Seven Things Every Traffic Engineer Should Know About Rail Preemption Installations

1. The presence of a nearby traffic signal has been identified in traffic safety studies as a leading indicator of grade crossing collisions (relative to other grade crossings). That’s not to say that signals are the cause of collisions, but that the combination of modes and presence of both highway-highway controls and highway-rail controls requires attention to detail to provide safe operations under the widest range of operational conditions.

2. The old 200-foot rule of thumb (under which preemption is mandated) while still provided in the Manual on Uniform Traffic Control Devices has been expanded considerably with new guidance for use of robust strategies which include “Pre-Signals” (use of supplemental traffic signal faces to control traffic approaching the grade crossing) for short clear-storage distances (50 to 75 feet) and also provides guidance that “coordination with the flashing-light signal system, queue detection, or other alternatives”

3. State of the art preemption requires more than a 2 wire connection to the traffic signal controller. The current MUTCD mandates the use of a “supervised interconnect” circuit which is not only fail-safe against the interconnect cable being cut but also against it being shorted. In addition, it is recommended that traffic signals tied to railroad crossing systems be provided with backup power so assure tracks can be cleared even when commercial power to the signal is disrupted.

4. It is important to take into account the time required to provide proper service times to all of the movements in a preemption sequence. This may include, were mandated by state requirements, not truncating pedestrian clearance intervals for active pedestrian phases for movements parallel to the tracks, as well as assuring enough clearance time is provided for heavy vehicles (if present) to clear through the crossing and downstream intersection (where pre-signals are present.)

5. The prior standard practice of simultaneously initiating the preemption sequence on the traffic signal at the same time the railroad warning devices (flashing lights and gates) are activated is no longer adequate at many modern eight-phase traffic signal installations. In order to allow enough time for the traffic signal to satisfy all of the minimums and transfer right of way to the track clearance green phase, an “advance preemption” pulse may be required in which case the railroad will need to install track detection circuitry which extends well beyond the distance required for simultaneous preemption.

6. As much as advance preemption may be required to clear all of the traffic movements, if it is used, additional measures need to be taken to assure the automatic gates, if present, are in the horizontal position before the track clearance green is terminated. This is necessary because in the event the right-of-way clearance time to bring up track clearance green is short (due to the point in the phase when the train was first detected) it is possible for the track clearance phase to time out before the gates can prevent more vehicles from entering the crossing.

7. Even where no traffic signal is present, the presence of an intersection downstream from a grade crossing may require installation of a preempted traffic signal to assure vehicles can be cleared from the crossing prior to the arrival of a train. The MUTCD includes a new warrant in Section 4C.10 (Intersection Near a Grade Crossing) 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.

There are many resources available including the Manual on Uniform Traffic Control Devices, the Highway Grade Crossing Handbook and the ITE Recommended Practice on Traffic Signals at Or Near Highway-Rail Grade Crossings that can help traffic engineers with railroad preemption. However, practitioners are encouraged to consult with an engineer experienced in such designs.

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