	312	32.6	0.75	234
Pic- up	48	96	10.0	1	96
Total	479	958	100		1092

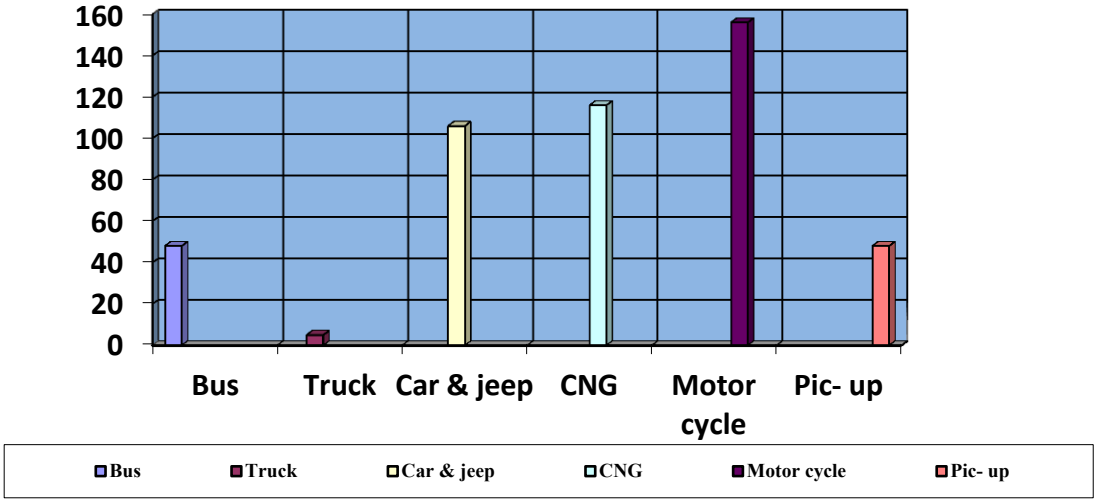


Fig 5.5: Percentage of vehicle composition from Technical intersection to Shyamoli bus stand (day- 2)

Day- 2

Site & location: Technical intersection to Shyamoli bus stand

Observation: One direction (S to N) classified vehicle count.

Data: 10-11-2022

Time: 5:30 pm- 6:00 pm

Duration: 30 minutes

Weather condition: a clear sky and light wind

Data collection table

Table no 5.12**:** percentage of vehicle observation (day- 2)

Vehicle classification	observation in 30 minutes	Hourly volume	Vehicle %	PCU	Hourly PCU
Bus	89	178	12.9	3	534
Truck	6	12	0.9	3	36
Car & jeep	159	318	23.2	1	318
CNG	131	262	19.1	1	262
Motor cycle	214	428	31.1	0.75	321
Pic- up	89	178	12.9	1	178
Total	688	1376	100		1649

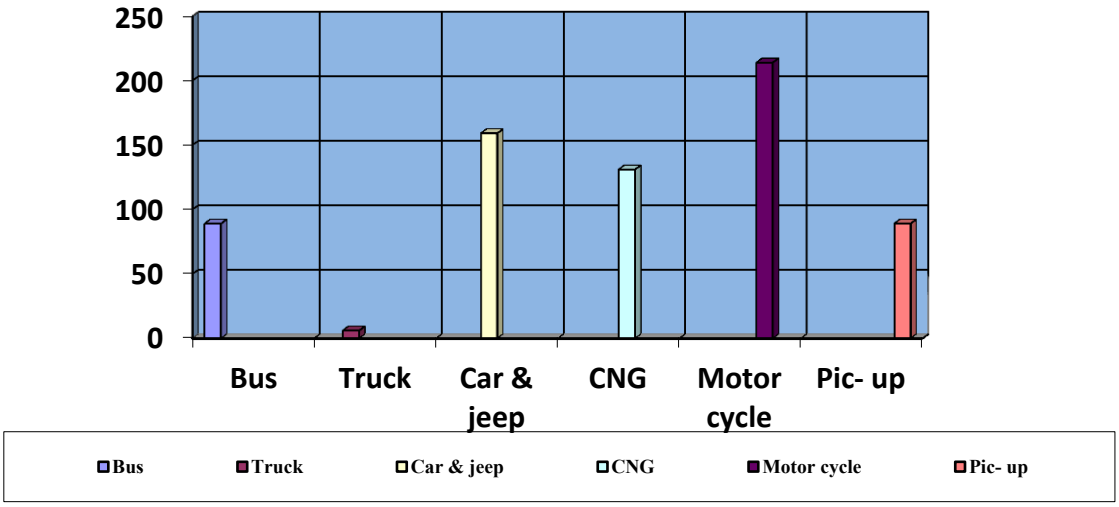


Fig 5.6: Percentage of vehicle composition from Technical intersection to Shyamoli bus stand (day- 2)

5.3 Service flow rate and level of service (LOS)

Service flow rate is the maximum hourly rate at which persons or vehicles reasonably can be expected to traverse a point or uniform segment of a lane or roadway during a given period under prevailing roadway, traffic, and control conditions while maintaining a designated level of service. The service flow rates generally are based on 30 minutes. Typically, the hourly service flow rate is defined as four times the peak 30 minute's volumes. Service flow rate is the traffic parameter most used in capacity and level- of-service (LOS) evaluations. Knowledge of highway capacity and (LOS) is essential to properly fit a planned highway or street to the requirements of traffic demand.

LOS Criteria

Level of service (LOS) is a qualitative measure used to relate to the quality of motor vehicle traffic service. (LOS) is used to analyze roadways and intersections by categorizing traffic flow and assigning quality levels of traffic based on performance measures like vehicle speed, density, congestion, etc. (Chandra and Prasad, 2004)

LOS- A

Represents free- flow condition; freedom to select travel speed; side- friction or interaction is very low; level of comfort and convenience is excellent.

LOS- B

Represents a zone of stable flow; reasonable freedom to select travel speed; side friction starts affecting and level of comfort and convenience is relatively lower.

LOS- C

Also, a zone of stable flow; selection of speed is affected by others; side friction significantly affects the drivers, and level of comfort and convenience declines noticeably.

LOS- D

Represents the limit of stable flow; freedom to select travel speed is severely affected; side friction severely affects the drivers and level of comfort and convenience is poor.

LOS- E

Represents close to the capacity level; average speeds are low but uniform; side friction causes forced maneuvers and level of comfort and convenience is extremely poor and driver frustration is high.

LOS- F

Represents zone of forced or breakdown flow; queue formation takes place (stop- and-go waves); delays results. Passenger car equivalent (PCE) is a metric used in transportation engineering, to assess traffic- flow rate on a highway. A passenger car equivalent is essentially the impact that a mode of transport has traffic variables (such as headway, speed, density) compared to a single car.

5.4 Determination of service flow rate

It is necessary to determine the minimum headway between two intermediate vehicles to get the service flow rate. But in context of the existing data collection as minimum headway is not possible to trace out so flow rate of the three hours is assumed to be the service flow rate.

Table no 5.13: Service flow rate

Time	Shyamoli bus stand to Technical intersection	Technical intersection to Shyamoli bus stand
	PCU/hr	**PCU/hr**
9:00- 9:30 am	1448	1406
12:30- 1:00 pm	788	1092
5:30- 6:00 pm	1440	1649
Total	3676	4147
Service flow rate	**1226**	**1383**

LOS	Service Flow Rate (PCU/hr)
A	<600
B	600- 700
C	700- 900
D	900- 1200
E	1200- 1400
F	>1400

Fig 5.7: Service Flow Rate (PCU/hr)

5.5 Directional Distribution

The directional distribution is defined as the percentage of heavier volume over the total highway volume. This directional distribution is relevant only when designing or analyzing highways with two or more lanes in one direction. Directional distribution are used for capacity analysis, signal timing, justifying traffic control etc.

The directional distribution can be calculated from the data obtained as below:

Table no 5.14: Directional Distribution

Direction	Time	PCU/hr	Average PCU/hr	Directional Distribution
Shyamoli bus stand to Technical intersection	9:00 am-9:30 am	1448	1448	50.7%
Technical intersection to Shyamoli bus stand	9:00 am-9:30 am	1406	1406	49.3%
Shyamoli bus stand to Technical intersection	12:30 pm-1:00 pm	788	788	42%
Technical intersection to Shyamoli bus stand	12:30 pm-1:00 pm	1092	1092	58%
Shyamoli bus stand to Technical intersection	5:30 pm-6:00pm	1440	1440	46.7%
Technical intersection to Shyamoli bus stand	5:30 pm-6:00pm	1649	1649	53.3%

5.6 Peak hour factor (PHF)

The peak hour factor (PHF) is the hourly volume during the maximum- volume hour of the day divided by the peak 15- minutes flow rate within the peak hour.

Details calculations are shown below:

Site & location: Shyamoli bus stand to Technical intersection

Table no 5.15: Data for peak hour factor determination

VEHICLE COMPOSITION							
Vehicle Type	Interval minutes						
	09:00-09:05	09:05-09:10	09:10-09:15	09:15-09:20	09:20-09:25	09:25-09:30	Total
Bus	14	10	4	8	16	10	62
Truck	2	1	0	1	2	0	6
Car & jeep	42	36	30	46	39	44	237
CNG	25	28	10	12	27	29	131
Motor cycle	37	31	16	11	36	41	172
Pick- up	4	3	3	4	5	4	23
Total	124	109	63	82	125	128	631

Data for PHF determination

$$PHF = \frac{\text{Hourly volume}}{\text{Peak rate of flow within the hour}}$$

$$PHF = \frac{335}{4(82+125+128)}$$

PHF= 0.25

Table 5.16: Peak hour factor (PHF) data

Time	Shyamoli bus stand to Technical intersection	Technical intersection to Shyamoli bus stand
	PHF	**PHF**
9:00- 9:30 am	0.25	0.25
12:30- 1:00 pm	0.25	0.25
5:30- 6:00 pm	0.25	0.25

Observation: PHF measure traffic demand fluctuations within the peak hour. From short count data, the actual (design) flow rate can be calculated by dividing the peak hour volume by the PHF, or by multiplying the peak 15 minute's volumes by four.

5.7 Estimate ADT & AADT

Site & location: Shyamoli bus stand to Technical intersection

Details calculations of ADT & AADT are given below. Expansion factors used here are known as Mohib's JMB factors.

Here

MEF= 1.186 for November

DEF= 9.515 for Sunday

HEF= 18.8 (Time: 9:00 am- 9:30am)

Estimated 24 hour volume for Sunday (Shyamoli bus stand to Technical intersection) using HEF,

= 1448×18.8

= 27222.4 PCU

= 27223 PCU

From 24 hours volume for Sunday estimated volume for the week using DEF, total 7 days volume

= 27223×9.515

= 259026.85 PCU

= 259027 PCU

Average 24 hours volume (on average daily traffic, ADT)

= 259027÷7

= 37003.86 PCU

= 37004 PCU (Shyamoli bus stand to Technical intersection)

Since the data were collected in November, using the MEF for obtained AADT is

= 37004×1.186 PCU

= 43887 PCU

Table no 5.17: Flow fluctuation curve data

Time	Shyamoli bus stand to Technical intersection flow rate (PCU/hr)	Technical intersection to Shyamoli bus stand flow rate (PCU/hr)	Shyamoli bus stand to Technical intersection ADT	Technical intersection to Shyamoli bus stand ADT	Shyamoli bus stand to Technical intersection (%ADT)	Technical intersection to Shyamoli bus stand (%ADT)
9:00-9:30 am	1448	1406	37004	26479	43.97	37.93
12:30-1:00 pm	788	1092	20042	20468	23.82	29.32
5:30-6:00 pm	1440	1649	27110	22879	32.22	32.77

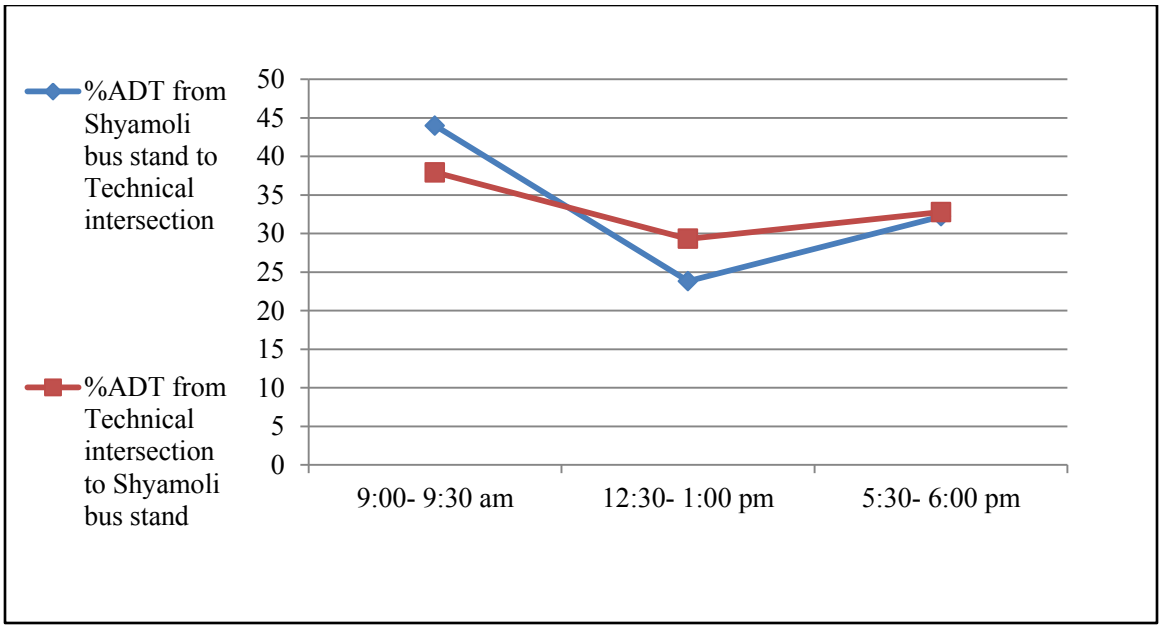


Fig 5.8: Traffic flow fluctuation curve

- In this traffic flow fluctuation curve we see %ADT from shyamoli bus stand to Technical intersection, traffic flow in 9:00- 9:30 am is high. At 12:30- 1:00 pm this traffic flow getting down. At the end of the day at 5:30- 6:00 pm again its getting high. Meanwhile %ADT from Technical intersection to Shyamoli bus stand traffic flow fluctuation curve is almost similar.

Table no 5.18: ADT and AADT data

Time	Shamoli bus stand to Technical intersection (ADT)	Technical intersection to Shyamoli bus stand (ADT)	Shamoli bus stand to Technical intersection (AADT)	Technical intersection to Shyamoli bus stand (AADT)
9:00- 9:30 am	37004	26479	43887	52050
12:30- 1:00 pm	20042	20468	23770	28192
5:30- 6:00 pm	27110	22879	32153	27135

5.8 Overview

In our study, we see that Lights vehicle (car, jeep, etc.) occupied about 59% of total vehicle. The percentage amount of Bus is low. There is a lot of traffic pressure at the beginning of the day, this result in an invisible competition between the drivers. This traffic flow decreases with time and returns to normal around noon. Again in the evening the traffic flow increase and one point it became severe.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 General

This chapter discusses on the results obtained from the analysis and their importance. This report presented all possible analysis by the data collected from field.

6.2 Discussion on Vehicle Composition

Vehicle composition shows that Lights vehicle (car, jeep, etc.) occupied about 59% of total vehicle. The reason behind this is the area where we study traffic volume associated with commercial and residential purposes. The percentage amount of Bus is low. To develop the existing traffic condition, it is suggested that if number of bus is increased by users, traffic congestion may be reduced efficiently. The condition of bus is old, rusty and sometimes having broken glass. To facilitate public transport system, this condition must be developed.

6.3 Discussion on service flow rate

Standard level of service (LOS) of a city should be LOS- C. According by our data we get for day 1 & day 2 level of service is LOS- E. Which is close to the capacity level, average speeds are low but uniform, side friction causes forced maneuvers and level of comfort and convenience is extremely poor and drivers frustration is high.

6.4 Discussion on directional composition

50.7% of traffic flow was towards which indicates tidal flow towards north- south. It was morning rush hour. So the flow was higher toward the city center. 49.3% of traffic was flowing towards south- north. 42% of traffic flow towards north- south & 58% of traffic flow towards south- north at noon. It means traffic flow is normal at noon. At the end of the day 46.7% of traffic flow towards north- south & 53.3 % of traffic flow towards south- north. It was evening rush hour.

6.5 Recommendations

There are some recommendations based on the study took place. They are as follows-

- The manual count method required trained enumerators, which was not available in this case.
- For more reliable data, an automatic data collection process should be used.
- More public transport facilities should be provided to support the need of inhabitants living in the residential area near the road.

6.6 Limitation

- Un- skilled enumerators.
- Time and Resources are Limited.
- Data collected by manual method which is unreliable and irreversible.
- In future the traffic volume study should be implemented through grater time to get more proper and uniform result. There is more analysis can be added to this traffic volume study.

6.7 Scope for Further Study

- Effectiveness of a traffic control measure.
- To check existing, operating service condition of a roadway section.
- Planning traffic operation and control of existing facility.
- To design intersection, signal timings, channelization.
- Structural design of pavements, geometric design and road way capacity.

6.8 Overview

The traffic volume survey was taking place with limited resources and equipment. As the main purpose of this survey is to know the process of traffic volume count, this limitation can be overlooked.

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APPENDIX

Table: Monthly Expansion Factors for a Rural Primary Road

Month of Year	MEF	Month of Year	MEF
January	1.756	July	0.578
February	1.976	August	0.521
March	1.635	September	0.632
April	1.482	October	0.948
May	1.395	November	1.186
June	0.948	December	1.355

Table: Daily Expansion Factors for a Rural Primary Road

Days of week	DEF
Sunday	9.515
Monday	7.012
Tuesday	7.727
Wednesday	6.582
Thursday	7.012
Friday	5.724
Saturday	6.51

Table: Hourly Expansion Factors for a Rural Primary Road

Hour	HEF	Hour	HEF
6:00- 7:00 am	42.01	6:00- 7:00 pm	16.6
7:00- 8:00 am	28.99	7:00- 8:00 pm	17.5
8:00- 9:00 am	22.05	8:00- 9:00 pm	20.4
9:00- 10:00 am	18.8	9:00- 10:00 pm	25.3
10:00- 11:00 am	17.11	10:00- 11:00 pm	31.2
11:00- 12:00 pm	18.52	11:00- 12:00 am	34.2
12:00- 1:00 pm	18.71	12:00- 1:00 am	51.2
1:00- 2:00 pm	16.71	1:00- 2:00 am	82.3
2:00- 3:00 pm	14.84	2:00- 3:00 am	124
3:00- 4:00 pm	14.77	3:00- 4:00 am	137
4:00- 5:00 pm	12.85	4:00- 5:00 am	144
5:00- 6:00 pm	13.85	5:00- 6:00 am	90.2