Measure Name: Pre-signal

Definition: A traffic signal that controls traffic approaching a highway-rail grade crossing, in conjunction with a downstream traffic signal that controls traffic approaching a highway-highway intersection beyond the tracks.

Tags:

Type of Incident:

- ☐ Non-Motorized Users Only
- ☒ Motor Vehicles Only
- ☐ Both

Intervention Strategy:

- ☐ Data: application and planning
- ☐ Education: outreach and messaging
- ☐ Enforcement: policy development and rulemaking
- ☒ Engineering: technological and physical deterrents

Type of Problem:

- ☐ Non-Motorized Users Violating Warning Devices
- ☒ Motor Vehicles Violating Warning Devices
- ☐ Vehicle ROW Incursion
- ☐ Vehicle Congestion
- ☒ Blocked Crossing
- ☐ Vehicle Hang-up

Measure Category:

- ☐ Risk Assessment
- ☐ Policy and Enforcement
- ☐ Collaboration, Training, and Education
- ☐ Public Communication
- ☐ Physical Barriers
- ☐ Detection and Lighting
- ☒ Infrastructure Modification
- ☐ Post-Incident Management
- ☒ Warning Devices

Description

A pre-signal is a traffic signal controlling traffic approaching a highway-rail grade crossing, in conjunction with a downstream traffic signal that controls traffic approaching a highway-highway intersection beyond the tracks [1]. The pre-signal indication is designed to flash a red signal before the downstream intersection traffic signal, thus preventing vehicles from queueing between the signalized intersection and tracks [2]. A pre-signal is typically used where the clear storage distance (CSD) between the intersections is small, thus increasing the likelihood of vehicles queueing across the tracks; this is especially important at intersections where the CSD is insufficient to store one or more design vehicles [3]. The device is intended to minimize queueing of vehicles across grade crossing tracks by using a traffic signal to stop drivers before entering the grade crossing.

Pre-signal mast poles can be positioned either upstream or downstream from the railroad crossing, but placement of the pre-signal mast pole downstream from the railroad crossing is often preferred because it allows the placement of the pre-signal stop line much closer to the track [3]. In all placements, the pre-signal should always maintain visibility of the railroad flashing lights [3].

Implementation of pre-signals can sometimes cause driver confusion due to several conflicting signal directions in the line of sight [1]. Louvers or programmable-visibility heads can be used to eliminate confusion caused by several traffic signals in a road user's field of vision. These devices should be used to limit the visibility of downstream signals [3].

Pre-signals are most suitable where the CSD is relatively small. The Southern California Regional Rail Authority (operator of Metrolink) recommends pre-signals only where CSD is 50 feet or less, 75 feet or less for intersections which a high percentage of long-length vehicles, or there is otherwise a justification for a pre-signal [1]. For sites with a larger CSD, queue cutters or hybrid pre-signal/queue cutters may be more suitable [3].

Additional search terms: *traffic lights, storage issue, traffic jam*

Advantages

- Significantly reduces the likelihood that vehicles are within the minimum track clearance distance. [1]

Drawbacks

- Can cause confusion for drivers due to conflicting signal directions in line of sight. [1]
- Installation of new traffic signal can be expensive.

Notable Practices

- If a pre-signal is installed at an interconnected highway-rail grade crossing near a signalized intersection, a “STOP HERE ON RED” sign should be placed near the pre-signal or at the stop line. [4]
- If the highway-rail grade crossing does not have gates, or if the signalized intersection has insufficient clear storage distance for a design vehicle, a “NO TURN ON RED” sign should be installed to warn approaching traffic. [1]
- If the clear storage distance cannot fully store the design vehicle, a vehicle detection loop should be considered. This prevents vehicles from being trapped by extending the track clearance green time if a vehicle is detected. [1]
- A study evaluating the implementation of a pre-signal should include: site conditions of the cross and intersection, traffic patterns (including queuing at the crossing), types of vehicles using the crossing, and visual obstructions to the crossing. [1]
- Pre-signal intervals should be progressively timed with downstream intersection signals to provide adequate time for vehicles to clear the tracks and downstream intersection. The timing intervals should consider vehicles that make mandatory stops at rail crossings. [1]

References

[1] Southern California Regional Rail Authority. (2021). SCRRA Highway-Rail Grade Crossings Recommended Design Practices and Standards Manual.

> Excerpt: This Manual was developed in 2009 and issued as a Recommended Design Practices and Standards Manual.

[2] Texas Transportation Institute. (2000). Guide for Traffic Signal Preemption Near Railroad Grade Crossing.

> Excerpt: Traffic operations at traffic signals adjacent to railroad grade crossings are very complicated. The current operational guidelines are not comprehensive and cause confusion due to inconsistent terminology. Research conducted by the Texas Transportation Institute (TTI) has identified some of the limitations of the current preemption guidelines. These limitations are more apparent in cases where advance preemption is being used. This guide will assist traffic operation engineers to design safer preemption timings.

[3] U.S. Department of Transportation. (2019). Highway-Rail Grade Crossing Handbook – Third Edition.

> Abstract: The purpose of the *Highway-Rail Crossing Handbook, 3rd Edition* is an information resource developed to provide a unified reference document on prevalent and best practices as well as adopted standards relative to highway-rail grade crossings. The handbook provides general information on highway-rail crossings; characteristics of the crossing environment and users; and physical and operational changes that can be made at crossings to enhance the safety and operation of both highway and rail traffic over such intersections. The guidelines identified and potential alternative improvements presented in this handbook reflect current best practices nationwide.

[4] Federal Highway Administration. (2009). Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition.

> Document Excerpt: The Manual on Uniform Traffic Control Devices (MUTCD), by setting minimum standards and providing guidance, ensures uniformity of traffic control devices across the nation. The use of uniform TCDs (messages, locations, sizes, shapes, and colors) helps reduce crashes and congestion, and improves the efficiency of the surface transportation system. Uniformity also helps reduce the cost of TCDs through standardization. The information contained in the MUTCD is the result of years of practical experience, research, and/or the MUTCD experimentation process. This effort ensures that TCDs are visible, recognizable, understandable, and necessary. The MUTCD is a dynamic document that changes with time to address contemporary safety and operational issues.

Additional Resources

Related Measures

- Queue cutters
- Traffic signal preemption

Images

Figure 1. Example of downstream mounted pre-signal at a grade crossing in Fontana, CA
Image Credit: FRA, Highway-Rail Crossing Handbook – Third Edition