April 2005

CANADIAN ROAD/RAILWAY GRADE CROSSING DETAILED SAFETY ASSESSMENT FIELD GUIDE

Transport Canada **Transports Canada**

UNB Transportation Group

Metric Conversion

Length			Mass (Weight)	
1 millimetre (mm)	= 0.039 in.		1 gram (g)	= 0.035 oz
1 centimetre (cm)	= 0.393 in.		1 kilogram (kg)	= 2.204 lb
1 metre (m)	= 1.093 yd.		1 metric tonne (t)	= 1000 kg
1 kilometre (km)	= 0.621 mi.		1 ounce (oz)	= 28.350 g
1 inch (in)	= 2.54 cm		1 pound (lb)	= 0.453 kg
1 foot (ft)	= 0.304 m		1 short ton	= 2000 lb
1 yard (yd)	= 0.914 m		1 short ton	= 0.907 metric ton
1 mile (mi)	= 1.609 km			
Velocity			**Volume**	
1 kilometre/hour (kph)	= 0.621 miles/hour (mph)		1 litre (l)	= 0.220 Imp. gal
1 metre/second (m/s)	= 3.279 feet/second (ft/s)		1 cubic metre (m^3)	=1.308 yd^3
1 mile/hour (mph)	= 1.609 km/hour (kph)		1 Imp. gal	= 4.545 litres
1 foot/second (ft/s)	= 0.304 metres/second (m/s)		1 cu foot (ft^3)	= 0.028 m^3

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Introduction

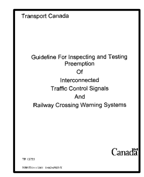
The purpose of this document is to guide individuals through a safety assessment of road/railway grade crossings. It provides an overview of the safety assessment objectives and process, guidelines for selecting an assessment team and developing a program, and methodologies for conducting crossing assessments.

Pursuant to the Railway Safety Act, Transport Canada has developed a national document entitled "*Grade Crossing Regulations*" which requires road authorities and railway companies to conduct periodic detailed safety assessments (sections 5 through 14) at all unrestricted road/ railway grade crossings. It is anticipated that the regulations and the companion document entitled "*RTD10 Road/Railway Grade Crossing Technical Standards and Inspection, Testing and Maintenance Requirements*" will be implemented in the near term. The *Canadian Road/Railway Grade Crossing Safety Assessment Guide* is intended to provide consistent and comprehensive guidelines for conducting safety assessments at road/railway grade crossings.

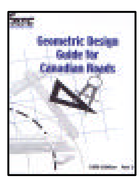
It should be noted that the field sheets or 'prompt lists' included in this guide, cannot, and should not take the place of experience and due diligence by members of the assessment team. Rather, the lists are provided to remind those in the field of the range of issues that must be considered in the review. Those involved in the assessments must have a thorough working knowledge of the key documents that specify the design guidelines and standards for road/railway grade crossings including:

RTD 10 Road/Railway Grade Crossing Technical Standards and Inspection, Testing and Maintenance Requirements, Transport Canada, October 2002

Guideline for Inspecting and Testing Preemption of Interconnected Traffic Control Signals and Railway Crossing WARNING SYSTEMS, TRANSPORT CANADA, 2001



Geometric Design Guide for Canadian Roads, T.A.C., 1999.



The Manual of Uniform Traffic Control *DEVICES FOR CANADA, T.A.C., 1998.*

What are Detailed Safety Assessments?

A *detailed safety assessment* is a systematic process to evaluate the safety of a road/railway grade crossing. It is a *proactive* strategy to:

- Reduce crash risk within the grade crossing environment.
- Minimize the frequency and severity of preventable crashes by ensuring that all measures to eliminate or reduce the identified safety problems are fully considered, evaluated and documented.
- Consider the safety of all grade crossing users including trains, pedestrians, and motorized and non-motorized vehicles.

- Verify compliance to the safety technical standards referred to in the Railway Safety Act/Grade Crossing Regulations and contained in the RTD10 Road/Railway Grade Crossing Technical Standards and Inspection, Testing and Maintenance Requirements document.

It is intended to be a relatively inexpensive method for improving safety, which complements existing safety programs at road/railway grade crossings. Detailed safety assessments should not be used to replace other strategies such as identifying high crash locations or regular road/railway grade crossing maintenance inspections. Further information is contained in sections 5-14 of the Regulations.

Who conducts the detailed safety assessments?

The railway company and road authority are required to take joint responsibility for the detailed safety assessments. It is recommended that a team of at least two (2) people (one representing each organization) conduct the assessments. Costs can be minimized if the road authority and the railway company work together to plan and execute the safety assessments. Some guidelines regarding the composition of the assessment team are provided in Appendix A. Note that a professional engineer is required by the Railway Safety Act (see section 11, of the Act at http://www.tc.gc.ca/railway/RSA/rsa_english.htm) to take responsibility for any engineering related work which would include these assessments.

How are the detailed safety assessments completed?

The assessment teams are required to review each crossing in the field and identify and evaluate all the factors that may impact the safety of the crossing. The team must review all relevant guidelines and standards considering the site characteristics, the existing traffic control system, and the railway and roadway operational characteristics including the types of vehicles and pedestrians using the crossing.

The teams are challenged to consider the cumulative effect of the individual standards and guidelines on overall safety. Findings and recommendations from the assessments are reported in a brief formal document. The road authority and railway company are required to respond to recommendations in their jurisdictions.

How are crossings selected?

Assessments should be applied to all existing unrestricted grade crossings and any new grade crossings that have been recently designed and are about to be constructed. The railway company and road authority should jointly develop a policy to review a certain proportion of these crossings on an annual basis. Crossings can be prioritized on the basis of safety performance and any known problems such as vehicles entering the grade crossing when the warning lights are activated or vehicles recurrently blocking the crossing.

When are the detailed safety assessments done?

Transport Canada's "Grade Crossing Regulations" requires road authorities and railway companies to conduct detailed safety assessments at all unrestricted road/ railway grade crossings every five (5) years. The period for follow-up assessments may be extended to ten (10) years if the responsible authorities agree that the safety-related conditions at, or in the vicinity, of the grade crossing will remain stable and the agreement is documented. Other circumstances may precipitate the requirement for an assessment including cessation of whistling, construction or significant operational changes, and two or more fatal collisions in five years. Details are available in sections 5 through 9 of the Regulations.

The Detailed Safety Assessment Process

The detailed safety assessment process can be summarized in the following five steps:

Step 1: Project organization, planning, and data collection.

- Identify a coordinator and assessor(s). Guidelines are presented Appendix A.
- Jointly prepare a project plan and identify a priority schedule of grade crossings to be evaluated.
- Collect and exchange all relevant rail and road data. Guidelines for data collection are provided in the field sheets in Appendix C (items identified with *Road* or *Rail* as the source).
- Hold a start-up meeting with responsible stakeholders to:
    - Confirm project plan and schedule.
    - Review and exchange project information/data.
    - Confirm applicable sections of RTD 10 (see Appendix B for an overview).
    - Agree on the data to be collected in the field.

Step 2: Site Visit

- Make arrangements for work zone safety on both the railway and roadway (e.g., temporary signing for work crews ahead, etc.)
- Conduct site visit (mandatory)
- Review field sheets (Appendix C) while conducting site visit.
- Collect the data.

Step 3: Safety Assessment Analysis

- Review responses to the field sheets to ensure all relevant factors have been considered and identified.
- Conduct a detailed safety assessment of the field data (including any necessary calculations), design drawings and other relevant documents.
- Jointly assess the crash risks based on the detailed safety review of the data.
- Develop and agree on a list of key findings and recommendations for the assessment report.

Step 4: Safety Assessment Report

- Prepare a safety assessment report (see Appendix D).
- The report must list the findings and recommendations, provide alternatives and indicate the date for the next assessment.
- Jointly review and prepare a response within four (4) weeks of receiving the assessment report indicating what action will be taken to address each finding.

Step 5: Post Assessment

- Each responsible authority will maintain a copy of the report and responses as required by the Regulations.

Using This Guide

The field sheets in Appendix C have been “packaged” such that one set would be used when assessing a ***passive*** crossing (i.e., one with Standard Reflective Crossing Signs) while the other set would be used to review an ***active*** crossing (e.g., Flashing Lights and Bell (FLB) or Flashing Lights, Bell and Gates (FLBG)).

Most sheets are keyed to specific sections of RTD10 and all references are to RTD10 tables and figures unless otherwise noted. Most line items are linked to a *source* such as Road, Rail, measure, calculate, field and look-up. Data that is sourced as coming from either ‘Road’ or ‘Rail’ should be provided by the respective authorities <u>before</u> the field visit if at all possible.

Tools for an Assessment

The following items may be necessary for the completion of most safety assessments:

- appropriate workzone traffic warning signs
- personal safety gear (boots, hard hat, safety vest)
- 2-way radios
- measuring wheel (or laser range finder and target)
- tape measure
- 4-foot level
- digital camera
- large protractor
- stop watch
- retroreflectometer (for sign sheeting evaluation)
- recent drawing and/or aerial photograph of crossing (if available)
- ladder

Appendix A: THE SAFETY ASSESSMENT TEAM

Road/Railway Grade Crossing Safety Assessment Coordinator

An assessment coordinator should be selected by the road and rail authorities to manage the various activities of the program including:

- Select the assessment team members
- Select grade crossings to be assessed
- Oversee the safety assessment process and data collection and exchange
- Keep process moving
- Maintain communications
- Resolve conflicts
- Process reports and arrange meetings

The coordinator for each authority should ideally be an employee of the railway company or the road authority who is competent in safety engineering and understands the grade crossing safety assessment process.

Assessment Team

The grade crossing safety assessment team needs to bring together a set of skills that will ensure the most relevant safety aspects of the grade crossing environment are addressed. It is recommended that a team approach be used with representation from both the road agency and the railway company. The following core skills are typically required of the team as a whole:

- **Railway Safety:** expertise in understanding the causes of railway crashes and what countermeasures can be effective in reducing the crash risks at grade crossings.
- **Road Safety:** expertise in understanding the causes of road crashes and what countermeasures can be effective in reducing the crash risks at grade crossings.
- **Traffic Operations:** experience in the principles of traffic engineering (traffic flow, capacity, design and placement of traffic control devices, traffic signal timings and interconnection systems etc.).
- **Geometric Design:** extensive road design and railway design experience including the design of road/railway grade crossings for all users.
- **Railway Signal Operations:** extensive knowledge of active train control systems, interconnection with adjacent signalized highway intersections and general experience with railway operations and maintenance.

Typically the team will include persons with more than one of the above noted skill sets. A team member should also have a good knowledge of local conditions including rail and road traffic patterns and proposed local and regional developments. There may be other specialist skills required other than the ones mentioned but these may be needed only to assess the more complex grade crossings. The safety assessment team should have a designated team leader. Regardless, Section 11 of the Grade Crossing Regulations requires a “qualified person” (as defined in Section 1) to conduct an assessment.

Team Size

It is recommended that a grade crossing safety assessment team consist of two people. For more complex grade crossings it may be desirable to have a larger safety assessment team.

Team Composition

It is the responsibility of the Railway Company and Road Authority to select the safety assessment team members. The team members can come from various sources such as, staff members from the road authority, staff members from the Railway Company or qualified engineering safety consultants. Ideally, there should be representation from the Railway Company and the Road Authority.

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 it’s 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. Section14 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.

Appendix C1: FIELD DATA FORMS

Passive Crossings

Date of Assessment:

Assessment Team Members & Affiliations:

Reason for Assessment:

___ periodic assessment	___ significant change in infrastructure	___ significant change in road or rail volumes
___ cessation of whistling	___ significant change in train operations	___ significant change in road or rail speeds
___ change in vehicle types	___ 2+ fatal collisions in 5yr. period	___ other collision experience (see below)

Railway Authority:

Crossing Location:

Location Number:

Municipality:

Railway: **Mile:**

Sub-division: **Spur:**

Type of Grade Crossing: [SRCS, FLB, FLBG]

Track Type: [mainline, etc.]

Road Authority:

Road Name / Number:

Province:

Location Reference (control section, etc.):

Road Classification
(freeway/expressway arterial, collector, local, etc.):

Collision History (5-year period):

Property Damage collisions:	_______		
+ Personal Injury collisions:	_______	**Number of Persons Injured:**	_______
+ Fatal Injury Collisions:	_______	**Number of Persons Killed:**	_______
= Total Collisions in last 5 year period:	_______		

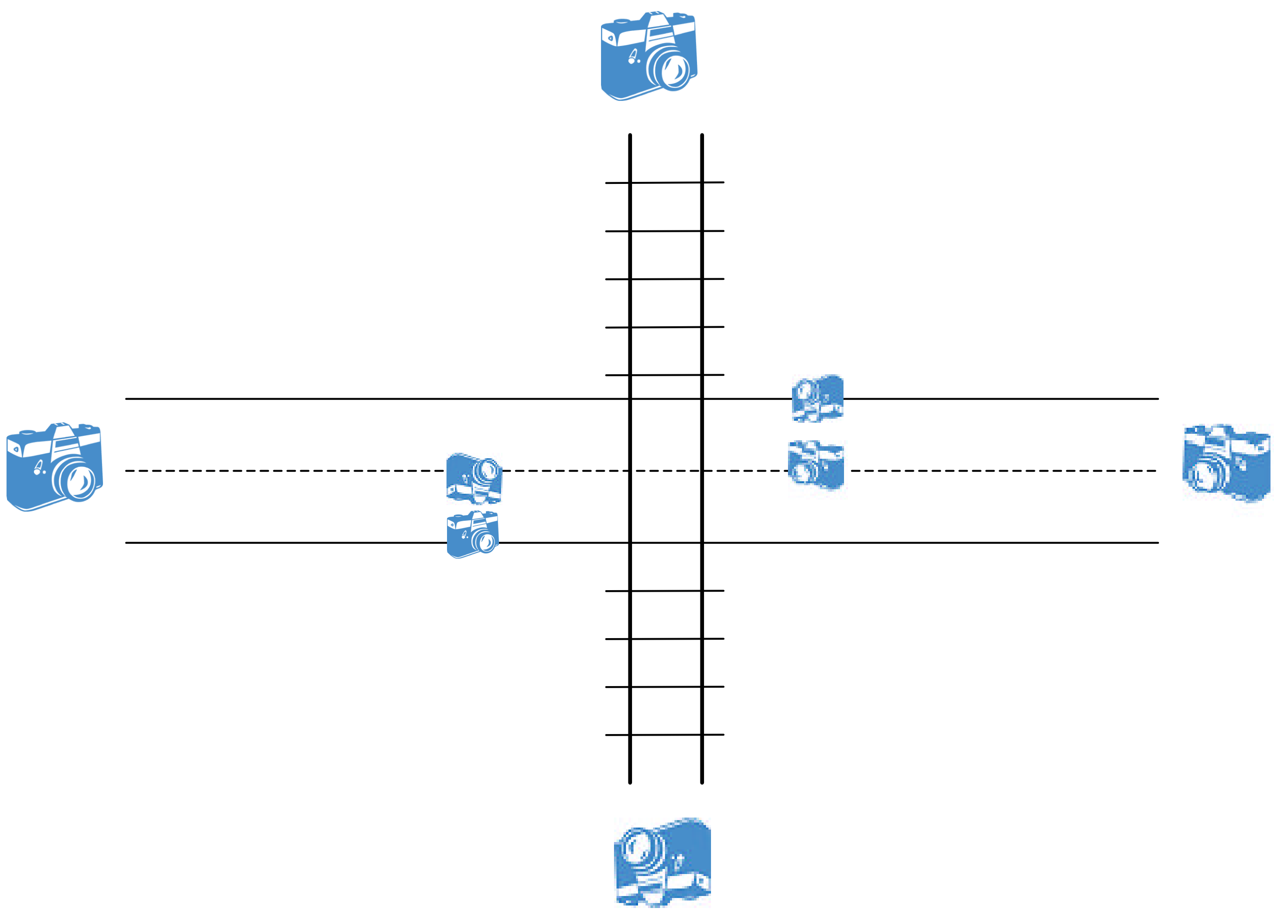
<u>Provide Details of the collisions and any remedial measures taken if available:</u>

- identify main contributing factors -attach collision diagrams if available

SCENE PHOTOGRAPHS

- as a minimum, take pictures all road/rail approaches and each quadrant

- key the orientation of pictures to the scene sketch (Sheet 2a)



Sheet 2

SCENE SKETCH

NOTE: All references to direction in this safety review are keyed to this diagram.

Magnetic North

Include:

-directions to nearby municipalities for both road & rail approaches (use arrows)

-adjacent intersections	-landmarks	-geographical features
-relevant road signs/signals	-crosswalks/paths	-bus stops, etc.

Sheet 3 **GENERAL INFORMATION**

Source	Item	Reference
Rail	Maximum Railway Operating Speed, $\mathbf{V_T}$ = (mph)	Sect. 2.1
Rail	Daily Train Volume: = (freight trains/day) = (passenger trains/day)	
Rail	Switching during daytime? Y/N nighttime? Y/N	
Road	Avg. Annual Daily Traffic, AADT = (vpd) Year of count:______	
Road	High seasonal fluctuation in volumes?	
Road	Pedestrian Volumes = (ped./day)	
Road ✓	Is crossing on a School Bus route?	
Road ✓	Do Dangerous Goods trucks use this roadway?	
Road	Cyclist Volumes = (cyclists/day)	
Road ✓	Regular use of crossing by persons with Assistive Devices ?	
Road ✓	Other special road users? type____________ daily volume___________	
Road	Forecasted AADT[2] = (vpd) Forecast Year: ________	
Road ✓	Design Speed: _______km/h Posted Speed: _______ km/h Maximum Operating Speed: _______ km/h note: provide details if all approaches are not the same	Sect. 2.1
Road ✓	Road Surface Type (asphalt, concrete, gravel, etc.):	
observe	Surrounding Land Use: Urban / rural?	
observe	Any schools, retirement homes, etc. nearby ?	

Notes:
✓ indicates information should be confirmed by field observation

1. Road Authority should provide plans if available.
2. Forecast AADT until next assessment if significant developments are expected or if a planned bypass may reduce volumes.

Figure 4-1: Clearance Distance for Grade Crossings

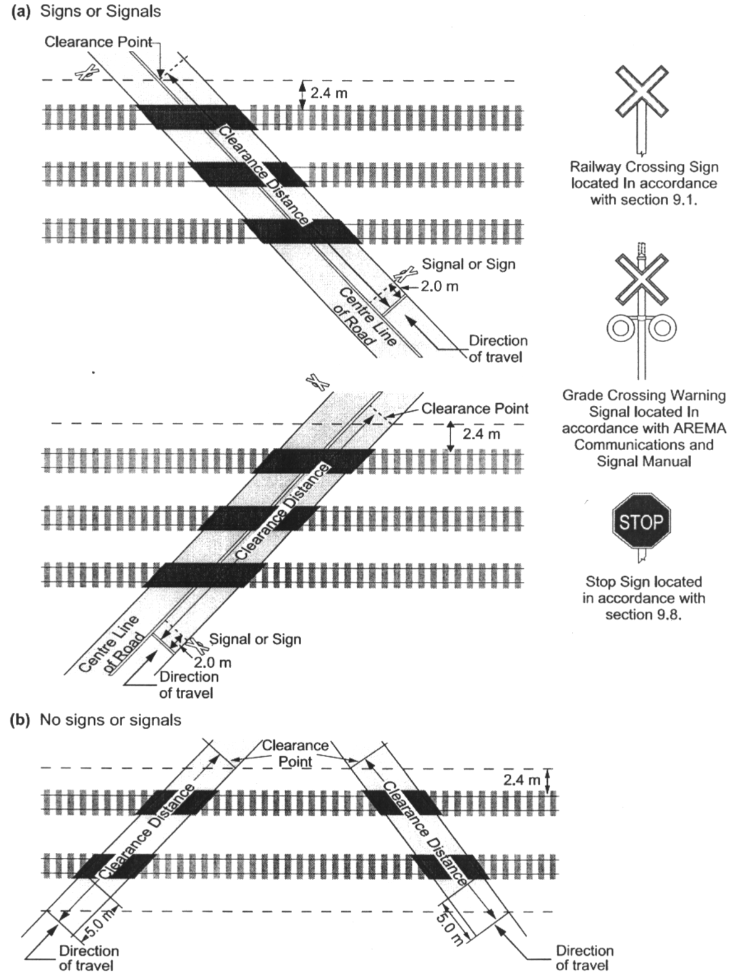


Figure 4-2 Assumed Acceleration Curves - General Design Vehicles
(Geometric Design Guide)

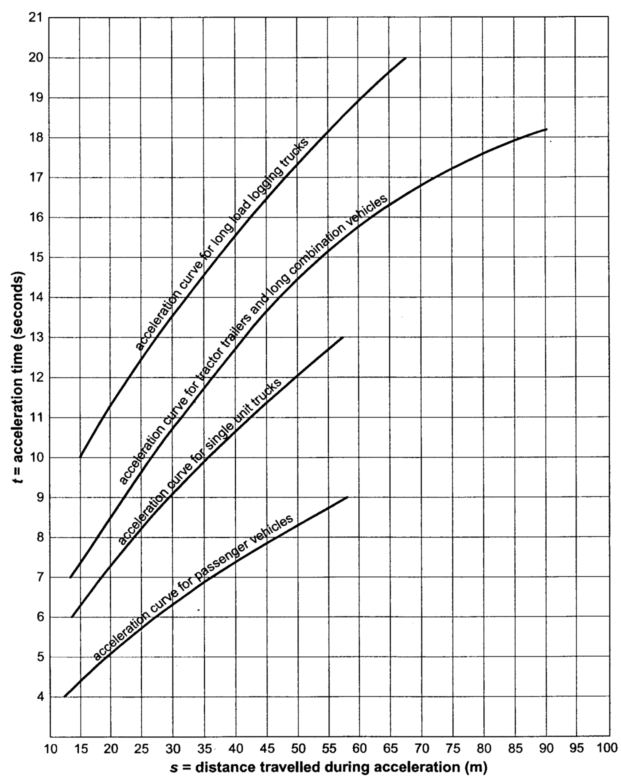


Table 4-6: Ratios of Acceleration Times on Grades

Design Vehicle	***Road Grade %***				
	-4	***-2***	***0***	***+2***	***+4***
Passenger Car	0.7	0.9	1.0	1.1	1.3
Single Unit Truck and Buses	0.8	0.9	1.0	1.1	1.3
Tractor- Semitrailer	0.8	0.9	1.0	1.2	1.7

Source	Item	Reference
	Design Vehicle	
Road	Type:	T 4-1
look-up	Length, **L** = m	T 4-1
look-up	**Stopping Sight Distance, SSD** = m (required)	T 4-5
measure	**Clearance Distance, cd** = m	Fig 4-1
calculate	**Vehicle Travel Distance:** **S** = L+cd = m	Sect. 4.6
look-up	**Vehicle Departure Time, t** = sec	Fig 4-2
	Road Grade Effect:	
Road ✓	maximum approach grade within 'S': = ± %	
look-up	grade adjustment factor =	T4-6
calculate	**T**= t x adjustment factor = sec	
calculate	**Design Vehicle Departure Time, Td** = J + T + K	
	where J = 2 sec perception & reaction	Sect. 4.7
	where K = additional time due to crossing conditions	
calculate	**Td** = = sec	
observe	Do field acceleration times exceed Td?	
look-up	**Pedestrian, cyclist & Assistive Devices Departure Time** **Tp** = sec	T 4-7

✓ indicates information should be confirmed by field observation

Table 4-1: General Vehicles

Class	*General Vehicle Descriptions*	*Length (m)*
Passenger Car	1. Passenger Cars, Vans, and Pickups (P)	5.6
Trucks		
Single-Unit Trucks	2. Light Single-Unit Trucks	6.4
	3. Medium Single-Unit Trucks	10.0
	4. Heavy Single-Unit Trucks	11.5
Tractor Trailers	5. WB-19 Tractor-Semitrailers	20.7
	6. WB-20 Tractor-Semitrailers	22.7
Combination Vehicles	7. A-Train Doubles (ATD)	24.5
	8. B-Train Doubles (BTD)	25.0
Buses		
	9. Standard Single-Unit Buses (B-12)	12.2
	10. Articulated Buses (A-BUS)	18.3
	11. Intercity Buses (I-BUS)	14.0

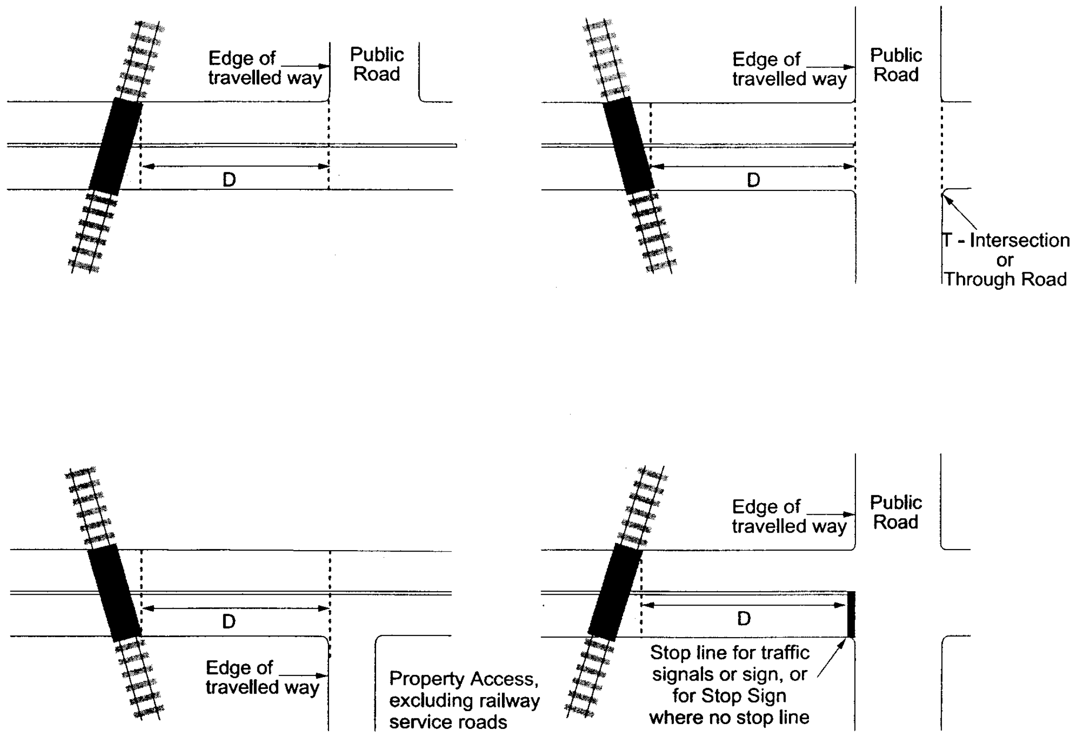
***Table 4-5: Stopping Sight Distances** (level grade, on wet pavement and gravel surfaces)*

Stopping Sight Distances (SSD)		
Maximum Road Operating Speed (km/h)	***Passenger Car Class (m)***	***Truck Class (m)***
40	45	70
50	65	110
60	85	130
70	110	180
80	140	210
90	170	265
100	210	330
110	250	360

Table 4-7: Departure Time - Pedestrians, Cyclists, Persons Using Assistive Devices

Clearance Distance (m)	***Departure Time (s)***
9	7.4
14	12
18	15
22	18
26	22
30	25

Figure 5-1: Restrictions on the Proximity of Intersections and Entranceways to Unrestricted Grade Crossing



Drawing not to scale

NOTE:

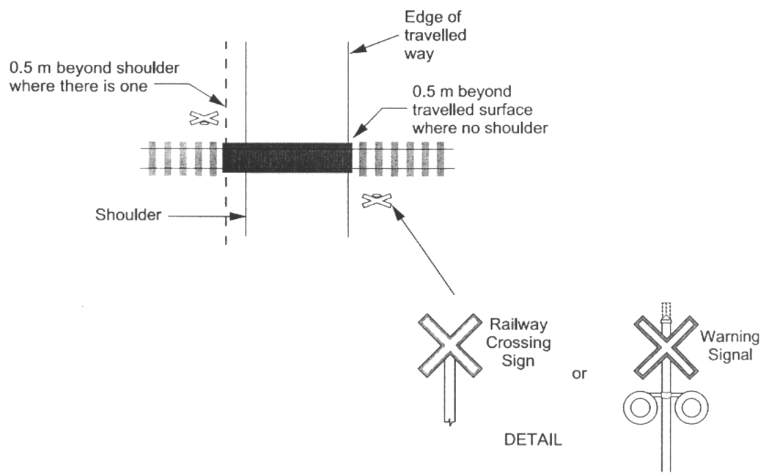
D not less than 30 m where the maximum railway operating speed exceeds 15 mph.

Source	Item	Reference
observe	"**D**" should not be less than 30m for either approach if the train speed exceeds 15 mph.	Fig 5-1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks? Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing? -comment below	

Comments Following Site Visit:

Figure 6-1: Grade Crossing Surface - Plan View

a) ROAD, INCLUDING A PATH OR TRAIL



b) SIDEWALK, PATH, OR TRAIL ALONGSIDE A ROAD

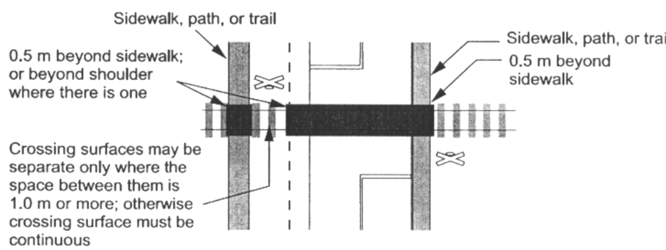
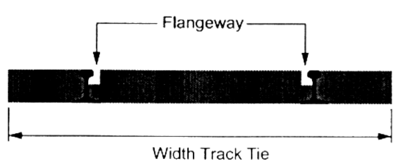


Figure 6-2: Grade Crossing Surface - Cross Section



a) Flangeway:		
Width:	Installation all grade crossings	65-76 mm
	Maximum wear limit Grade crossings regularly used by a person using an assistive device	76 mm
	All other grade crossings	100 mm
Depth:	Minimum	50 mm
	Maximum: Urban areas and any other grade crossing regularly used by a person using an assistive device	76 mm
	All other grade crossings	none
b) Space for Field Side Rail Grinding: A space is permitted on the outer side of the rail at locations where there is frequent rail grinding, except for grade crossings regularly used by a person using an assistive device.		
	Maximum width:	50 mm
	Minimum depth:	38 mm
c) Elevation of Top of Rail with respect to the Crossing Surface: The top of rail shall be installed as close as possible to the crossing surface, with the exception of a grade crossing regularly used by a person using an assistive device, where the top of rail may be installed above the crossing surface within the wear limit.		
Wear limits:	Any route identified for regular use by a person using an assistive device	
	Maximum distance above crossing surface	+13 mm
	Minimum distance below crossing surface	-7 mm
	Unrestricted grade crossings for vehicle use, and other grade crossings if used regularly by passenger cars, trucks other than off-road trucks, and recreational vehicles.	± 25 mm
	All other grade crossings	± 50 mm

Source	Item	Reference
observe	**Is the crossing smooth enough to allow road vehicles, pedestrians, cyclists, and other road users to cross at their normal speed without consequence? -comments below**	
observe	**Grade Crossing Surface Material**: (e.g., asphalt, wood, concrete, rubber, etc.)	
observe	Approach Road Surface Type: Approach Road Surface Condition: Roadway Illumination?:	
measure	**Road Surface crossing width** = m (note: min. = 8m) note: measured at right angle to roadway centre line	Fig 6-1
measure	**Road Surface extension beyond travel lanes** (note: min. = 0.5m) = ______ m N / E approach = _______ m S / W approach	Fig 6-1
measure	**Sidewalk/Path/Trail crossing width** = m (note: min. = 1.5m)	Fig 6-1
measure	Sidewalk/Path/Trail extension beyond sidewalk (note: min. = 0.5m) = ______ m N / E approach = _______ m S / W approach	Fig 6-1
measure	Distance Between Travel Lane and Sidewalk = m	
	Cross-Section:	
measure	Flangeway width = mm (note: max. = 76 or 100mm)	Fig 6-2
measure	Flangeway depth = mm (note: min. = 50mm/ max.=76mm or none)	Fig 6-2
measure	Side Grinding width = mm (note: max. = 50mm or 0[1])	Fig 6-2
measure	Side Grinding depth = mm (note: min.= 38mm)	Fig 6-2
measure	Elevation of Top Rail above road surface = mm (note: max. = 13mm[1], 25mm, or 50mm)	Fig 6-2
measure	Elevation of Top Rail below road surface = mm (note: min. = -7mm[1], -25mm, or –50mm)	Fig 6-2

1. if frequent use by persons using assistive devices

Comments Following Site Visit:
-rough crossing surface, loose timbers, etc. -surface distress of roadway approaches -photos

Sheet 7 **ROAD GEOMETRY** **RTD Section 7**

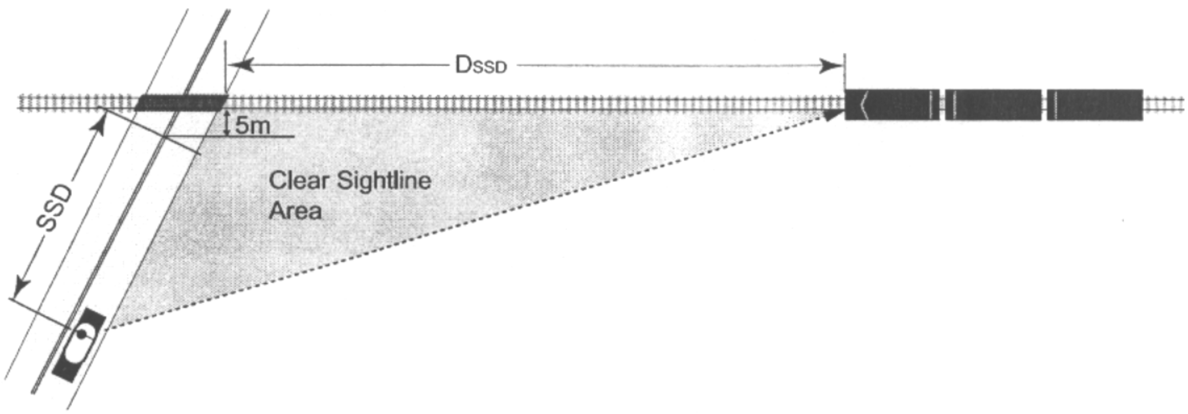
Source	Item	Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? N / E Approach: S / W Approach:	Sect. 7-1
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L (see form 4)? N / E Approach: S / W Approach:	Sect. 7-1
observe	Are the road lanes at least the same width on the crossing as on the road approaches? N / E Approach: S / W Approach:	Sect. 7-5
	Grades	
measure	Slope within 8m of nearest rail = % (on N / E approach) (max. = 2%)	Sect. 7-1
measure	Slope within 8m of nearest rail = % (on S / W approach) (max. = 2%)	Sect. 7-1
measure	Slope between 8m & 18m of nearest rail = % (on N / E approach) (max. = 5 or 10%)	Sect. 7-1
measure	Slope between 8m & 18m of nearest rail = % (on S / W approach) (max. = 5 or 10%)	Sect.7-1
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices: slope within 5m of nearest rail = % (max. = 1 or 2%)	Sect. 7-1
Road ✓	General approach grade = % N / E (max. = ± 5%) = % S / W (max. = ± 5%)	Sect.7-1
Rail ✓	Are rail tracks super-elevated? Y / N Rate of s-e: _______ m/m	Sect. 7.4
Road ✓	If train speeds exceed 15mph: - what is the angle between the crossing and the roadway? =___________degrees (70^{o} minimum w/o warning system; 45^{o} minimum with warning system)	Sect.7.6
observe	**Condition of Road Approaches:** (e.g., anything that might affect stopping or acceleration)	
observe	Is there any evidence that "low bed" trucks have difficulty negotiating the crossing (i.e., might they bottom-out or get stuck)? 	

✓ indicates information should be confirmed by field observation

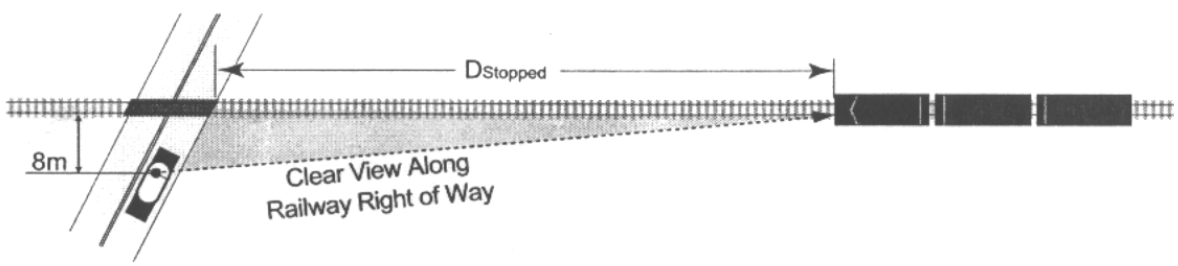
Comments Following Site Visit:

Figure 8-1: Minimum Sightlines - Grade Crossings Without A Grade Crossing Warning System

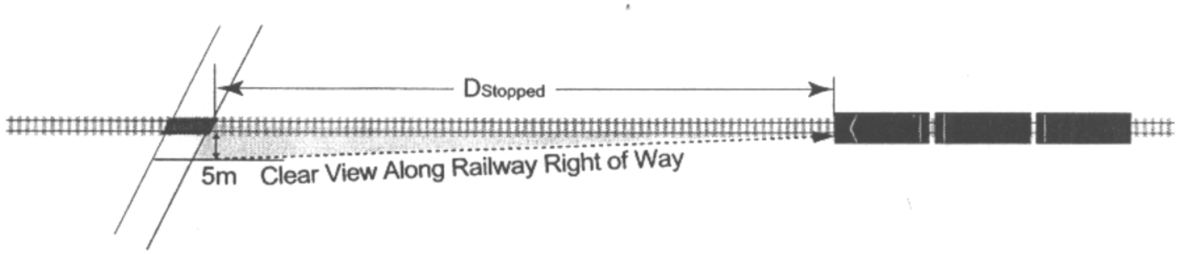
(A) Minimum Sightlines for Drivers Approaching a Grade Crossing



(B) Minimum Sightlines for Drivers Stopped at the Grade Crossing



(C) Minimum Sightlines for Pedestrians and Cyclists Stopped at the Grade Crossing



Driver Eye Height	=	1.05m	passenger vehicles, pedestrians, cyclists & assistive devices
	=	1.80m	buses & straight trucks
	=	2.10m	large trucks & tractor-trailers
Target Height	=	1.20m above rails	

Source	Item	Reference
observe	Are sightlines within the rail R.O.W. clear of bushes/vegetation; 15 m on each side of the track and, 30 m along the track, on each side of the crossing? -if no, detail the location	Sect. 8-1
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location	Sect.8-1
look up	**SSD** minimum = m (from sheet #4)	
measure	**SSD** actual: N / E approach = m S / W approach = m	Sect. 8.5
<u>Warning</u>: some formulae are based on <u>Imperial</u> units while others are <u>Metric</u>		
calculate	D_{SSD} minimum (ft) = **$1.47V_T$ x T_{SSD}** where V_T is from sheet #4	Sect. 8-5
	T_{SSD} is the greater of: [(SSD+cd+L)/0.28V] →V=max. road operating speed in km/h or 10 seconds	
	ˆ D_{SSD} minimum = ft. m (calculate or use Table 8-1)	T 8-1
measure	D_{SSD} actual: N / E approach = m (to driver's left); = m (to driver's right) S / W approach = m (to driver's left); = m (to driver's right)	Fig 8-1
calculate	$D_{STOPPED}$ minimum (ft) **= 1.47Vt x Td** with Td from sheet #4	Sect. 8.5
	$D_{STOPPED}$ minimum = ft. m (calculate or use Table 8-1)	T 8-1
measure	$D_{STOPPED}$ actual: N / E approach = m (to driver's left); = m (to driver's right) S / W approach = m (to driver's left); = m (to driver's right)	Fig 8-1
look up	**Ped./Cyclist $D_{STOPPED}$** (m) using Table 8-1 and Tp (from sheet #4)	T 4-7
measure	**Ped./Cyclist $D_{STOPPED}$ Actual:** N / E approach = m (to cyclist's left); = m (to cyclist's right) S / W approach = m (to cyclist's left); = m (to cyclist's right)	Fig 8-1
observe	**Are there any obstacles within the sight triangles (Figure 8-1) other than traffic signs/utility poles that might affect visibility?**	Fig 8-1
	Consideration should be given to also utilizing the newer methodologies for determining sight distances and clearance times developed by M. Gou, 2003 http://www.tc.gc.ca/tdc/summary/14100/14172e.htm	[TP14172E]

Comments Following Site Visit:

-visibility along the track impaired due to the angle of crossing?
-special considerations for large trucks?
-can sightlines be maintained on an ongoing basis? (snow)
-check visibility at all pedestrian crossing points
-special design vehicle?
-photos

Figure 9-2: Retroreflective Material on the Back of the Railway Crossing Sign and on the Post (unrestricted grade crossing without grade crossing warning system)

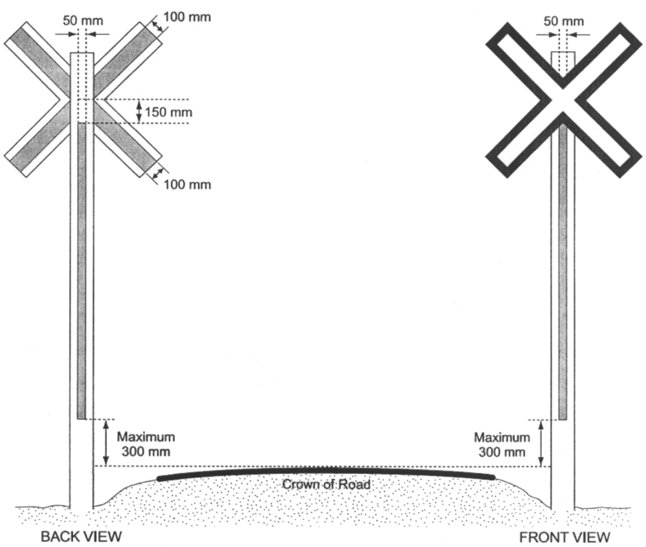
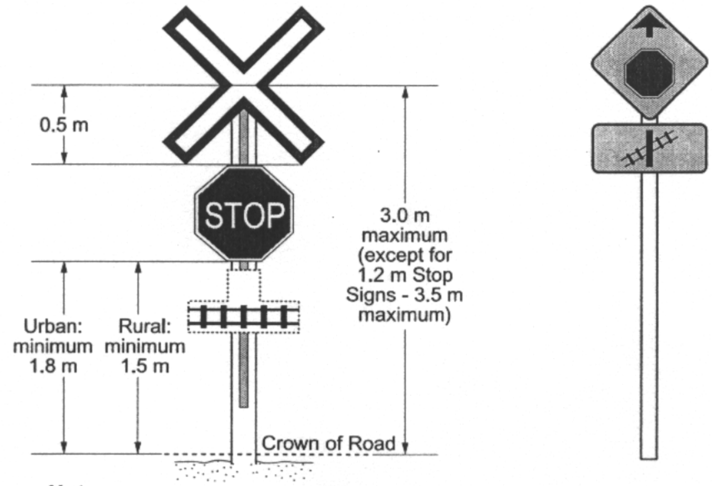


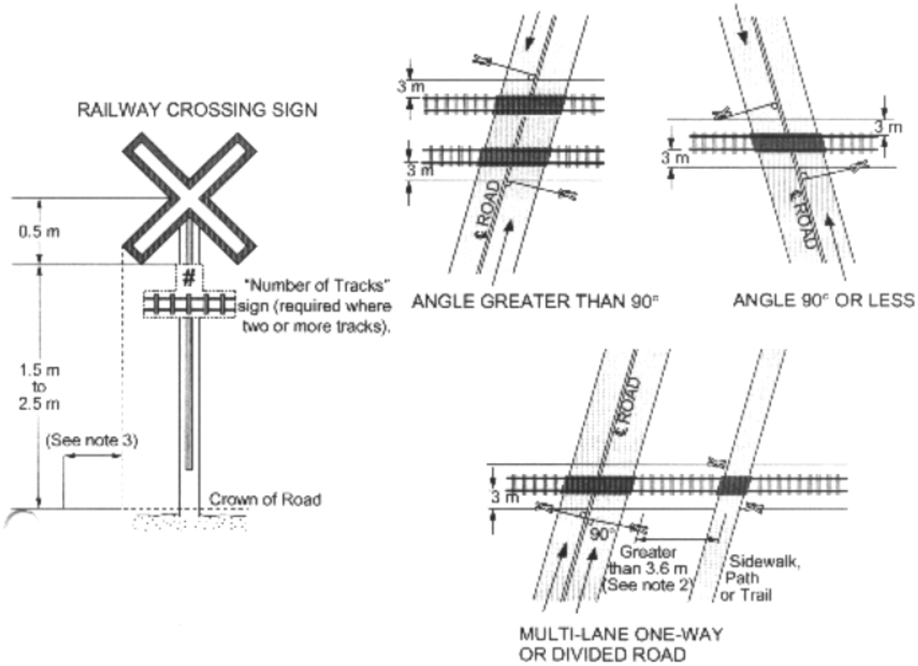
Figure 9-4: Stop Signs and Stop Ahead Signs



Note:

1) Top of stop sign should be at the elevation of the lowest points of crossing sign.

Figure 9-3: Location of Railway Crossing Signs and Number of Tracks Signs (unrestricted grade crossings without grade crossing warning systems)



Drawing Not To Scale

NOTES:

1. Where a road crosses adjacent tracks and the minimum distance between track centre lines, measured along the travelled surface parallel to the axis of the road, is more than 30 m, each track or set of tracks so separated shall have separate Railway Crossing Signs.
2. A sidewalk, pedestrian or bicycle path, or trail with its centreline more than 3.6 m (12 ft.) from a Railway Crossing Sign supporting post beside a road for vehicle traffic shall have separate Railway Crossing Signs.
3. Signs shall be located between 0.75 m and 1.25 m from the face of curb, or outer edge of road shoulder; or, where there is no curb or shoulder, 2.0 m to 2.5 m from the edge of travelled way.
4. Railway Crossing Signs shall be located as close as possible to the travelled way of the road, within the limits shown, to be clearly visible to all persons approaching the grade crossing on the grade crossing road or intersecting roads. Location outside the limits specified is permissible to the extent necessary to make the sign visible to approaching drivers, pedestrians, cyclists and persons using assistive devices.

Source	Item	Reference
	Railway Crossing Sign 	Sect. A2.2.4 MUTCD
	--comment on the following in the field:	
observe	location:	Fig 9-2/9-3
observe	height:	Fig 9-3
observe	retroreflective material on back of crossing signs?: front & back of posts?	Fig 9-2
measure	retroreflectivity readings: N / E approach: sign = cd/lux/m^2 post = cd/lux/m^2 S / W approach: sign = cd/lux/m^2 post = cd/lux/m^2	Fig 9-2
observe	Number of Tracks sign?	Fig 9-3

Comments Following Site Visit:

-general condition -clear sightlines to the sign -posts -photos

Source	Item	Reference
	DO NOT STOP ON TRACK 	U.S. MUTCD
Road ✓	Does queued traffic routinely encroach closer than 5m from the crossing surface?	Sect. 9.5
observe	Are these signs present on either approach?	Sect. 9.5

✓ indicates information should be confirmed by field observation

Comments Following Site Visit:

general condition -clear sightlines to the sign -posts -photos

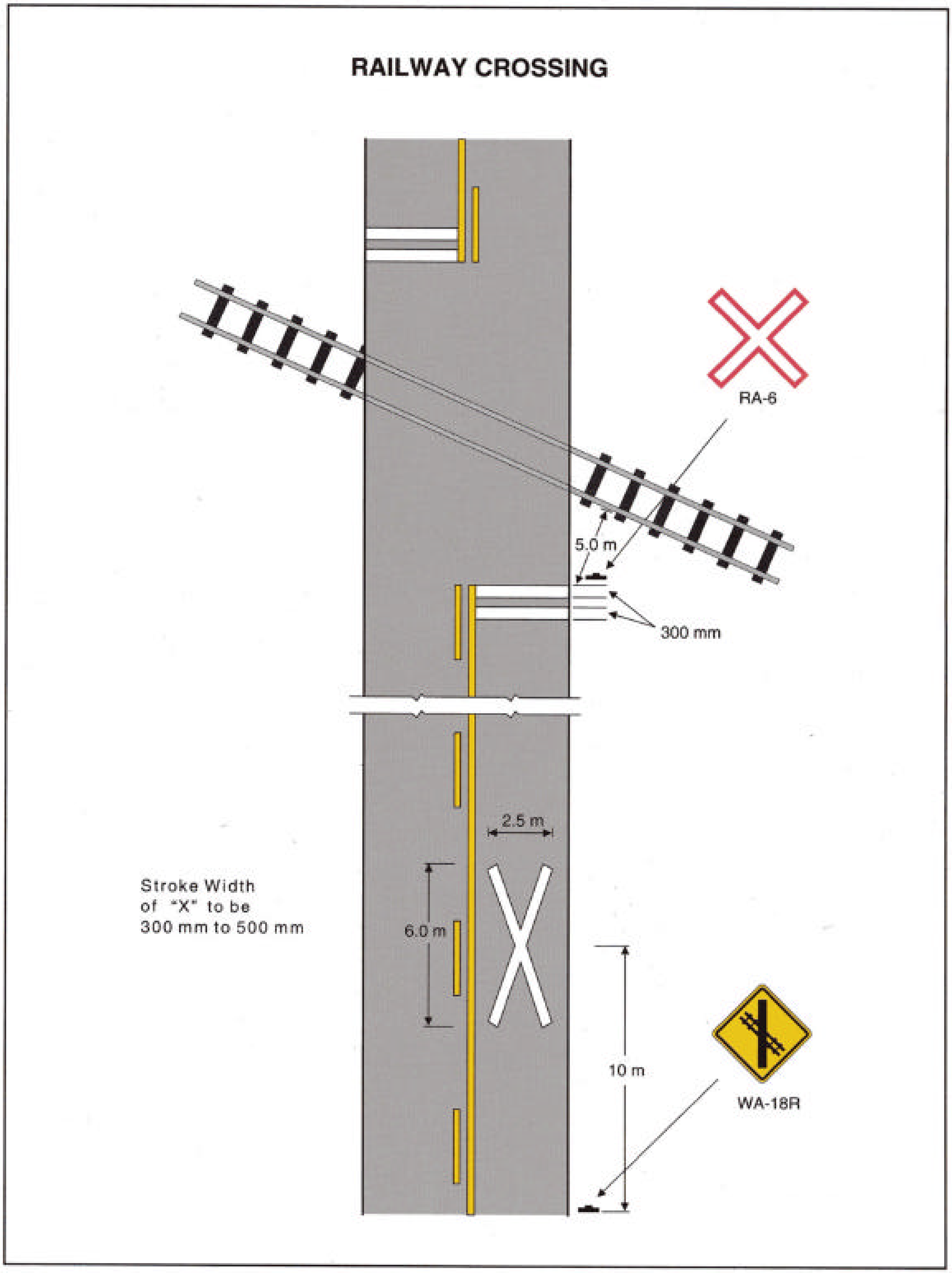
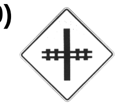


FIGURE C1-5

JUNE 2001

Source	Item	Reference
	Railway Crossing Ahead Sign (WA18-20) 	Sect. 3.4.2 MUTCD
look-up	Is AADT > 100? (see sheet #3)	
observe	Is area urban such that WA18-20 is not required?	Sect. 9.3b
measure	Distance from nearest rail to sign = m N / E approach = m S/ W approach	Fig C1-5
	--comment on the following in the field:	
observe	location:	Fig C1-5
observe	height:	
observe	appropriate orientation of symbol	Fig C1-5

Comments Following Site Visit:

-general condition -clear sightlines to the sign -posts -aligned to the driver -photos

Source	Item	Reference
	ADVISORY SPEED SIGN  **normally used in conjunction with WA18-20 signs if reduced speeds are necessary to provide adequate sight distance.**	Sect. A3.2.5 MUTCD
observe	Are they present on both approaches? Posted speed limit?	
look-up	Are they required on either approach?	check SSD (sheet 8)

Comments Following Site Visit:

-general condition -clear sightlines to the sign -posts -photos

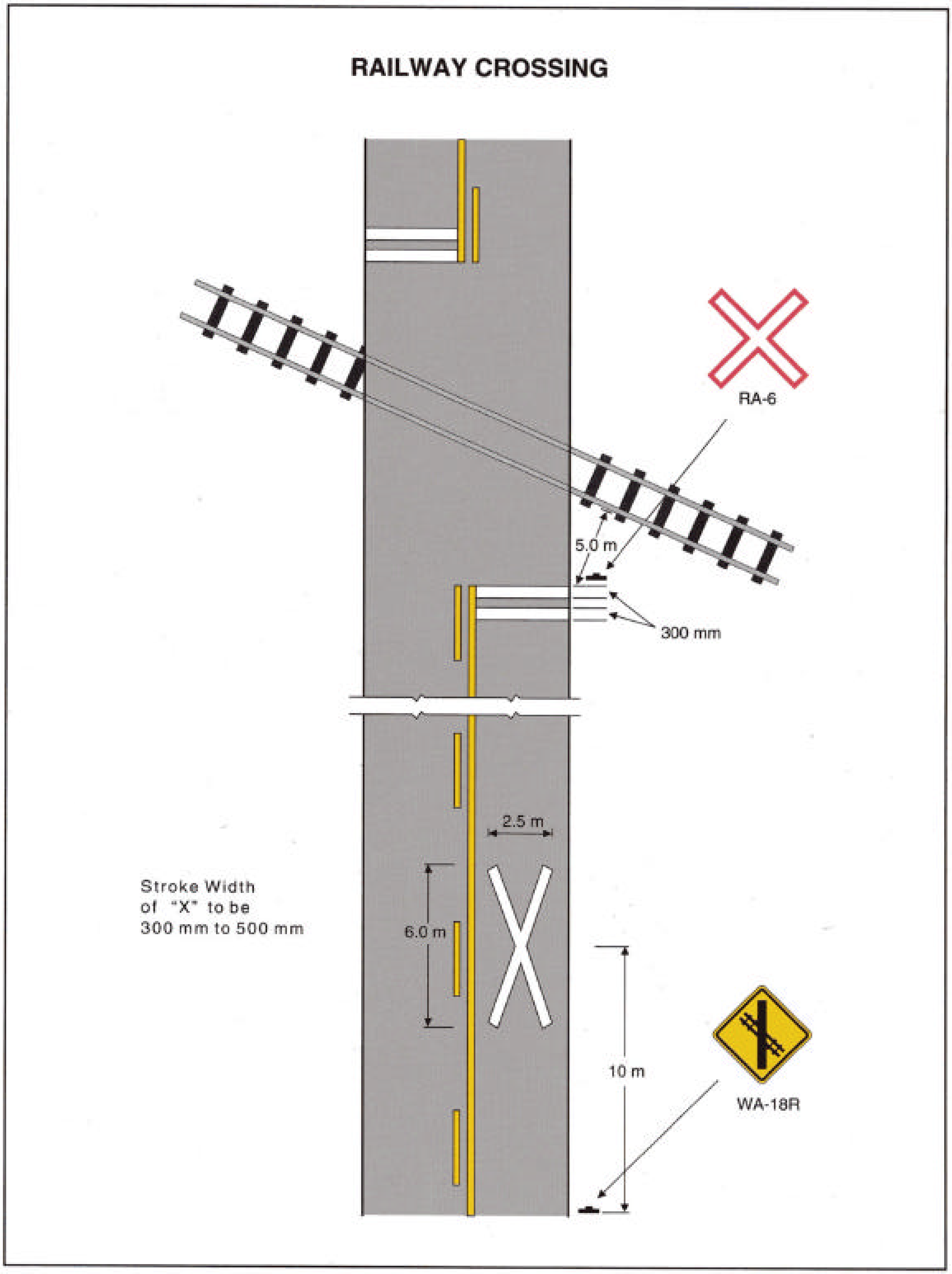


FIGURE C1-5

JUNE 2001

Source	Item	Reference
	STOP SIGN AHEAD 	Sect. A3.6.1 MUTCD
observe	Is sign present on either approach?	
look-up	Is sign required on either approach?	check SSD
observe	Is there an advisory tab with a track symbol present?	
measure	What is the distance from the nearest rail to the sign? = m N / E approach = m S / W approach	

Comments Following Site Visit:

-general condition -clear sightlines to the sign -posts -aligned to the driver -photos

Source	Item	Reference
	STOP SIGN 	Sect. A2.2.1 MUTCD
observe	Is sign present on either approach?	
look-up	Is sign required on either approach?	check $D_{STOPPED}$
observe	Are signs mounted on same post as Railway Crossing Signs?	Fig 9-4
measure	What is the distance from the nearest rail to the sign? = m N / E approach = m S / W approach	Fig C1-5

Comments Following Site Visit:

-general condition -clear sightlines to the sign -position -posts -aligned to the driver -photos

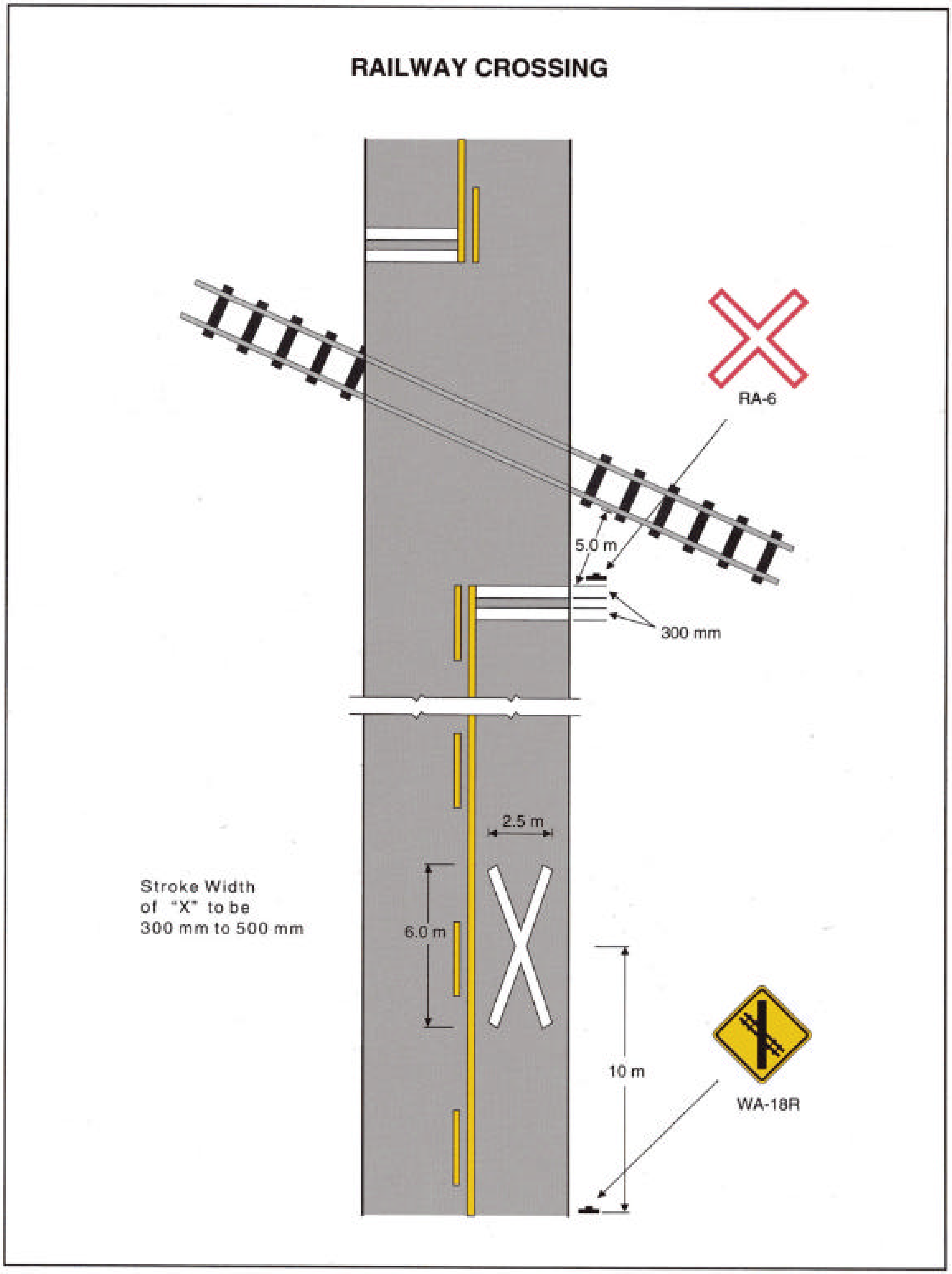


FIGURE C1-5

JUNE 2001

Source	Item	Reference
	PAVEMENT MARKINGS	
observe	Are pavement markings consistent with those from the MUTCD Manual?	Fig C1-5 MUTCD
observe	Are there lines to delineate sidewalks/paths?	Sect. 9.7

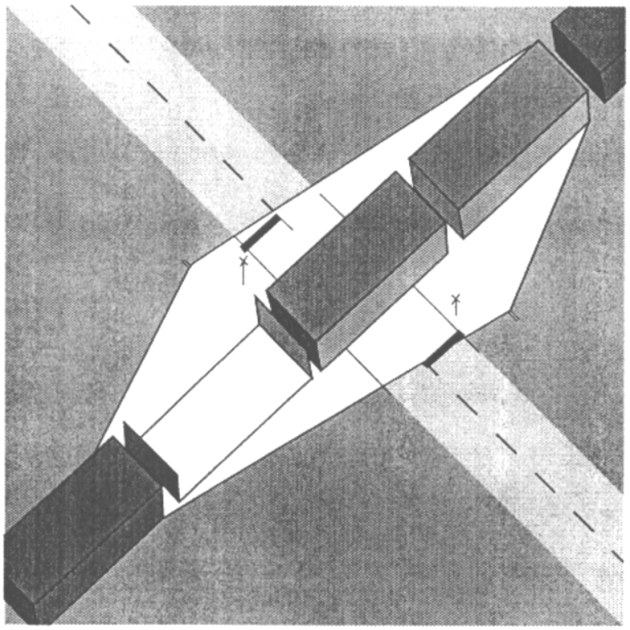
Comments Following Site Visit:

-general condition of markings -are centerlines or stop lines present? -width of markings? -provincial practice not to use *X* ?

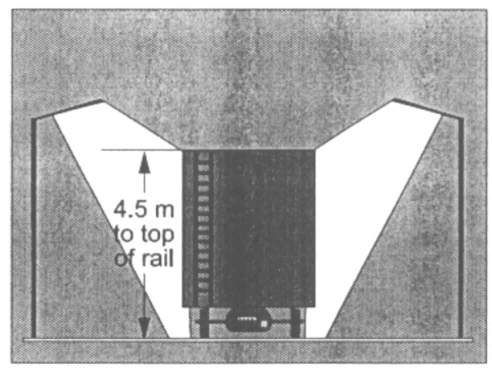
General Comments Regarding Signs & Pavement Markings:

-special sign required? -missing signs -visual clutter -obscured view / sightlines -retroreflectivty levels at night

Figure 10-1: Train Illumination: Grade Crossings without Grade Crossing Warning Systems



Plan View



Height to be covered by luminaire

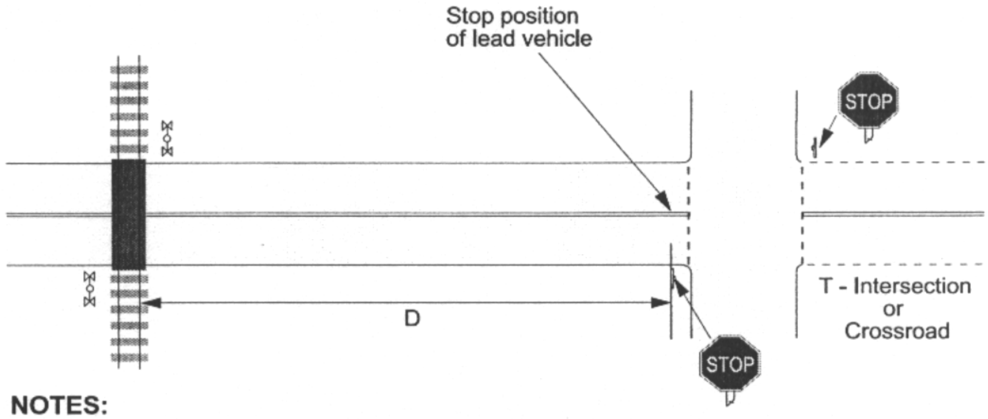
TRAIN ILLUMINATION
(only for crossings without warning systems)

Source	Item	Reference
	Flood lighting is required if **<u>all</u>** of the following exist: -unrestricted grade crossing -road speed limit is ≥ 50 km/h -routinely equipment on rails after dark is either stopped or traveling # 15mph	sec 10.1
Rail	Are luminaires required?	
observe	Are luminaires present on both approaches?	Fig 10-1

Comments Following Site Visit:
-general condition of luminaires -visibility at night -adjacent commercial lighting? -appropriate orientation of lights?

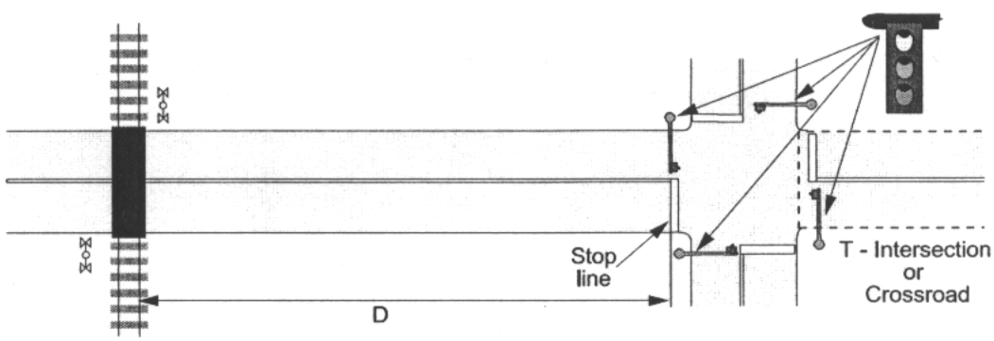
Figure 11-1: Proximity of Grade Crossing Warning Systems to Stop Signs and Traffic Signals

a) NEAR STOP SIGNS



NOTES:
Where the maximum railway operating speed exceeds 15 mph:
- if D is less than 30 m, a grade crossing warning system including gates is required;
- if D is 30 m or greater, a grade crossing warning system including gates is required unless a traffic study indicates that traffic will not normally queue to within 2.4 m of the rail nearest the road intersection. For grade crossings or road intersections nearby an existing grade crossing, where the maximum railway operating speed exceeds 15 mph:

b) NEAR TRAFFIC SIGNALS



NOTES:
For grade crossings or road intersections nearby an existing grade crossing, where the maximum railway operating speed exceeds 15 mph:
- if D is less than 60 m, a grade crossing warning system including gates is required;
- if D is 60 m or greater, a grade crossing warning system including gates is required unless a traffic study shows that traffic will not queue to within 2.4 m of the rail nearest the road intersection.

Source	Item	Reference
	Warning System Warrants -if any of A through E below are met, then a warning system is warranted	Sect. 11.1 & 11.2
look-up	Existing AADT = Forecast AADT = (if available)	sheet 3
look-up	Daily Train Volume =	sheet 3
calculate	**A. Cross-Product =** ____________________ (1,000 min.)	Sect. 11.1
look-up	**B. Maximum Rail Operating Speed =** _____________mph (max = 80mph or 60 mph with crosswalk)	sheet 3
Rail ✓	**C. Number of Tracks =** ______ ……..if ≥ 2, can trains pass one another?	Sect. 11.1
look up	**D. Are Sightlines obscured?** (see form 8)	Sect. 8.3
observe	**E. Is at least one of the proximity conditions met to warrant a warning system?**	Fig. 11-1

✓ indicates information should be confirmed by field observation

Comments Following Site Visit:

-extraordinary conditions why warning system should be installed -on a school bus route?

Table 16-1: Requirements for Public Grade Crossings Within an Area Without Train Whistling

Maximum Railway Operating Speed	Grade Crossings for Vehicle Use		Grade Crossings Exclusively for Pedestrians, Cyclists or Assistive Devices; and Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles (Refer to Figure 13-5)	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Stop & proceed	Manual protection or FLB	Manual protection or FLB	-----------------	-----------------
Up to 15 mph	FLB	FLB or FLB & G (Note 1)	'Z' barriers & guide fencing (Note 3)	'Z' barriers & guide fencing (Note 3)
16 - 49 mph	FLB or FLB & G (Note 2)	FLB & G	FLB, 'Z' barriers & guide fencing (Note 3)	FLB & G
50 mph or more	FLB & G	FLB & G	FLB & G	FLB & G

Where:

Manual protection is by a member of the train crew in accordance with the Canadian Rail Operating Rules.

FLB is a grade crossing warning system consisting of flashing lights and a bell.

FLB & G is a grade crossing warning system consisting of flashing lights, gates, and a bell.

Source	Item	Reference
Rail	**Is train whistling prohibited at this crossing? 24 hours?**	sec 16.1
Observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?	sec 16.7
Observe	Are the requirements of Table 16-1 met?	sec 16.2

Comments Following Site Visit:

Additional Prompt Lists

Human Factors:

° Control device visibility / background visual clutter.
° Driver workload through this area (i.e., are there numerous factors that simultaneously require the driver's attention such as traffic lights, pedestrian activity, merging/entering traffic, commercial signing, etc.).
° Driver expectancy of the environment (i.e., are the control measures in keeping with the design levels of the road system and adjacent environment).
° Need for positive guidance.
° Conflicts between road and railway signs and signals.

Environmental Factors:

° Extreme weather conditions.
° Lighting issues (night, dawn/dusk, tunnels, adjacent facilities, headlight or sunlight glare, etc.)
° Landscaping or vegetation.
° Integration w/ surrounding land use (e.g., parked vehicles blocking sightlines, merging traffic lanes, etc.)

All Road Users:

° Have needs of the following been met:
-pedestrians (including strollers, baby carriages, and blind persons)
-children / elderly
-assistive devices (wheelchairs, scooters, walkers, etc)
-bicyclists
-motorcyclists
-over-sized trucks
-buses
-recreational vehicles
-golfcarts
-hazardous materials

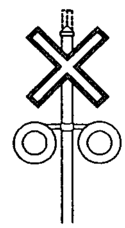
° Significant volume of pedestrians requiring special safety measures:
(maze barriers/guide fencing, sign indicating potential presence of 2nd train at a multi track crossing, etc)

Other:

° Should closure of the crossing be considered due to inactivity, presence of nearby adjacent crossings, etc.

Comments Following Site Visit:

Appendix C2: FIELD DATA FORMS



Active Crossings

Date of Assessment:

Assessment Team Members & Affiliations:

Reason for Assessment:

___ periodic assessment	___ significant change in infrastructure	___ significant change in road or rail volumes
___ cessation of whistling	___ significant change in train operations	___ significant change in road or rail speeds
___ change in vehicle types	___ 2+ fatal collisions in 5yr. period	___ other collision experience (see below)

Railway Authority:

Crossing Location:

Location Number:

Municipality:

Railway: **Mile:**

Sub-division: **Spur:**

Type of Grade Crossing: [SRCS, FLB, FLBG]

Track Type: [mainline, etc.]

Road Authority:

Road Name / Number:

Province:

Location Reference (control section, etc.):

Road Classification
(freeway/expressway arterial, collector, local, etc.):

Collision History (5-year period):

Property Damage collisions: _______

+ Personal Injury collisions: _______ **Number of Persons Injured:** _______

+ Fatal Injury Collisions: _______ **Number of Persons Killed:** _______

= Total Collisions in last 5 year period: _______

<u>**Provide Details of the Collisions if available:**</u>

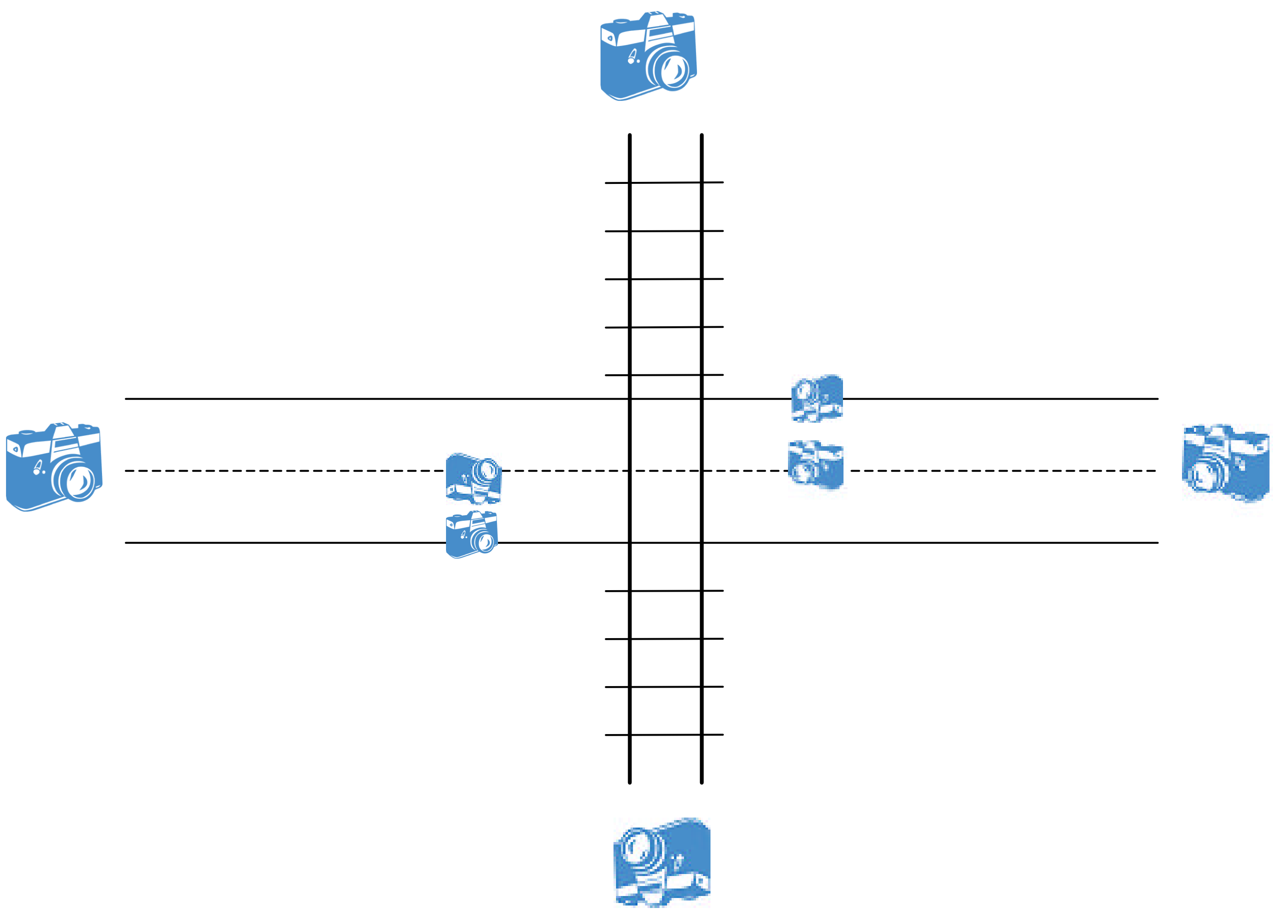
- identify main contributing factors

-attach collision diagrams if available

SCENE PHOTOGRAPHS

- as a minimum, take pictures all road/rail approaches and toward each quadrant

- key the orientation of pictures to the scene sketch (Sheet 2a)



Sheet 2

SCENE SKETCH

NOTE: All references to direction in this safety review are keyed to this diagram.

Magnetic North

Include:

-directions to nearby municipalities for both road & rail approaches (use arrows)

-adjacent intersections	-landmarks	-geographical features
-relevant road signs/signals	-crosswalks/paths	-bus stops, etc.
-signal warning systems hardware		

Sheet 3 **GENERAL INFORMATION**

Source	Item	Reference
Rail	Maximum Railway Operating Speed, V_T = (mph)	Sect. 2.1
Rail	Daily Train Volume: = (freight trains/day) = (passenger trains/day)	
Rail	Switching during daytime? Y/N nighttime? Y/N	
Road	Avg. Annual Daily Traffic, AADT = (vpd) Year of count:___	
Road	High seasonal fluctuation in volumes?	
Road	Pedestrian Volumes = (ped./day)	
Road ✓	Is crossing on a School Bus route?	
Road ✓	Do Dangerous Goods trucks use this roadway?	
Road	Cyclist Volumes = (cyclists/day)	
Road ✓	Regular use of crossing by persons with Assistive Devices ?	
Road ✓	Other special road users? type_____________ daily volume____________	
Road	Forecasted AADT[2] = (vpd) Forecast Year: _________	
Road ✓	Design Speed: _______km/h Posted Speed: _______ km/h Maximum Operating Speed: _______ km/h note: provide details if all approaches are not the same	Sect. 2.1
Road ✓	Road Surface Type (asphalt, concrete, gravel, etc.):	
observe	Surrounding Land Use: Urban / rural?	
observe	Any schools, retirement homes, etc. nearby ?	

Notes:
✓ indicates information should be confirmed by field observation
1. Road Authority should provide plans if available.
2. Forecast AADT until next assessment if significant developments are expected or if a planned bypass may reduce volumes.

Figure 4-1: Clearance Distance for Grade Crossings

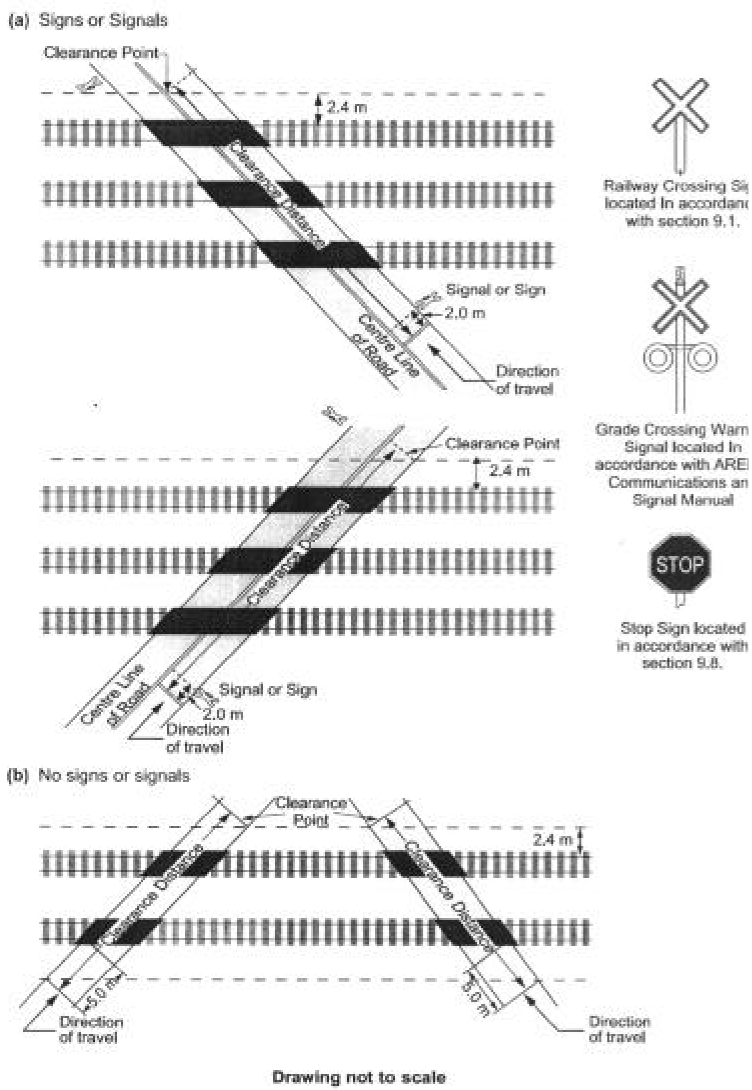


Figure 4-2 Assumed Acceleration Curves - General Design Vehicles
(Geometric Design Guide)

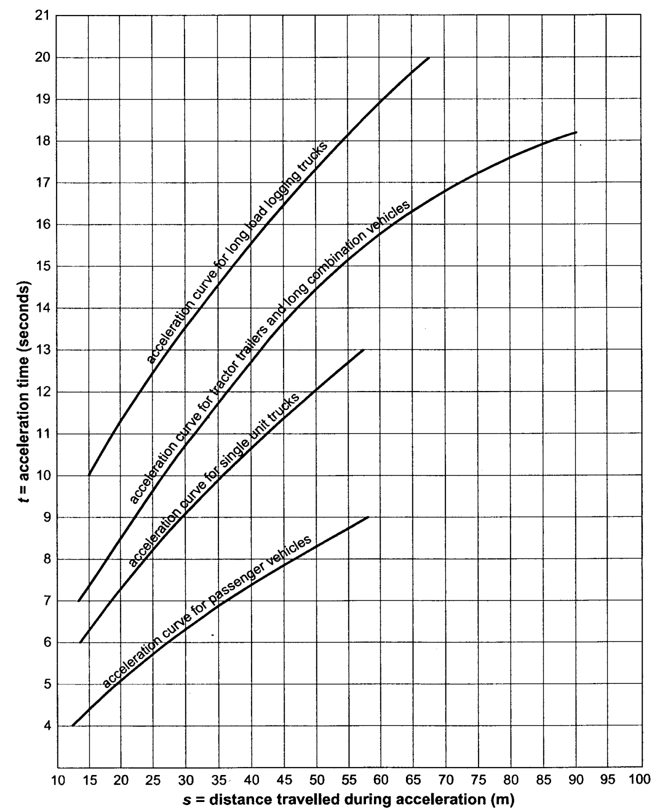


Table 4-6: Ratios of Acceleration Times on Grades

Design Vehicle	*Road Grade %*				
	-4	*-2*	*0*	*+2*	*+4*
Passenger Car	0.7	0.9	1.0	1.1	1.3
Single Unit Truck and Buses	0.8	0.9	1.0	1.1	1.3
Tractor- Semitrailer	0.8	0.9	1.0	1.2	1.7

Source	Item	Reference
	Design Vehicle	
Road	Type:	T 4-1
look-up	Length, **L** = m	T 4-1
look-up	**Stopping Sight Distance, SSD** = m (required)	T 4-5
measure	**Clearance Distance, cd** = m	Fig 4-1
calculate	**Vehicle Travel Distance:** **S** = L+cd = m	Sect. 4.6
look-up	**Vehicle Departure Time, t** = sec	Fig 4-2
	Road Grade Effect:	
Road ✓	maximum approach grade within ‘S’: = ∀ %	
look-up	grade adjustment factor =	T4-6
calculate	**T**= t x adjustment factor = sec	
calculate	**Design Vehicle Departure Time, Td** = J + T + K	
	where J = 2 sec perception & reaction	Sect. 4.7
	where K = additional time due to crossing conditions	
calculate	**Td** = = sec	
observe	Do field acceleration times exceed Td?	
look-up	**Pedestrian, cyclist & Assistive Devices Departure Time** **Tp** = sec	T 4-7

✓ indicates information should be confirmed by field observation

Table 4-1: General Vehicles

Class	*General Vehicle Descriptions*	*Length (m)*
Passenger Car	1. Passenger Cars, Vans, and Pickups (P)	5.6
Trucks		
Single-Unit Trucks	2. Light Single-Unit Trucks	6.4
	3. Medium Single-Unit Trucks	10.0
	4. Heavy Single-Unit Trucks	11.5
Tractor Trailers	5. WB-19 Tractor-Semitrailers	20.7
	6. WB-20 Tractor-Semitrailers	22.7
Combination Vehicles	7. A-Train Doubles (ATD)	24.5
	8. B-Train Doubles (BTD)	25.0
Buses		
	9. Standard Single-Unit Buses (B-12)	12.2
	10. Articulated Buses (A-BUS)	18.3
	11. Intercity Buses (I-BUS)	14.0

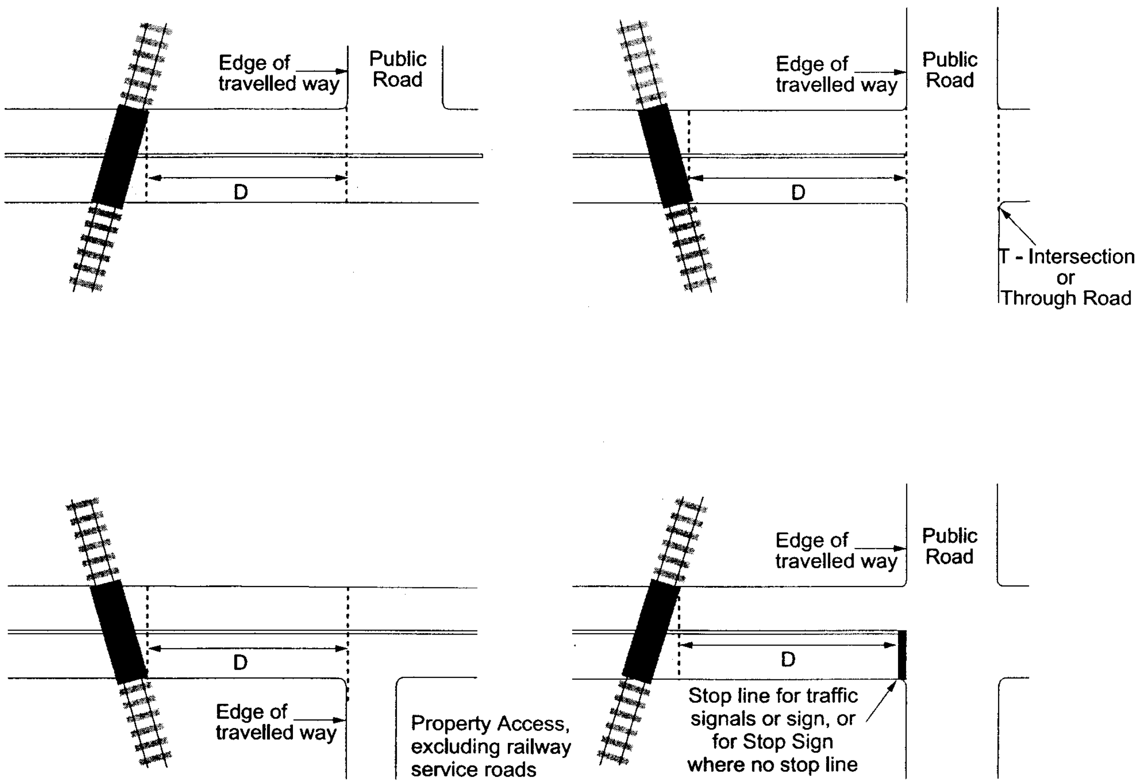
Table 4-5: Stopping Sight Distances *(level grade, on wet pavement and gravel surfaces)*

Stopping Sight Distances (SSD)		
Maximum Road Operating Speed (km/h)	***Passenger Car Class (m)***	***Truck Class (m)***
40	45	70
50	65	110
60	85	130
70	110	180
80	140	210
90	170	265
100	210	330
110	250	360

Table 4-7: Departure Time - Pedestrians, Cyclists, Persons Using Assistive Devices

Clearance Distance (m)	***Departure Time (s)***
9	7.4
14	12
18	15
22	18
26	22
30	25

Figure 5-1: Restrictions on the Proximity of Intersections and Entranceways to Unrestricted Grade Crossing



Drawing not to scale

NOTE:

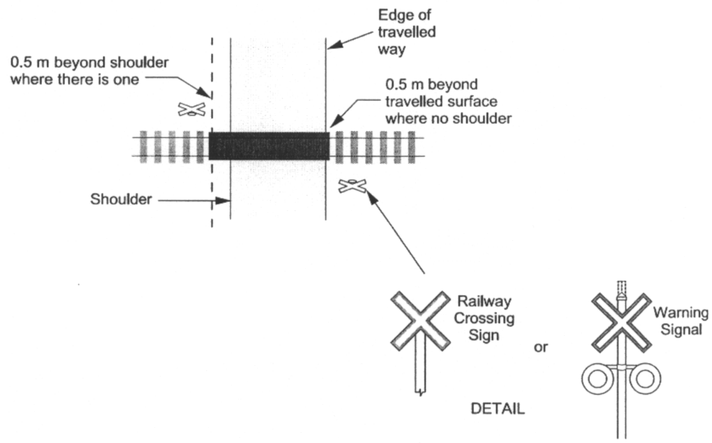
D not less than 30 m where the maximum railway operating speed exceeds 15 mph.

Source	**Item**	**Reference**
observe	"**D**" should not be less than 30m for either approach if the train speed exceeds 15 mph.	Fig 5-1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks? Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing? -comment below	

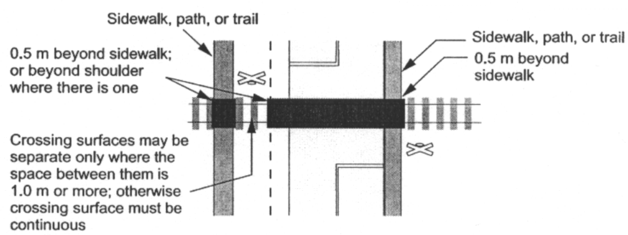
Comments Following Site Visit:

Figure 6-1: Grade Crossing Surface - Plan View

a) ROAD, INCLUDING A PATH OR TRAIL

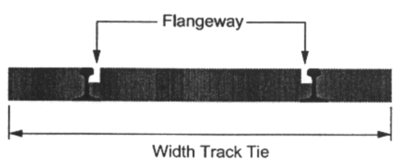


b) SIDEWALK, PATH, OR TRAIL ALONGSIDE A ROAD



Drawing not to scale

Figure 6-2: Grade Crossing Surface - Cross Section



a) Flangeway:		
Width:	Installation all grade crossings	65-76 mm
	Maximum wear limit Grade crossings regularly used by a person using an assistive device	76 mm
	All other grade crossings	100 mm
Depth:	Minimum	50 mm
	Maximum: Urban areas and any other grade crossing regularly used by a person using an assistive device	76 mm
	All other grade crossings	none
b) Space for Field Side Rail Grinding: A space is permitted on the outer side of the rail at locations where there is frequent rail grinding, except for grade crossings regularly used by a person using an assistive device.		
	Maximum width:	50 mm
	Minimum depth:	38 mm
c) Elevation of Top of Rail with respect to the Crossing Surface: The top of rail shall be installed as close as possible to the crossing surface, with the exception of a grade crossing regularly used by a person using an assistive device, where the top of rail may be installed above the crossing surface within the wear limit.		
Wear limits:	Any route identified for regular use by a person using an assistive device	
	Maximum distance above crossing surface	+13 mm
	Minimum distance below crossing surface	-7 mm
	Unrestricted grade crossings for vehicle use, and other grade crossings if used regularly by passenger cars, trucks other than off-road trucks, and recreational vehicles.	± 25 mm
	All other grade crossings	± 50 mm

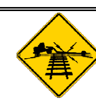
Sheet 6 **GRADE CROSSING SURFACE** **RTD Section 6**

Source	Item	Reference
observe	**Is the crossing smooth enough to allow road vehicles, pedestrians, cyclists, and other road users to cross at their normal speed without consequence? -comments below**	
observe	**Grade Crossing Surface Material**: (e.g., asphalt, wood, concrete, rubber, etc.)	
observe	Approach Road Surface Type: Approach Road Surface Condition: Roadway Illumination?:	
measure	**Road Surface crossing width** = m (note: min. = 8m) note: measured at right angle to roadway centre line	Fig 6-1
measure	**Road Surface extension beyond travel lanes** (note: min. = 0.5m) = ______ m N / E approach = ______ m S / W approach	Fig 6-1
measure	**Sidewalk/Path/Trail crossing width** = m (note: min. = 1.5m)	Fig 6-1
measure	Sidewalk/Path/Trail extension beyond sidewalk (note: min. = 0.5m) = ______ m N / E approach = ______ m S / W approach	Fig 6-1
measure	Distance Between Travel Lane and Sidewalk = m	
	Cross-Section:	
measure	Flangeway width = mm (note: max. = 76 or 100mm)	Fig 6-2
measure	Flangeway depth = mm (note: min. = 50mm/ max.=76mm or none)	Fig 6-2
measure	Side Grinding width = mm (note: max. = 50mm or 0[1])	Fig 6-2
measure	Side Grinding depth = mm (note: min.= 38mm)	Fig 6-2
measure	Elevation of Top Rail above road surface = mm (note: max. = 13mm[1], 25mm, or 50mm)	Fig 6-2
measure	Elevation of Top Rail below road surface = mm (note: min. = -7mm[1], -25mm, or –50mm)	Fig 6-2

1. if frequent use by persons using assistive devices

Comments Following Site Visit:
-rough crossing surface, loose timbers, etc. -surface distress of roadway approaches -photos

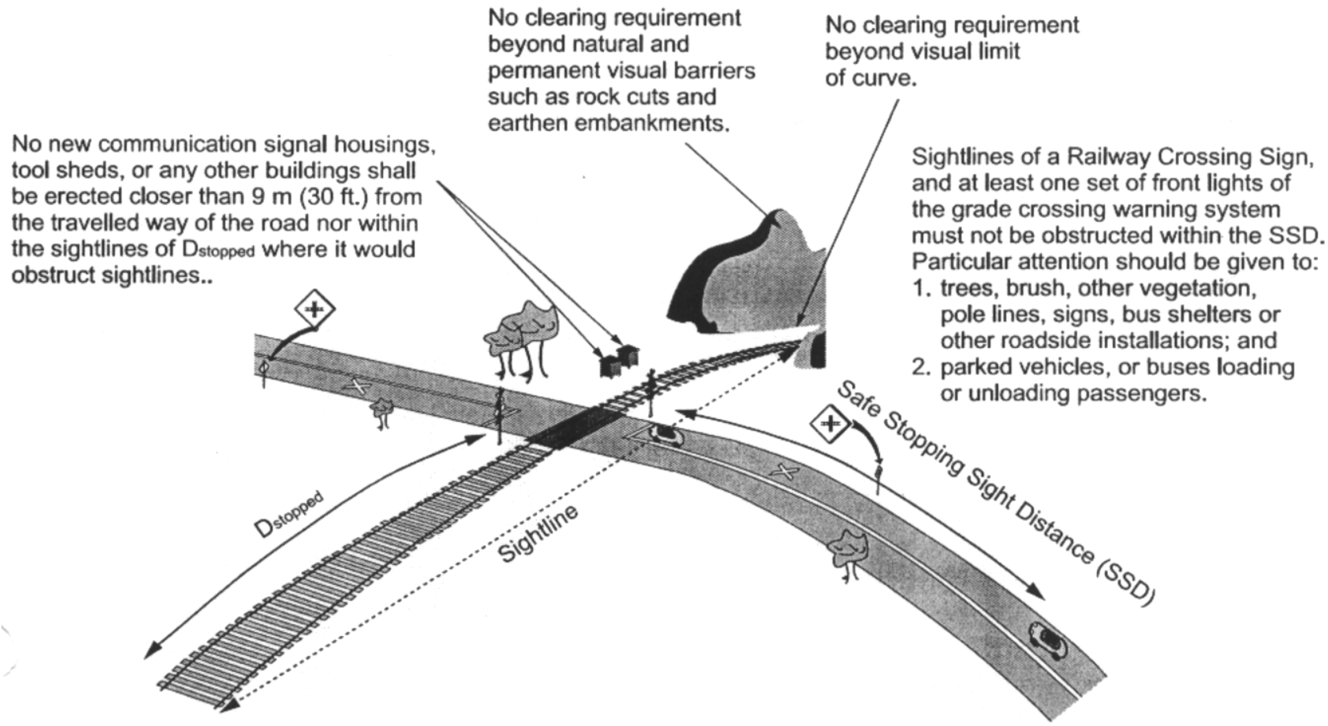
Sheet 7 **ROAD GEOMETRY** **RTD Section 7**

Source	Item	Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? N / E Approach: S / W Approach:	Sect. 7-1
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L (see form 4)? N / E Approach: S / W Approach:	Sect. 7-1
observe	Are the road lanes at least the same width on the crossing as on the road approaches? N / E Approach: S / W Approach:	Sect. 7-5
	Grades	
measure	Slope within 8m of nearest rail = % (on N / E approach) (max. = 2%)	Sect. 7-1
measure	Slope within 8m of nearest rail = % (on S / W approach) (max. = 2%)	Sect. 7-1
measure	Slope between 8m & 18m of nearest rail = % (on N / E approach) (max. = 5 or 10%)	Sect. 7-1
measure	Slope between 8m & 18m of nearest rail = % (on S / W approach) (max. = 5 or 10%)	Sect.7-1
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices: slope within 5m of nearest rail = % (max. = 1 or 2%)	Sect. 7-1
Road ✓	General approach grade = % N / E (max. = ± 5%) = % S / W (max. = ± 5%)	Sect.7-1
Rail ✓	Are rail tracks super-elevated? Y / N Rate of s-e: _______ m/m	Sect. 7.4
Road ✓	If train speeds exceed 15mph: - what is the angle between the crossing and the roadway? =__________degrees (70° minimum w/o warning system; 45° minimum with warning system)	Sect.7.6
observe	**Condition of Road Approaches:** (e.g., anything that might affect stopping or acceleration)	
observe	Is there any evidence that "low bed" trucks have difficulty negotiating the crossing (i.e., might they bottom-out or get stuck)? 	

✓ indicates information should be confirmed by field observation

Comments Following Site Visit:

Figure 8-2: Minimum Sightlines - Grade Crossings with a Grade Crossing Warning System



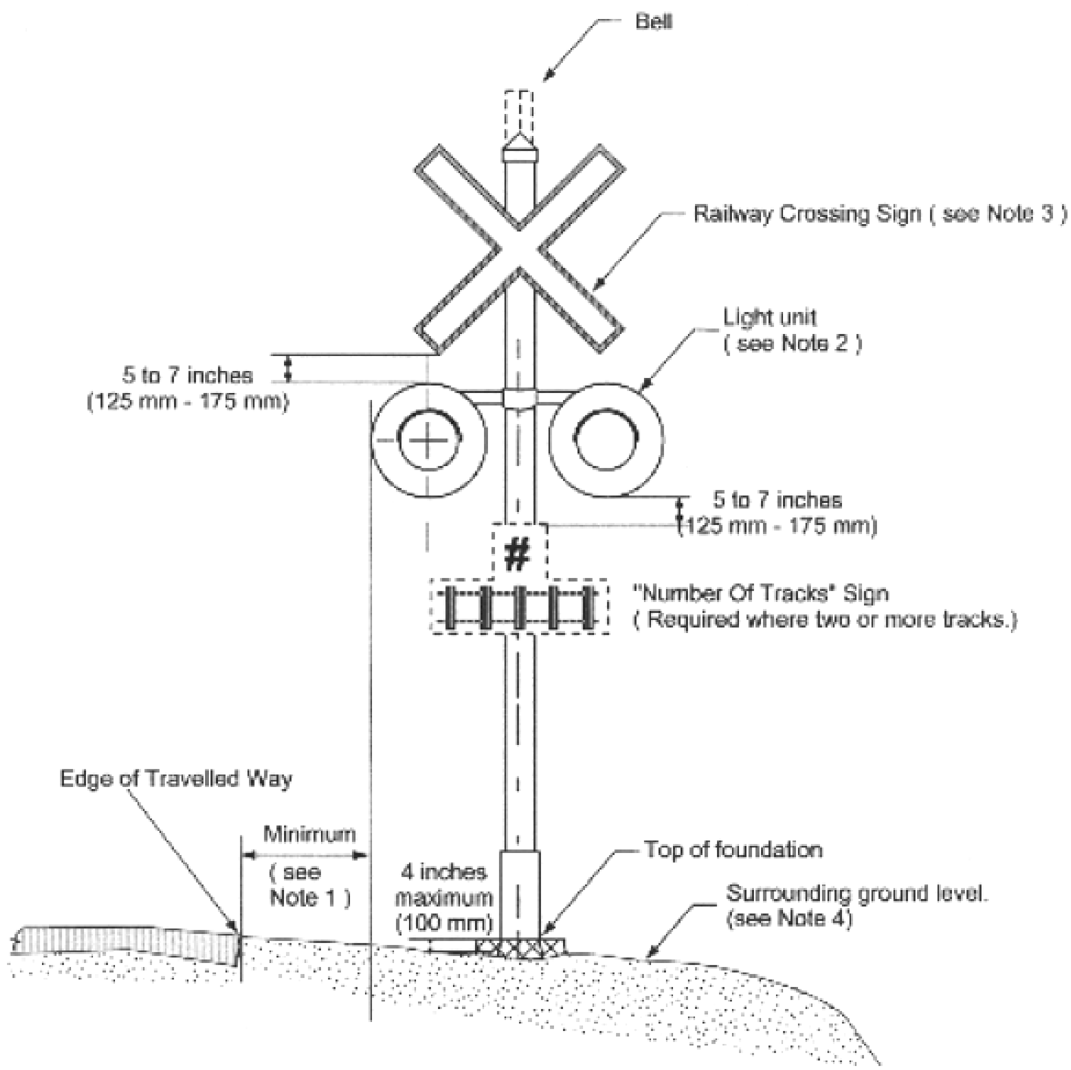
Driver Eye Height	=	1.05m	passenger vehicles, pedestrians, cyclists & assistive devices
	=	1.80m	buses & straight trucks
	=	2.10m	large trucks & tractor-trailers
Target Height	=	1.20m above rails	

Source	Item	Reference
observe	Are sightlines within the rail R.O.W. clear of bushes/vegetation; 15 m on each side of the track and, 30 m along the track, on each side of the crossing? -if no, detail the location	Sect. 8-1
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location	Sect.8-1
look up	**SSD** minimum = m (from sheet #4)	
measure	**SSD actual: N / E approach = m S / W approach = m**	Sect. 8.5
Warning: some formulae are based on Imperial units while others are Metric		
calculate	**$D_{STOPPED}$** minimum (ft) **= 1.47Vt x Td** with Td from sheet #4	Sect. 8.5
	$D_{STOPPED}$ minimum = ft. m (calculate or use Table 8-1)	T 8-1
measure	**$D_{STOPPED}$** actual: N / E approach = m (to driver's left); = m (to driver's right) S / W approach = m (to driver's left); = m (to driver's right)	Fig 8-2
look up	**Ped./Cyclist $D_{STOPPED}$** (m) using Table 8-1 and Tp (from sheet #4)	T 8-1
measure	**Ped./Cyclist $D_{STOPPED}$ Actual:** N / E approach = m (to cyclist's left); = m (to cyclist's right) S / W approach = m (to cyclist's left); = m (to cyclist's right) note: measured from a point 2m in advance of sign/signals see Section 4.8)	Fig 8-1
observe	**Are there any obstacles within the sight triangles (Figure 8-2) other than traffic signs/utility poles that might affect visibility?**	Fig 8-2
	Consideration should be given to also utilizing the newer methodologies for determining sight distances and clearance times developed by M. Gou, 2003 http://www.tc.gc.ca/tdc/summary/14100/14172e.htm	[TP14172E]

Comments Following Site Visit:

-visibility along the track impaired due to the angle of crossing?
-special considerations for large trucks?
-can sightlines be maintained on an ongoing basis? (snow)
-check visibility at all pedestrian crossing points
-special design vehicle?
-photos

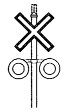
Figure 18-1: Warning Signal Assemblies



Drawing not to scale

NOTES:

1. Minimum of 625 mm (2 ft) from the face of a curb; minimum of 625 mm (2 ft) from the outer edge of a shoulder and a minimum of 1.875 m (6ft) from the edge of the travelled way.
2. Additional light units on the warning signal may be required in accordance with sections 13 and 19.
3. The Railway Crossing Sign must be clearly visible to all approaching drivers.
4. The top of the warning signal foundation shall be not more than 100 mm (4 inches) above the level of the surrounding ground. The slope away from the foundation of the surrounding ground towards the travelled portion of the road and the road shoulders shall not exceed the ratio of 4:1.

Source	Item	Reference
	Railway Crossing Sign 	Sect. A2.2.4 MUTCD
	--comment on the following in the field:	
observe	location:	Fig 9-2/9-3
observe	height:	Fig 9-3
measure	retroreflectivity readings: N / E approach: sign = cd/lux/m^2 S / W approach: sign = cd/lux/m^2	Fig 9-1
observe	Number of Tracks sign?	Fig 9-3

Comments Following Site Visit:

-general condition -clear sightlines to the sign -posts -photos

Source	Item	Reference
	DO NOT STOP ON TRACK 	US MUTCD
Road ✓	Does queued traffic routinely encroach closer than 5m from the crossing surface?	Sect. 9.5
observe	Are these signs present on either approach?	Sect. 9.5

✓ indicates information should be confirmed by field observation

Comments Following Site Visit:

-general condition -posts -photos

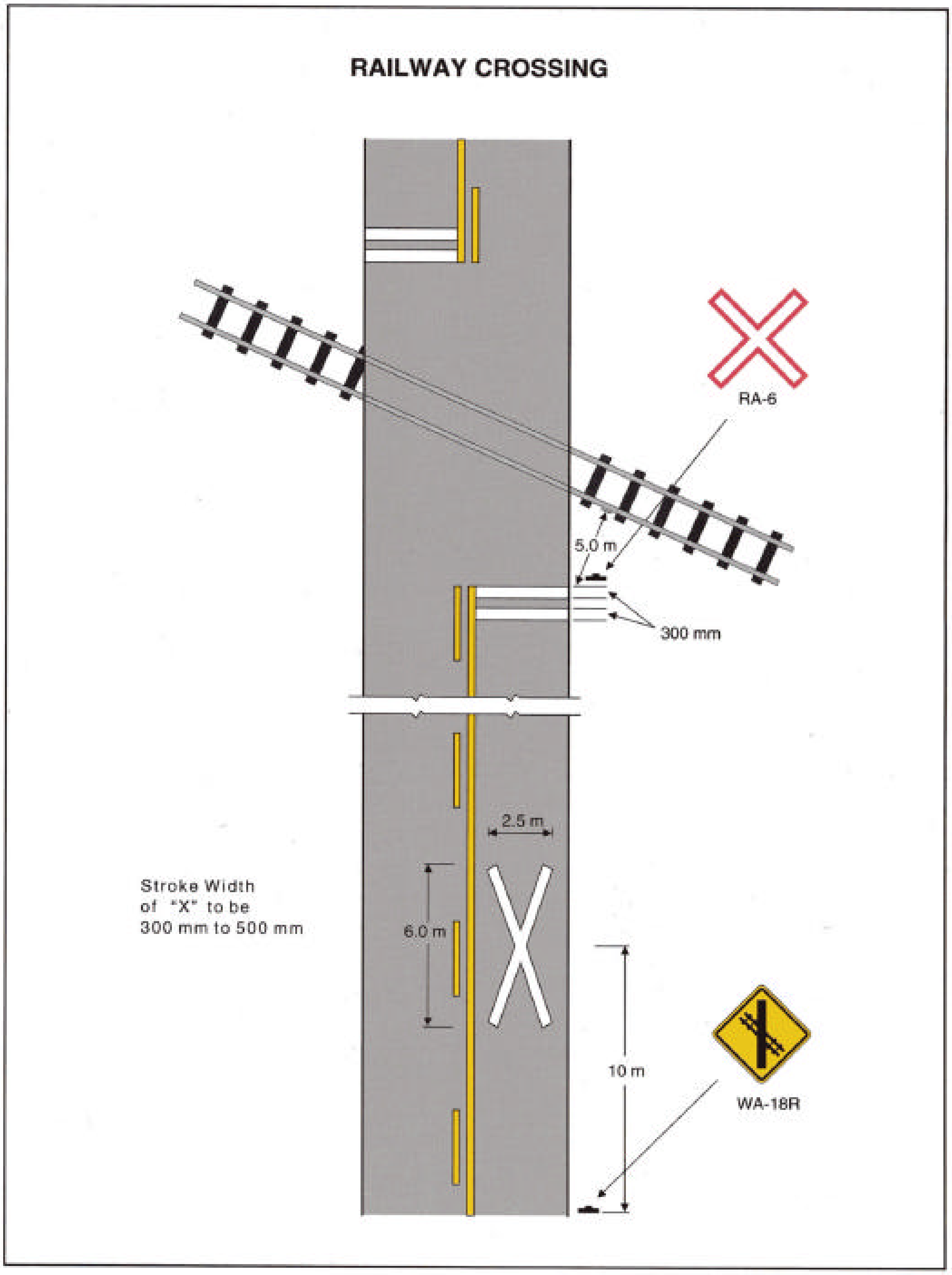
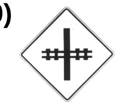


FIGURE C1-5

JUNE 2001

Source	Item	Reference
	Railway Crossing Ahead Sign (WA18-20) 	Sect. 3.4.2 MUTCD
look-up	Is AADT > 100? (see sheet #3)	
observe	Is area urban such that WA18-20 is not required?	Sect. 9.3b
measure	Distance from nearest rail to sign = m N / E approach = m S/ W approach	Fig C1-5
	--comment on the following in the field:	
observe	location:	Fig C1-5
observe	height:	
observe	appropriate orientation of symbol	Fig C1-5

Comments Following Site Visit:

-general condition -clear sightlines to the sign -posts -aligned to the driver -photos

Source	Item	Reference
	ADVISORY SPEED SIGN  **normally used in conjunction with WA18-20 signs if reduced speeds are necessary to provide adequate sight distance.**	Sect. A3.2.5 MUTCD
observe	Are they present on both approaches? Posted speed limit?	
look-up	Are they required on either approach?	check SSD (sheet 8)

Comments Following Site Visit:

-general condition -posts -photos

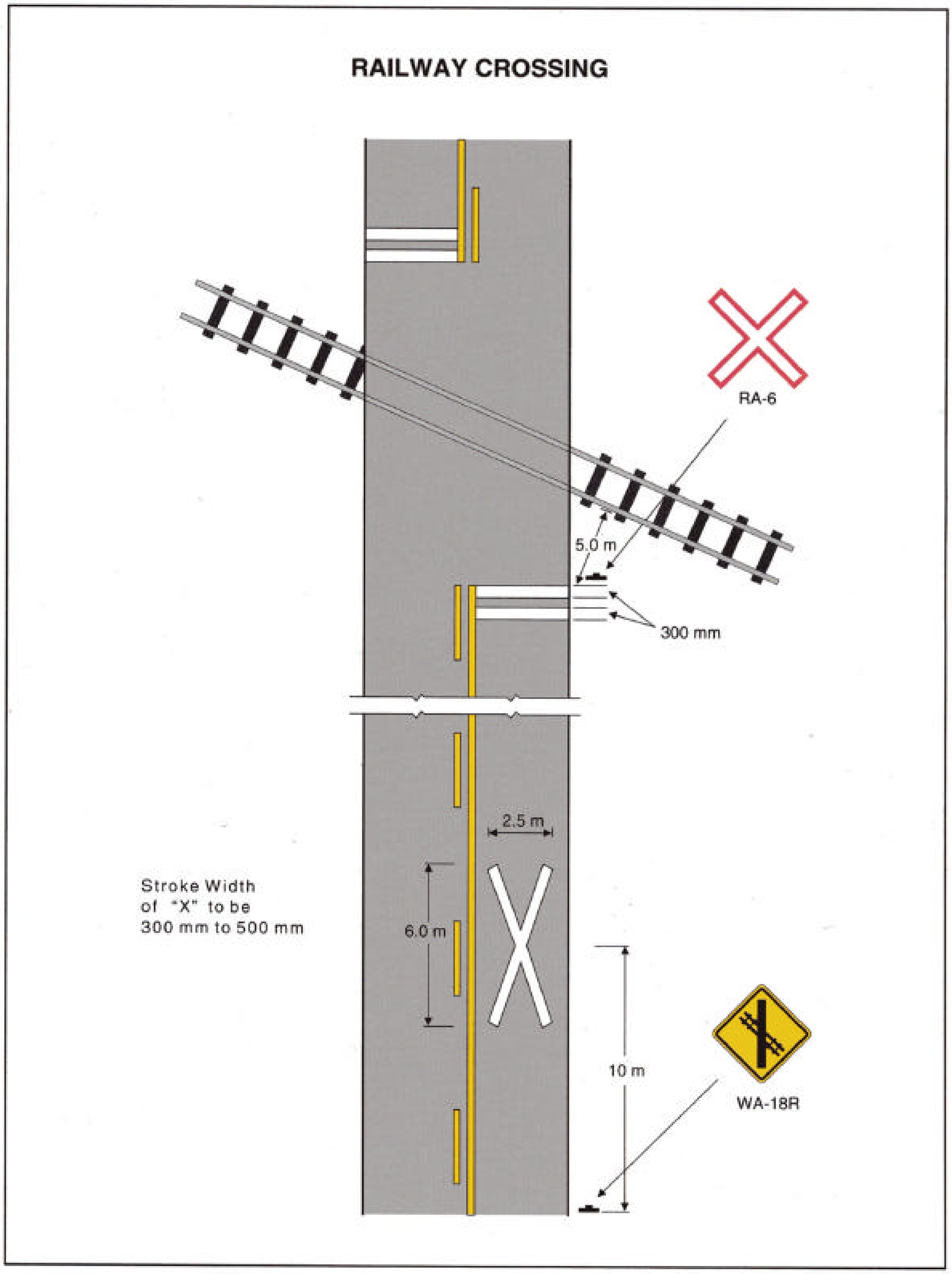

RAILWAY CROSSING
RA-6
5.0 m
300 mm
2.5 m
Stroke Width
of "X" to be
300 mm to 500 mm
6.0 m
10 m
WA-18R

FIGURE C1-5

Source	Item	Reference
	PAVEMENT MARKINGS	
observe	Are pavement markings consistent with those from the MUTCD Manual?	Fig C1-5 MUTCD
observe	Are there lines to delineate sidewalks/paths?	Sect. 9.7

Comments Following Site Visit:

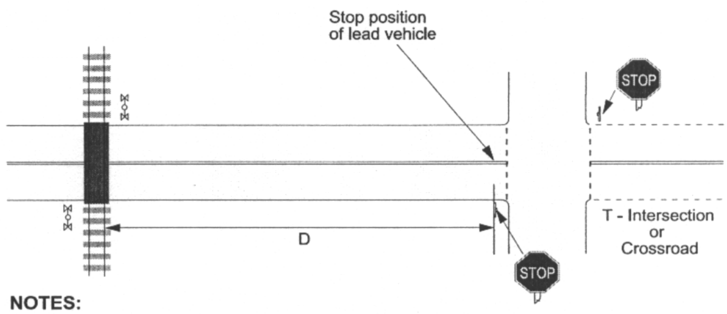
-general condition of markings -are centerlines or stop lines present? -width of markings? -provincial practice not to use *X* ?

General Comments Regarding Signs & Pavement Markings:

-special sign required? -missing signs -visual clutter -obscured view / sightlines -retroreflectivty levels at night

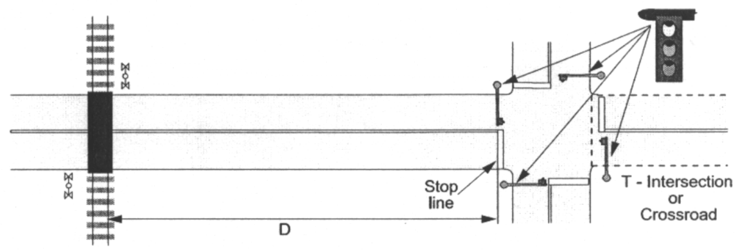
Figure 11-1: Proximity of Grade Crossing Warning Systems to Stop Signs and Traffic Signals

a) NEAR STOP SIGNS



NOTES:
Where the maximum railway operating speed exceeds 15 mph:
- if D is less than 30 m, a grade crossing warning system including gates is required;
- if D is 30 m or greater, a grade crossing warning system including gates is required unless a traffic study indicates that traffic will not normally queue to within 2.4 m of the rail nearest the road intersection. For grade crossings or road intersections nearby an existing grade crossing, where the maximum railway operating speed exceeds 15 mph:

b) NEAR TRAFFIC SIGNALS



NOTES:
For grade crossings or road intersections nearby an existing grade crossing, where the maximum railway operating speed exceeds 15 mph:
- if D is less than 60 m, a grade crossing warning system including gates is required;
- if D is 60 m or greater, a grade crossing warning system including gates is required unless a traffic study shows that traffic will not queue to within 2.4 m of the rail nearest the road intersection.

Figure 18-1: Warning Signal Assemblies

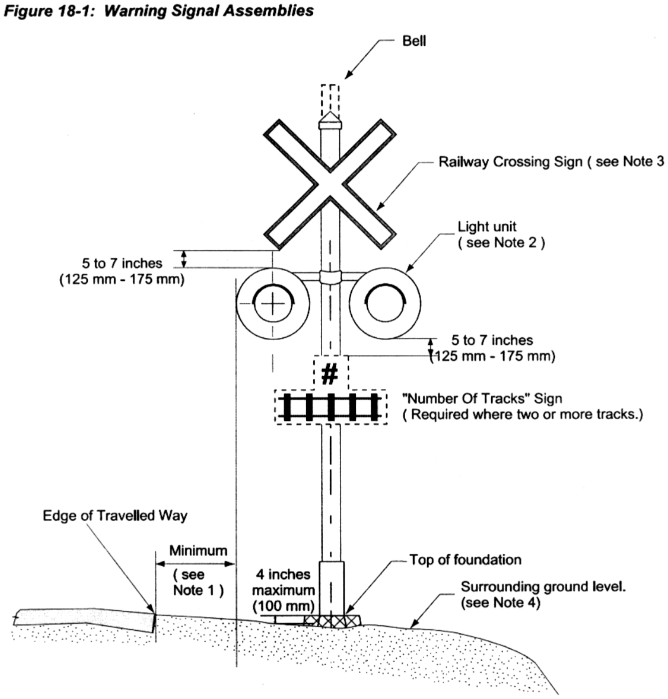
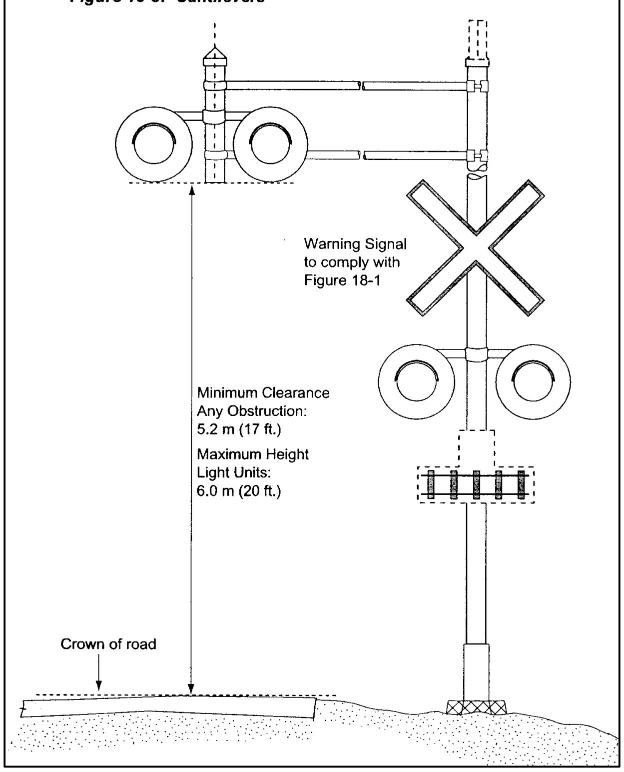


Figure 18-3: Cantilevers



Sheet 11 **GRADE CROSSING WARNING SYSTEMS** **RTD Sections 11, 18, 19**

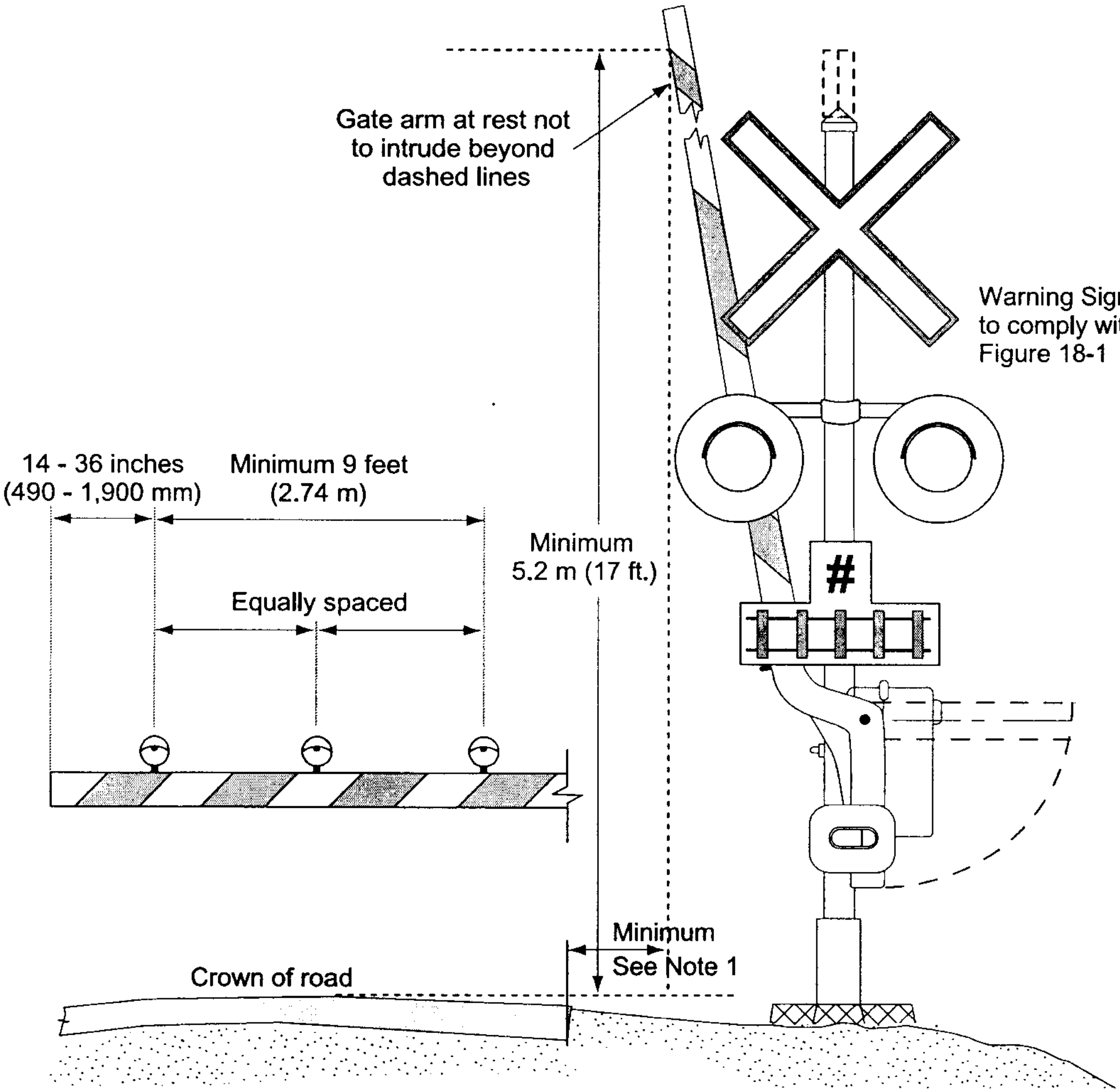
Source	Item	Reference
	Warning System Warrants -if any of A through E below are met, then a warning system is warranted	Sect. 11.1 & 11.2
look-up	Existing AADT = Forecast AADT = (if available)	sheet 3
look-up	Daily Train Volume =	sheet 3
	A. Cross-Product = ____________________ (1,000 min.)	Sect. 11.1
look-up	**B. Maximum Rail Operating Speed =** _____________mph (max = 80mph or 60 mph with crosswalk)	sheet 3
Rail	**C. Number of Tracks =** ______ ……..if ≥ 2, can trains pass one another?	Sect. 11.1
look up	**D. Are Sightlines Obscured?** (see form 8)	Sect. 8.3
observe	**E. Are any of the proximity conditions met?**	Fig. 11-1
	Field Visit:	
observe	Light Units, Y / N condition / alignment:	Sect. 19.3
observe	Bells, Y / N condition:	Sect. 19.1
observe	Gates, Y / N condition:	Sect. 19.2
observe	Cantilever Lights, Y / N condition:	
observe	Check that warning signal assemblies and cantilevers are in accordance with Figures 18-1 and 18-3	Fig 18-1 Fig 18-3
observe	Is warning system housing at least 9m from traveled way of the road and 8m from the nearest rail?	Sect. 18.2
observe	If there is a sidewalk, is a bell on the adjacent assembly?	Sect. 19-1
Rail ✓	Have all light units been aligned? Date?___________	Sect. 19.5-9
Rail	Design Approach Warning Time: N / E approach _______sec S / W approach _______ sec	Sect. 20.1
observe	Is warning time less than 35 sec (without gates) or 55 sec (with gates)	Sect. 20.4

Comments Following Site Visit:

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted?

Figure 18-2: Gates



Drawing not to scale

Source	Item	Reference
	Warning System Warrants -if any of A through E below are met, then a warning system with gates is warranted.	
look-up	**A. Cross-Product =** ______________________ (50,000 min.)	Sect. 12.1
look-up	**B. Maximum Rail Operating Speed =** _______________mph (max = 50mph)	sheet 3
Rail ✓	**C. Number of Tracks =** ______ ……..if ∃ 2, can trains pass one another?	Sect. 12.1
look-up	**D. Is $D_{STOPPED}$ insufficient?** (see form 8)	Sect. 8.3
observe	**E. Are any of the proximity conditions met?**	Fig. 11-1 Sec.12-1e
calculate	Gate arm clearance times: _______ sec	Sect. 4.9
look-up	Gate arm delay time: _______ sec	T4-8
calculate	effect of grade = sec	T4-8
measure	Measure gate arm delay and compare with above:	
observe	**Do gates conform to standards depicted in Figure 18-2?**	Fig 18-2
observe	**Check gate descent (10 to 15 sec) and ascent (6 to 12 sec)**	sec. 19.2

T indicates information should be confirmed by field observation

Comments Following Sight Visit:

-extraordinary conditions why gates should be installed

-are gates present but <u>not</u> warranted?

Figure 13-1: Horizontal Cone of Vision

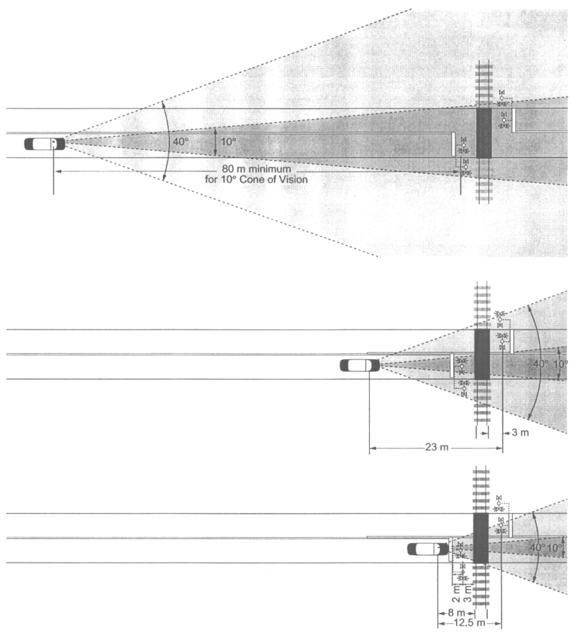


Figure 13-3: Typical Light Unit Arrangement for an Adjacent Intersection

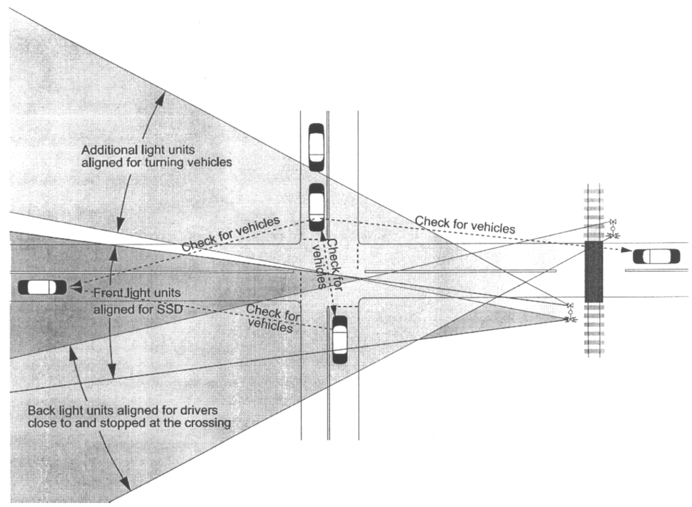
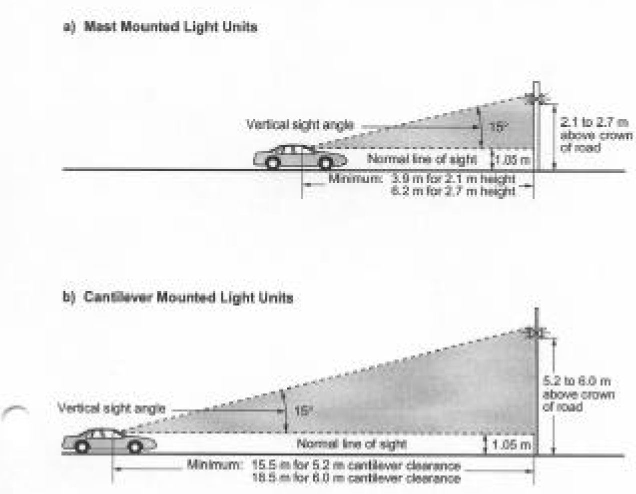


Figure 13-2: Vertical Cone of Vision

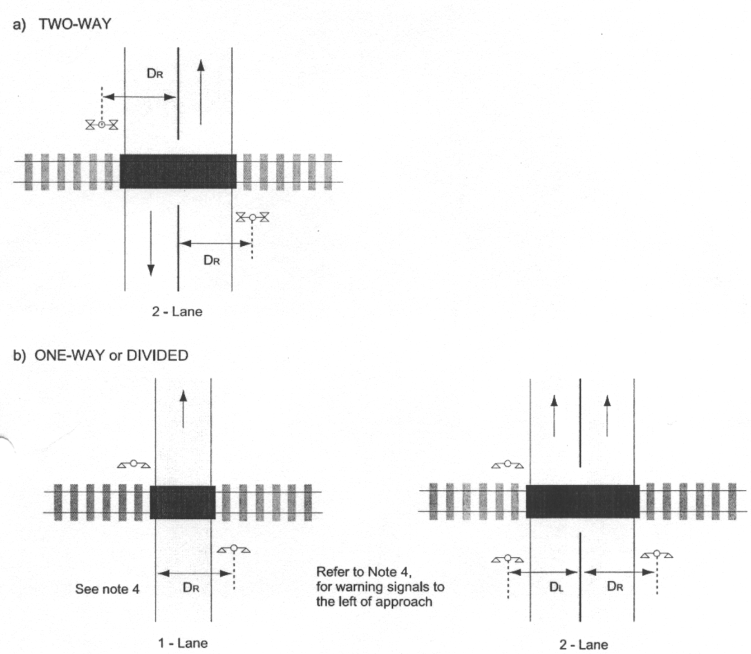


Drawing not to scale

NOTE:

Vertical cone of vision is limited to 15° by the top of the windshield.

Figure 13-4: Warning Signal Offsets Requiring Cantilevered Light Units



Drawing not to scale

Note: Driver's cone of vision is ± 5^{o} horizontally; limited by top of windshield vertically.

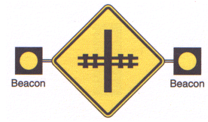
Source	Item	Reference
	Number and Location	
look-up	Minimum Distance for Primary Light Units = m	T19-1
look-up	Recommended Distance for Primary Light Units = m	T19-1
observe	Are flashing light units located within 5^{o} horizontally of the centerline of the road (throughout the approach distance above)? Does horizontal / vertical curvature necessitate supplemental units?	
observe	Can back lights be seen by all stopped drivers?	Fig 13-1
observe	Are lights obscured by vehicles stopped on adjacent intersections?	Fig 13-3
observe	Are additional light units required for drivers as they begin to turn onto an approach road from an intersecting road/lane/parking lot, etc.	Fig 13-3
	Cantilevered Light Units	
measure	Does D_R exceed 7.7m?	Fig 13-4
measure	Does D_L exceed 8.7m?	Fig 13-4
	Multiple Lanes	
observe	Can front light units be seen by drivers in all lanes (….would T/T obscure?)?	
observe	Can back light units be seen by all stopped drivers in all lanes?	
	Sidewalks, paths, trails, etc.	
measure	Distance from path centerline to signal to signal mast = m (max.= 3.6m)	Sect 13.8a
observe	Are separate light units required?	Fig 13-5

Comments Following Site Visit:

Table 19-1: Alignment - Front Light Units

Maximum Road Operating Speed (km/h)	Recommended Distance Primary Set of Light Units (m)	Minimum Distance Primary Set of Light Units for Passenger Cars and Light Trucks (m)	Minimum Distance Primary Set of Light Units for Heavy Trucks (m)	Add for % Downgrade (m)		Subtract for % Upgrade (m)	
				5%	10%	5%	10%
40	100	65	70	3	6	3	5
50	125	85	110	5	9	3	6
60	160	110	130	7	16	5	9
70	195	135	180	11	23	8	13
80	235	165	210	15	37	11	20
90	295	195	265	* For speeds exceeding 80 km/h, distance shall be adjusted for gradient in accordance with section 4.			
100	360	235	330				
110	390	275	360				

Note: reference MUTCD section A3.6.6, sign # WB-6



Source	Item	Reference
observe	Are signs present? North / East approach South / West approach	
look-up	Minimum Distance for Primary Light Units _________ m (see sheet 13)	T19-1
look-up	Recommended distance for Primary Light Units _________ m (see sheet 13)	T19-1
	Warrants	
observe	Are all front light units obscured within minimum distance above?	Sect. 14.1
look-up	Is the facility designated a “freeway” or “expressway”? (see sheet 3)	Sect. 14.1
observe	Do environmental conditions frequently obscure signal visibility?	Sect. 14.1
	Considering maximum prevailing speeds, geometry, and traffic composition, check the following:	
observe	Does sign flash during operation of grade crossing warning system?	
measure	Distance from the sign to 2.4m beyond the furthest rail = m	
observe	Does the sign flash before the actuation of the crossing warning system by the time required to travel from the sign to clear the crossing?	Sect. 14.2 b
measure	Distance from the sign to the closest gate = m	
observe	Does the flashing sign precede the actuation of the descent of the gate arms by the time required to travel from the sign to clear the closest gate?	Sect. 14.2 b
measure	Time required for all queued vehicles to resume to maximum road operating speed = sec	Sect. 14.2 c

Comments Following Site Visit:

-general condition -placement / orientation of signs -functions as intended

Source	Item	Reference
Road ✓ **Rail** ✓	Are adjacent traffic signals preempted by a grade crossing warning system? note: provide timing plan if preemption.	
Road **Rail**	Date of last preemption check? ______________	
	Warrants	
measure	Less than 60m between stop line at traffic signal and nearest rail?	Sect. 15.1
observe	Do vehicles queued for traffic signal regularly encroach closer than 2.4m to the nearest rail?	Sect. 15.1
	Field Checks:	
observe	Does preemption provide adequate time to clear traffic from grade crossing before train's arrival?	Sect. 15.3
observe	Does preemption prohibit road traffic from moving from the street intersection toward the grade crossing?	Sect. 15.3
observe	Any known queuing problems on the tracks?	
observe	Are pedestrians accommodated during preemption?	
	Have longer/slower vehicles been considered?	
observe	Are supplemental signs needed for motorists (no right turn on red light, etc)?	

✓ indicates information should be confirmed by field observation

Comments Following Site Visit:

-functions as intended

Table 16-1: Requirements for Public Grade Crossings Within an Area Without Train Whistling

Maximum Railway Operating Speed	Grade Crossings for Vehicle Use		Grade Crossings Exclusively for Pedestrians, Cyclists or Assistive Devices; and Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles (Refer to Figure 13-5)	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Stop & proceed	Manual protection or FLB	Manual protection or FLB	-----------------	-----------------
Up to 15 mph	FLB	FLB or FLB & G (Note 1)	'Z' barriers & guide fencing (Note 3)	'Z' barriers & guide fencing (Note 3)
16 - 49 mph	FLB or FLB & G (Note 2)	FLB & G	FLB, 'Z' barriers & guide fencing (Note 3)	FLB & G
50 mph or more	FLB & G	FLB & G	FLB & G	FLB & G

Where:

Manual protection is by a member of the train crew in accordance with the Canadian Rail Operating Rules.

FLB is a grade crossing warning system consisting of flashing lights and a bell.

FLB & G is a grade crossing warning system consisting of flashing lights, gates, and a bell.

Source	Item	Reference
Rail	**Is train whistling prohibited at this crossing? 24 hours?**	sec 16.1
observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?	sec 16.7
observe	Are the requirements of Table 16-1 met?	sec 16.2

Comments Following Site Visit:

Additional Prompt Lists

Human Factors:

° Control device visibility / background visual clutter.
° Driver workload through this area (i.e., are there numerous factors that simultaneously require the driver's attention such as traffic lights, pedestrian activity, merging/entering traffic, commercial signing, etc.).
° Driver expectancy of the environment (i.e., are the control measures in keeping with the design levels of the road system and adjacent environment).
° Need for positive guidance.
° Conflicts between road and railway signs and signals.

Environmental Factors:

° Extreme weather conditions.
° Lighting issues (night, dawn/dusk, tunnels, adjacent facilities, headlight or sunlight glare, etc.)
° Landscaping or vegetation.
° Integration w/ surrounding land use (e.g., parked vehicles blocking sightlines, merging traffic lanes, etc.)

All Road Users:

° Have needs of the following been met:
-pedestrians (including strollers, baby carriages, and blind persons)
-children / elderly
-assistive devices (wheelchairs, scooters, walkers, etc)
-bicyclists
-motorcyclists
-over-sized trucks
-buses
-recreational vehicles
-golfcarts
-hazardous materials

° Significant volume of pedestrians requiring special safety measures:
(maze barriers/guide fencing, additional pedestrian bell, pedestrian gates, sign indicating potential presence of 2nd train at a multi track crossing, etc)

Other:

° Should closure of the crossing be considered due to inactivity, presence of nearby adjacent crossings, etc.

Comments Following Site Visit:

Appendix D: SAFETY ASSESSMENT REPORT

The grade crossing assessment report should be brief and concise, and should document and highlight the safety issues identified by the assessment team. It should include a description and evaluation of the alternatives that were considered. The report should make clear recommendations/suggestions on how to reduce the crash risks for each safety issued identified. The report should also contain a statement about providing a formal response to the assessment and when the next grade crossing safety assessment is to be conducted. The safety assessment report should typically be prepared within 3 to 4 weeks after the safety assessment has been conducted. A letter report format should be sufficient for the non-complex grade crossing safety assessments. A typical table of contents is presented below.

TYPICAL TABLE OF CONTENTS: GRADE CROSSING SAFETY ASSESSMENT REPORT [1]

1.0 BACKGROUND

1.1 Project Description

Briefly describe the objectives of the project. Explain how the crossings were selected for the assessment and how they fit into the overall grade crossing safety assessment program.

1.2 Assessment Objectives

Briefly describe the grade crossing safety assessment objectives.

1.3 Assessment Scope and Material

Describe the type of assessment (pre-construction or in-service/ Level 1 or Level 2). Explain what items are grand-fathered under the regulations and are not subject to change. List all the material that was reviewed as part of the assessment.

1.4 Assessment Team and Process

Describe the assessment team members and their qualifications and the milestone project dates. These include dates for the start-up meeting, site visits and assessment analysis.

1.5 Site Visit Objectives

Summarize the key site observations that may affect the safety performance of the grade crossings studied.

2.0 FINDINGS AND SUGGESTIONS

2.1 Safety Concern/Threat 1

Describe the safety concern. Provide an assessment of the crash risk. Describe the road/railway grade crossing user that is at risk. Describe the alternatives/suggestions that the road authority and/or the railway company can consider to reduce the risk.

2.2 Safety Concern/Threat 2

2.X Other Safety Issues

Describe other miscellaneous and minor safety issues and inconsistencies that may not necessarily be concerns, but could potentially be easily addressed or corrected by the road authority or railway company.

2.Y Next Steps

Remind the road authority and the railway company of the need to provide a response report and make recommendations when the next safety assessments are required.

1. Adapted from The Canadian Road Safety Audit Guide (TAC) Ref.1.

EXEMPLARY DETAILED SAFETY ASSESSMENT REPORT

Date

Recipient's Name
and Address

Dear Mr. Smith

Re: Grade Crossing Safety Assessment:
Main St., Pleasantville
Rail Company mile 98.76, Pleasantville Subdivision

A safety assessment of the above captioned grade crossing was undertaken on April 6, 2004. The crossing was assessed as part of Rail Company's and Road Authority's joint program to periodically assess the safety of road/railway grade crossings.

The fundamental objectives of the assessment were:

1) Reduce crash risk within the grade crossing environment.
2) Minimize the frequency and severity of preventable crashes.
3) Consider the safety of all grade crossing users.
4) Verify compliance of the technical standards referred to in the Railway Safety Act/Grade Crossing Regulations and contained in the RTD 10 Road/Railway Grade Crossing Technical Standards and Inspection, Testing and Maintenance Requirements document.
5) Ensure that all the crash mitigation measures/factors aimed to eliminate or reduce the identified safety problems are fully considered, evaluated and documented for review/action by the appropriate authorities.

The assessment team assembled for this review included:

- name, title, company
- name, title, company
- etc.

Data on the crossing were collected in accordance with the Transport Canada Field Guide for conducting Detailed Safety Assessments. Completed field data forms from the guide are attached as Appendix A.

For the purposes of this report, Main St. crossing is described in a north-south orientation, while the rail line is described in an east-west orientation. The crossing does not have an active warning system in place. With only six freight trains and no passenger trains daily, the cross-product is well below the threshold of 1,000 which is specified in the RTD-10 as a warrant for a grade crossing warning system. Even though this road only serves a few houses before its termination south of the crossing, the design vehicle selected was a tractor-trailer to represent daily traffic to and from a farm (see Photo 6).

Outstanding safety issues are outlined in Table 1 along with suggested remediation. Note that provisions are made in Table 1 for recording the decision of the appropriate authorities relative to the assessment findings.

> Note:
>
> *The safety assessment of the grade crossing on Main Street, Pleasantville, NB covers physical features which may affect road and rail user safety and it has sought to identify potential safety hazards. However, the auditors point out that no guarantee is made that every deficiency has been identified. Further, if all the recommendations in this assessment were to be addressed, this would not confirm that the crossing is 'safe'; rather, adoption of the recommendations should improve the level of safety of the facility.*

Sincerely,

____

Names and signatures of assessment team members

TABLE 1: **Grade Crossing Safety Assessment: Main Street, Pleasantville, NB**
Canadian National, mile 98.76, Pleasantville Subdivision

Observations	Suggested Actions	CLIENT RESPONSE	
		Agree yes/no	COMMENTS
1.0 Sight Distances			
a. Detailed sightline calculations are attached on the field sheets in Appendix A. It was found that insufficient sight distance exists for stopped vehicles (D-stopped) on the northbound approach (looking west) due to the presence of vegetation. Furthermore, if large vehicles are parked in lots located in the northeast, southeast, and southwest quadrants, Dstopped will not be available. Although the presence of gates partially mitigates the necessity to provide Dstopped, these sightlines should be maintained wherever possible.	Remove vegetation in the northeast quadrant. Restrict parking in the adjacent quadrants where possible.		
b. The warning light control cabinet located in the northwest quadrant can potentially block sight lines for trains approaching from the west (see Photo #8) if the autos are not stopped in the proper location.	Provide a stop line (see item 2 a. below).		
2.0 Signs and Road Markings			
a. There are no pavement markings present on either approach to the rail crossing.	Apply pavement markings to comply with the Uniform Traffic Control Devices Manual.		

Observations	Suggested Actions	CLIENT RESPONSE	
		Agree yes/no	COMMENTS
3.0 Sidewalks			
a. The crosswalk width provided on the west side of the crossing is not wide enough as illustrated in Photos 5 and 6.	Extend crosswalk as needed.		
4.0 Warning System			
a. The base structure for both the north and south gates are located too close to the travel lanes (see Figures 3,4 and 7). This is likely a result of street widening that has occurred at some point.	Reposition gate structures or provide additional crash protection.		
5.0 Miscellaneous			
a. School children were observed crossing the rail line east of the crossing near the rail station.	Either restrict access to the rail line or re-institute whistling practices in this area.		
b. Westbound traffic turning left from Maple Street have the potential to by-pass an activated rail crossing gate.	Consider countermeasures such as prohibiting lefts turns from this street, reconfiguring the street to one-way flow eastbound, or install a supplemental FLB fixture for this approach.		

Main Street Rail Crossing

Date, 2004

Photo 1: Main St. Southbound Approach

Photo 2: Main St. Southbound Approach

Photo 3: Southbound Main showing alignment of gate hardware

Photo 4: Northbound Main showing intrusion of gate hardware.

Main Street Rail Crossing

Date, 2004

Photo 5: non-contiguous crosswalk on west side of crossing

Photo 6: reverse view of Photo 5

Photo 7: Looking west from northbound Main St.

Photo 8: Looking west from southbound Main St.

Photo 9: Maple St. adjacent to the crossing in the northeast quadrant

Photo 10: Example of design vehicle