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Highway & Traffic Engineering

Traffic Volume Studies

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Chapter Description

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

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

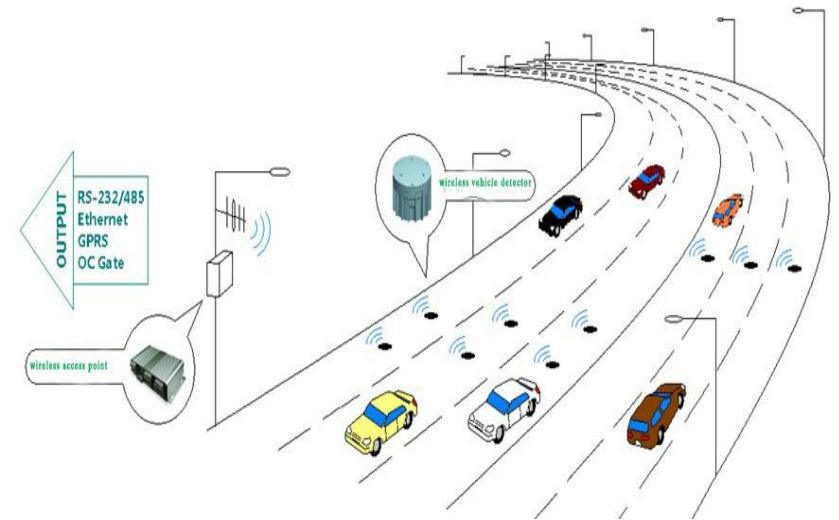
Automatic method

Pneumatic detector



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

Radar detector



http://rosimits.en.alibaba.com/product/1938169242-219424376/Magnetometer_road_sensor_wireless_vehicle_counter_instead_of_radar_counter.html

Traffic Volume Studies Method

Manual method

Counting and record in counting form



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

Electronic Counting Boards



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



Figure : Electronic Counting Boards

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<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

Traffic volume Studies Measures

- 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.

Daily Volumes

- 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;

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

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 : $ADT = \frac{\text{Total Monthly Volume (vehs)}}{\text{Total Days in Month (days)}}$

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

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.

Day	June 2014 (veh/day)	December 2014 (veh/day)
Monday	12500	14500
Tuesday	10500	12000
Wednesday	12200	11050
Thursday	13400	13500
Friday	13000	14000
Saturday	14500	15500
Sunday	13500	15000

Solution:

Day	June 2014 (veh/day)	December 2014 (veh/day)
Monday	12500	14500
Tuesday	10500	12000
Wednesday	12200	11050
Thursday	13400	13500
Friday	13000	14000
Saturday	14500	15500
Sunday	13500	15000
	89600	95550
ADT	12800	13650
AWT	12320	13010
AADT	13225	

Therefore, this imply that the road is serving a recreational area with traffic strongly peaking on weekends .

Traffic volume Studies Measures

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

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

- Road Engineering Association of Malaysia, A GUIDE ON GEOMETRIC DESIGN OF ROADS, REAM-GL 2/2002, 2002.
- Roger P. Roess, Elena S. Prassas and William R. McShane, TRAFFIC ENGINEERING 3rd Edition, Pearson Education International, 2004.