

**As approved by the
National Committee
June 30, 2006.**

TECHNICAL COMMITTEE RECOMMENDATION

TECHNICAL COMMITTEE: Signals Technical Committee

DATE OF ACTION: January 19, 2006

TOPIC: **Proposed new Section 4C.10 Warrant 9, Intersection
Near Highway-Rail Grade Crossing**

ORIGIN OF REQUEST: Signals Technical Committee

DISCUSSION: At some stop-controlled intersections near highway-rail grade crossings, the distance from the stop line to the track is shorter than the length of a large vehicle. Insufficient sight distance may preclude waiting on the approach side of the grade crossing before entering the intersection. A traffic signal that can be preempted by a train is a possible treatment but many of these intersections may not meet one of the traffic signal warrants in the MUTCD. These warrants set minimum thresholds for considering installation of a traffic signal and do not consider the proximity of heavy or light rail. A traffic signal may also be beneficial at other locations where vehicles often queue over the tracks.

It is desirable that the decision to install a signal at these types of locations be based on an assessment of risk. Factors that may influence the probabilities of risk include the number of trucks or busses approaching; the length and acceleration capability of those large vehicles; the space between the intersection and the tracks; the traffic volumes, speeds, and driver expectancy on the parallel highway; the acceptable gap or the time needed for a bus or truck to cross or turn onto the highway; and train characteristics such as the type of train (i.e., heavy or light), number of trains per day, and speeds. There may be other factors worth considering, such as sight distance, the type of railroad-crossing control in place, and the impacts on the train operator's and the transportation agency's liability.

The development of a recommended new MUTCD traffic signal warrant for a highway-highway intersection near a highway-rail grade crossing was the objective of NCHRP Project 3-74A. Project recommendations have been presented to the Signals Technical Committee.

The Signals Technical Committee recommends that the National Committee submit the following proposed MUTCD changes to sponsors for comments.

COMMITTEE ACTION :

See following pages for proposed text. All the text is new so no underline or strikethrough is used.

VOTE:

For	- 28
Opposed	- 2
Abstentions	- 0

**REFERENCE TO AFFECTED
PAGE NUMBERS IN MUTCD:**

Not in 2003 Edition of MUTCD, Rev.1. Proposed for addition on Page 4C-9 immediately following Section 4C.09.

Notes:

All of the following Section 4C.10 is proposed new text.

The new figures included in this new section were originally labeled 4C-5 & 4C-6. However, new figures 4C-5 through 4C-8 were approved as part of the revisions to Section 4C.05. Therefore, the two new figures for this new section are now labeled 4C-9 & 4C-10. The text has been updated to reflect this. These changes are considered editorial.

Section 4C.10 Warrant 9, Intersection Near Highway-Rail Grade Crossing

Support:

The Intersection Near Highway-Rail Grade Crossing signal warrant is intended for use at a location where none of the conditions described in the other eight traffic signal warrants are met, but the proximity to the intersection of a highway-rail grade crossing on an intersection approach controlled by a STOP or YIELD sign is the principal reason to consider installing a traffic control signal.

Guidance:

This signal warrant should be applied only after an adequate consideration of other alternatives, such as (a) providing additional pavement to enable vehicles to clear the track or be assured space for an evasive maneuver, or (b) reassigning the stop controls at the intersection to make the approach across the track a non-stopping approach, has failed to alleviate the safety concerns associated with the highway-rail grade crossing.

Standard:

The need for a traffic control signal shall be considered if an engineering study finds that both of the following criteria are met:

- A. A highway-rail grade crossing exists on an approach controlled by a STOP or YIELD sign and the center of the track nearest to the intersection is within 43 m (140 ft) of the stop line on the approach;**
- B. During the highest traffic volume hour during which trains use the crossing, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the minor-street approach that crosses the track falls above the applicable curve in Figure 4C-9 or 4C-10 for the existing combination of approach lanes over the track and the distance D.**

If the train arrival times are unknown, use the peak traffic volume hour. The minor-street approach is for one direction only (the one over the tracks, approaching the intersection), and is adjusted as allowed by the Options, using up to three multiplicative factors. The distance D is the clear storage distance as defined in Section 8A.01.

Guidance:

When plotting the traffic volume data on Figure 4C-9 or 4C-10:

- A. Use Figure 4C-9 if there is only one lane approaching the intersection at the track crossing location. Use Figure 4C-10 if there are two or more lanes approaching the intersection at the track crossing location.
- B. After determining the actual distance D, use the curve for the distance D that is nearest to the actual distance D. For example, if the actual distance D is 28 m (95 ft), compare the plotted point to the curve for D = 27 m (90 ft).

Option:

Because the curves are based on an average of 4 trains per day, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-2 for the appropriate number of trains per day.

Because the curves are based on typical vehicle occupancy, if at least 2% of the vehicles crossing the track are buses carrying at least 20 people, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-3 for the appropriate percentage of high-occupancy buses.

Because the curves are based on tractor-trailer trucks comprising 10% of the vehicles crossing the track, the vehicles per hour on the minor-street approach may be multiplied by the adjustment factor shown in Table 4C-4 for the appropriate distance and percentage of tractor-trailer trucks.

Standard:

If this warrant is met and a traffic control signal at the intersection is justified by an engineering study, then:

- A. The traffic control signal shall have actuation on the minor street,**
- B. Preemption control shall be provided in accordance with Sections 4D.13 and 8D.07, and**
- C. The highway-rail grade crossing shall have flashing-light signals and gates (see Chapter 8D).**

Figure 4C-9. Warrant 9, Intersection Near Highway-Rail Grade Crossing (One Approach Lane at Track Crossing)

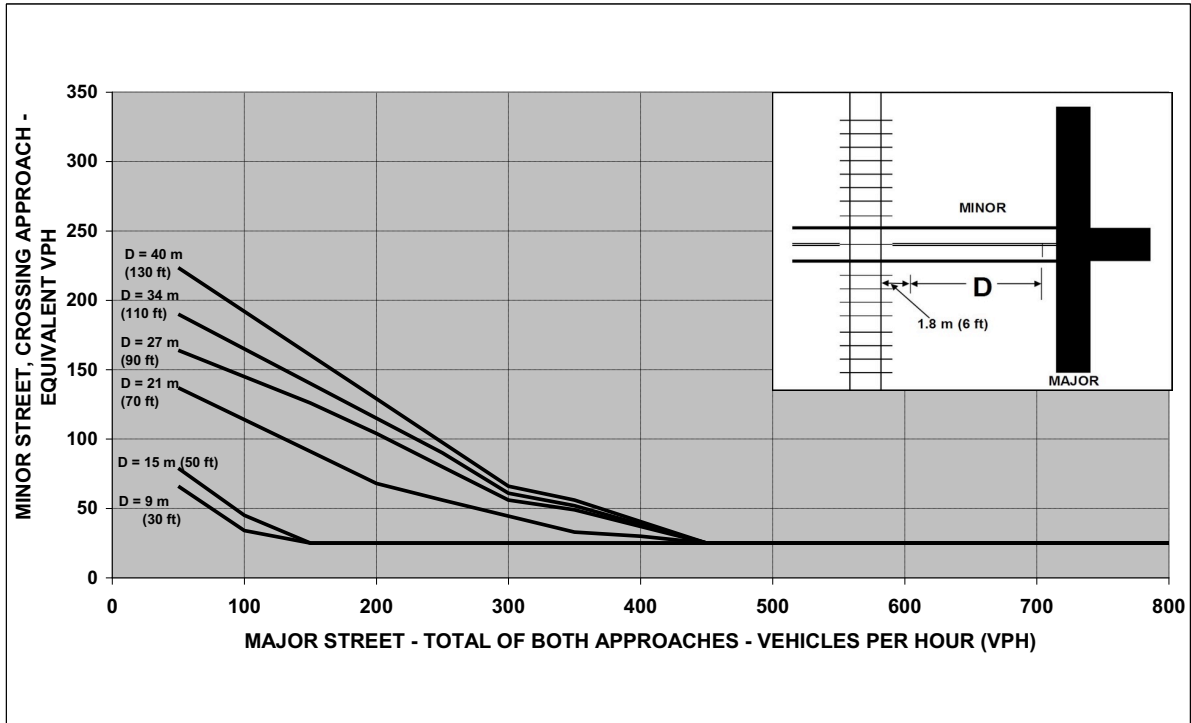


Figure 4C-10. Warrant 9, Intersection Near Highway-Rail Grade Crossing (Two or More Approach Lanes at Track Crossing)

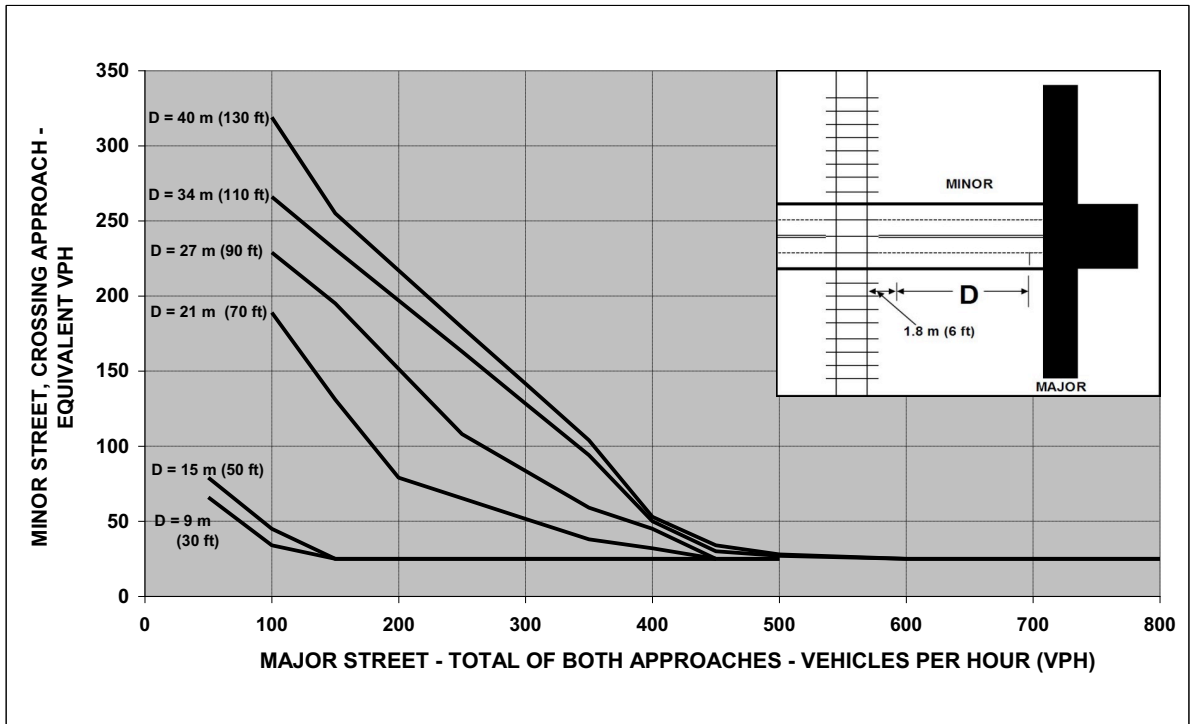


Table 4C-2. Adjustment for Train Frequency

Number of Trains per Day	Adjustment Factor
1	0.67
2	0.91
3 to 5	1.00
6 to 8	1.18
9 to 11	1.25
12 or more	1.33

Table 4C-3. Adjustment for High-Occupancy Buses

% of High-Occupancy Buses, Minor Street Approach	Adjustment Factor
0%	1.00
2%	1.09
4%	1.19
6% or more	1.32
<i>A high-occupancy bus is defined as a bus occupied by at least 20 people.</i>	

Table 4C-4: Adjustments for Tractor-Trailers

% of Tractor-Trailers, Minor Street Approach	Adjustment Factor	
	for $D < 21$ m (70 ft)	for $D \geq 21$ m (70 ft)
0-2.5%	0.50	0.50
2.6-7.5%	0.75	0.75
7.6-12.5%	1.00	1.00
12.6-17.5%	2.30	1.15
17.6-22.5%	2.70	1.35
22.6-27.5%	3.28	1.64
27.6% or more	4.18	2.09