

SIGNALIZED INTERSECTION SAFETY STRATEGIES



Optimize Clearance Intervals

WHERE TO USE

Signalized intersections with a high frequency of crashes related to clearance interval lengths that are possibly too short. These crashes include angle crashes between vehicles continuing through the intersection after one phase has ended and the vehicles entering the intersection on the following phase. Rear-end crashes may also be a symptom of short clearance intervals.



DETAILS

Clearance intervals provide safe, orderly transitions in right-of-way assignment between conflicting streams of traffic. Clearance intervals always include a yellow change interval and, in most cases, an all-red clearance interval.

Clearance intervals are a function of operating speed, the width of the intersection area, lengths of vehicles, and driver operational parameters such as reaction, braking, and decision-making time. The Institute of Transportation Engineers (ITE) has developed an equation for determining the length of the clearance interval.

Clearance intervals that are too short in duration (compared to the ITE method) can contribute to rear-end crashes related to drivers stopping abruptly and right-angle crashes resulting from signal violations. One study showed clearance intervals shorter than those calculated using the ITE equation have higher rear-end and right-angle crash rates than intersections with timings that exceed the ITE value. In the extreme, a too short interval can result in drivers operating at the legal speed limit being forced to violate the red phase. Another study noted that short signal intervals are associated with vehicle conflicts and red-light running.

Establishment of a policy for determining clearance interval duration is necessary to provide consistency throughout a jurisdiction's system. Also, consideration should be given to other enforcement actions associated with potential red-light running.



KEY TO SUCCESS

Clearance intervals should not be long enough to encourage disrespect in drivers for the interval—thereby contributing to red-light running and even more severe crashes—or so short as to violate driver expectancy regarding the length of the interval, resulting in abrupt stops and possible rear-end crashes.

ISSUES

One study suggests that drivers often do not assume that longer clearance intervals at some locations will mean they will occur at all signalized intersections. Further research may be needed, however, to show that lengthening a clearance interval does not create general expectations among drivers. As clearance intervals are increased, cycle length and delay will usually increase. Thus, an intersection may become safer, but the increased level of delay may raise objections from the traveling public. Longer cycle lengths may also lessen a single progression scheme's effectiveness.

TIME FRAME ●○○○

Implementation time is low for changing the length of a clearance interval. Engineering studies, development of retiming plans, and field implementation are required.

COSTS ●○○○

Costs for changing the length of a clearance interval will be low. The design of the new signal timing and the reprogramming of the signal should be the only costs.

EFFECTIVENESS

PROVEN: This strategy is proven effective in reducing multivehicle crashes at signalized intersections. A study of signalized intersections in two counties in New York found a 9% reduction in multivehicle and a 12% reduction in injury crashes at intersections where the duration of the yellow change intervals was lengthened to meet ITE recommendations. The same study showed a 37% reduction in crashes involving pedestrians or bicyclists. Another study showed an 18% decrease in all types of crashes when the clearance interval was increased. Yet another study indicated a 15% decrease in all crashes and a 30% decrease in right-angle crashes when the yellow change interval was increased.

COMPATIBILITY

Optimizing the length of the clearance interval is compatible with other safety improvement strategies. Note that some strategies, including widening an approach to add left-turn lanes, may increase required clearance intervals. An alternative to clearance interval optimization is implementation of measures to reduce speeds on one or more approaches.

SUPPLEMENTAL INFORMATION

A detailed discussion on yellow and all-red intervals is provided in *Making Intersections Safer: A Toolbox of Engineering Countermeasures to Reduce Red-Light Running* (available from: <http://safety.fhwa.dot.gov/intersections/>).

For more details on this and other countermeasures: <http://safety.transportation.org>

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