

TECHNICAL COMMITTEE: Railroad and Light Rail Transit Technical Committee

DATE OF ACTION: June 22, 2007

TOPIC: MUTCD Proposed Changes to Section 8D.07 (Preemption)

ORIGIN: Railroad and Light Rail Transit Technical Committee

DISCUSSION: The RR&LRT TC has proposed the following changes to Section 8D.07 to provide additional guidance and standards to support emerging and established preemption operation and technology within the industry. The following revisions incorporate suggested changes proposed by NTSB.

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**Section 8D.07 Traffic Control Signals at or Near Highway-Rail
Grade Crossings**

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Option:

Traffic control signals may be used instead of flashing-light signals to control road users at industrial highwayrail grade crossings and other places where train movements are very slow, such as in switching operations.

Standard:

The appropriate provisions of Part 4 relating to traffic control signal design, installation, and operation shall be applicable where traffic control signals are used to control road users instead of flashing-light signals at highway-rail grade crossings.

Traffic control signals shall not be used instead of flashing-light signals to control road users at a mainline highway-rail grade crossing.

Guidance:

The highway agency with jurisdiction, the regulatory agency with statutory authority, if applicable, and the railroad company should

jointly determine the preemption operation at highway-rail grade crossings adjacent to signalized highway intersections.

If a highway-rail grade crossing is equipped with a flashing-light signal system and is located within 60 m (200 ft) of an intersection or midblock location controlled by a traffic control signal, the traffic control signal should be provided with preemption in accordance with Section 4D.13.

Coordination with the flashing-light signal system, queue detection, a queue cutter signal or other alternatives should be considered for traffic control signals located farther than 60 m (200 ft) from the highway-rail grade crossing. Factors to be considered should include traffic volumes, vehicle mix, vehicle and train approach speeds, frequency of trains, and queue lengths.

Standard:

If preemption is provided, the normal sequence of traffic control signal indications shall be preempted upon the approach of trains to avoid entrapment of vehicles on the highway-rail grade crossing.

This preemption feature shall incorporate an interconnect circuit of the closed-circuit principle incorporating supervision or double break design, or a serial data communication circuit utilizing IEEE-1570 or other fail-safe protocol between the control circuits of the highway-rail grade crossing warning system and the traffic control signal controller. The traffic control signal controller preemptor shall be activated via the interconnect circuit. The approach of a train to a highway-rail grade crossing shall de-energize the interconnect circuit or send a message via the serial data communication circuit, which in turn shall activate the traffic control signal controller preemption sequence. This shall establish and maintain the preemption condition during the time the highway-rail grade

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crossing warning system is activated, except that when automatic gates are used, the preemption condition shall be canceled at the point the automatic gates are energized to start their upward movement. When multiple or successive preemptions occur, train activation shall receive first priority.

Guidance:

The decision to implement simultaneous or advance preemption should include consideration of the Right-of-Way Transfer Time, Queue Clearance Time and the Separation Time in order to determine the Maximum Preemption Time. These time periods should be compared to and coordinated with the operation of the highway-rail grade crossing traffic control devices in order to evaluate the operation of the traffic control signal. These factors should be considered regardless of whether simultaneous or advance preemption operation is implemented as they are based on traffic signal minimum timing, vehicle acceleration and physical distances along the roadway.

Where advance preemption is utilized, a thorough analysis of preemption operation and sequencing should be conducted throughout the range of anticipated railroad Warning Times and traffic signal Right-of-Way Transfer Times to identify preemption time variability. This can occur when the traffic signal controller enters the track clearance green interval with very little or no Right-of-Way Transfer Time and/or the approaching train is decelerating.

Standard:

Advance preemption operation shall be designed to minimize the likelihood of the traffic signal leaving the track clearance green interval before the automatic gate(s) is/are lowered.

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The following are two examples of mutually exclusive methods to resolve preemption time variability:

1. Gate Down – Gate down circuitry is utilized to provide a means to hold the traffic signal controller sequence in the track clearance green interval until the gate(s) controlling access over the highway-rail grade crossing approaching the signalized intersection is/are down.
2. Timing Correction – Timing correction is utilized to resolve Right-of-Way Transfer Time variability by adding the Right-of-Way Transfer Time to the track clearance green interval in the traffic signal controller unit.

Standard:

Where Gate Down circuitry is utilized to resolve preemption time variability, the crossing, controls circuits shall release the track clearance green interval no earlier than when the train enters the crossing in the event a gate is broken or is not fully lowered

Where Timing Correction is utilized to resolve Right-of-Way transfer time variability, a timing circuit shall be employed to maintain a maximum time interval between the initiation of advance preemption and operation of the warning system for a train move where speed is decreasing. This time interval will decrease in the event train speed is increasing.

Guidance:

When a highway intersection controlled by traffic control signals is interconnected with a highway-rail grade crossing equipped with exit gates, advance preemption should be considered due to the required additional operating time for the exit gates.

Where trains routinely stop within or just outside of approaches to highway-rail grade crossings interconnected with traffic control

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signals, engineering judgment should consider the effects of train operations on the preemption operation.

Standard:

Where traffic control signals are programmed to operate in a flashing mode during the preemption dwell interval (period following track clearance green) the flashing mode shall be delayed until the train enters the crossing.

Guidance:

If a highway-rail grade crossing is located within 15 m (50 ft) (or within 23 m (75 ft) for a highway that is regularly used by multi-unit vehicles) of an intersection controlled by a traffic control signal, the use of pre-signals to control traffic approaching the grade crossing should be considered.

Standard:

If used, the pre-signals shall display a red signal indication during the track clearance portion of a signal preemption sequence to prohibit additional vehicles from entering the Minimum Track Clearance Distance.

Guidance:

Consideration should be given to using visibility-limited signal faces (see Section 4A.02) at the intersection for the downstream signal faces that control the approach that is equipped with pre-signals.

Option:

The pre-signal phase sequencing may be timed with an offset from the signalized intersection such that the railroad track area and the area between the railroad track and the downstream signalized intersection is generally kept clear of stopped vehicles.

Standard:

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If a pre-signal is installed at an interconnected highway-rail grade crossing, a STOP HERE ON RED (R10-6) sign shall be installed near the pre-signal or at the stop line, and a NO TURN ON RED (R10-11) sign shall be installed for the approach that crosses the railroad track.

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Option:

If highway traffic signals must be located within close proximity to the flashing-light signal system, the highway traffic signals may be mounted on the same overhead structure as the flashing-light signals.

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Standard:

Where used, a queue-cutter signal shall normally display a Circular Green indication. When activated or preempted, the queue-cutter signal shall display a Circular Yellow during the yellow change interval followed by a Circular Red indication in accordance with Section 4D.10.

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The queue-cutter signal shall be activated by a vehicle presence detection system located between the highway-rail grade crossing and the signalized intersection. When queue lengths extend to a pre-determined point, the queue-cutter signal shall be activated.

The queue cutter signal shall be interconnected with train detection circuits and be preempted upon approach and passage of a train. Preemption shall override operation of the queue detection system.

When the queue length is reduced and no preemption call is present, the queue-cutter signal shall return to normal operation.

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Guidance:

The queue-cutter signal control system and vehicle presence detection system should be designed using fail-safe principles

Standard:

A STOP HERE ON RED (R10-6) sign shall be installed at the stop line in conjunction with a queue cutter signal.

Option:

A “DO NOT STOP ON TRACKS” (R8-8) sign may be installed in conjunction with a queue cutter signal.

If queue-cutter signal faces must be located within close proximity to the flashing-light signal system, the highway signal faces may be mounted on the same overhead structure as the flashing-light signals.

Support:

Section 4D.13 describes additional considerations regarding preemption of traffic control signals at or near highway-rail grade crossings.

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