

# TRAFFIC AND SAFETY INFORMATIONAL SERIES

## FREQUENTLY ASKED QUESTION #11

### CAN ALL TRAFFIC SIGNALS BE TIMED SO I RECEIVE A GREEN LIGHT AT EVERY INTERSECTION?

Traffic signals cannot be timed so that everyone receives a green light all of the time, and there are several reasons a minor street typically receives a shorter green light when compared with a major street. There are many different types of signals and uses for them and certain guidelines for their placement. Table 1 shows the speed that allows a vehicle to progress along a roadway for specific signal spacing and characteristics. The addition of a new signal (possibly due to a new development) will alter the signal spacing, and may lower or negate the possibility of vehicle progression along a roadway. The progression of vehicles along a roadway must be reconsidered whenever the characteristics of a roadway or its traffic control changes.

**TABLE 1 Maximum Progressive Vehicle Speed for Various Cycle Lengths and Intersection Spacing**

Traffic Signal Cycle Length (seconds)	Maximum Progressive Speed (mph)			
	0.125-mile Intersection Spacing	0.25-mile Intersection Spacing	0.5-mile Intersection Spacing	1.0-mile Intersection Spacing
60	15	30	—	—
90	10	22	45	—
120	7.5	15	30	60

Adapted from *System Considerations for Urban Arterial Streets*. Institute of Transportation Engineers, 1969.

#### WHY IS THE GREEN TIME SO MUCH SHORTER FOR MINOR STREETS?

This question can easily be answered by considering the definitions of arterial (i.e., major streets) and collector (i.e., minor streets) roadways. By definition, an arterial is a main thoroughfare that carries the majority of the traffic volume through an area. On the other hand, a collector is a street that carries the minority of the traffic volume and it provides a route to access the arterial.

Because the arterial street carries the largest volumes, the signal plan should provide the majority of the green time to the arterial intersection approaches. This signal timing minimizes the delay for the traffic on the main arterial but sometimes causes larger delays for the traffic on the minor streets. If signals are timed correctly and the appropriate type of signal controller is used, minimum total delay (for major and minor street traffic) should be achieved.

#### WHAT IS THE DIFFERENCE BETWEEN PRETIMED AND ACTUATED SIGNALS?

*Pretimed Signals:* These signals have a preset cycle length for specified times of the day or for the entire day. Unlike the actuated signals, a pretimed signal cannot adjust to traffic flow. Therefore, the optimum cycle lengths for these intersections must be determined. Factors considered in designing a cycle length include the number of phases, the largest number of vehicles that can use a green light, and the number of

lanes having right-of-way, just to name a few. Pedestrians are also a major consideration and their presence could increase the side-street green times and consequent cycle length at an intersection.

*Actuated Signals:* These signals can vary their cycle length (i.e., they vary the length of the green lights given) to the traffic flow that uses the intersection. Detectors register vehicles that approach these intersections and send the information to a signal controller. The controller adjusts the length of green for the current traffic conditions. There are two types of actuated signals: fully actuated and semi-actuated.

*Fully actuated signals* are found at intersections that exhibit large fluctuations of traffic volumes from all of the approaches during the day. There is a set minimum and maximum green time for these signals. If there are no opposing vehicles stopped at the intersection, the moving traffic will receive additional green time. The minimum green time is often set equal to the time required for a pedestrian to safely cross the intersection.

*Semi-actuated signals* have detectors only on the minor street approaches to an intersection. They are often found at the intersections of main arterials and minor low-volume roadways. The main arterial has a green light until a vehicle is detected on the minor street. When the traffic volume is high on the side streets (during peak travel times) the semi-actuated signal acts as a pretimed signal.

## **HOW IS THE DECISION TO PLACE A TRAFFIC SIGNAL MADE?**

Traffic engineers cannot simply install traffic signals where they are not warranted. Traffic signals are expensive and the incorrect placement can actually be harmful. Refer to the *Manual of Uniform Traffic Control Devices* (MUTCD) for the 11 warrants for the placement of traffic signals. A traffic signal should not be placed if one of these warrants has not been met.

There are some general objectives in placing a traffic signal. Good engineering judgment must be made in order to balance among these objectives. According to the MUTCD, traffic engineers assess these four goals when allocating the right-of-way to traffic:

1. moving traffic in an orderly fashion,
2. minimizing delay to vehicles and pedestrians,
3. reducing crash-producing conflicts, and
4. maximizing capacity for each intersection approach.

### **For more information**

For more information, please contact \_\_\_\_\_.

## TRAFFIC AND SAFETY INFORMATIONAL SERIES FREQUENTLY ASKED QUESTION #11

### Could traffic signals be timed so I have a green light at every intersection?

Because of the complexity of most transportation systems, it would be nearly impossible to orchestrate traffic patterns and traffic signal timing so that everyone could receive green lights at every intersection. Here are some of the factors that determine when traffic signals change and why drivers can't always get green lights:

#### **Green times vary for minor and major streets**

Because major streets carry the largest volumes, traffic signals give a longer green light to the traffic on these streets. This usually minimizes the delay for the majority of the traffic crossing an intersection. However, the smaller volume of traffic on the minor street may sometimes experience larger delays as a result. The minimum *total* delay is the goal.

#### **Traffic signal timing at isolated intersections**

Many traffic signals, especially those at isolated intersections, are designed on an individual basis to change at cycles that are best for that particular intersection. These traffic signal timings are controlled and change either on a pretimed schedule or by adjusting to current traffic conditions.

*Pretimed signals* have preset cycle lengths (that is, the length of the green light is fixed), either for specified times of the day or for the entire day. Pretimed signals do not adjust to traffic flow. Therefore, the optimum cycle lengths for a particular flow pattern at the intersection must be determined so that the ideal signal timings can be set. An example of one of the many factors that determine how long a green light will last is whether or not there is a pedestrian crossing at the intersection.

*Actuated signals*, on the other hand, vary their cycle lengths, based on the traffic flow. When a vehicle approaches these intersections, it is detected and the information is sent to an electronic signal controller. The controller adjusts the length of the green light to be optimal for the current traffic conditions.

#### **Some traffic signals are timed as a system**

Many signals, especially when closely spaced, are also timed as a system so that some vehicles can travel a segment of roadway and receive a green light at each intersection.

#### **Reducing the delay**

In general, traffic signals are timed to reduce the delay for the most vehicles and help traffic flow more smoothly.

#### **For more information**

For more information, please contact \_\_\_\_\_.

# TRAFFIC AND SAFETY INFORMATIONAL SERIES

## FREQUENTLY ASKED QUESTION #15

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

Installing stop signs or traffic signals where they are not needed can cause significant disruption of traffic flow and increase intersection delay for drivers. The induced delay increases travel time and annoys drivers, and the additional starts and stops result in increased fuel consumption and the consequent production of carbon monoxide, nitrous oxide, particulate matter, and other pollutants.

#### WHAT IS THE HARM IN INSTALLING A STOP SIGN?

Two-way stop signs assign the right-of-way at an intersection. The warrants for the installation two-way stop signs in the *Manual for Uniform Traffic Control Devices* (MUTCD) are listed below. Because a stop sign causes substantial inconvenience to motorists, it should be used only where warranted. It may be warranted where the following conditions exist:

1. the intersection of a less important road with a main road where the applications of the normal right-of-way rule is hazardous;
2. a street entering a through highway or street;
3. an unsignalized intersection in a signalized area;
4. other intersections where a combination of high speed, restricted view, and serious accident record indicates a need for control by the stop sign.

The amount of delay created by the stop sign depends on both major and minor street flows. The gaps in the major flow traffic stream must be adequate to allow the stopped traffic to execute the through, right, or left movement through the intersection. The term “critical gap” is often used to describe the median gap accepted by drivers for specific turning maneuvers and roadway characteristics. According to the 1997 *Highway Capacity Manual*, typical critical gaps are 6.2 to 6.9 seconds for right turns from a minor roadway and 7.1 to 7.5 seconds for left turns from a minor roadway. Left-turning movements take longer, and left-turning drivers must cross more traffic streams. Additional delay for minor street vehicles is also determined by the vehicle arrival rate. The arrival rate of vehicles on the minor street is related to how long drivers will wait in the queue to get to the stop line.

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

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

## WHAT IS THE HARM IN INSTALLING TRAFFIC SIGNALS?

Justification of signal installation requires considerable data collection and analysis. The following data need to be collected and analyzed:

- traffic volumes by approach and movement for the 16 highest hours in a day,
- pedestrian counts in crosswalks,
- intersection approach speed distributions,
- collision diagrams for recent crashes, and
- condition diagram for the intersection.

The MUTCD lists 11 warrants for the placement of traffic signals. These warrants are summarized below (please refer to the MUTCD for details). If none of these warrants are met, a traffic signal should not be placed. In addition, the fulfillment of a warrant or warrants also does not in itself justify the installation of a signal. Please

1. *Minimum vehicular volume.* The volume of intersecting traffic must be above a certain value.
2. *Interruption of continuous traffic.* The traffic volume on a major street is so significant that the traffic on the minor street cannot safely merge, enter, or cross the major street.
3. *Minimum pedestrian volume.* The volume of pedestrians crossing a major street exceeds a certain value.
4. *School crossing.* At an established school crossing, a signal can be placed if it is shown that there are not enough gaps in the traffic for the children to safely cross.
5. *Progressive movement.* To maintain the proper grouping of vehicles and to effectively regulate the group speed.
6. *Accident experience.* When less restrictive remedies and enforcement has failed to decrease the accident rate below levels expected with signalization.
7. *Systems warrant.* A common intersection that serves a principle network for through traffic flow.
8. *Combination of warrants.* If warrants 1 and 2 are each satisfied by 80 percent of the stated values, a signal placement could be justified.
9. *Four-hour vehicular volume.* The traffic volumes on the major and minor streets exceed a certain value for each of any four hours on an average day.
10. *Peak hour delay.* The minor street traffic suffers major delay in entering or crossing the major street for only one hour of an average weekday.
11. *Peak hour vehicular volume.* The traffic volumes on the major and minor streets exceed a certain value for only one hour of the day.

Installing a traffic signal at a low-volume intersection can significantly increase crashes and delays. Again, the increase in delay and stops then translates into higher fuel consumption, increased travel times, and higher point source pollution. The length of delay is directly related to a number of factors. Cycle length is one factor, for example, that is influenced by traffic volumes and the need to safely accommodate pedestrians. The pedestrian crossing time constraints could significantly increase the necessary cycle lengths. Although traffic signals can reduce the total number of collisions 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 signal.

Traffic signals can represent a positive public investment when justified, but they are costly. A modern signal can cost \$80,000 to \$100,000 to install. In addition, there is the cost of the electrical power consumed in operating a signalized intersection 24 hours a day (which can average about \$1,400 per year).

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

**For more information**

For more information, please contact \_\_\_\_\_.

# TRAFFIC AND SAFETY INFORMATIONAL SERIES

## FREQUENTLY ASKED QUESTION #15

### **What is the harm in installing traffic signs and signals that aren't really needed?**

It may surprise you to learn that adding more stop signs or traffic signals along a roadway does not necessarily slow drivers down or increase safety. In fact, in some cases, especially when they are not really needed, the overuse of signs and signals can lead drivers to ignore or not properly obey them.

#### **Too many signs can lead to ineffectiveness**

Studies have shown that when stop signs are placed at intersections where they don't appear to be needed, motorists become careless about stopping.

#### **Too many traffic signals can negatively impact traffic flow**

Installing traffic signals where they are not needed can create traffic congestion, add travel time, and frustrate drivers, who may start driving impatiently.

#### **Other options can provide safety**

To make travel efficient and safe and to help ensure the proper observance of stop signs and traffic signals, they are usually installed only where they are absolutely necessary. Other solutions—for example, a yield sign—may also provide enough safety, without any detriment to traffic flow.

#### **For more information**

For more information, please contact \_\_\_\_\_.

## TRAFFIC SAFETY AND INFORMATIONAL SERIES FREQUENTLY ASKED QUESTION #16

### WON'T A TRAFFIC SIGNAL REDUCE ACCIDENTS?

Traffic signals are not always the answer to reducing crashes at intersections. Crash analysis is very complicated and multiple causes for a crash are usually identified. For this reason, the solution to a safety problem at a particular intersection is not always obvious, and the placement of any type of traffic control device must be considered carefully. The incorrect installation or placement of a traffic signal can actually result in additional crashes at an intersection.

#### WHAT ARE THE WARRANTS FOR A TRAFFIC SIGNAL?

Traffic control signals should not be installed unless one or more of the signal warrants contained in the *Manual on Uniform Traffic Control Devices (MUTCD)* are met. Among other things, these warrants are related to intersection vehicular and pedestrian volumes, crash history, and the presence of a school crossing. However, fulfillment of a warrant or warrants does not in itself justify the installation of a signal. A comprehensive engineering study should also be done to indicate that the installation of a traffic signal would improve the overall safety and/or operation of the intersection. If the study indicates otherwise, a traffic signal should not be installed even though one or more of the warrants are met. A complete listing of the 11 signal warrants in the MUTCD is included in the answer to the "What is the harm in installing an unwarranted traffic control device?" question within this informational series.

#### WHAT CONTRIBUTES TO INTERSECTION CRASHES?

According to the US Department of Transportation's 1994 *Technical Report on Intersection Crossing Path Crashes*, intersections controlled with traffic signals represent approximately one-third of all intersection crossing path crashes. Most of the crashes related to traffic signals are rear-end collisions. The Iowa Governor's Traffic Safety Bureau has published several fact sheets containing information about crashes. The major contributors to crashes are summarized below:

- *Young drivers* are major contributors to crashes in Iowa. In 1996, although 16 and 17 year olds only represented 3.5 percent of Iowa's licensed drivers, they contributed to 11 percent of all at-fault drivers in vehicle crashes.
- *Alcohol* is a major contributing factor of traffic fatalities and the leading cause of death among people 1 to 34 years of age. In 1998, there were 2,626 Iowa alcohol-related traffic injuries and approximately 17,000 operating-under-the-influence (OWI) arrests.

- *Speeding* ranks just behind alcohol and stop light/stop sign violations as a contributing factor to fatal crashes in Iowa. When a vehicle is traveling at a faster speed, a much greater distance is required to make the same driving decisions as when traveling at a slower speed.
- *Red light running* also results in a large number of crashes at signalized intersections. For example, in 1998 there were 89,000 red light running crashes in the United States that resulted in 80,000 injuries and 986 deaths.

## **WHAT CAN BE DONE TO REDUCE THESE CRASHES?**

The goal of an intersection crash analysis is to develop countermeasures that should lead to a reduction in crashes. However, no two intersections are the same. Each intersection has its own unique characteristics that must be studied and analyzed in detail. The traffic engineer observes the site, uses proper analysis techniques and his or her background and experience to identify solutions.

Signalization may not eliminate the crash concerns at an intersection. It may change the type of crashes or simply shift them to another location. The installation of a traffic signal (especially an unwarranted signal) can cause excessive delay. Violation of these types of signals can contribute to crashes or result in a diversion of traffic to parallel residential streets.

The evaluation of an intersection and its characteristics may indicate that measures other than a traffic signal could result in adequate and less intrusive intersection safety improvements. Some countermeasures that might be considered for crash reduction have been identified by the Institute of Transportation Studies in the fourteenth edition of the *Fundamentals of Traffic Engineering*. The countermeasures at an intersection include

- prohibiting a turning movement,
- providing turn lanes,
- installing or improving warning signs,
- improving roadway lighting,
- providing a stop sign,
- installing or improving pedestrian crosswalk,
- improving skid resistance for wet-weather accidents,
- creating truck escape ramps,
- providing rumble strips to improve drift-off-road accidents, and
- correcting the roadway curve.

## **WHAT ABOUT INSTALLING A TRAFFIC SIGNAL?**

The installation of a traffic signal (or four-way stop control) must be preceded by a thorough engineering study to determine whether the location meets minimum signalization warrants. Traffic signals, when warranted, can produce a more orderly movement of traffic, increased intersection capacity, a reduction in certain types of crashes (especially right-angle collisions), nearly continuous movement along a route, and an interruption of traffic to permit other traffic or pedestrians to cross. However, improperly installed or

unwarranted traffic signals can produce excessive delay, disobedience of the signal indications, increased use of minor roadways (to avoid signals), and an increase in certain types of crashes (especially rear-end collisions). There are 11 warrants for signal installation (see informational series answer to “What is the harm in installing an unwarranted traffic control device?” for signal warrants). A traffic signal should only be installed if the intersection meets one or more of these warrants.

There is only one traffic signal warrant related to the crash history of an intersection. This warrant requires that remedies less restrictive than a traffic signal be considered first, that there be at least five reportable crashes in a year that could be corrected by a traffic signal, and that certain minimum volume levels be met.

**For more information**

For more information, please contact \_\_\_\_\_.

## TRAFFIC SAFETY AND INFORMATIONAL SERIES FREQUENTLY ASKED QUESTION #16

### **Wouldn't installing a traffic signal reduce the number of accidents at an intersection?**

It may surprise you to learn that adding traffic signals would not necessarily increase safety at an intersection. In fact, in some cases, especially when the traffic signals do not seem to be needed, some drivers may begin to ignore them or run yellow lights in an attempt to avoid delays. Therefore, officials in your area make careful decisions concerning the use of traffic signals. Here are some of the factors they consider:

#### **Too many traffic signals can negatively impact traffic flow**

Installing traffic signals where they are not needed can create traffic congestion, add travel time, and frustrate drivers, who may start driving impatiently and make inappropriate decisions. To make travel efficient and safe and to help ensure the proper observance of traffic signals, they are usually installed only where they are absolutely necessary.

#### **Where traffic signals are installed**

At least one of 11 conditions must be met for a traffic signal to be installed. The conditions include high vehicle and/or pedestrian volumes, a record of severe crashes, and school crossings where there is not enough of a gap in traffic flow for children to cross safely.

#### **Other solutions**

Many crashes at intersections are not caused by a lack of a traffic signal. Inexperienced drivers, drunk drivers, and speeding are often the cause. Therefore, traffic signals do not always offer increased safety at an intersection. Other solutions that might be considered include providing turning lanes, installing warning signs, improving roadway lighting, and installing a pedestrian crosswalk.

#### **For more information**

For more information, please contact \_\_\_\_\_.

## TRAFFIC AND SAFETY INFORMATIONAL SERIES

### FREQUENTLY ASKED QUESTION #20

#### WHEN DO INTERSECTIONS RECEIVE STOP SIGNS (TWO-WAY AND FOUR-WAY) AND SIGNALS?

Traffic control devices are present to safely assist and guide drivers. Several people believe that many of our traffic problems would be solved by the addition of a stop sign or traffic signal. Some would even like a traffic signal or a stop sign at every intersection. In fact, there are situations in which the absence of a stop sign or traffic signal actually provides a safer situation.

Based on the *Manual on Uniform Traffic Control Devices (MUTCD)*, traffic control devices should meet five basic requirements. They should

- fulfill a need;
- command attention;
- convey a clear, simple meaning;
- command respect of road users; and
- give adequate time for proper response.

#### WHAT IS THE APPROPRIATE USE AND PLACEMENT OF STOP SIGNS?

The stop sign is a regulatory sign used to stop traffic. It is a red octagon that has a white border and large white letters that read "STOP." At multiway stop intersections, a small plate is placed below the stop sign to inform the driver of how many approaches are required to stop.



Because stop signs inconvenience drivers, they should only be used where they are strictly warranted. The following warrants for the placement of stop signs are found in the MUTCD:

1. the intersection of a less important road with a main road where application of the normal right-of-way rule is unduly hazardous;
2. a street entering a through highway or street;
3. an unsignalized intersection in a signalized area;
4. other intersections where a combination of high speed, restricted view, and serious accident record indicates a need for control by the stop sign.

There are also locations where the use of stop signs should be avoided. Every time a stop sign is considered, a less restrictive method such as a yield sign should first be considered.

#### WHAT DETERMINES THE PLACEMENT OF A MULTI-WAY STOP SIGN?

The multiway stop sign may improve the safety of an intersection. Normally, it is used at the intersection of two roads that contain similar traffic volumes. A three-way stop is used at intersections that have only three approaches (e.g., a T-intersection). According to the MUTCD, the warrants for placing multiway stop signs are as follows:

1. where traffic signals are going to be placed soon and the intersection needs a temporary solution to control the traffic;
2. an intersection that has several crashes ( $\geq 5$  correctable accidents in 12 months);
3. when an intersection has the following traffic volumes: (a) the total volume of traffic entering the intersection from all approaches must average at least 500 vehicles per hour for any eight hours of an average day; (b) the combined vehicular and pedestrian volume that enters the intersection from the minor street must average at least 200 units per hour for the same eight hours, with an average delay to the minor street traffic of at least 30 seconds per vehicle during the maximum hour; (c) the 85th percentile approach speed (this is the speed at or below which 85 percent of the vehicles travel on a given roadway) of the major street traffic exceeds 40 miles per hour, and the minimum vehicular volume warrant is 70 percent of the above requirements.

### **WHY CAN'T WE PLACE A TRAFFIC SIGNAL AT EVERY SCHOOL CROSSING?**

The fourth MUTCD warrant for traffic signalization explains traffic signal placement with regard to school crossings. If a traffic study shows that the number and length of gaps in the traffic flow are not adequate to allow the children to cross safely, then a traffic control signal may be warranted. When the gaps are sufficient, the addition of a traffic control device may not be necessary. A crossing guard or school crossing sign at the crosswalk with warning signs at the approaches can also help control traffic during peak traffic flow times.

When traffic control signals are installed entirely because of this warrant, the MUTCD notes the following:

- Pedestrian indications shall be provided for each crosswalk established as a school crossing.
- At an intersection, the signal normally should be traffic-actuated. As a minimum, it should be semi-actuated, but full actuation with detectors on all approaches may be desirable. Intersection installations that can be fitted into progressive signal systems may have pretimed control.
- At nonintersection crossings, the signal should be pedestrian-actuated, parking and other obstructions should be prohibited for at least 100 feet in advance of and 20 feet beyond the crosswalk, and the installation should include suitable standard signs and pavement markings. Special police supervision and/or enforcement should be provided for a new nonintersection location.

### **WHAT DETERMINES THE PLACEMENT OF TRAFFIC SIGNALS?**

The warrants for the placement of traffic signals are found in the MUTCD. Please refer to the informational series answer for the question, "What is the harm in installing an unwarranted traffic control device?"

#### **For more information**

For more information, please contact \_\_\_\_\_.

# TRAFFIC AND SAFETY INFORMATIONAL SERIES

## FREQUENTLY ASKED QUESTION #20

### When do intersections receive stop signs and signals?

It may surprise you to learn that adding stop signs or traffic signals would not necessarily slow drivers down or increase safety at an intersections. In fact, in some cases, especially when the signs or signals do not seem to be needed, some drivers may begin to ignore them. Therefore, officials in your area make careful decisions concerning the use of stop signs and traffic signals. Here are some of the factors they consider:

#### **Too many signs can lead to ineffectiveness**

Studies have shown that when stop signs are placed at intersections where they are not really needed, motorists become careless about stopping. Installing traffic signals where they are not needed can also create traffic congestion, add travel time, and frustrate drivers, and these drivers may become impatient and make unsafe maneuvers.

#### **The use of signs and signals should be restricted to locations where they will be effective**

Signs and signals are only effective and should only be used when they meet the following four requirements. They should (1) fulfill a need, (2) convey a clear, simple meaning, (3) command attention and respect, and (4) give adequate time for drivers to respond.

Locations must have one or more of the following the conditions for two-way stop signs to be installed:

- an intersection of a minor and a major road, where the application of the normal right-of-rule would be hazardous;
- a street enters a highway;
- an unsignalized intersection in a signalized area;
- there is high-speed traffic, it is hard to see, and there is a previous crash record.

Four-way stop signs are often used at the intersection of two roadways that contain similar traffic volumes. The location must have at least one of the following conditions:

- a traffic signal is going to be installed and the intersection needs a temporary solution to control the traffic;
- within 12 months at least five crashes have occurred at the intersection that could have been prevented by stop signs;
- relatively high volumes and/or high major-street vehicle speeds exist.

At least one of 11 conditions must be met for a traffic signal to be installed. The conditions include high vehicle and/or pedestrian volumes, a record of severe crashes, and school crossings where there is not enough of a gap in traffic flow for children to cross safely.

#### **Other options**

To make travel efficient and safe and to help ensure the proper observance of stop signs and traffic signals, they are installed only where they are absolutely necessary. Other solutions—for example, a yield sign—should be considered first and may be more appropriate.

#### **For more information**

For more information, please contact \_\_\_\_\_.