

CRITERIA FOR TRAFFIC SIGNALS

INTRODUCTION

Difficult deliberations often precede the decision to install a new traffic signal. The *Manual on Uniform Traffic Control Devices* (MUTCD) lists different ways that a traffic signal can be “justified.” These nine different ways will be called “criteria” in this report. In the *MUTCD*, the criteria are called warrants. Regardless of the terminology, the nine criteria provide a nationally used, systematic method to evaluate the need for traffic signals. Meeting just one of these eight criteria can be justification for installing signals. However, many other factors need to be considered. Addressing travel needs by alternative means without installing signals may be desirable at some locations even when one or more of the eight signal criteria are met.

PROCESS

The City Traffic Engineering Division will use the nine criteria published as warrants in the *MUTCD*. Traffic will be counted, typically by automatic machine methods that segregate traffic for each approach. Locations that appear close to meeting one or more criteria will receive more intense study, including manual counts that segregate traffic by type (motor vehicle, bicycle, pedestrian) and movement (left turn, right turn, straight through); vehicle delay study; field review of existing intersection conditions; etc.

Special Considerations:

- (1) When a manual count has been made, on-street bicycle traffic will be included in vehicle volumes before comparing to the criteria.
- (2) Pedestrian volume will generally include those crossing at the intersection and within one-half block of the intersection. The adequacy of alternative pedestrian crossings (safety, travel route, etc.) to meet pedestrian needs will be considered.
- (3) Where “side street” right-turn traffic exceeds 25% of approach volume, all or a portion of right-turn traffic will be deducted before the volumes are compared to the criteria.
- (4) Intersection topography and geometry will be considered.
- (5) The effect and influence of nearby roadway features will be considered. Such features would include driveways, intersections, railroad crossings, etc.
- (6) Future traffic, especially in a growing area, will be considered.
- (7) Traffic redirection resulting from a signal will be considered. This especially includes the impact on neighborhood streets of installing and not installing the signal.
- (8) Benefits to land uses having access to a potential signalized intersection need to be considered.
- (9) The effects of new signals for travel along an arterial highway need to be considered.

PRIORITY LIST AND COMMENTARY

A rank order priority list will be prepared for review by the Transportation Commission. Staff will prepare commentary on those intersections of most interest to the Commission. The commentary will cover special consideration items listed earlier and other issues.

TRAFFIC SIGNAL WARRANTS: PARAPHRASED DESCRIPTION

Warrant #1-A: Minimum Vehicular Volume

The "side street" traffic volume is the principal reason for signals under this warrant. Typical minimum volume thresholds needed for at least 8 hours:

Main Street: 600 vehicles each hour
Side Street: 200 vehicles each hour

Warrant #1-B: Interruption of Continuous Traffic

The high volume on the major street and lack of traffic bunching does not allow enough gaps for side street traffic. Typical minimum volume thresholds needed for at least 8 hours:

Main Street: 900 vehicles each hour
Side Street: 100 vehicles each hour

Warrant #1-C: Combination of Warrants

For exceptional cases, warrants 1-A and 1-B are each over 80% of the minimum threshold volumes.

Warrant #2: Four-hour Volumes

Traffic volumes for four hours fall above the threshold lines on the warrant chart. Traffic concentrated within a four-hour period justifies signal control.

Warrant #3-A: Peak-hour Delay

The side street traffic needs to wait too long on average during a one-hour period. Typical minimum thresholds:

- Five vehicle-hours of delay for a two-lane side street approach, and
- Side street volume exceeds 150 vehicles during the same hour, and
- Total intersection traffic exceeds 800 vehicles during the same hour.

Warrant #3-B: Peak-hour Volume

Traffic volumes for one hour fall above the threshold lines on the warrant chart. Traffic concentrated within a one-hour period justifies signal control.

Warrant #4: Minimum Pedestrian Volume

The high volume and lack of traffic bunching on the major street does not allow enough gaps for pedestrians to cross. Typical minimum volume thresholds needed are as follows:

- 100 pedestrians crossing each hour for any four hours.
- The frequency of gaps in major street traffic average less than one per minute.

The study location must be suitable for maintaining existing platoons of vehicles created by nearby signals.

Warrant #5: School Crossing

The high volume and lack of traffic bunching on the major street does not allow enough gaps for students to cross. Adequate gaps occur less frequently than once a minute or once each signal cycle when adjacent signals create gaps.

Warrant #6: Coordinated Signal System

Traffic signal control is needed to keep traffic bunched (i.e., to keep platoons from getting too spread out). Traffic bunching or platooning is helpful in reducing speeding and allowing gaps at non-signalized intersections.

Warrant #7: Crash Experience

Traffic signal control is determined to be the safer control type. Other measures to maintain safety have not proven effective. This is one of the most controversial warrants to justify signal control. Typical minimum thresholds:

- Five or more accidents in the past 12 months of a type that could theoretically have been prevented if signal control had been in operation.
- Warrants 1-A, 1-B or 4 are at least 80% met.
- Progressive traffic flow would not be significantly affected.

Warrant #8: Roadway Network Warrant

Signals are needed to keep traffic on the major streets. Typical minimum thresholds:

- Vehicle volume of 1000 vehicles during the peak hour.
- Projected volumes will meet warrants 1, 2, or 3 within five years.

Warrant #9: Intersection Near a Grade Crossing

This warrant is intended for use at a location where none of the conditions described in the other eight warrants are met, but the proximity to the intersection of a railroad crossing at grade is controlled nearby downstream by a stop or yield sign.

This warrant addresses situations where drivers are unable to clear the tracks due to a stop controlled intersection and heavy enough traffic on the cross street, and where other measures cannot be taken, such as changes to the configuration of stop control.

- Distance from center of track to stop/yield line is 140-ft or less
- During the highest traffic hour at which the railroad is expected to be in use, the plot of major and minor street volumes falls above the lines in Figure 4C-9 or 4C-10 depending on the lane configuration and distance from track to stop/yield line.

To request a copy of the section on Traffic Signal Warrants in the 2009 edition of the MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, call Brian Smith at 261-9625.