

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 _____.