

Appendix B: CONFIRMING / VERIFYING DESIGN STANDARDS

For existing crossings, the safety assessment team has the responsibility of confirming/verifying the design standards during the site visit. The technical standards are contained in RTD 10, the TAC Geometric Design Guide for Canadian Roads and the TAC Manual of Uniform Traffic Control Devices for Canada. It should be noted that certain technical standards may be “grandfathered” or may be delayed “coming into force” (CIF). Sections 24, 25 and 26 of the Grade Crossing Regulations specify the requirements regarding applicable enforcement dates. The following design standards should be confirmed and applied uniformly by the railway company and the road authority.

DESIGN VEHICLE SELECTION (Section 4, RTD-10)

In selecting the design vehicle, consideration should be given to vehicles that are expected to routinely use the grade crossing. It is not practical to design each grade crossing for all road vehicles. It is very important that the design vehicle be established at the beginning of the detailed grade crossing safety assessment. Table 4-3 in RTD 10 may be used as a guide for the selection of a grade crossing design vehicle. Once the design vehicle has been selected then the other important design considerations can be determined using the procedures outlined in section 4 of RTD 10. These considerations include safe stopping sight distances, length of grade crossing clearance distance, sightline requirements along the rail line, and the advance warning time and gate descent time requirements of grade crossing warning systems.

LOCATION OF GRADE CROSSINGS (Section 5, RTD-10)

When an unrestricted grade crossing, or road intersection or property access on the road approach to an unrestricted grade crossing, is to be constructed, the location shall be such that no part of the traveled way of the intersecting road or entranceway, or the stop line or the position for a traffic control device, shall be closer than 30m to the nearest rail of the grade crossing, where the maximum permissible train speed exceeds 15 mph. See Figure 5-1 in RTD 10

GRADE CROSSING SURFACE (Section 6, RTD-10)

The grade crossing surface standards are contained in section 6 of RTD 10. The minimum width of the grade crossing surface for public roads for vehicle use is 8m. The minimum width of the grade crossing surface for a sidewalk, or path or trail, or any other route for a person for regular use by a person using an assistive device is 1.5m. In general, grade crossing surfaces shall be smooth and continuous so that design vehicles can use the grade crossing safely at the maximum permissible road speed.

ROAD GEOMETRY (Grade Crossing and Road Approaches) (Section 7, RTD-10)

Section 7 in RTD 10 contains the technical standards regarding road geometry for grade crossings and road approaches. The standard specifies that the horizontal and vertical alignment of the road approach and the road over the grade crossing shall be smooth and continuous within the safe stopping sight distance. It further states that, the profile and elevation of the grade crossing surface and the rest of the road shall match and safely accommodate the road design speed in accordance with the design standards of the Geometric Design Guide for Canadian Roads. Section 7.2 discusses the design standards regarding maximum gradients at and in the vicinity of the grade crossings.

Roads and grade crossings constructed before the RTD 10 Technical Standards come into force must conform to section 7.3.

Figure 7-1 in RTD 10 specifies the maximum crossing angle for grade crossings. For each grade crossing being assessed the “actual” road geometry data should be compared to the new standards for compliance. Any deviations should be recorded and addressed.

SIGHTLINES (Section 8, RTD-10)

The sightline requirements specified in section 8 of RTD 10 apply to all unrestricted grade crossings. Sightlines are the lines of sight between persons at a grade crossing or its approaches and the grade crossing, crossing warning signs, signals and approaching trains. The general sightline requirement (section 8.1 and 8.2) is that road and railway rights of way near all crossings at grade shall be maintained clear of trees, brush and stored materials. Highway traffic signs, utility poles and other roadside installations must not obstruct sightlines of crossing signs, signals, and warning systems.

The assessment of sightlines requires an examination of the road and knowledge of the types and speed of vehicles using the road and the speed of trains operating on the tracks. Most often, the minimum sightlines specified for crossings without automatic warning systems are adequate for passenger cars and light trucks. However, the minimums must be increased under some circumstances because of factors affecting acceleration or deceleration of vehicles using the road. Acceleration and deceleration of vehicles is affected by road gradient and surface condition, as well as vehicle weight, length and power. Therefore, road gradients in the vicinity of the crossing, use of heavy or long combination vehicles such as occurs on truck routes, designated over dimensional load routes, roads in industrial parks and some crossings used for farm purposes must be considered when determining the sightline requirements for any particular crossing.

Sightlines for drivers stopped 8m from the nearest rail at crossings are a particular safety concern. Some vehicles require more than the minimum time of 10 seconds for their drivers to start then up and clear a grade crossing, which is the minimum time a train must be seen in advance of its arrival at a crossing without an automatic warning system, or more than 20 seconds which is the minimum time an automatic warning system must operate in advance of a train’s arrival. For example:

- Some trucks now legally operating on Canadian roads require over 30 seconds at full acceleration to clear a crossing from a stopped position even under ideal conditions
- Where drivers are required to stop just beyond a grade crossing (such as at a controlled intersection), they may have to cross the track slowly preparing to be stopped just as the rear of the vehicle clears the danger zone. They also may be compelled to go slowly if turning just beyond the grade crossing.

As mentioned previously, the safety assessment process relies on the railway company and road authority to work cooperatively and share and exchange data. The railway company can provide the road authority with maximum permissible train speeds. The road authority can advise on maximum and operating roadway speeds, and either know, or can determine the types/classification of vehicles using the public roadways. It is important that both the railway company and road authority both are aware of all the factors affecting sightlines as both are involved in providing adequate sightlines. This is why the data forms must be exchanged and reviewed by the safety assessment team.

Sightlines at grade crossings without a grade crossing warning system are specified in Figure 8-1 of RTD 10. The sightlines must be appropriate for the existing road and railway maximum permissible operating speeds. This must be accomplished by clearing sightlines or reducing vehicular or train speeds or, possibly, restricting the use of heavy or long combination vehicles.

For a grade crossing with a grade crossing warning system, the sightline requirements are specified in Figure 8-2 of RTD 10. In determining whether sightline requirements are met, consideration must be given to the ability to maintain sightlines on an ongoing basis, or, some other means of positive control of the road or rail traffic over the crossing must be provided.

SIGNS AND ROADMARKINGS (Section 9, RTD-10)

All traffic signs specified in section 9 of RTD 10 shall be retro-reflective. The railway crossing sign shall be erected at all unrestricted grade crossings. The number of tracks sign shall be erected at all unrestricted grade crossings with more than one track. The railway advance warning sign (AWS) shall be installed on all road approaches for vehicles leading to grade crossings with an AADT volume exceeding 100. The advisory speed sign and stop ahead sign shall be erected in accordance with the Manual of Uniform Traffic Control Devices for Canada. The DO NOT STOP ON TRACKS sign would be erected in advance of the grade crossing where it has been determined that queued traffic would routinely stop closer than 5m from the crossing surface. Stop signs are installed at crossings without an automatic warning system where it is necessary to bring motorists to a stop for safety or operational reasons. Use of stop signs should be limited to crossings where it is impossible for drivers to see a train approaching within the sightline requirements without first slowing down to 15 km/h or stopping at the railway crossing sign. Also, stop signs may be installed at unrestricted crossings if a detailed safety assessment indicates conditions warrant the installation.

The road markings for grade crossings shall be applied at all unrestricted grade crossing with paved roads. The road markings are specified in the Manual of Uniform Traffic Control Devices for Canada.

The safety assessment process requires the team to assess the condition, placement and adherence to the standards, for all traffic control devices that are required at grade crossings. It is important to site check the traffic controls in daytime and nighttime conditions.

TRAIN ILLUMINATION (Section 10, RTD-10)

The standards for train illumination are contained in section 10 of RTD 10. These standards should be referenced during the safety assessment to ensure the grade crossing being evaluated conforms to the standard.

GRADE CROSSING WARNING SYSTEMS (Section 11, RTD-10)

Section 11 of RTD 10 specifies the warrants for installing a grade crossing warning system at unrestricted grade crossings. These standards should be referenced during the safety assessment process to determine if the existing or proposed conditions warrant the upgrading to a grade crossing warning system.

GATES (Section 12, RTD-10)

Section 12 of RTD 10 specifies the warrants for installing gates at grade crossings equipped with grade crossing warning systems. The design standards should be referenced during the safety assessment process to determine if conditions warrant the upgrading to gates.

FLASHING LIGHT UNITS (Section 13, RTD-10)

The number, type and location of flashing light units is specified in Section 13 of RTD 10. The effectiveness of a grade crossing warning system is dependant upon the capability of the warning lights to attract the attention of a driver looking ahead along the road in the direction of travel. The

design standards regarding flashing light units should be referenced during the safety assessment process to determine if the existing or proposed conditions comply with the technical standards.

PREPARE TO STOP AT RAILWAY CROSSING SIGN (AAWS) (Section 14, RTD-10)

The prepare to stop at railway crossing sign indicates to drivers in advance of a railway grade crossing that there is a high probability of having to stop for railway crossing signals ahead. The primary function is to reduce the dilemma zone incidents and to warn drivers that the train is approaching or occupying the grade crossing. Section 14 of RTD 10 and the Manual of Uniform Traffic Control Devices for Canada specifies the design standards for the sign.

The main purpose of the safety assessment for the AAWS is to check and evaluate the timing and flashing operation. Each installation requires an assessment to ensure that the operation of the advance warning flashers adequately addresses the existing conditions of road geometry, volume and composition of traffic and maximum permissible road speeds.

PREEMPTION OF TRAFFIC SIGNALS BY GRADE CROSSING WARNING SYSTEMS (Section 15, RTD-10)

Close proximity of traffic signals to any type of crossing with automatic warning system creates an environment in which persons can receive conflicting signal indications if the operation of those signals is not coordinated with the crossing warning system. Interconnection of traffic signals with the crossing automatic warning system is done to preempt the normal operation of the traffic signals upon the approach of a train, permitting any vehicles and pedestrians occupying the grade crossing to clear, while preventing additional vehicles from occupying or approaching the grade crossing during the approach and passage of trains.

Section 15 in RTD 10 specifies the design standards for preemption of traffic signals by grade crossing warning systems. Additional references are; the *ITE Preemption Practices*, *AREMA Communications and Signals Manual*, and Transport Canada's *Guideline for Inspecting and Testing Preemption of Interconnected Traffic Control Signals and Railway Crossing Warning Systems*. These standards should be referenced during the safety assessment process to ensure that the grade crossing being evaluated is in compliance.