

Locations with potential for information overload should be identified and corrected. The adequacy of the sight lines and sight distances should be assessed, and it should be determined whether unusual vehicle maneuvers are needed and whether likely driver expectancies may be violated.

Potential driver behavior can be anticipated in the design process by using information about the driving tasks and possible driver errors to assess the design. When trade-offs are appropriate, they should be made with the drivers' capabilities in mind so that the resultant design is compatible with those capabilities. Properly designed highways that provide positive guidance to drivers can operate at a high level of efficiency and with relatively few crashes; therefore, designers should seek to incorporate these principles in highway design.

2.3 TRAFFIC CHARACTERISTICS

2.3.1 General Considerations

The design of a highway and its features should explicitly consider traffic volumes and traffic characteristics. All information should be considered jointly. Financing, quality of foundations, availability of materials, cost of right-of-way, and other factors all have important bearing on the design; however, traffic volumes can indicate the need for the improvement and directly influence the selection of geometric design features, such as number of lanes, widths, alignments, and grades.

Traffic data for a road or section of road are generally available or can be obtained from field studies. The data collected by state or local agencies include traffic volumes for days of the year and time of the day, as well as the distribution of vehicles by type and weight. The data also include information on trends from which the designer may estimate the traffic to be expected in the future.

2.3.2 Volume

Average Daily Traffic

The most basic measure of the traffic demand for a highway is the average daily traffic (ADT) volume. The ADT is defined as the total volume during a given time period (in whole days), greater than one day and less than one year, divided by the number of days in that time period. The current ADT volume for a highway can be readily determined when continuous traffic counts are available. When only periodic counts are taken, the ADT volume can be estimated by adjusting the periodic counts according to such factors as the season, month, or day of week.

Knowledge of the ADT volume is important for many purposes, such as determining annual highway usage as justification for proposed expenditures or designing the cross-sectional elements of a highway. However, the direct use of ADT volume in the geometric design of highways is not appropriate, except for local and collector roads with relatively low volumes, because it does not indicate traffic volume variations occurring during the various months of the year, days of the week, and hours of the day. The amount by which the volume of an average day is exceeded on certain days is appreciable and varied. At typical rural locations, the volume on certain days may be significantly higher than the ADT. Thus, a highway designed for the traffic on an average day would need to carry a volume greater than the design volume

for a considerable portion of the year, and on many days the volume carried would be much greater than the design volume.

Peak-Hour Traffic

Traffic volumes for an interval of time shorter than a day more appropriately reflect the operating conditions that should be used for design. The brief, but frequently repeated, rush-hour periods are significant in this regard. In nearly all cases, a practical and adequate time period is one hour.

The traffic pattern on any highway shows considerable variation in traffic volumes during the various hours of the day and in hourly volumes throughout the year. A key design decision involves determining which of these hourly traffic volumes should be used as the basis for design. While it would be wasteful to predicate the design on the maximum peak-hour traffic that occurs during the year, the use of the average hourly traffic would result in an inadequate design. The hourly traffic volume used in design should be a value that will not be exceeded very often or by very much. On the other hand, it should not be a value so high that traffic would rarely be sufficient to make full use of the resulting facility. One guide in determining the hourly traffic volume that is best suited for use in design is a curve showing variation in hourly traffic volumes during the year.

Figure 2-28 shows the relationship between the highest hourly volumes and ADT on rural arterials. This figure was produced from an analysis of traffic count data covering a wide range of volumes and geographic conditions. The curves in the chart were prepared by arranging all of the hourly volumes for one year, expressed as a percentage of ADT, in a descending order of magnitude. The middle curve is the average for all locations studied and represents a highway with average fluctuation in traffic flow.

Based on a review of these curves, it is recommended that the hourly traffic volume that should generally be used in design is the 30th highest hourly volume of the year, abbreviated as 30 HV. The reasonableness of 30 HV as a design control is indicated by the changes that result from choosing a somewhat higher or lower volume. The curve in Figure 2-28 steepens quickly to the left of the point showing the 30th highest hour volume and indicates only a few more hours with higher volumes. The curve flattens to the right of the 30th highest hour and indicates many hours in which the volume is not much less than the 30 HV.

On rural roads with average fluctuation in traffic flow, the 30 HV is typically about 15 percent of the ADT. Whether or not this hourly volume is too low to be appropriate for design can be judged by the 29 hours during the year when it is exceeded. The maximum hourly volume, which is approximately 25 percent of the ADT on the graph, exceeds 30 HV by about 67 percent.

Whether the 30 HV is too high for practical economy in design can be judged by the trend in the hourly volumes lower than the 30th highest hour. The middle curve in Figure 2-28 indicates that the traffic volume exceeds 11.5 percent of the ADT during 170 hours of the year. The lowest of this range of hourly volumes is about 23 percent less than the 30 HV.