Highway & Traffic Engineering

Traffic Volume Studies

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Aims
This chapter provides students on the understanding on the traffic volume studies with emphasis on the basic data collection and processing.

Expected Outcomes
- Describe the concepts and principles of traffic volume studies data collection
- Analyze traffic volume data for specific application
Contents

• Introduction
• Traffic Volume Studies Method
• Traffic Volume Data Presentation
• Traffic volume Studies Measures
  i. Daily Volumes
  ii. Hourly Volumes
Traffic Volume Studies by Azlina Ismail

Introduction

• Traffic volume – Nos. of vehicles passing a specific reference point on a road section within a specified period of time (time period varies from 15 min to a year)
• Data may include directional movements, vehicle classification, and pedestrian age
• Typical Units: veh/hr (hourly traffic) veh/day (daily traffic), veh/yr (annually traffic)
Traffic Volume Studies Method

Manual method
• One or more persons manually counting observed vehicles using manual data collection or using a counter (Single or multiple-gang tally counter)
• Small samples
• Time periods less than a day

Automatic method
• consists of two parts, a detection device and a counting that laying on road surface/subsurface and recording device
• Large samples
• Time period more than a day
• Type of traffic detection:
  ➢ Pneumatic detector
  ➢ Radar detector
Traffic Volume Studies Method

Automatic method

Pneumatic detector

Radar detector

https://miovision.com/blog/top-5-reasons-to-upgrade-from-road-tubes/

Traffic Volume Studies Method

Manual method

Counting and record in counting form

Electronic Counting Boards

http://njbikeped.org/innovative-ways-count-pedestrians-bicyclists/

https://www.slideshare.net/stone159/traffic-volume-study-46222139
Traffic Volume Data Presentation

The results of the study may be presented in the following format:

• In the summary of traffic flow tables
• Pie chart to show proportions of volumes by types of vehicles
• Histogram and graph (line graph) to illustrate traffic volume over time
• Intersection flow diagram which gives the direction and volume of all movements
i. **Daily Volumes** - Used to document annual trends in highway usage (planning purposes)

- Planning activities, such as developing freeway systems or arterial street system; and selecting best route for a new facility.
- Evaluating the present traffic flow.
- To compute accident rates
- Establishment of traffic volume trends.
• Four **daily volume** parameters:-
  a. Average Annual Daily Traffic (AADT)
  b. Average Annual Weekday Traffic (AAWT)
  c. Average Daily Traffic (ADT)
  d. Average Weekday Traffic (AWT)
Annual Average Daily Traffic (AADT))

• An average 24 hours traffic volume over a full year (365 days)

Total yearly traffic volume divided by the number of days in the year

OR

• Acquired by doing survey work twice a year with 6 months interval (minimum)

For example, AADT;

\[
= \frac{\text{volume of traffic in 7 days (March)}}{14} + \frac{\text{volume of traffic in 7 days (Sept)}}{14}
\]
Average Daily Traffic (ADT)

- An average 24 hours traffic volume for some period of time less than a year
- Measure for each and every month of the year or a day in a week or a day
- E.g: \( \text{ADT} = \frac{\text{Total Monthly Volume (vehs)}}{\text{Total Days in Month (days)}} \)
Annual Average Weekly Traffic (AAWT))

• The average 24-hour volume occurring on weekdays over full 365-day year.

• Can be described as :-

The **number of vehicles passing a point on a weekdays in a year** divided by the **number of weekdays**.
Average Weekly Traffic (AWT)

• The average 24-hour weekday volume at a given location over a defined time period less than one year.

• $\text{AWT} = \frac{\text{Total Weekdays Volume (vehs)}}{\text{No. of Weekdays in Month (days)}}$
Example:

The following Table contains two sets of one week traffic counts data obtained using Pneumatic detector at a point on a stretch of rural road in Malaysia. Referring to the table:

i. Compute ADT for both datasets.
ii. Discuss on the character of the facility/roadway and the demand it serves.
iii. Estimate the AADT for the road section.

<table>
<thead>
<tr>
<th>Day</th>
<th>June 2014 (veh/day)</th>
<th>December 2014 (veh/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>12500</td>
<td>14500</td>
</tr>
<tr>
<td>Tuesday</td>
<td>10500</td>
<td>12000</td>
</tr>
<tr>
<td>Wednesday</td>
<td>12200</td>
<td>11050</td>
</tr>
<tr>
<td>Thursday</td>
<td>13400</td>
<td>13500</td>
</tr>
<tr>
<td>Friday</td>
<td>13000</td>
<td>14000</td>
</tr>
<tr>
<td>Saturday</td>
<td>14500</td>
<td>15500</td>
</tr>
<tr>
<td>Sunday</td>
<td>13500</td>
<td>15000</td>
</tr>
</tbody>
</table>
### Solution:

<table>
<thead>
<tr>
<th>Day</th>
<th>June 2014 (veh/day)</th>
<th>December 2014 (veh/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>12500</td>
<td>14500</td>
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<td>Wednesday</td>
<td>12200</td>
<td>11050</td>
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<tr>
<td>Thursday</td>
<td>13400</td>
<td>13500</td>
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<tr>
<td>Friday</td>
<td>13000</td>
<td>14000</td>
</tr>
<tr>
<td>Saturday</td>
<td>14500</td>
<td>15500</td>
</tr>
<tr>
<td>Sunday</td>
<td>13500</td>
<td>15000</td>
</tr>
</tbody>
</table>

**Total:**

<table>
<thead>
<tr>
<th></th>
<th>June 2014</th>
<th>December 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADT</td>
<td>12800</td>
<td>13650</td>
</tr>
<tr>
<td>AWT</td>
<td>12320</td>
<td>13010</td>
</tr>
<tr>
<td>AADT</td>
<td>13225</td>
<td></td>
</tr>
</tbody>
</table>

Therefore, this imply that the road is serving a recreational area with traffic strongly peaking on weekends.
ii. **Hourly Volumes**: useful in design & operational analysis

- To determine peak periods
- To evaluate capacity deficiencies
- To establish traffic controls

- PHF : Peak Hour Factor
- PHV : Peak Hour Volume
- DHV : Design Hourly Volume
• PHV is a maximum number of vehicles that pass a point on a highway during period of 1-hour.

• PHV is used for:-
  – Functional Classification of Highways
  – Capacity Analysis
  – Design of geometric characteristics.
Peak-hour Factor

- to determine the variation of traffic within given hour
- PHF = is a measure of the variability of demand during peak hour. (non uniformity of traffic condition)

\[
PHF = \frac{V}{4 \times V_{m15}}
\]

- \( V \) = Hourly Volumes
- \( V_{m15} \) = maximum 15-minutes volume within the hour.
Design Hourly Volume (DHV)

• projected hourly volume that used for design
• represent the proportion of AADT occurring during the 30th peak hour of the year

$K\text{-factor} = \frac{DHV}{AADT} \times 100$

• REAM suggested $K = 12\%$ for urban, $15\%$ for rural
Conclusion of The Chapter

• Conclusion #1
  – Traffic Volume data one of most fundamental principles in all traffic engineering analysis, design, planning and operation.
  – Traffic volume counts are performed either using manual or automatic methods.

• Conclusion #2
  – Traffic Volume measures can be divided into two; daily volumes (ADT, AADT, AWT and AAWT) and hourly volumes (PHV, DHV) depending by it purposes of study.
References