Traffic Studies:

A. Type of traffic facility according to type of flow:

The Highway Capacity Manual (HCM) 2010 describes traffic facilities according to the type of controlling flow into:

1. Uninterrupted flow: These facilities have no external interruptions to the traffic stream such as intersections, traffic signals, stop or yield signs, or other interruptions external to the traffic stream itself. Such facilities have full control of access; there are no intersections at grade, or any forms of direct access to abutting lands. Remember that the term uninterrupted flow refers to type of facility, not the quality of operations on that facility. For example, Freeway facilities and Basic freeway segments.

2. Interrupted flow: These facilities are those that incorporate fixed external interruptions into their design and operation. Such as:
   - Urban street facilities
   - Urban street segments
   - Signalized control intersections.
   - Roundabouts
   - Interchange ramp terminals
   - Off-street pedestrian and bicycle facilities.

B. Measurement of traffic flow:

Traffic volume: A continuous count of vehicles passing a particular point at a section of road during a given interval of time. Traffic volume can be expressed in terms of hourly traffic, daily traffic or annual traffic will show that traffic volume varies from hour to hour, from day to day, and from month to month.

1. Peak hourly volume (PHV)

The volume for each hour of the day is represented as a percentage of the ADT. For example AM and PM peak hours volumes. Peak hourly volumes are used for:
   a. Functional classification of highways
   b. Design of the geometric characteristics of a highway, for example, number of lanes, signalized intersection, or channelized intersection.
   c. Capacity analysis.
   d. Development of programs related to traffic operations, for example, one-way street systems.
   e. Development of parking regulations.
2. Average Daily Traffic (ADT):
Is used for:
   i. Planning of highway activities.
   ii. Measurement of the current demand.
   iii. Evaluation of existing traffic flow.

3. Annual Average Daily Traffic (AADT):
Is used for:
   i. Computation of accident rates.
   ii. Establishment of traffic volume trends.
   iii. Development of freeway and major arterial street system.
   iv. Development improvement and maintenance programs.

C. Methods of counting traffic
1. Manual counting method (Direct Method or Indirect Method)
2. Automatic counting method (Contact System or Contact-less System)

1- Manual counting method (Direct method)
Manual counting involves one or more persons recording observed vehicles using a counter. With this type of counter, both the turning movements at the intersection and the types of vehicles can be recorded. Manual counts are recorded using one of three methods: tally sheets, mechanical counting boards, or electronic counting boards.
- Tally sheet

Recording data onto tally sheets is the simplest means of conducting manual counts. The data can be recorded with a tick mark on a pre-prepared field form. A watch or stopwatch is necessary to measure the desired count interval.

Example manual intersection volume count Tally Sheet
Example manual volume count

- Mechanical counting boards

Mechanical count boards consist of counters mounted on a board that record each direction of travel.
• Electronic counting boards

Electronic counting boards are lighter, more compact, and easier to handle. This is battery-operated, hand-held devices that are easy to handle compared to tally sheets and mechanical boards.

Manual counting method (Indirect method)

• Photographic Techniques

Observers can record count data by videotaping traffic or CCTV video Surveillance System. Traffic volumes can be counted by viewing videos recorded. A digital clock in the video image can prove useful in noting time intervals. CCTV/Videotaping is not a cost-effective option in most situations. Cameras are installed to monitor traffic conditions allow for remote traffic counting capability - Turning Movement, Volume, Occupancy and other traffic information can be collected from the central control room deleting the necessity to field locate personnel.

2- Automatic counting method (Contact System or Contact-less System)

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.
i. Pneumatic road tube (Contact System)

ii. Magnetic loop detector (Contact System)

iii. Bending plate detector (Contact System)
iv. Radar device (Contact-less System)

D. Traffic Volume Data Presentation

The data collected from traffic volume counts may be presented in one of several ways, depending on the type of count conducted and the primary use of the data.

1- Traffic flow maps

These maps show traffic volumes on individual routes. The volume of traffic on each route is represented by the width of a band, which is drawn in proportion to the traffic volume it represents, providing a graphic representation of the different volumes that facilitates easy visualization of the relative volumes of traffic on the different routes.
Example of a traffic flow map

2- Intersection summary sheets

These sheets are graphic representations of the volume and directions of all traffic movements through the intersection.
Example of an intersection summary sheets

3- Summary Tables

This gives a summary of traffic volume (PHV, PHF, % HV, etc) in tabular form.
E. Traffic composition

Vehicles of different types have different road space requirements and different effects on the capacity of highway and intersection because of variation in size and performance.

The overall effect on traffic operations by any vehicle can be expressed in terms of the effect of the basic unit – usually a passenger car, so vehicles should be converted to equivalent passenger car unit (PCU) as following:

<table>
<thead>
<tr>
<th>Class of vehicles</th>
<th>PCE Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private car, Taxi, Pick up less than 4 tons, Car with seating capacity less than 9 passengers</td>
<td>1</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>0.5</td>
</tr>
<tr>
<td>Single unit trucks, Bus up to 24 passengers.</td>
<td>1.25</td>
</tr>
<tr>
<td>Semi-trailer truck, Bus above 24 passengers.</td>
<td>2</td>
</tr>
<tr>
<td>Truck – trailer combination</td>
<td>3</td>
</tr>
</tbody>
</table>

Example:

A rural highway has the following traffic composition:

Passenger car 50%

Heavy good vehicles 42%

Buses above 25 passenger 5%

Motorcycle 3%

Find the equivalent passenger car unit if the total number of the vehicles passing is 6000 veh.
Solution:
Number of passenger car = 6000 (50/100) = 3000
Number of HGV = 6000 (42/100) = 2520
Number of buses above 25 passenger = 6000 (5/100) = 300
Number of motorcycles = 6000 (3/100) = 180
Total No. of PCU = (3000*1) + (2520*3) + (300*2) + (180*0.5) = 11250