National Committee on
Uniform Traffic Control Devices

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Item No.:19A-RR-03

NCUTCD Proposal for Changes to the Manual on Uniform Traffic Control Devices

TECHNICAL COMMITTEE:	Railroad/Light Rail Transit Committee
ITEM NUMBER:	19A-RR-03
TOPIC:	Definition and Application of Right-of-Way Transfer Time for Traffic Control Signals at Grade Crossings
ORIGIN OF REQUEST:	RR/LRT Technical Committee
AFFECTED SECTIONS OF MUTCD:	1A.13, 8C.10

DEVELOPMENT HISTORY:

- Approved by Technical Committee: 01/10/2019
- Approved by NCUTCD Council:

This is a proposal for recommended changes to the MUTCD that has been developed by a technical committee of the NCUTCD. The NCUTCD is distributing it to its sponsoring organizations for review and comment. Sponsor comments will be considered in revising the proposal prior to NCUTCD Council consideration. This proposal does not represent a revision of the MUTCD and does not constitute official MUTCD standards, guidance, or options. If approved by the NCUTCD Council, the recommended changes will be submitted to FHWA for consideration for inclusion in a future MUTCD revision. The MUTCD can be revised only through the federal rulemaking process.

SUMMARY:
The purpose of these proposed changes is to revise the definition of right-of-way transfer time (RWTT) used in traffic signal preemption for grade crossings. The changes are needed to provide improved clarity and consistency for practitioners in the calculation and application of RWTT.

DISCUSSION
In in the aftermath of the collision involving a school bus and commuter train in Fox River Grove, Illinois, in October 1995, the National Transportation Safety Board (NTSB) recommended the development of a common glossary of railroad/highway grade crossing terms. The definition of Right-of-Way Transfer Time was subsequently developed by a FHWA and FRA technical working group (TWG).

While section 4D.27 of the MUTCD allows for shortening or omission of the pedestrian intervals, the current definition of Right-of-Way Transfer Time implies that the maximum time

for all intervals should be used. In addition, the application of right-of-way transfer time is discussed within the definition and is proposed to be moved to section 8C.10, which was previously approved by NCUTCD Council as item 13B-RR-01 in June 2014.

RECOMMENDED MUTCD CHANGES

The following present the proposed changes to the current MUTCD within the context of the current MUTCD language. Proposed additions to the MUTCD are shown in blue underline and proposed deletions from the MUTCD are shown in ~~red strikethrough~~. Changes previously approved by NCUTCD Council (but not yet adopted by FHWA) are shown in green double underline for additions and ~~green double strikethrough~~ for deletions. In some cases, background comments may be provided with the MUTCD text. These comments are indicated by [highlighted light blue in brackets].

Section 1A.13 Definitions of Headings, Words and Phrases in this Manual

175. Right-of-Way Transfer Time – when used in Part 8, the maximum amount of time needed ~~for the worst case condition,~~ prior to display of the track clearance ~~green~~ interval. ~~This includes any railroad or light rail transit or highway traffic signal control equipment time to react to a preemption call, and any traffic control signal green, pedestrian walk and clearance, yellow change, and red clearance intervals for conflicting traffic.~~

Section 8C.10 Preemption of Traffic Control Signals at Grade Crossings

Support:

01 Traffic signal preemption for grade crossings is a complex topic which requires very specific understating of both traffic signals and grade crossing warning systems. While most traffic signal operations are governed only by the traffic signal controller unit and associated traffic signal equipment, preemption for grade crossings is also governed by the railroad warning system. Active railroad warning systems include flashing light signals and may include automatic gates as well as varying types of train detection equipment. When the two systems are interconnected to each other for the purpose of preemption, a third system is created. It is the third system which requires thorough understanding of the design and operating parameters in order to provide proper operation of the preemption system.

02 The Federal Railroad Administration (FRA) has issued two documents which provide additional information relating to preemption of traffic signals near grade crossings. The first document is Technical Bulletin S-12-01, Guidance Regarding the Appropriate Process for the Inspection of Highway-Rail Grade Crossing Warning System Pre-emption Interconnections with Highway Traffic Signals The second document is Safety Advisory 2010-02 which addresses Signal Recording Devices for Highway-Rail Grade Crossing Active Warning Systems that are Interconnected with Highway Traffic Signal Systems.

Guidance:

03 *If a grade crossing is equipped with a flashing-light signal system and is located within 200 feet of any traffic control signal or hybrid beacon, the traffic control signal or hybrid beacon should be provided with preemption in accordance with Part 4.*

04 *Coordination with the flashing-light signal system, examples of which may include queue detection, a queue cutter signal, blank-out signs, preemption, or other alternatives should be considered for traffic control signals or hybrid beacons located farther than 200 feet from the highway-rail grade crossing. Factors to be considered should include traffic volumes, highway vehicle mix, highway vehicle and train approach speeds, frequency of trains, presence of midblock driveways or unsignalized intersections, traffic backed up from a nearby downstream railroad crossing and the likelihood of vehicular queues extending into the Minimum Track Clearance Distance.*

05 *The highway agency or authority with jurisdiction and the regulatory agency with statutory authority, if applicable, should jointly determine the preemption operation and the timing of traffic control signals interconnected with highway-rail grade crossings adjacent to signalized highway intersections.*

06 *If a traffic control signal or hybrid beacon is installed near a grade crossing with passive traffic control devices and traffic is likely to queue onto the tracks, an active grade crossing warning system should be installed at the grade crossing to provide a means to preempt the traffic control signal or hybrid beacon in order to clear vehicles from the Minimum Track Clearance Distance upon approach of a train.*

07 *If a traffic control signal is interconnected with a flashing light signal system, the flashing light signal system should be provided with automatic gates unless a diagnostic team determines otherwise.*

Support:

08 If the Preemption Clearance Interval displays a green to vehicles to clear the MTCD, automatic gates can prevent additional vehicles from being drawn into the MTCD.

Guidance:

09 *The highway agency or authority with jurisdiction, and the regulatory agency with statutory authority, if applicable and the railroad or LRT operator should jointly inspect and verify the preemption operation, the amount of warning time and/or advanced preemption time being provided by the railroad warning system and the timing of traffic control signals interconnected and/or coordinated with flashing-light signals no less than once per year.*

Support:

10 Section 4D.27 includes a recommendation that traffic control signals that are adjacent to highway-rail grade crossings and that are coordinated with the flashing-light signals or that include railroad preemption features be provided with a back-up power supply.

Guidance:

11 *When a backup power supply is installed for a traffic control signal that is interconnected with a grade crossing, the backup power supply should provide for a minimum operating period sufficient to allow the implementation of alternative traffic control measures during a power outage.*

Standard:

12 **Information regarding the type of preemption and any related timing parameters shall be provided to the railroad company so that the railroad company can design the appropriate train detection circuitry.**

13 **If preemption is provided, unless otherwise determined by a diagnostic team, the normal sequence of traffic control signal indications shall be preempted upon the approach of through trains to provide a preemption clearance interval of adequate duration to**

minimize the likelihood of vehicles not having sufficient time to clear the minimum track clearance distance prior to the arrival of the train.

[14] **Where a flashing light signal system is in place at a grade crossing, any traffic control signal faces or hybrid beacon signal faces installed within 50 feet of any rail shall be preempted upon the approach of a train. The signal faces that control movements across the grade crossing shall display RED indications in accordance with Section 4D.27 in order to avoid conflicting indications with the flashing light signal system.**

Guidance:

[15] *Where a flashing light signal system is in place at a grade crossing, the operation of any flashing yellow beacon installed within 50 feet of any rail should be considered by a Diagnostic Team to determine whether the operation of the beacon should be terminated during the approach and passage of the train.*

Standard:

[16] **The preemption special control mode shall be activated by a supervised preemption interconnection using fail-safe design principles between the control circuits of the grade crossing warning system and the traffic signal controller unit. The approach of a train to a grade crossing shall de-energize the interconnection or send a message via a fail-safe data communication protocol, which in turn shall activate the traffic signal controller preemption sequence. This shall establish and maintain the preemption condition during the time the grade crossing warning system is activated, except that when automatic gates are used, the preemption condition shall be terminated at the point the automatic gates are energized to start their upward movement.**

Support:

[16a] The right-of-way transfer time is the amount of time needed prior to display of the track clearance interval. This includes any time needed by the railroad, light rail transit, busway, or highway traffic signal control equipment to react to a preemption call, and any traffic control signal green, pedestrian walk and clearance if used (see Section 4D.27), yellow change, and red clearance intervals for conflicting traffic.

[17] A supervised preemption interconnection is one that incorporates both a normally-open and a normally-closed circuit from the grade crossing warning system to verify the proper operation of the interconnection.

[18] An example of a fail-safe data communication protocol for preemption is IEEE 1570.

[19] In lieu of supervision, a double-break preemption interconnection circuit which utilizes two normally-closed circuits that open both the source and return energy circuits may be used.

[20] A preemption interconnection may incorporate both supervision and double-break circuits.

Guidance:

[21] *Where no active devices exist at the grade crossing but train detection circuits are present, the operation of the preemption interconnection should be treated as if active devices exist at the crossing.*

[22] *Where no active devices exist at the grade crossing but train detection circuits are present, the preemption operation should be determined by a diagnostic team.*

[23] *Where left turns are allowed from the approach that crosses the track and a delayed or impeded left turn movement could prevent vehicles from clearing the track, a protected left turn movement should be provided during the preemption clearance interval if green indications are displayed for track clearance.*

[24] *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 verified with the operation of the grade crossing traffic control devices in order to evaluate the operation of the traffic control signal and the preemption operation. 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.*

Support:

[25] Preemption time variability occurs when the traffic signal controller enters the preemption clearance interval with less than the maximum design Right-of-Way Transfer Time or the speed of a train approaching the grade crossing varies.

[26] The time interval between the initiation of advance preemption and operation of the warning system for a train will decrease in the event train speed is increasing.

Guidance:

[27] *Where preemption is used and gates are present, an analysis of a gate descending upon vehicles should be conducted.*

[28] *If simultaneous preemption is used, an analysis of extended grade crossing warning times should be conducted as this condition is frequently encountered with simultaneous preemption operation.*

[29] *If advance preemption is used, an analysis of preemption operation and sequencing should be conducted to identify preemption time variability. The analysis should include the condition requiring the longest period of time to enter the preemption clearance interval and the condition requiring the least amount of time to enter the preemption clearance interval.*

Support:

[30] The condition requiring the least amount of time to enter the preemption clearance interval occurs when the currently displayed indications are the same as the preemption clearance interval indications.

Standard:

[31] **Where automatic gates are present and the preemption clearance interval displays green indications, the preemption sequence shall be designed such that the green indications are not terminated until the automatic gate(s) that control access over the crossing toward the intersection is/are fully lowered.**

Support:

[32] 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 preemption clearance interval until the gate(s) controlling access over the grade crossing approaching the signalized intersection is/are down.
2. Timing Correction – Timing correction is utilized to resolve Preemption Time Variability by adding the Right-of-Way Transfer Time to the preemption clearance interval in the traffic signal controller unit and setting a fixed maximum period of time between the start of advance preemption and the operation of the flashing light signals.

Standard:

33 Where Gate Down circuitry is used to resolve preemption time variability and a gate is broken or is not fully lowered, the crossing control circuits shall release the preemption clearance interval no earlier than when the train enters the crossing.

34 Where Timing Correction is utilized to resolve preemption 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 movement where speed is decreasing.

Guidance:

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

36 Where trains routinely stop and re-start within or just outside of approaches to grade crossings interconnected with traffic control signals, the effects of train operations on the preemption operation should be considered.

37 Traffic signal control equipment should be capable of providing immediate re-service of successive requests for preemption from the railroad warning devices, even if the initial preemption sequence has not completed. As appropriate, the traffic control equipment should be able to promptly return to the start of the preemption clearance interval at any time the demand for preemption is cancelled and then reactivated. The traffic signal control equipment should have the ability to provide this re-service from within any point of the preemption sequence.

Standard:

38 Where traffic control signals are programmed to operate in a flashing mode during the preemption dwell interval (period following preemption clearance interval for the duration of the activation of the preemption interconnection), the beginning of flashing mode shall be delayed until the railroad equipment indicates that the train has entered the crossing.

Support:

39 Section 4C.10 describes the Intersection Near a Grade Crossing signal warrant that is intended for use at a location where the proximity to the intersection of a grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

40 Section 4D.27 describes additional considerations regarding preemption of traffic control signals at or near grade crossings.

Standard:

41 At locations where conflicting preemption calls may be received to serve boats and trains, the Diagnostic Team shall determine which mode shall receive first priority when conflicting preemption calls occur. Where the boat and the train do not conflict, the Diagnostic Team shall determine the preemption sequence when the two preemption calls occur simultaneously. The Coast Guard or other appropriate authority that regulates the operation of the waterway shall be invited to participate on the Diagnostic Team and/or to provide input to the Diagnostic Team. [approved June 28, 2014, 13B-RR-01].