

TRAFFIC AND SAFETY INFORMATIONAL SERIES

FREQUENTLY ASKED QUESTION #15

WHAT IS THE HARM IN INSTALLING AN UNWARRANTED TRAFFIC CONTROL DEVICE?

Installing traffic control devices such as stop signs or traffic signals where they are not needed can significantly disrupt traffic flow and increase intersection delay for drivers. The induced delay increases travel time and frustrates drivers, and the additional starts and stops result in increased fuel consumption and the consequent production of vehicle emissions.

WHAT IS THE HARM IN INSTALLING A STOP SIGN?

A two-way stop sign assigns the right-of-way at an intersection. Because a stop sign causes substantial inconvenience to motorists, it should be used only where warranted. The *Manual on Uniform Traffic Control Devices* (MUTCD) states that a two-way stop sign may be warranted at an intersection where one or more the following conditions exists:

1. A less important road intersects a main road and application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law.
2. A street is entering a through highway or street.
3. The intersection is in a signalized area but is itself unsignalized.
4. A combination of high entering traffic volumes, a restricted view, or a problematic crash history indicates a need for control by a stop sign.

The amount of delay created by a two-way stop sign at a given intersection depends on the traffic flows on both the major and minor streets. The gaps in the traffic stream on the major street must be sufficient to allow the stopped traffic on the minor street to execute the desired through, right-turn, or left-turn movements through the intersection. The term “critical headway” is often used to describe the median gap accepted by drivers for specific turning maneuvers and roadway characteristics. According to the 2010 *Highway Capacity Manual*, typical critical headways are 6.2 to 7.1 seconds for right turns from a minor roadway and 6.4 to 7.5 seconds for left turns from a minor roadway. Left-turn movements take longer than right-turn movements, and left-turning drivers must cross more traffic streams than right-turning drivers. The delay for vehicles on the minor street is also determined by the vehicle arrival rate on the minor street, which is related to how long drivers must wait in the queue to get to the stop line.

The delay times at stop-controlled approaches can become excessive if the traffic flow on either the major or minor street is high. However, the advantage of a two-way stop is that the major flows do not have to stop and thus incur almost no delay at the intersection (i.e., the majority of the traffic does not have to stop).

Multiway stop control is often controversial because it can sometimes confuse motorists and cause more average delay than other types of traffic control. A multiway stop sign should only be used where the traffic volumes on all approaches to the intersection are approximately equal and relatively low. However, a multiway stop sign can be quite useful in unusual situations where two-way stop control has not solved the observed safety problems but where signalization is not yet warranted.

WHAT IS THE HARM IN INSTALLING A TRAFFIC SIGNAL?

Justifying the installation of a traffic signal requires considerable data collection and analysis. The following data must be collected and analyzed:

- Traffic volumes by approach and movement during 12 hours of an average day
- Pedestrian counts in crosswalks
- Information on nearby facilities and activity centers that serve the young, elderly, and/or disabled
- Posted or statutory speed limits or the 85th percentile speeds on the uncontrolled approaches
- Collision diagrams of recent crashes
- Condition diagram of the intersection

The MUTCD lists nine warrants for the placement of traffic signals, as summarized below (please refer to Chapter 4C of the MUTCD for details):

1. Eight-hour vehicular volume. The volume of intersecting traffic is sufficiently high to consider installing a traffic control signal, or the traffic volume on a major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street.
2. Four-hour vehicular volume. The volume of intersecting traffic is sufficiently high to consider installing a traffic control signal.
3. Peak hour volume. Traffic conditions are such that for a minimum of one hour of an average day, the minor street traffic suffers undue delay when entering or crossing the major street.
4. Pedestrian volume. Traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street.
5. School crossing. The frequency and adequacy of gaps in the traffic flow are insufficient for schoolchildren crossing the major street.
6. Coordinated signal system. The installation of a traffic signal as part of a coordinated signal system at an unsignalized intersection would provide progressive movement and maintain vehicle platooning.
7. Crash experience. Other alternatives do not decrease crashes, and the severity and frequency of crashes are correctable by use of a traffic signal.
8. Roadway network. A signal installation would encourage traffic flow concentration and organization on the roadway network.
9. Intersection near a grade crossing. An intersection approach controlled by a stop or yield sign is in close proximity to a railroad grade crossing.

If none of these warrants are met, a traffic signal should not be installed. In addition, the fulfillment of a warrant or warrants does not in itself justify the installation of a signal.

Installing a traffic signal at a low-volume intersection can significantly increase delays and crashes. The length of delay is directly related to a number of factors. For example, one factor is cycle length, which is influenced by traffic volumes and the need to safely accommodate pedestrian crossing times. As noted above, the increase in delay and stops then translates into higher fuel consumption, increased travel times, and higher point source emissions. Additionally, although traffic signals can reduce the total number of crashes at an intersection, research has shown that certain types of crashes (e.g., rear-end collisions) may actually increase after a signal is installed. For this reason, the type and number of crashes at an intersection should be considered before the installation of a traffic signal.

Traffic signals can represent a positive public investment when justified, but they are costly. A modern traffic signal can cost between \$250,000 and \$500,000 to install. In addition, the electrical power consumed in operating a signalized intersection 24 hours a day can cost an average of about \$1,500 per year.

It is important to carefully consider whether a traffic control device is needed before rushing to make an implementation decision. The costs and benefits must be carefully evaluated, and a careful analysis and engineering study must be completed.