

# SIGNALIZED INTERSECTION SAFETY STRATEGIES



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

## Coordinate Closely Spaced Signals near At-Grade Railroad Crossings

### WHERE TO USE

Signalized intersections in close proximity to at-grade railroad crossings with a high frequency of crashes. This situation presents a significant potential for vehicle-train crashes, but vehicle-vehicle crashes could also occur if drivers try to speed through an intersection to avoid waiting in a queue near the railroad crossing.



Photo by: Texas Transportation Institute

### DETAILS

At-grade railroad crossings on approaches to intersections have potential safety problems related to vehicle queues forming across the railroad tracks. The railroad and nearby traffic control signals should be coordinated to provide preemption of the traffic signals when trains are approaching the intersection.

### KEY TO SUCCESS

A key to success is the compatibility of the traffic signal and railroad active warning devices in order to safely control vehicle, train, bicycle, and pedestrian movements. Vehicles must be provided with adequate green time to clear the railroad tracks when a train is approaching. This means that potential queue lengths during congested periods must be considered and train detection systems provided on the railroad tracks far enough upstream of the crossing for the signal preemption to clear all vehicles. A gate is an integral part of the active warning system.

### ISSUES

The *Manual on Uniform Traffic Control Devices* states that warning lights shall flash for at least 20 seconds before a train approaches (for train speeds of 20 miles per hour or more). Train detection may need to occur earlier than when the train is 20 seconds away from the crossing, depending upon the amount of time needed to preempt the nearby signal and clear the tracks.



The railroad tracks may be so close to the intersection that a design vehicle cannot fit between the tracks and the intersection if it has to stop for a red signal. A pre-signal can be used to control traffic approaching the at-grade crossing. Pre-signals are installed on the near side of an at-grade railroad crossing, upstream of the traffic signal. The pre-signal turns red as a train approaches; this will occur before the downstream traffic signal turns red in order to allow vehicles to clear the railroad tracks. Care must be taken that a driver with a red pre-signal does not mistakenly think the green track clearance signal at the intersection is his or her signal. A special design of the signal face may be needed to ensure vehicles approaching the tracks do not misunderstand the signals.

Traffic engineers should communicate with railroad agencies to verify that the signal preemption system being designed is compatible with the railroad signal systems. Often there are problems with differences in terminology between various agencies (such as "preemption"), and care should be taken to clarify terminology.

### TIME FRAME ●●○○

Implementation time can vary, depending upon the communication and coordination among railway, highway, and any other agencies that would be involved in improvement of signal control at and near railroad grade crossings.

### COSTS ●●○○○

Costs involved in improving signal control near at-grade crossings can vary, depending upon the compatibility of existing equipment with the desired treatment. Installation of new equipment that allows coordination of signals will increase costs. Maintenance is another cost element to be considered.

### EFFECTIVENESS

TRIED: Coordination of signals to clear the tracks when a train is approaching should eliminate the potential for vehicles to be trapped on the tracks.

### COMPATIBILITY

Coordination of traffic signals with train detection and warning systems is compatible with most other strategies to improve signalized intersection safety.

### SUPPLEMENTAL INFORMATION

A traffic signal preemption system should be designed considering many geometric, traffic flow, and vehicle and train characteristics. The Institute of Transportation Engineer's document entitled *Preemption of Traffic Signals at or near Railroad Grade Crossings with Active Warning Devices* contains discussion of these items.

Additional information can be found in *NCHRP Synthesis 271: Traffic Signal Operation near Highway-Grade Crossings*, including discussion of traffic signal and train detection systems.

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

#### For more information contact:

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