

Low Cost Intersection Safety Improvements

Did you know?

In Massachusetts, intersection crashes account for 29% of fatal crashes & 47% of incapacitating injury crashes

[\(Source: Massachusetts Strategic Highway Safety Plan\).](#)

Background

An intersection, a place where two or more roads meet, may be one of the most complex environments a driver will encounter along the roadway. Intersections can present conflicts for vehicles and pedestrians alike. In the U.S., over 2.8 million intersection-related crashes occurred in 2000 representing 44 percent of all crashes. Approximately 8,500 fatalities (23 percent of total fatalities) and one million injury crashes occurred at intersections, costing society about \$40 billion. As a result, intersection safety is continually a priority in the U.S. and in Massachusetts, however, in many instances there is an inherent tradeoff between mobility and safety. Low cost safety improvements provide the opportunity to implement countermeasures at intersections where resources are limited.

Intersections and Countermeasures

Four major types of crashes occur at intersections: (1) angle collisions, (2) rear-end collisions, (3) vehicles improperly changing lanes collisions, and (4) pedestrian and bicycle collisions. Reducing the frequency and severity of crashes can be accomplished through analyzing intersection crash patterns and applying appropriate countermeasures. Intersection crashes have many causes including, but not necessarily limited to, poor geometry and design, deficient operational control, insufficient maintenance, and human error. Considering all of these elements, the optimal approach to improved intersection safety is multidisciplinary in nature; however, many low cost countermeasures focused on the intersection design and operation can be both implemented and effective at the local level. When improving an intersection consider some general strategies such as the following:

- Attempt to minimize intersection conflicts and crashes, and lessen the impacts of crashes when they do occur;
- Attempt to match a countermeasure to an identified safety problem;
- Evaluate implemented countermeasures to identify what works and what does not, for consideration at future locations; and
- Select countermeasures that are technically feasible and practical, and provide an advantageous benefit/cost ratio.



Photo Source: AASHTO Strategic Highway Safety Plan



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Low Cost Countermeasures

Although large-scale intersection treatments can be used, there are also many effective low cost countermeasures that can be implemented. This fact sheet targets some of the common safety challenges at intersections, and places an emphasis on identifying low-cost improvements that could likely be implemented in a short timeframe (i.e., less than a year). Although several definitions exist for low cost improvements, such as the [Federal Highway Administration's \(FHWA\)](#) definition of less than \$50,000, the information below is based upon treatments under \$15,000. Lastly, focusing on low cost measures often allows for a proactive approach to traffic safety, and may eliminate, or at least defer, the need for a high-cost improvement.

Did you know?

According to a [Kentucky Transportation Center](#) Research Report warning signs in general are associated with a 25% reduction in crashes. The same report also indicates that all-way stop control reduces crashes by 55%

Identified Safety Challenge	Potential Countermeasures
Driver confusion resulting from lane usage patterns	<ul style="list-style-type: none"> • Install lane use designation signage along side or above the intersection approach. • Add symbolic lane use markings. • Delineate paths through intersection for confusing vehicle movements (e.g., left turns).
Crashes involving left-turning vehicles	<ul style="list-style-type: none"> • At signalized locations add protected left-turn phase; however, this should be based upon a capacity analysis. • Consider existing lane usage patterns and reconfigure existing usage to dedicate an exclusive left-turn lane.
Sight distance issues	<ul style="list-style-type: none"> • Improve sight lines by clearing obstacles such as brush, unnecessary signs, etc. • Add advance warning signs alerting motorists of intersection ahead.
Traffic signal conspicuity	<ul style="list-style-type: none"> • Add backplates to traffic signal heads. • Consider use of LED signal indications. • Consider position of traffic signal heads with respect to driver sight lines (see MUTCD for guidance).
Driver navigation errors	<ul style="list-style-type: none"> • Install improved street direction and guidance signage to aid drivers.
STOP sign violations	<ul style="list-style-type: none"> • Upgrade STOP signs (e.g., size and retroreflectivity). • Add advance signage or pavement markings. • Consider flashing intersection control beacons.



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Identified Safety Challenge	Potential Countermeasures
Red light running crashes	<ul style="list-style-type: none"> • Revise signal timing for yellow and all-red intervals. • Add advance signal ahead signage when traffic signal sight distance is limited, and based upon conditions consider dynamic signage.
Accommodation of bicycles and pedestrians	<ul style="list-style-type: none"> • Mark intersection crosswalks. • Consider pedestrian signal phasing. • Restrict turns during pedestrian phase. • Potentially restripe roadway to provide a travel lane for bicycles at bicycle/traffic intersections. • Install bicycle detection at signalized locations.
Signs obstruct driver vision or increase driver workload	<ul style="list-style-type: none"> • Remove or relocate unnecessary signage either on the intersection approach or at the intersection itself that may obstruct other more important signs. Similarly, unnecessary signs or flashing lights may capture drivers attention causing drivers to miss critical information.
Transit stop issues	<ul style="list-style-type: none"> • Relocate transit stops from intersections. • Relocate transit stops from near side to far side.
Angle crashes at unsignalized intersections	<ul style="list-style-type: none"> • At intersections with no exiting control where right-of-way may not be obvious consider stop control. • Consider multiway stop control at intersections with nearly equivalent volumes and right-of-way issues.
Turning radius challenges	<ul style="list-style-type: none"> • Add “No Parking” restrictions near intersections to improve turning radii for heavy vehicles.

Resources

NCHRP 500 Series – Implementation of AASHTO Strategic Highway Safety Plan

This series of guidebooks provides recommendations and countermeasures aimed at targeting specific safety problems along roadways, and is found at <http://safety.transportation.org/guides.aspx>

Massachusetts Traffic Safety Toolbox Series

This series of fact sheets provides information on safety improvements that can be implemented at the local level. Information on problem areas, possible countermeasures, and implementation considerations is included in each fact sheet which can be found at www.mass.gov/mhd/safetytoolbox/

Massachusetts Traffic Safety Toolbox Series



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