

# TRAFFIC SIGNALS

## FREQUENTLY ASKED QUESTIONS

### **What is the purpose of a traffic signal?**

A traffic signal's purpose is to assign the right-of-way to vehicles or pedestrians entering or crossing a roadway at an intersection. It facilitates an orderly shared use of the roadway space by separating conflicting vehicle/pedestrian movements. Traffic signals are one type of intersection control, along with yield signs, stop signs, and roundabouts.

### **What are the advantages of a traffic signal?**

Traffic signals, when properly installed, can be an invaluable tool for the control of vehicular and pedestrian traffic. They can provide better flow of traffic, decrease delay at an intersection, create needed gaps in traffic, and reduce certain types of crashes.

### **What are the disadvantages?**

When traffic signals are improperly installed or not necessary, conditions can actually worsen and become less safe. Unnecessary traffic signals can create issues, including excessive or unnecessary delays and increased traffic congestion, which leads to increased fuel consumption and increased air pollution. Signals may also cause an increase in crashes, especially rear-end crashes. This is why an in-depth engineering analysis is done to determine if a traffic signal is necessary before installation.

### **Do traffic signals reduce crashes?**

No. It is a widely-held belief that the installation of a traffic signal will reduce crashes. This, unfortunately, is false. Although traffic signals may be able to reduce certain types of crashes such as right-angle crashes, the installation of a traffic signal typically will increase the frequency of other types of crashes, especially rear-end crashes.

### **But won't a traffic signals eliminate fatal crashes?**

Unfortunately, traffic signals are not a "cure-all" for the elimination of fatalities. A recent five-year review of fatalities reported by Nebraska Law Enforcement from 2014 to 2018 revealed that 1 out of every 15 fatalities in Nebraska occurred at a traffic signal.

### **How much does a typical traffic signal cost to install?**

Over the past few years, the installation of a standard, new, permanent traffic signal in Nebraska has ranged in cost from \$150,000 to \$300,000. In addition to signal equipment, other costs (e.g., turn lanes) may need to be constructed prior to installing traffic signals at an intersection.



# TRAFFIC SIGNAL ANALYSIS

## Signal Warrant Analysis

State and Federal law requires that a traffic engineering study be completed before a traffic control device such as a traffic signal is installed on any public roadway. The study may consist of a number of factors such as; traffic volumes, turning traffic, pedestrians, approaching speeds, crash history, intersection design, anticipated delays, nearby signals, and future land use and roadway improvement projects. When considering the installation of a traffic signal, the engineers must comply with the guidelines or “warrants” for signal installation set forth in the *Manual on Uniform Traffic Control Devices* (MUTCD). These traffic signal warrants have been determined from past national research and are established as the required practice to ensure that traffic signals are only justified by comprehensive, objective criteria.

A key component of a Traffic Signal Study is a Traffic Signal Warrant Analysis. Chapter 4C of the MUTCD identifies nine (9) warrants which should be evaluated to determine if the installation of a traffic control signal may be justified at a given location. Please note, fulfilling the criteria of a warrant does not mean a traffic signal must be installed. A short description of the nine warrants follows. Warrant 1 and/or Warrant 2 must typically be satisfied before a traffic signal is considered. Warrants 3-9 are only used in specific circumstances.

## Traffic Signal Warrants

**Warrant 1, Eight Hour Vehicular Volume:** Intended for application at locations with a large volume of intersecting traffic, or where major street traffic volumes are so heavy that minor street traffic experiences excessive delay.

**Warrant 2, Four Hour Vehicular Volume:** Intended for application at locations with a high volume of intersecting traffic.

**Warrant 3, Peak Hour:** Intended for locations where minor street traffic suffers undue delay entering or crossing the major street during a minimum of one (1) hour during the day. Warrant 3 is only examined in unusual cases, such as office complexes, manufacturing plants, industrial complexes, high schools, or other facilities that attract or discharge large numbers of vehicles over a short period of time.

**Warrant 4, Pedestrian Volume:** Intended for locations where the traffic volume on the major street is so heavy that pedestrians experience excessive delay crossing the major street. Criteria, such as number of pedestrians, traffic volumes, at the location of crossing are reviewed with this warrant. Warrant 4 only applies when the number of pedestrians is around 100 pedestrians PER HOUR.

**Warrant 5, School Crossing:** Intended for locations where the presence of school children crossing the road is the principal reason to consider installing a traffic control signal.

**Warrant 6, Coordinated Signal System:** Intended for locations at which the installation of a traffic control signal is necessary to maintain proper platooning of vehicles within a coordinated signal system.

**Warrant 7, Crash Experience:** Intended for locations where the severity and frequency of certain types of crashes are the principal reason to consider installing a traffic control signal. Satisfying the requirements of Warrant 7 also requires traffic volume that satisfies Warrant 1.

**Warrant 8, Roadway Network:** Intended for locations where the installation of a traffic control signal might be justified to encourage concentration and organization of flow on a roadway network.

**Warrant 9, Intersection Near a Grade Crossing:** Intended for locations where the proximity to the intersection of an at-grade railroad crossing is the principal reason to consider installing a signal.

Additional information on traffic signal warrants can be found at: <https://mutcd.fhwa.dot.gov/pdfs/2009r1r2/part4.pdf>

