

TRAFFIC SIGNALS



QUICK FACTS

Advantages of traffic signals

Traffic signals control vehicle and pedestrian traffic by assigning priorities to various traffic movements to influence traffic flow.

Properly designed, located and maintained traffic signals have one or more of these advantages:

- Provide for orderly movement of traffic;
- Increase traffic-handling capacity of an intersection;
- Reduce frequency and severity of certain types of crashes, especially right-angle collisions;
- Provide for continuous movement of traffic at a definite speed along a given route;
- Interrupt heavy traffic at intervals to permit other vehicles or pedestrians to cross.

Disadvantages of traffic signals

Traffic signals are not a solution for all traffic problems at intersections, and unwarranted signals can adversely affect the safety and efficiency of traffic by causing one or more of the following:

- Excessive delay;
- Increased traffic congestion, air pollution and gasoline consumption;
- Disobedience of signals;
- Increased use of less-adequate streets to avoid traffic signals;
- Increased frequency of crashes, especially rear-end collisions.



How do traffic signals work?

WYDOT has prepared this brochure to answer frequently asked questions about the process for installing traffic signals.

What is the purpose of a traffic signal?

Traffic signals are designed to ensure an orderly flow of traffic, provide an opportunity for pedestrians or vehicles to cross an intersection and help reduce the number of conflicts between vehicles entering intersections from different directions.



Do traffic signals reduce intersection crashes?

Certain types of crashes can be reduced in number or severity by installing a signal, while other types of crashes will increase. Where signals are used unnecessarily, the most common result is an increase in total crashes, especially rear-end collisions.

Fixed-time signals follow a predetermined sequence of signal operation, always providing the same amount of time to each traffic movement, whether traffic is present or not. Actuated signals change the lights according to the amount of traffic in each direction. They use various types of sensors to detect vehicles, and adjust the length of the green time to allow as many vehicles as possible through the intersection before responding to the presence of vehicles on another approach.

When should signals be considered?

Traffic signals should be considered when they will alleviate more problems than they create. A warranted signal properly operated may provide for more orderly movement of traffic, and reduce the occurrence of certain types of collisions. However, traffic signals function by stopping traffic, and whenever a vehicle is stopped on the road, the potential for a crash is created. As a result, unwarranted signals can result in increased crashes, delays and congestion.



How does WYDOT determine where traffic signals are installed?

An engineering study of traffic conditions, pedestrian use, the physical or geometric characteristics of the intersection and the distance to other signalized intersections is completed to determine whether installation of a traffic signal is justified. Justification is based on minimum conditions called warrants, as described in the Manual on Uniform Traffic Control Devices (MUTCD).

This manual contains national standards developed by all 50 states and the federal government to ensure uniformity in the design and use of traffic signals, signs and pavement markings throughout the country.

Why is traffic engineering essential?

Unnecessary or excessive traffic signals can create hazards. One of the greatest obstacles to applying sound principles of traffic engineering is the common belief that simply installing a traffic signal will solve any traffic problem.

What does a traffic engineer consider when solving traffic problems?

The engineer takes traffic counts, analyzes crash statistics, studies speed data, examines road conditions, conducts research and reviews what other professionals are doing and the results they have achieved.

How do traffic engineers promote safer traffic operation?

They design for conditions that contribute to smooth and efficient traffic flow. Disrupting the flow of traffic increases the probability of crashes. Unwarranted traffic signals and too many signs may cause driver confusion and indecision, resulting in vehicles stopping or slowing in the road.



What are the criteria used in traffic signal studies?

MUTCD criteria used to define the appropriateness of a traffic signal are usually expressed in the form of numerical requirements such as the volume of vehicular or pedestrian traffic. The most recent edition of the MUTCD can be accessed online at <http://mutcd.fhwa.dot.gov/>.

Warrants are guidelines, not absolute values. If no warrants are met, a signal will not be installed. Satisfaction of one or more warrants does not guarantee a signal is needed. Engineering judgment is exercised in making the final decision. The engineering study must find that installation of a signal will improve the overall safety and operation of the intersection.

Traffic engineers carefully evaluate the physical layout of the intersection, the average number of vehicles and pedestrians using it, delays experienced during peak hours, average vehicle speeds, roadside development, spacing of existing signals and the number and types of crashes that have occurred. If a signal is warranted, the project is programmed for design and construction.

What happens once the signal is recommended?

Design plans are developed and reviewed. Environmental and right-of-way documents are prepared and, if necessary, public meetings are held. Once the design plans are completed, the signal installation project is publicly bid and awarded to an electrical contractor. The entire process may take two years or more.

Why does it take so long to get a traffic signal installed?

After a traffic engineering study has indicated the need for a signal, it must be determined how the signal will be funded, who will do the installation and who will maintain and operate it. Then the project is added to a list of statewide projects competing for funds. These funds must be allocated well in advance, so projects often are on a waiting list for several years.

How much does a traffic signal cost?

A typical traffic signal installation costs between \$200,000 and \$600,000. This includes some cost for miscellaneous work such as sidewalk repair, utility adjustments, pedestrian access ramps and pavement markings often required for a newly signalized intersection.

How is a study for a new traffic signal requested?

A written request must be made to the nearest WYDOT resident engineer, district traffic engineer, district engineer or public involvement specialist.

For more information contact the WYDOT public involvement specialist in your area of the state:

Southeast, 745-2142;

Central, 473-3303;

Southwest, 352-3065;

Northeast, 674-2356; or

Northwest, 856-1341.

Why do some intersections have left-turn arrows and others don't?

Left-turn arrows are installed where they can reduce the overall delay experienced by motorists, or at locations that have an identified left-turn crash problem that an arrow can improve. If installed indiscriminately they can cause more problems than they solve.

Left-turn arrows typically decrease the delay for left-turning drivers, but increase the delay for through traffic. At locations where there is a high volume of left turns and delays are high, the longer delay a turn arrow causes for through traffic can be offset by the decrease in the delay for those turning left. However, where the volume of through traffic is considerably higher than left-turning traffic, the benefit to left-turning traffic usually does not outweigh the increase in delay for through traffic. If arrows are installed under these circumstances, it can lead to more congestion, increases in fuel consumption and emissions and an increase in rear-end crashes.



Do left-turn arrows reduce the number of crashes at intersections?

No significant differences in left-turn crash rates have been noted between intersections where there are no left-turn arrows and intersections where left-turn arrows operate in protected-permissive mode. Most left-turn crashes occur at the end of a green light interval, when the light changes to yellow and some drivers turn assuming oncoming traffic will stop. This situation occurs whether turn arrows are installed or not.

Most left-turn arrows in Wyoming now operate in permissive-protected mode, which means left-turning vehicles are first given a flashing yellow left-turn arrow which means they can turn left after first yielding to all oncoming traffic and to any pedestrians in the crosswalk. Then, if there is still demand for the left turn, a green arrow may be displayed after the flashing yellow arrow to help clear the left-turn traffic.

This mode of operation has been shown to reduce left-turn crashes when used judiciously. Intersections without arrows are regularly evaluated to determine if changing traffic volumes and patterns have created the need for turn arrows.



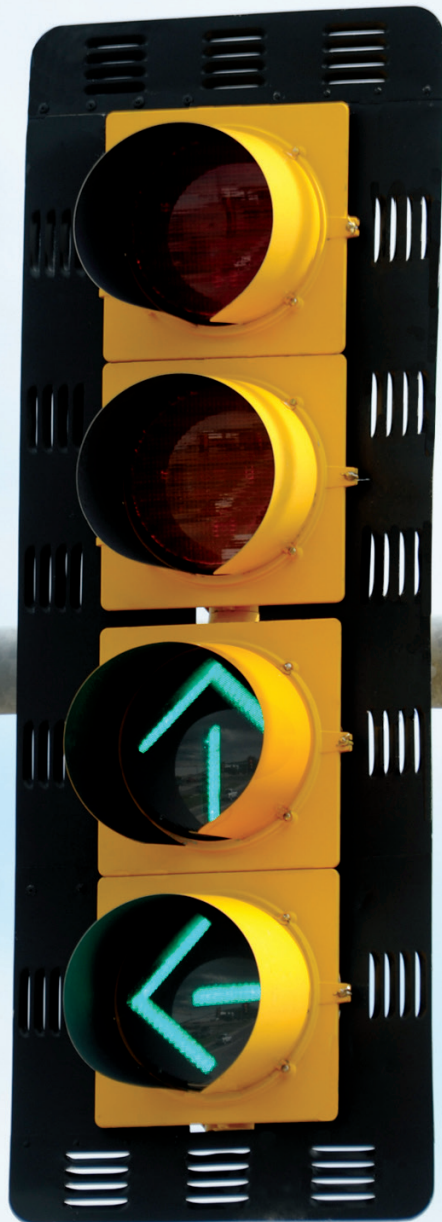
Why doesn't the arrow come on every time there is a vehicle in the left-turn lane?

Effective programming of traffic signals is a balancing act between safety and efficiency. Some protected-permissive left-turn signals will not turn on until there are at least three vehicles waiting in line. If only one or two vehicles are turning left during one signal cycle, in most cases drivers are able to complete the turn by finding gaps in the opposing through traffic.

At most intersections, left-turn traffic is only 10 to 20 percent of through traffic volumes. Providing a protected left turn for one or two vehicles on every green cycle would unnecessarily delay the majority of through traffic.

Why are there cameras at some signalized intersections?

The cameras are vehicle detectors used in the operation of the traffic signal. Video detection offers advantages over in-pavement detectors, including more flexibility in the placement of vehicle detection zones and better detection of bicyclists and motorcyclists. They can be used to count the amount of traffic lane by lane to help time the signal. WYDOT does not use cameras for any automated enforcement of intersections, and no recording is done.



Basic traffic signal operations

Left-turn lane

Steady red arrow

- No left turns are allowed during red. STOP and wait for flashing yellow arrow or green arrow.

Steady yellow arrow

- Signal is about to turn red. Be prepared to STOP.

Flashing yellow arrow

- Left turns are permitted but not protected. Proceed with caution after YIELDING to oncoming traffic and any pedestrians in the crosswalk.

Steady green arrow

- Left turns are protected from oncoming traffic. The green arrow can come at the beginning or end of the signal sequence.



Through Lane

Solid Red

- A red signal means “STOP.” You can make a right turn after you stop and yield to all other traffic. Do not turn if a “NO TURN ON RED” sign is posted.

Solid Yellow

- A yellow signal light means “CAUTION,” the red signal is about to appear.

Solid Green

- A green light means “GO,” after first yielding to vehicles and pedestrians already lawfully in the intersection.

Start crossing

- Watch for vehicles



Don't start

- Finish crossing if started



Don't cross



Don't start

- Finish crossing if started
- Time remaining to finish crossing



TIMER