TRANSMITTAL MEMO

CLIENT: VANCOUVER FRAISER PORT AUTHORITY (VFPA)

PROJECT: VFPA FSPL TRANSPORTATION IMPROVEMENTS PROJECT

SUBJECT: RAILWAY CROSSING SAFETYASSESSMENTS - SUMMARY

DATE: FEBRUARY 9th, 2021

WSP Canada Group Limited (WSP) has been contracted as part of the Vancouver Fraser Port Authority – Transportation Improvements Project, to complete a Railway Crossing Safety Assessment on eight (8) grade crossing within the Fraser Surrey Docklands. The crossings are owned by Vancouver Frasier Port Authority (VFPA) and Southern Railway of BC (SRY). The crossings are located along the Canadian National (CN) Brownsville Spur which comes off Mile 117 of the Yale Subdivision.

The Railway Crossing Field Safety Assessments were undertaken on the 22nd and 23rd of July 2020 and updates the previous Railway Crossing Assessments undertaken by WSP (formally MMM Group) on the 5th of May 2015. The Railway Crossing Assessments were conducted following the guidelines of applicable requirements identified in the most recent edition of Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossing Standards (GCS).

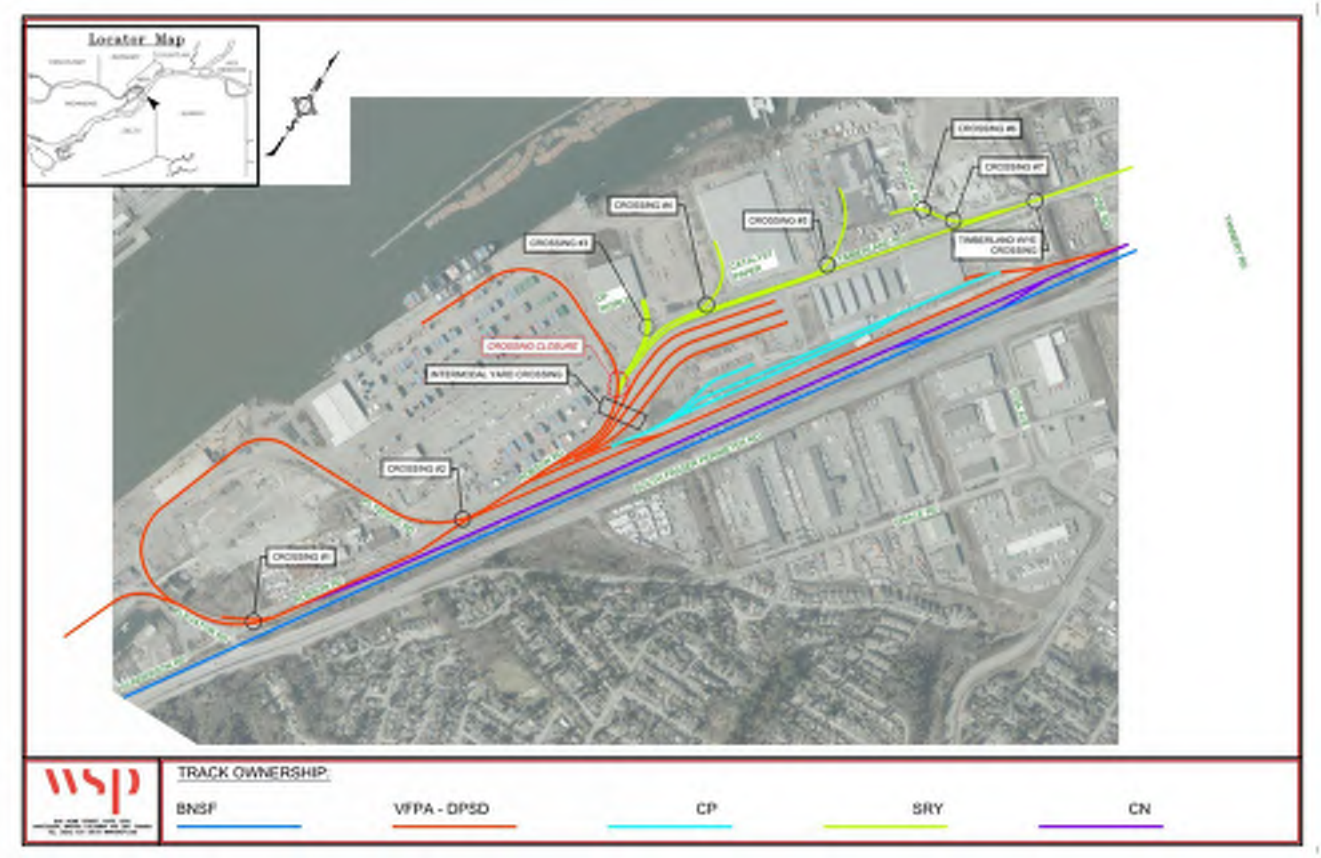
Below is a summary of the eights Railway Crossing Safety Assessments. Table 1, outlines the existing crossing warning systems, the recommended crossing warning systems and significant cost items for crossing upgrades.

Table 1: Crossing Summary Table (See Rail Map on Next Page for Crossing Numbers)

Crossing		Existing Warning System	Recommended Warning System	Recommendation Reasoning	Other Significant Cost Items	Total Estimated Cost	Next Steps
00	Timberland Wye	FLB	FLBG	• Vehicles cross the crossing at an angle less then 70 degrees	• None	$606,800	Prepare and submit E4 for review by railway
01	Mile 117.63 Spur 22.82, 75 Robson Road	SRCS	FLBG	• Cross product • Sightlines not met	• Crossing Surface Extension • Mitigate Sightline Non-Compliance	$617,800	Prepare and submit E4 for review by railway
02	Mile 117.63 Spur 0.04, 65 Robson Road	SRCS	FLBG	• Cross product • Crossing angle	• Crossing Surface Extension • Mitigate Sightline Non-Compliance • Repaving Crossing Surface	$637,050	Prepare and submit E4 for review by railway

03	10203, 59 Timberland Road	SRCS	SRCS	• AADT and rail traffic reduced from 2015	• Mitigate Sightline Non-Compliance	$501,300*	Address priority safety issues (sightline non-compliance)
04	10203, 57 Timberland Road	SRCS	FLB	• Sightlines not met	• Crossing Surface Extension • Mitigate Sightline Non-Compliance	$518,350	Prepare and submit E4 for review by railway
05	10550 Timberland Road	SRCS	FLB	• Sightlines not met	• Mitigate Sightline Non-Compliance	$520,750	Prepare and submit E4 for review by railway
06	357 Dock Road	SRCS	SRCS	• No rail traffic on spur	• None	$3,100	Address priority safety issues (signage)
07	10610 Timberland Road	SRCS	SRCS	• No rail traffic on spur	• None	$ -	None

SRCS = Standardizes Reflective Crossing Sign
FLB = Flashing Lights & Bell
FLBG = Flashing Lights, Bells & Gates
AADT = Average Annual Daily Traffic
* This cost assumes for warning systems with gate if the sightlines cannot be met by removing fencing or obstructions then gates are required. However, manual flagging can be discussed with SRY as cost-effective solution.



For further information on the assessed crossings, see the corresponding Railway Crossing Safety Assessment Reports and Field Assessment Reports for details.

As all of the assessed crossing are federally regulated and are governed by Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossings Standards (GCS), the next steps for the crossings that require active warning protection, is to complete an E4 grade crossing drawing. The E4 grade crossing drawing to be submitted to the applicable railway and the Canadian Transportation Agency.

Patrick McCabe, CPEng (Aus), NER, APEC Engineer, IntPE(Aus)
Track Designer, Rail & Transit

VFPA
REPORT NUMBER: 20-0173

VFPA FSPL TRANSPORTATION IMPROVEMENTS PROJECT

00 - MILE X.XX, TIMBERLANDS WYE, CROSSING ASSESSMENT REPORT

FEBRUARY 09, 2021

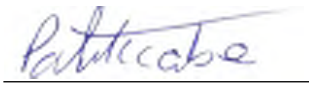
REVISION HISTORY

FINAL ISSUE

2020/09/03	FIRST DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	R. Sewell, Senior Project Engineer			
2020/10/21	SECOND DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2021/02/09	FINAL			
Prepared by	Reviewed by	Approved By		
P. McCabe, Track Designer	G. Smith, Senior Project Engineer	R. Sewell, Senior Project Engineer		

SIGNATURES

PREPARED BY



Patrick McCabe, CPEng (Aus), APEC Eng
Track Designer

09/02/2021
Date

Robert Sewell, P.Eng
Senior Project Engineer

09/02/2021
Date

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TABLE OF CONTENTS

1 CROSSING OVERVIEW

WSP Canada Group Limited (WSP) has been contracted as part of the Fraser Surrey Port Lands – Transportation Improvements Preliminary Design Services project, to complete a Railway Crossing Safety Assessment on the 10619 Timberland Road grade crossing (also known as the "Timberland Wye"). The SRY owned crossing is located within the Vancouver Fraser Port Authority (VFPA), Fraser Surrey Docklands adjacent to the Canadian National (CN) Brownsville Spur which comes off Mile 117 of the Yale Subdivision.

A Railway Crossing Field Safety Assessment was undertaken on the 23rd of July 2020 and updates the previous Railway Crossing Assessment undertaken WSP (formally MMM Group) on the 5th of May 2015. The Railway Crossing Assessment as conducted follows the guidelines of applicable requirements identified in the most recent edition of Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossing Standards (GCS).

The crossing is an active crossing (FLB), equipped with two RAILWAY CROSSING, STOP signs and flashing lights, located within an industrial area. A Tractor Trailer (WB-20) is the design vehicle used to represent daily traffic on port property. The Railway traffic volumes were provided by the SRY while the Average Annual Daily Traffic (AADT) was calculated based on the realigned infrastructure.

This report aims to identify the modifications to the grade crossing since the previous inspection completed by MMM Group in 2015, as well as highlight any new or previously identified non-compliances still relevant to this crossing.

1.1 LOCATION

The Timberland Wye grade crossing is located within Fraser Surrey Docks jurisdiction at 10619 Timberland Road and crosses the SRY Fraser Surrey Docks spur track. The crossing is located at the latitude and longitude of 49°11'44" and 112°53'53" respectfully. Figure 1, below shows the location of the crossing.

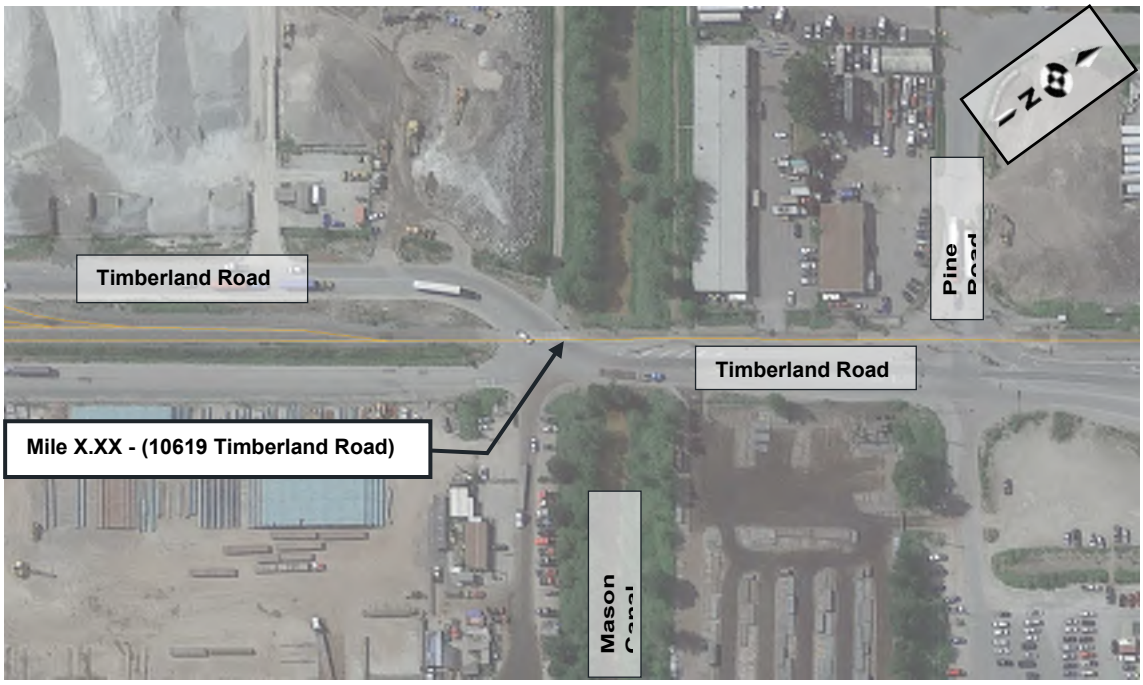


Figure 1: Crossing Location (source: Google Earth, 2020)

2 SAFETY ASSESSMENT

2.1 PREVIOUS ASSESSMENT (2015)

A previous crossing assessment was undertaken in 2015 by WSP for the Timberland Wye crossing. The objective of the assessment was to:

- Reduce crash risk within the grade crossing environment.
- Minimize the frequency and severity of preventable crashes.
- Consider the safety of all grade crossing users.
- Verify compliance of the technical standards referred to in the Railway Safety Act / Grade Crossing Regulations and contained in the Grade Crossing Standards.
- 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 outcome of the 2015 assessment offered recommendations for consideration by the VFPA. Table 1: Previous Non-Compliances illustrates the non-compliances and recommendations offered within the 2015 report. The recommendations were categorised within the three priority levels;

- Low - implement the measures as soon as practicable
- Medium - implement the measures by Transport Canada GCS & GCR November 2021 deadline.
- High - implement the measures forthwith

Table 1: Previous Non-Compliances

Observations	Suggested Actions	Priority	Addressed?
GCS Section 4 – Railway Crossing and Number of Tracks Sign (Basic Requirement)			
a. RAILWAY CROSSING sign on the east approach is located too close to the nearest railway and too far from the edge of travelled way. Sign is damaged and in poor condition.	Replace RAILWAY CROSSING sign on the east approach as per GCS Section 4.1.	High	Yes – New RAILWAY CROSSING sign installed in correct location
b. RAILWAY CROSSING sign on the west approach is located too far from the curb.	Relocate RAILWAY CROSSING sign on the west approach as per GCS Section 4.1.	High	Yes – New RAILWAY CROSSING Sign orientation adjusted
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to the Port Metro Vancouver Surrey Properties sign on the northwest corner of the crossing.	Install active warning system with gates if $D_{STOPPED}$ cannot be provided and maintained.	Medium	Yes – Port of Vancouver Sign removed. Flashing light installed above STOP signs
GCS Section 8 – Signs			
a. RAILWAY CROSSING AHEAD signs are not present on either approach of the crossing.	Install RAILWAY CROSSING AHEAD signs 45m +/- 10m in advance of the stopping location on both approaches.	Medium	Yes – RAILWAY CROSSING AHEAD signs installed
b. STOP signs are not present on both approaches	Install STOP signs on both approaches as per GCS Section 8.	Medium	Yes – STOP signs installed on all approaches
a. EMERGENCY NOTIFICATION signs are not present on both approaches.	Install EMERGENCY NOTIFICATION sign on both approaches as per GCS Section 8.5.	Medium	No

b. Double stop bars are not present on either approach to the crossing for vehicles.	Paint double stop bars on both road approaches as per MUTCD Fig.C1-6 (Jan. 2014).	High	Yes – double stop bars painted (now faded)
c. RAILWAY CROSSING symbol pavement markings are not present on either approach to the crossing for vehicles.	Paint RAILWAY CROSSING symbol on both road approaches as per MUTCD Fig.C1-6 (Jan. 2014).	Medium	No
d. No stopping or parking restrictions are observed along the railway right-of-way.	Install NO STOPPING signs within the railway right-of-way.	Low	Yes – DO NOT STOP ON TRACK installed under both RAILWAY CROSSING AHEAD signs
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system without gates is warranted based on cross-product.	Install active warning system without gates. However, Transport Canada indicated that the crossing could stay passive indefinitely unless the sightline requirements could not be met.	Low	Partial – A FLASHING LIGHT has been installed above the RAILWAY CROSSING sign

2.2 CROSSING MODIFICATIONS

As shown in Appendix A: Site Photographs, a number of changes have occurred at the crossing between inspections. Most changes were based on recommendations outlined in the 2015 inspection. Table 1, shows what changes have been made based on the 2015 recommendations. Below is a summarised list of all the changes observed from the site inspection:

- New grade crossing signage, including;
  - RAILWAY CROSSING Signs
  - STOP Signs
  - RAILWAY CROSSING AHEAD signs
  - DO NOT STP ON TRACKS Sign
  - SPEED ADVISORY TAB Sign
  - NO STOPPING Sign
  - 4-WAY Intersection Sign
- New FLASHING LIGHT installed above RAILWAY CROSSING Signs.
- Removal of Port of Vancouver Sign
- Asphalt resurfaced either side of concrete crossing panels.
- New concrete crossing panels.
- New MUTCD compliant pavement markings.
- New concrete barriers installed on the south side of the railway crossing and north side of the Timberland intersection on both sides adjacent to the SRY tracks to stop vehicles cutting across the crossing.

2.3 ASSESSMENT AND RECOMMENDATIONS

An updated Grade Crossing Safety Assessment was undertaken for the proposed realignment of the port road access and to determine any required crossing upgrades to ensure compliance with the GCR & GCS. **Appendix B: Site Inspection Report** provides details of the observations made during the site inspection. The inspection report also outlines outstanding safety issues, along with recommended remediations. Table 2: 2020 Crossing Recommendations, summarizes the updated recommendations from the field investigation.

Lack of sightlines is a warrant in the GSR and GCS to require installation of automatic gated crossing protection. The client needs to insure that the crossing design plans, fully completed crossing plans (E-4) and full crossing safety assessment, which comply with requirements of the GCR and GCS, have been completed and filed with Canadian Transportation Agency and applicable railway.

Table 2: 2020 Crossing Recommendations

Observations	Suggested Actions	Priority	Order of Magnitude Cost
GCS Section 5 – Crossing Surface			
a. Vertical movement of rails with in the Crossing Surface when vehicles cross.	Undertake appropriate maintenance of the substructure of the crossing surface.	High	$5000
GCS Section 8 – Signs			
a. EMERGENCY NOTIFICATION signs are not present on both approaches.	Install EMERGENCY NOTIFICATION sign on both approaches.	Medium	$800
b. RAILWAY CROSSING symbol pavement markings are faded on either approach to the crossing for vehicles.	Paint RAILWAY CROSSING symbol on both road approaches (including "X") as per MUTCD	Medium	$1000
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system with gates is warranted based on crossing angle being below 70°.	Install active warning system with gates.	Low	$600,000

APPENDIX

A SITE PHOTOGRAPHS

APPENDIX

A – East Approach (South)

B - East Approach

C – East Approach (North)

D - West Approach Drivers View Left

E - West Approach

F - West Approach Drivers View Right

APPENDIX

G – East Approach Driver View Left
(At Stopped Position)

H - East Approach (At Stopped Position)

I – East Approach Drivers View Right
(At Stopped Position)

J- West Approach Drivers View Left
(At Stopped Position)

K - West Approach (At Stopped Position)

L - West Approach Drivers View Right
(At Stopped Position)

APPENDIX

M – North Facing Crossing Surface

N – General Crossing Photo

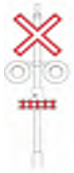
O – South Facing Crossing Surface

APPENDIX

B SITE INSPECTION REPORT

CANADIAN ROAD / RAILWAY GRADE CROSSING DETAILED SAFETY ASSESSMENT FIELD GUIDE (2005)*

Appendix C2: Field Data Forms



Passive & Active Crossings

MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia
For Vancouver Fraser Port Authority

Legend:

calculate	**Formula**	Spreadsheet cell has formula
look up		User to look up value in table or chart.
		User to input value here for conditional formatting or formulas in other cells to function
		Warning! Value beyond acceptable limits.
		Warning! Value beyond acceptable limits for certain conditions (i.e. for people using assistive devices).
	Rail	Information to be provided by Railway Company
	Road	Information to be provided by Roadway Authority
measure	observe	Information to be obtained during Site Investigation
	√	Information provided by others to be verified in the field

* Updated to reflect Transport Canada's Grade Crossing Standards (GCS) July 2014 and Grade Crossing Regulations (GCR)(SOR-2014-275 Feb 2016)

MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 1 | **Grade Crossing Safety Assessment** | **Passive Crossings**

Date of Assessment: **23-Jul-20** Site Investigation

Assessment Team Members & Affiliations: **Patrick McCabe**
Rob Sewell

Reason for Assessment: **New Proposed Pedestrian Crossing**

____	periodic assessment	**X**	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: **Southern Railway of British Columbia (SRY)**

Crossing Location: **10619 Tmberland Road**

Location Number: **N/A**

Municipality: **City of Surrey, BC**

Railway: **SRY** Mile: **N/A**

Sub-division: **N/A** Spur: **N/A**

Type of Grade Crossing [private/public; warning devices]: **SRSC**

Track Type: [mainline, etc.] **Yard**

Road Authority: **Vancouver Fraser Port Authority (VFPA)**

Road Name/Number: **10619 Timberland Road**

Province: **British Columbia**

Location Reference (control section, etc.): **DP Surrey Docks**

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

Roadway East/West (yes/ no) Yes
Roadway North/ South (yes/ no) No

*Urban Local Undivided

Collision History (5-year period): **No record of accitents at the subject railway crossing within the past five years**

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

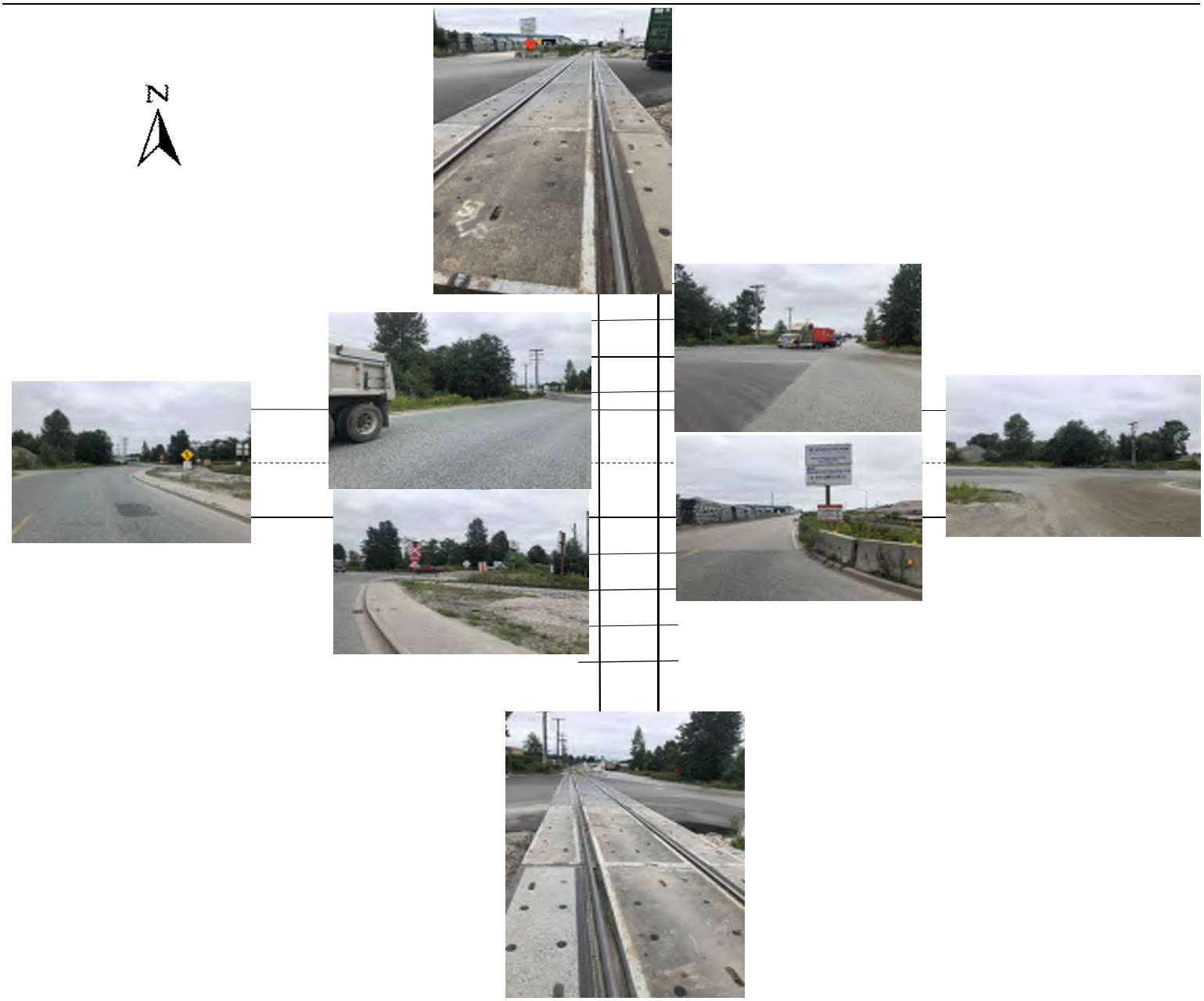
Provide Details of the collisions if available:
Sources:

- identify main contributing factors

- attach collision diagrams if available

MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 2a **SCENE PHOTOGRAPHS**

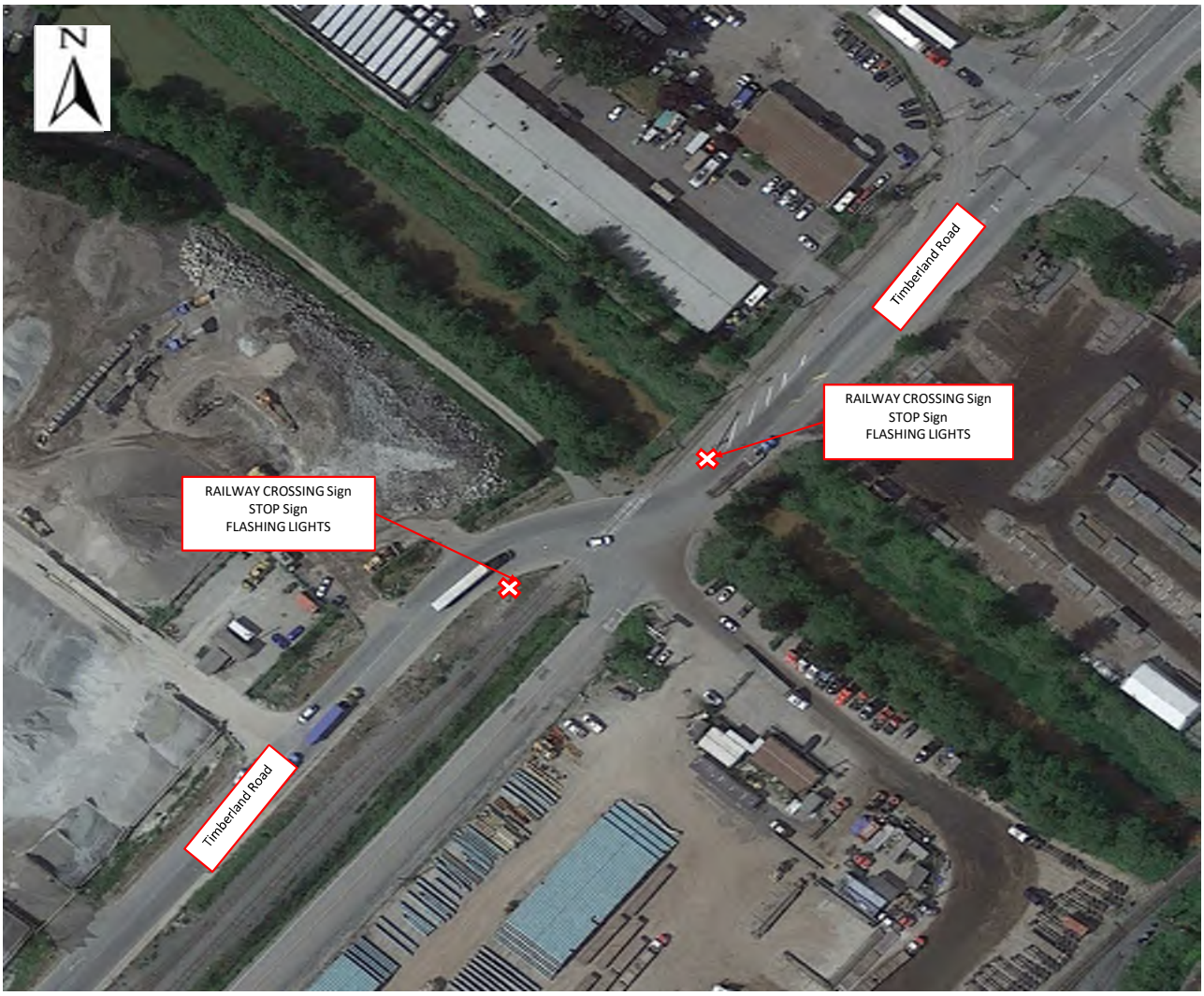


For the full set of photos taken, see the Appendix to the Safety Assessment Report.

MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 2b **SCENE SKETCH**

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



Notes: Images from Google Earth

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

MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 3 **GENERAL INFORMATION**

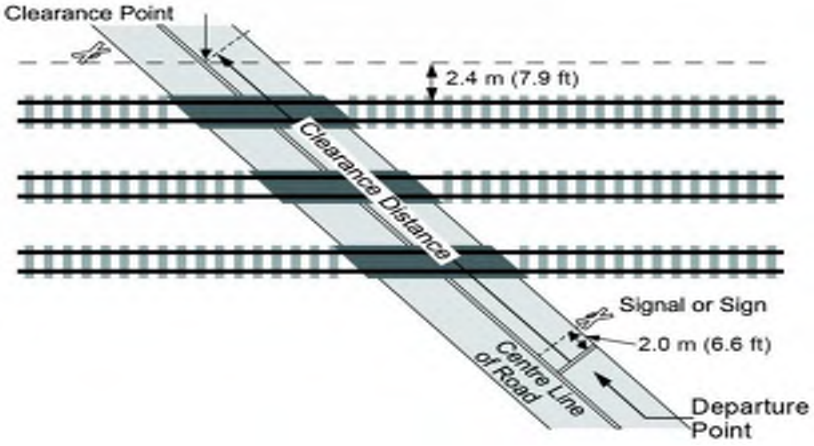
Source	Item							Reference
Rail	Maximum Railway Operating Speed, V_T	=	10	(mph)				
Rail	Daily Train Volume:	=	3	(freight trains/day)				
		=	0	(passenger trains/day)				
Rail	Switching during daytime? Y/N	No			nighttime? Y/N	No		
Road	Avg. Annual Daily Traffic, AADT:	=	3000	(vpd)	Year of count:	2020		
Road	High seasonal fluctuation in volumes?		No					
Road	Pedestrian Volumes	=	0	(ped./day)				
Road V	Is crossing on a School Bus route?		No					
Road V	Do Dangerous Goods trucks use this roadway?		Yes					
Road	Cyclist Volumes	=	0	(cyclists/day)	Cyclist not anticipated			
Road V	Regular use of crossing by persons with Assistive Devices?				Pedestrians using Assistive Devices not anticipated			
Road V	Other special road users?	type	Unknown	daily volume	None			
Road	Forecasted AADT[2]	=	1,170	(vpd)	Forecasted Year:	2022		
Road V	Design Speed:		50	km/h	Posted Speed:	50	km/h	
	Maximum Operating Speed:		50	km/h				
	note: provide details if all approaches are not the same							
Road V	Road Surface Type (asphalt, concrete, gravel, etc.):		Asphalt					
observe	Surrounding Land Use (urban/rural)?:		Industrial					
observe	Any schools, retirement homes, etc. nearby?		No					

Notes:
1. Road Authority should provided plans if available.
2. AADT is based upon modelled future traffic counts for the Realigned infrastrucutre.

From GCS Section 7.1.2:

Column 1	*Column 2*	*Column 3*
Class of Track	***The maximum allowable operating speed for freight trains is -***	***The maximum allowable operating speed for passenger trains is -***
Class 1 track	17 km/h (10 mph)	25 km/h (15 mph)
Class 2 track	41 km/h (25 mph)	49 km/h (30 mph)
Class 3 track	65 km/h (40 mph)	97 km/h (60 mph)
Class 4 track	97 km/h (60 mph)	129 km/h (80 mph)
Class 5 track	129 km/h (80 mph)	153 km/h (95 mph)

Figure 10-1 - Clearance Distance (cd) for Grade Crossings
(a) For Grade Crossings with a Warning System or Railway Crossing Sign



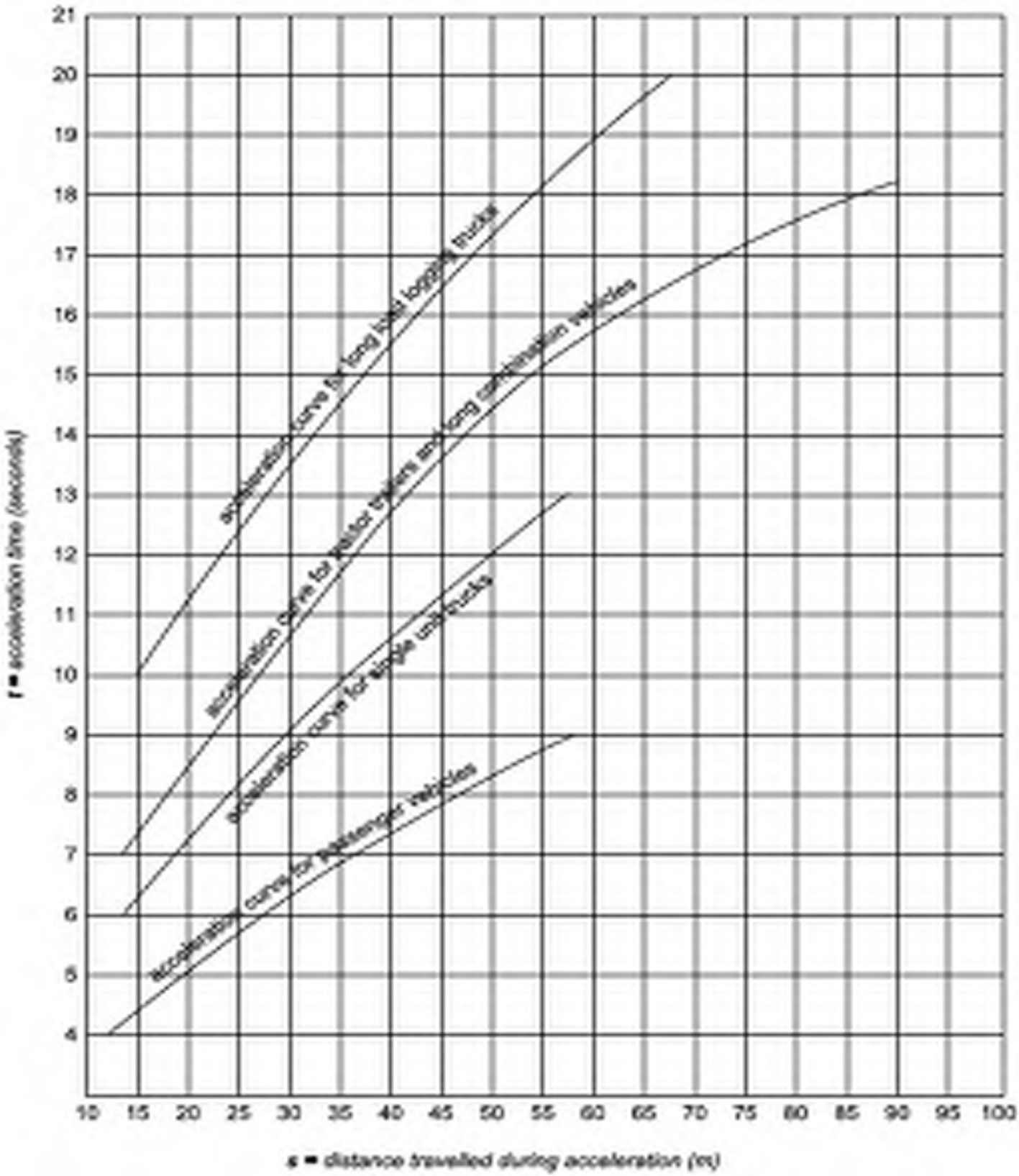
Grade Crossings Standards, July 2014

Table 10-1 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 & Buses	0.8	0.9	1.0	1.1	1.3
Tractor-Semitrailer	0.8	0.9	1.0	1.2	1.7

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 10-2 Assumed Acceleration Curves



MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 4 **DESIGN CONSIDERATIONS**

Source	Item						EB Approach		WB Approach		Reference
	Design Vehicle										
Road	Type:	6	WB-20 Tractor-Semitrailers (WB-20)								Table 1* SOR 57
look-up	Length, **L:**		22.7	m							Table 1*
look-up	**Stopping Sight Distance, SSD**		109	m (round to 1.0% of grade)		=	10	m	109	m	Table 3*
measure	**Clearance Distance, cd**					=	11.5	m	11.5	m	GCS 16.1.1
calculate	**Vehicle Travel Distance, S**	**S= L+cd**	34.2	max <---		=	34.2	m	34.2	m	
look-up	**Vehicle Departure Time, t**					=	11.7	sec	11.7	sec	GCS Figure 10-2
Road V	Road Grade Effect:	maximum approach grade within 'S':				=	0.00	%	0.50	%	Sheet 7
look-up	grade adjustment factor (anto calc assumes Truck)(manual input from Table 10-1 if other)					=	1.00		1.02		GCS Table 10-1
calculate	**T**= t x adjustment factor					=	11.7	sec	11.9	sec	
	Design Vehicle Departure Time, T_D = J + T (where J = 2 sec (min.) perception & reaction)						2.0	sec	2.0	sec	
calculate	**$T_{G\ stop}$ = T_D=**		13.9	sec		<-	13.7	sec	13.9	sec	GCS 10.3.2
observe	Do field acceleration times exceed T_D?	**Acceleration measurement beyond the scope of this assessment.**									
measure	**Pedestrian , cyclist & Assistive Devices Departure Time**				pedestrian **cd** distance	=	11.5	m	11.5	m	GCS 10.3.3
calculate	walking speed 1.22m/s max.	**T_P =**	11.5	sec	(1.0m/s used)	<-	11.5	sec	11.5	sec	
calculate	**T_{SSD}**	= (SSD+cd+L)/(0.277837 x $V_{road\ design}$) =	10.3	sec							

Comments Following Site Visit:

Table 1 – Design vehicle Lengths/Class

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

Source: *Geometric Design Guide for Canadian Roads*, TAC; September 1999.

Table 6 – Minimum Sightlines along the Rail Line ($D_{stopped}$) (as illustrated in Figure 3)

Railway Design Speed V_r (mph)	$T_{stopped}$ = Departure Time (greater of T_d or T_p) (seconds)											If greater of T_d or T_p > 20 sec., add for each additional second (m)
WARNING: Railway design speed in mph!	≤ 10	11	12	13	14	15	16	17	18	19	20	
	Minimum Sightlines along Rail Line ($D_{stopped}$) (m)											
STOP	30	30	30	30	30	30	30	30	30	30	30	+0
1-10	45	50	55	60	65	70	72	76	80	85	90	+5
11-20	90	100	110	120	125	135	145	155	165	170	180	+10
21-30	135	150	165	175	190	205	215	230	245	255	270	+15
31-40	180	200	220	235	250	270	285	305	325	340	360	+20
41-50	225	250	270	290	315	335	360	380	405	425	450	+25
51-60	270	300	325	350	380	405	430	460	485	510	540	+30
61-70	315	350	380	415	445	470	505	535	565	595	630	+35
71-80	360	395	435	465	505	540	580	610	650	680	720	+40
81-90	405	445	490	535	570	605	650	685	730	765	810	+45
91-100	450	500	540	580	630	670	715	760	805	850	895	+50

Table 3 – Determine SSD for Truck Class

Road Crossing Design Speed V (km/hr)	Truck Class Stopping Sight Distance (SSD) (m)																				
	Road Approach Gradient																				
	-10%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
20	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	24	24	24	24	24
30	48	48	47	47	47	46	46	46	45	45	45	45	45	44	44	44	44	44	44	43	43
40	76	75	74	74	73	73	72	71	71	70	70	70	69	69	68	68	68	67	67	67	67
50	121	120	118	117	116	115	114	113	112	111	110	109	108	108	107	106	106	105	105	104	104
60	149	146	144	142	140	138	136	134	133	131	130	129	128	126	125	124	123	122	122	121	120
70	210	205	202	198	195	192	189	187	184	182	180	178	176	175	173	171	170	169	167	166	165
80	252	246	241	236	231	227	223	219	216	213	210	207	205	202	200	198	196	194	192	191	189
90	318	311	304	297	292	286	281	277	273	269	265	262	258	255	252	250	247	245	243	240	238
100	401	391	382	373	365	358	352	346	340	335	330	325	321	317	314	310	307	304	301	298	295
110	455	441	428	417	406	397	388	380	373	366	360	354	349	344	339	334	330	326	322	319	315

* Source: Transport Canada's "Determining Minimum Sightlines at Grade Crossings: A Guide for Road Authorities and Railway Companies"

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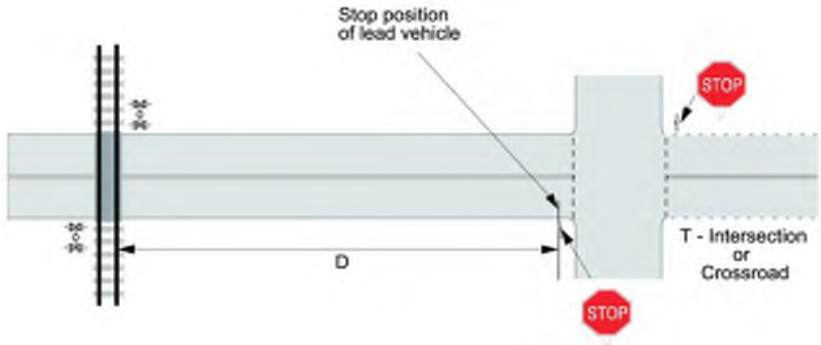
Sheet 5 **LOCATION of GRADE CROSSING**

Source	Item		Reference
observe	"D" should not be less than 30m for either approach if the train speed exceeds 15 mph.		
	D = 5.8m		GCS Section 9.1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	**No**	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks?	**No**	
	Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing?	**Yes**	

Comments Following Site Visit:
- Crossing is located on a 4-way intersection . The minimum "D" diminsion to the 4-way intersection is measured on the east approach. The western "D" is 21.3m
- RAILWAY CROSSING AHEAD sign installed from previous inspection (2015)
- Railwayspeed = 10mph

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

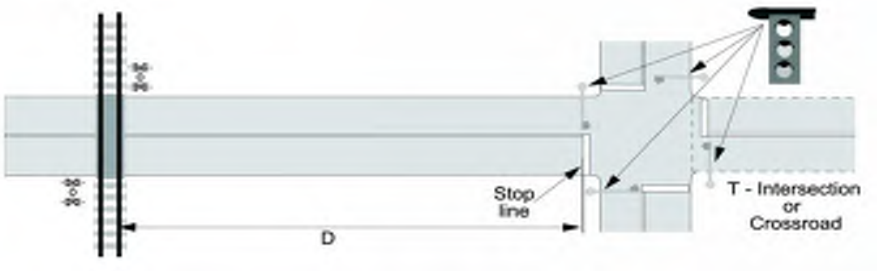
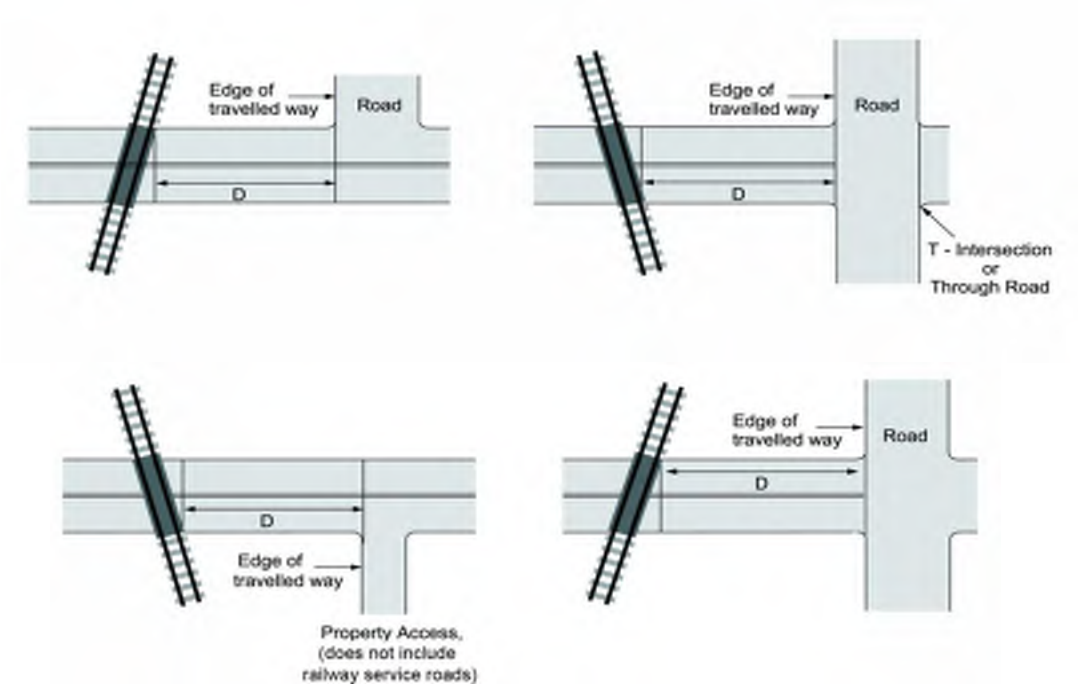


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings



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Sheet 6 **GRADE CROSSING SURFACE**

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? **Yes**								SOR 60; GCS 5
observe	Grade Crossing Surface Material: **Concrete Panels** Grade Crossing Surface Condition: **Good**								SOR 60; GCS 5
observe	Approach Road Surface Type: **Ashpalt** Approach Road Surface Condition: **Good - Resurfaced since last crossing inspection** Roadway Illumination?: **No**								SOR 60; GCS 5
		EB Approach			**WB Approach**				
measure	Road Surface crossing width (perp. C.L. min. = 8.0m) **Not installed**		**22.8**	m					GCS 5.1
measure	Road Surface extension beyond travel lanes (min. = 0.5m)	**0.5**	m		**2.5**	m			GCS 5.1
measure	Sidewalk/Path/Trail crossing width (min. = 1.5m)		**NA**	m	**1.5**	m	Crosswalk on WB only		GCS 5.1
measure	Sidewalk/Path/Trail extension beyond sidewalk (min. = 0.5m)	**NA**	m		**2.5**	m	Crosswalk on WB only		GCS 5.1
measure	Distance Between Travel Lane and C.L. of Trail		**0.8**	m					
	Cross-Section:		**South (Right) Rail:**			**North (Left) Rail:**			GCS Table 5-1
measure	Flangeway width (min. = 65mm; max.= 120mm or 75mm[1])		**75**	mm		**75**	mm		GCS Table 5-1
measure	Flangeway depth (min. = 50mm; max.= no limit or 75mm[1])		**55**	mm		**55**	mm		GCS Table 5-1
	Rural Field Side Gap:								GCS Table 5-1
measure	Side Gap width (max.= 120mm or 0[1])		**10**	mm		**10**	mm		GCS Table 5-1
measure	Side Gap depth (max.= no limit or 0[1])		**0**	mm		**0**	mm		GCS Table 5-1
	Wear Limits:								GCS Table 5-1
measure	Elevation of Top Rail above road surface (max. = 13mm[1], 25mm, or 50mm)		**5**	mm		**5**	mm		GCS Table 5-1
measure	Elevation of Top Rail below road surface (min. = -7mm[1],-25mm, or -50mm)		**0**	mm		**0**	mm		GCS Table 5-1

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Flangeway and field side gap constructed out of rubber. Some areas rubber flangeway is coming off. Full of debri
- Vehicles observed cutting crossing from the East (north east) approach. Shown by tire marks on asphalt
- Rail observed significantly moving vetrically when vehicles cross.
- New Ashpalt on crossing surface has been installed. Along with some concrete crossing panels.

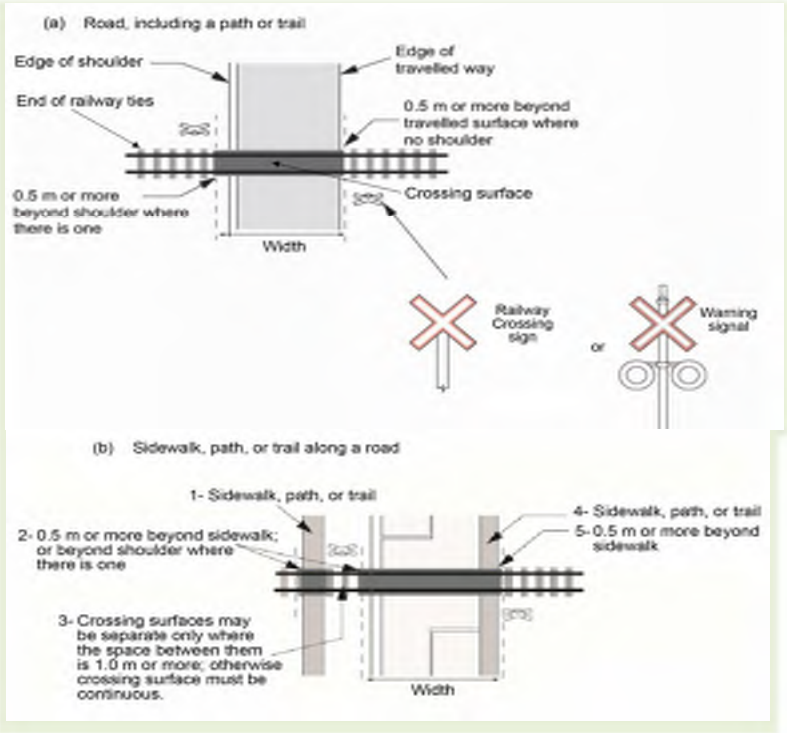
-rough crossing surface, loose timbers, etc. - difference between road grade and rail superelevation -surface distress of roadway approaches -photos

Grade Crossings Standards, July 2014

Table 5-1 – Grade Crossing Surface – Cross Section

a) Flangeway:		
Width	**Minimum**	65 mm
	Maximum for:	
	Public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	120 mm
Depth	**Minimum**	50 mm
	Maximum for:	
	Public sidewalks, paths and trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	No limit
(b) Field side gap A space is permitted on the outer side of the rail at rural locations, except for public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices		
	Maximum width	120 mm
	Maximum depth	No limit
(c) Elevation of the top of the rail with respect to the crossing surface The top of the crossing surface must be installed as close as possible to the top of the rail within the wear limits below:		
Wear limits:		
Public sidewalk, path or trail designated by the road authority for use by persons using assistive devices		
	Maximum distance of the top of the rail above crossing surface	13 mm
	Maximum distance of the top of the rail below crossing surface	7 mm
All other public grade crossings; the maximum distance of the top of the rail above or below the crossing surface		25 mm
Private grade crossings; the maximum distance of the top of the rail above or below the crossing surface		50 mm

Figure 5-1 - Grade Crossing Surface Dimensions



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Sheet 7 — **ROAD GEOMETRY**

Source	Item									Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L? WB Approach: **No** EB Approach: **No**									Sheet 4
observe	Are the road lanes at least the same width on the crossing as on the road approaches? WB Approach: **Yes** EB Approach: **Yes**									
	Grades		**EB Approach**		**WB Approach**		Difference: rail e & rd grade (GCS 6.1)			GCS Sect. 6
measure	Slope within 8m of nearest rail (max. = 2%)		**6.00**	%	**0.70**	%	**3.00%**	%	**0.35%**	Diff in Grade Max
measure	Slope between 8m & 18m of nearest rail (max. = 5%)		**0.00**	%	**0.50**	%				3%
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices (max. = 1[1] or 2%): slope within 5m of nearest rail =		**N/A**	%	**N/A**	%				
Road √	General approach grade (max. = +/- 5%)		**3.00**	%	**0.70**	%				
	measured over the SSD distance of:		**10**	m	**109**	m				Sheet 4
Rail √	Are rail tracks super-elevated?	**No**	Rate of s/e:	**0.00**	m/m Sdg	**0.00**	m/m ML			GCS Sect. 6.1 & 6.2
Road √	If train speeds exceed 15mph (70° minimum w/o warning system; 30° minimum with warning system): What is the angle between the crossing and the roadway?		=	**60.0**	degrees					
observe	**Condition of Road Approaches:** **Fair** (e.g., anything that might affect stopping or acceleration)									SOR 60
observe	NA									

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Crossing located on the west of a 4-way intersection.
- The road approach at the crossing has been resurfaced since last inspection.
- Main route is north to west across the 4-way intersection and over crossing. Crossing Angle taken from main route.
- Road barriers have been installed on the East approach (north & south ends of crossing) to stoptraffic from cutting corner of crossing (trucks still cut corner).

Grade Crossings Standards, July 2014

Table 6-1 – Difference in Gradient

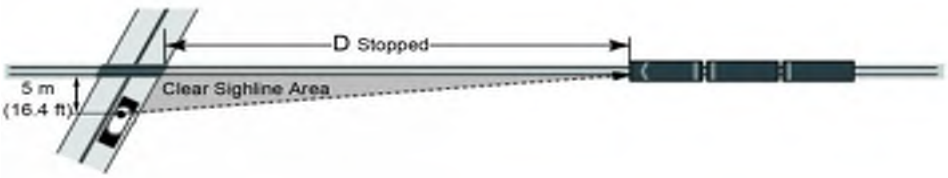
Classification	Difference in Gradient (%)
RLU	2
RCU	1
RCD	1
RAU	0
RAD	0
RFD	-
ULU	3
UCU	2
UCD	2
UAU	0

*Legend
Urban (U) Rural (R) Local (L) Collector (C) Arterial(A) Expressway (E) Freeway(F)
Divided (D) Undivided (U)

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 7-1 - Minimum Sightlines - Grade Crossings

(a) Sightlines for Users Stopped at a Grade Crossing (applicable to all quadrants)



(b) Sightlines for Users Approaching Grade Crossing (applicable to all quadrants)

MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 8 **SIGHTLINES**

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 **Yes**							
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location **Yes**							
				EB Approach		**WB Approach**		
look-up	**SSD** minimum =			**10**	m	**109**	m	Sheet 4
measure	**SSD Actual** (not including turning movements)**:**			**100.0**	m	**260**	m	
calculate	D_{SSD}	=	**0.277837 x $V_{train\ km/h}$ x T_{SSD}**	**46**	m	**46**	m	1.609 convert mph to km/h
calculate	$D_{STOPPED}$ minimum (m)	=	**0.277837 x $V_{train\ km/h}$ x T_D =**	**61**	m	**62**	m	T_D from Sheet 4
measure	**$D_{STOPPED}$ Actual**:		Driver looking LEFT	**300**	m (ne)	**70**	m (sw)	
			Driver looking RIGHT	**70**	m (nw)	**300**	m (se)	
calculate	**Ped./Cyclist $D_{STOPPED}$ (m)**			**52**	m	**52**	m	T_P from Sheet 4
measure	**Ped./Cyclist $D_{STOPPED}$ Actual:**		Person looking LEFT	**N/A**	m	**N/A**	m	
	note: measured from a point 2m in advance of sign/signals		Person looking RIGHT	**N/A**	m	**N/A**	m	
observe	Are there any obstacles within the sight triangles other than traffic signs/utility poles that might affect visibility? **Minor vegetatin in all sighttrianlges. Construction debri located in south west quadrent. .**							

Comments Following Site Visit:
- **Minor vegetation in all sight trianlges. Construction debris located in south west quadrant. Signs and barriers obstruct view in South East quadrant.**
- **SSD on East approach limited by 4-way intersection, West approach road geometry**
- **Port Property sign removed from 2015 inspection (northwest quadrant)**

Figure 8-3 - Location of Railway Crossing Signs and Number of Tracks Signs (public grade crossings without warning systems)

a) **b)**

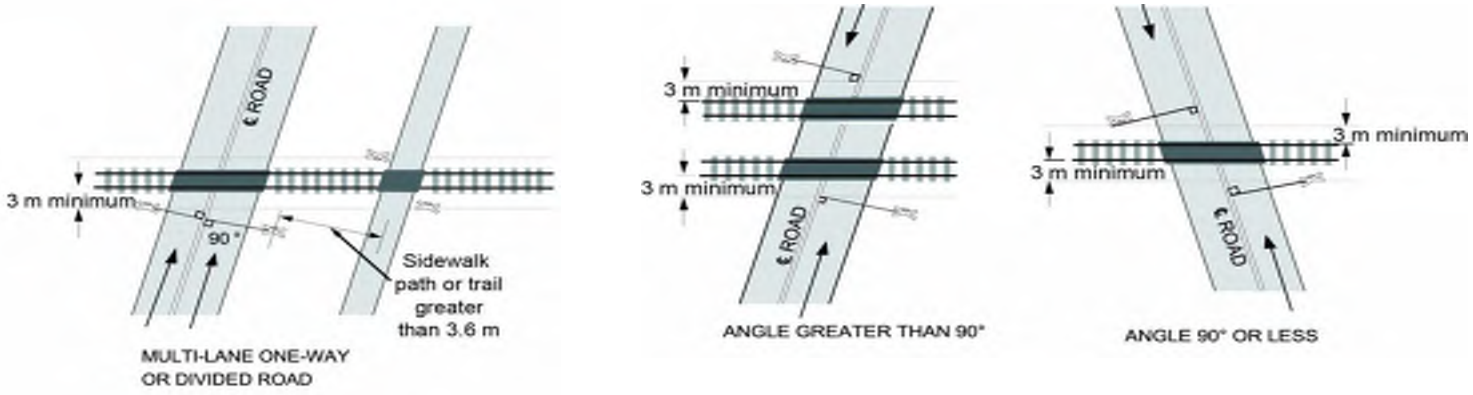
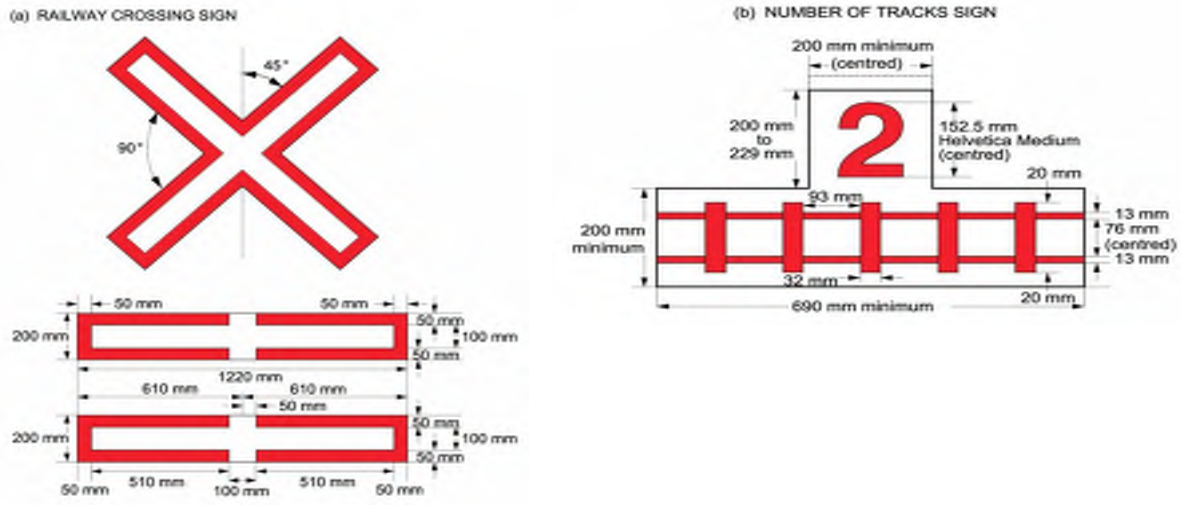


Figure 8-1 - Railway Crossing Sign and Number of Tracks Sign



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Sheet 9a — **SIGNS AND PAVEMENT MARKINGS**

Source	Item							Reference
	Railway Crossing Sign  **These signs will be required**							MUTCD
		EB Approach		**WB Approach**				
measure	distance from nearest rail:	**3.2**	m	**18.3**	m			
measure	distance from edge of road:	**2.7**	m	**3.6**	m			
measure	height of centre of crossbucks:	**2.2**	m	**2.5**	m			
measure	retroreflectivity readings:	**n/a**	cd/lux/m^2	**n/a**	cd/lux/m^2			
observe	Number of Tracks sign? **No**							
observe	A Stop Sign must be installed at grade crossing without a warning system if the road design speed is less than 15mph					Yes/ No/ NA	**Yes**	SOR 64
observe	A Stop Ahead sign must be installed if the Stop Sigh is not clearly visible within the Stopping Distance					Yes/ No/ NA	**NA**	SOR 65

Comments Following Site Visit:

- New RAILWAY CROSSING signs installed in 2015. Flashing lights have also been installed on top of the RAILWAY CROSSING Signs and STOP signs.

- The back of poles and signs only have partial reflective strips (reflectivity not measured).

- NUMBER OF TRACKS Sign not required as only 1 track.

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

Source	Item		Reference
	DO NOT STOP ON TRACKS 		MUTCD
Road √	Does queued traffic routinely encroach closer than 5m from the crossing surface?	**No**	
observe	Are these signs present on either approach?	**Yes**	

Comments Following Site Visit:

- DO NOT STOP ON TRACKS Sign not required but are installed.

-general condition -posts -photos

Source	Item				Reference
	Railway Crossing Ahead Sign (WA 18-20) 				MUTCD & SOR 66
look-up	Is AADT > 100? **Yes**	**EB Approach**	**WB Approach**		Sheet 3
observe	Is area urban such that WA 18-20 is not required?	**Yes**	**Yes**		
measure	Distance from nearest rail to sign =	**38** m	**34.0** m		MUTCD
observe	height:	**2.2** m	**2.2** m		
observe	appropriate orientation of symbol	**Yes**	**Yes**		

Comments Following Site Visit:

- RAILWAY CROSSING AHEAD Sign has been installed since the previous inspection.

- RAILWAY CROSSING AHEAD Sign installed Min. Approx 38m from crossing

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

Source	Item			Reference
	ADVISORY SPEED SIGN 			MUTCD & SOR 66 (2)
observe	Are they present on both approaches?	**No**		
	Posted speed limit?	**50**	km/h	
look-up	Are they required on either approach?	**No**		check SSD (Sheet 8)

Comments Following Site Visit:

- ADVISORY SPEED Sign installed on the North side of the road intersection only (East Approach)

-general condition -posts -photos

MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 9b **SIGNS AND PAVEMENT MARKINGS**

Source	Item		Reference
	EMERGENCY NOTIFICATION		GCS Sect. 8.5
observe	Are these signs present on both approaches?	**No**	
observe	Is the information complete and legible?	**N/A**	

Comments Following Site Visit:

- EMERGENCY NOTIFICATION Sign not present and is REQUIRED as of November 2021

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

Source	Item		Reference
	PAVEMENT MARKINGS		
observe	Are pavement markings consistent with those from the MUTCD Manual?	**Partial**	Fig C1-6 MUTCD
observe	Are there lines to delineate sidewalks/paths?	**No**	

Comments Following Site Visit:

- Road markings and DOUBLE STOP BARS have been installed since the 2015 inspection.

- Roadway "X" marking REQUIRED as per MUTCD.

- DOUBLE STOP BARS and ROAD MARKINGS needs to be repainted

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

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

GENERAL ASPECTS C1

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA

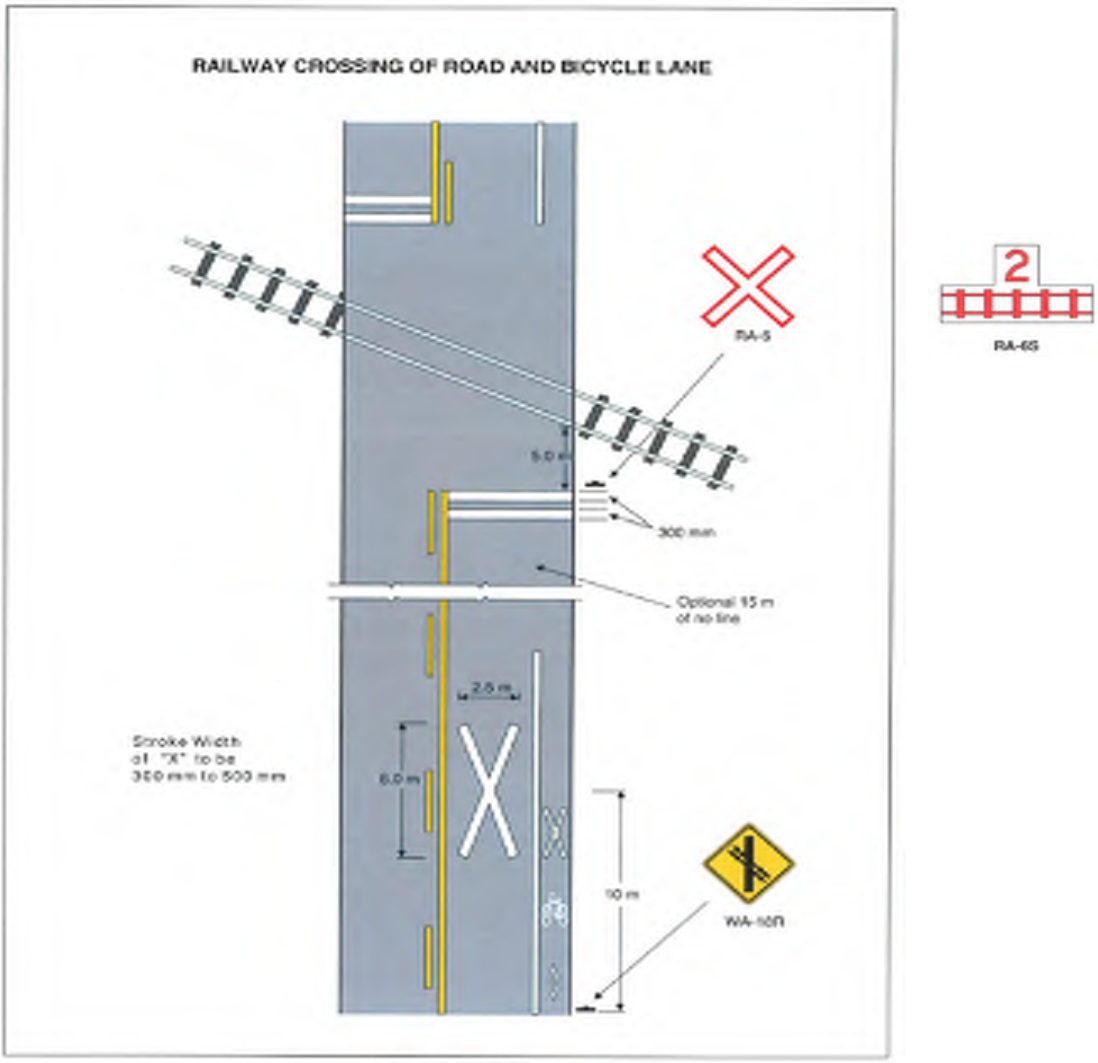
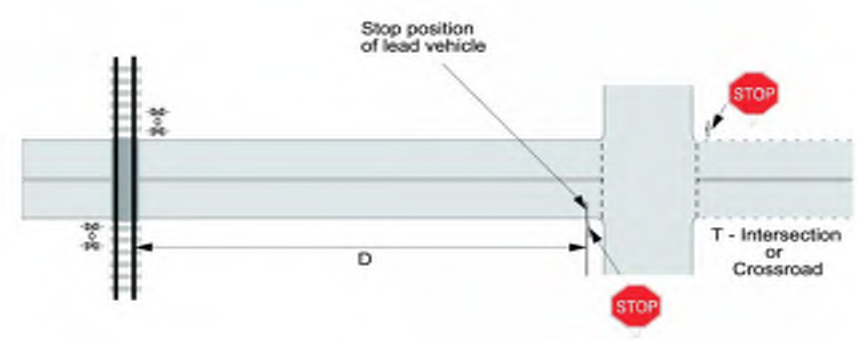


FIGURE C1-6

JANUARY 2014

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals

(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

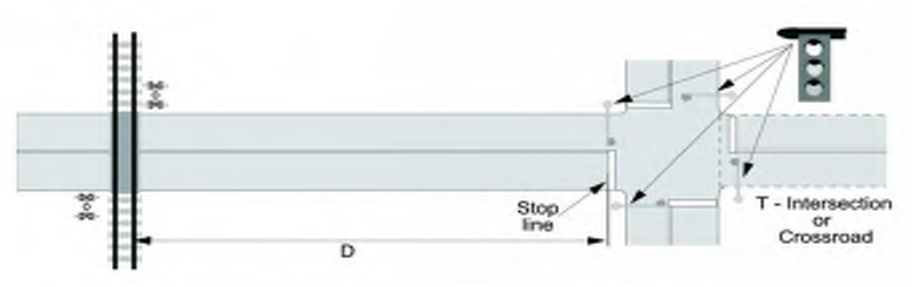


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings

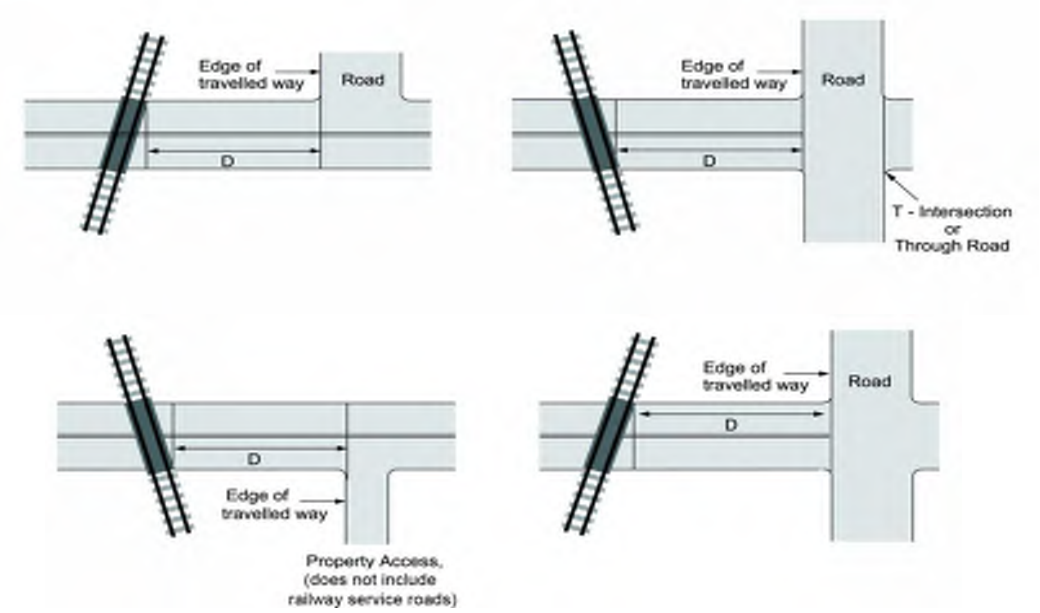
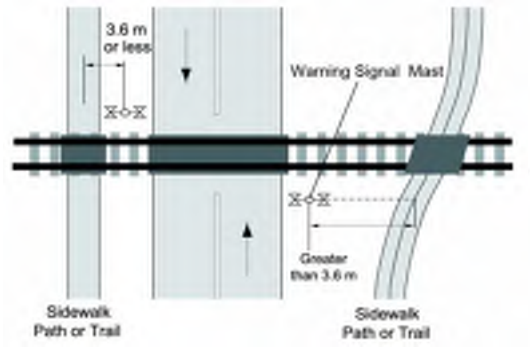
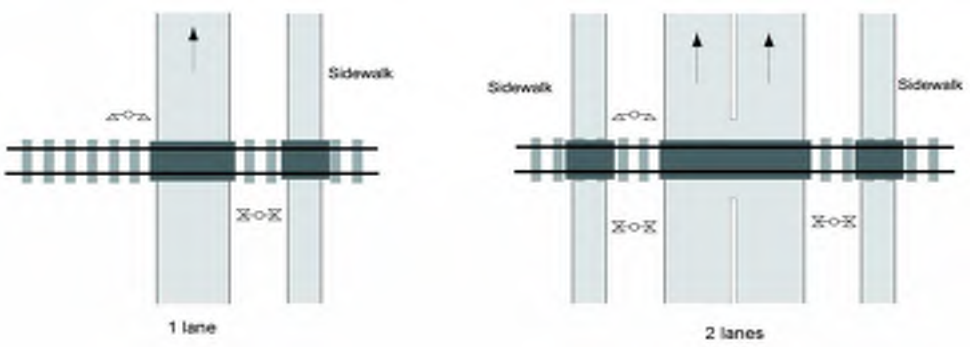


Figure 13-2 - Sidewalks, Paths and Trails

(a) Two Way



(b) One-Way



Sheet 10 eliminated in the new GCS

MileX.XX (10619 Timberland Road),SRY Rail
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Sheet 11 — **GRADE CROSSING WARNING SYSTEMS** — **GCS Section 9**

Source	Item is not required.									Reference
	Warning System Warrants if any of A through E below are met, then a warning system is warranted									
	Question							**Warrant for Warning System**		
look-up	Existing AADT =	3,000	Forecast AADT =	1,170						Sheet 3
look-up	Daily Train Volume =	3.0			trains					Sheet 3
calculate	**A. Cross-Product =**	3,510						> 2,000 FLB req'd	**> 50,000 requires gates**	
look-up	**B. Maximum Rail Operating Speed =**		10		mph			(max = 80mph or 50 mph with crosswalk)		Sheet 3
Rail	**C. Number of Tracks =**		1							
	if ≥ 2, can trains pass one another?		N/A					if ≥ 2 and trains can pass one another -> FLB req'd		
look-up	**D. Are Sightlines obscured?**		No					if "Yes" -> FLB req'd: If Fig 7.1 applies --> add G		Sheet 8 & Fig 7.1
observe	**E. Are any proximity conditions met?**		N/A					if "Yes" -> FLB required.		GCS Sect 9 & 11
look-up	Is a Warning System warranted?		No					If any of A through E above meet the Warrant		
	Field Visit	**Present? (Y/N)**	**Condition / Alignment:**							GCS 13
observe	Light Units,	N								GCS 13
observe	Bells,	N								GCS 13
observe	Gates,	N								GCS 13
observe	Cantilever Lights,	N								GCS 13
observe	Check that warning signal assemblies and cantilevers are in accordance with GCS Figures.									GCS Sect. 12
observe	Is warning system housing at least 9m from traveled way of the road and 8m from the nearest rail?									
observe	If there is a sidewalk, is a bell on the adjacent assembly?									
Rail √	Have all light units been aligned?	NA	Date?	NA						

Rail	Design Approach Warning Time (greatest of):			20sec OR [20+((cd-11)/3)] if cd>11m	Td	Tp	Gate Clearance Time + Descent Time + 5 seconds	Traffic Signal Clearance Time (=0 if no traffic signal)	(SSD + cd + L)/(0.277837xVv)	
	EB Approach	30.9	sec	20.2	13.7	11.5	30.9	0.0	3.2	
	WB Approach	30.9	sec	20.2	13.9	11.5	30.9	0.0	10.3	

observe	Is warning time less than 35 sec (without gates) or 55 sec (with gates)	N/A	

Comments Following Site Visit:

- As the Existing AADT will decrease, the cross product will still exceeds 2000 and the minimum distance between intersection exceeds 30m an active warning System is warrented for this crossing.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted?

Figure 12-1 - Warning Signal Assemblies

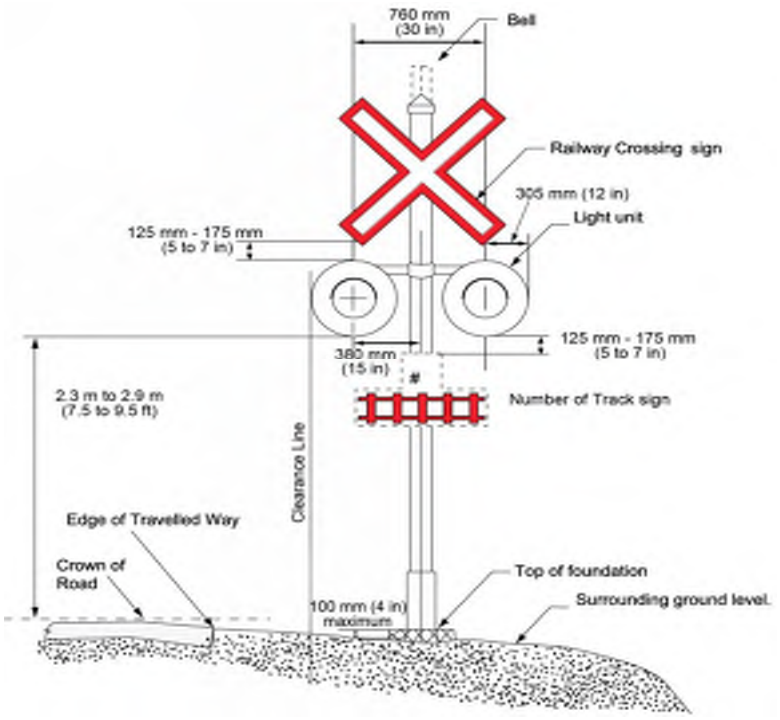
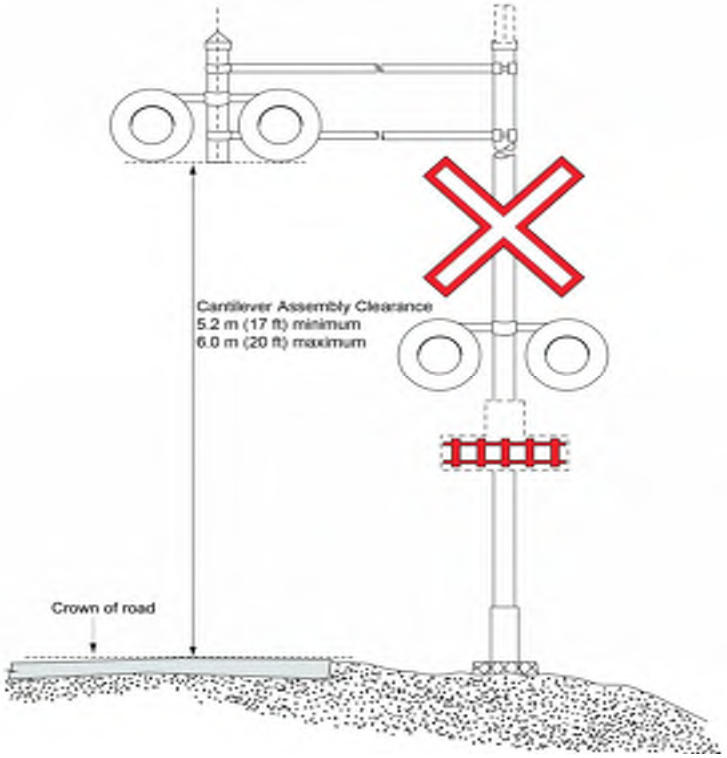


Figure 12-3 - Cantilevers



MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 12  **GATES FOR GRADE CROSSING WARNING SYSTEMS** **GCS Section 9**

Source	Item							Reference
	Warning System Warrants -if any of A through E below are met then a warning system with gates is warranted. **Not required as qwarning system is not necessary**							
calculate	**A. Cross-Product =**	**3510**	(50,000 min)					
look-up	**B. Maximum Rail Operating Speed =**	**10**	mph (max = 50mph)					Sheet 3
Rail v	**C. Number of Tracks =**	**1**						
	.....if ≥ 2 , can trains pass one another?	**N/A**						
look-up	**D. Is $D_{STOPPED}$ Insufficient?**	**No**						Sheet 8
observe	**E. Are any proximity conditions met?**	**N/A**						
calculate	Gate clearance distance: eq 10.4b	**24.7**	m cd $_{G\ stop}$	**34.7**	m cd ssd EB	**133.7**	m cd ssd WB	GCS Sect. 10.4
look-up	travel time =	**13.9**	sec $_{G\ stop}$					
calculate	Gate arm clearance times:	**13.7**	sec EB from stop	$T_{G\ ssd}$ = **2.5**	sec EB from SSD			
		13.9	sec WB from stop	$T_{G\ ssd}$ = **9.6**	sec WB from SSD			
look-up	Gate arm delay time: **13.9**	sec (greatest value from above)						
calculate	effect of grade =	**0.0**	sec (SB from Stop)	**-7.1**	sec EB from SSD			
		0.3	sec (NB from Stop)	**0.0**	sec WB from SSD			
measure	Measure gate arm delay and compare with above:	**N/A**						
observe	Do gates conform to standards depicted in GCS Figures?	**N/A**						
observe	Check gate descent (10 to 15 sec) and ascent (6 to 12 sec)	**N/A**						
observe	Is gate striping vertical as depicted in GCS Figures?	**N/A**						
observe	Where railway equipment regularly stops, or railway equipment is left standing, within the activating limits of a warning system, the warning system must be equipped with a control feature to minimize the operation of the warning system.					Yes/No/NA	**NA**	GCS 16.3.1

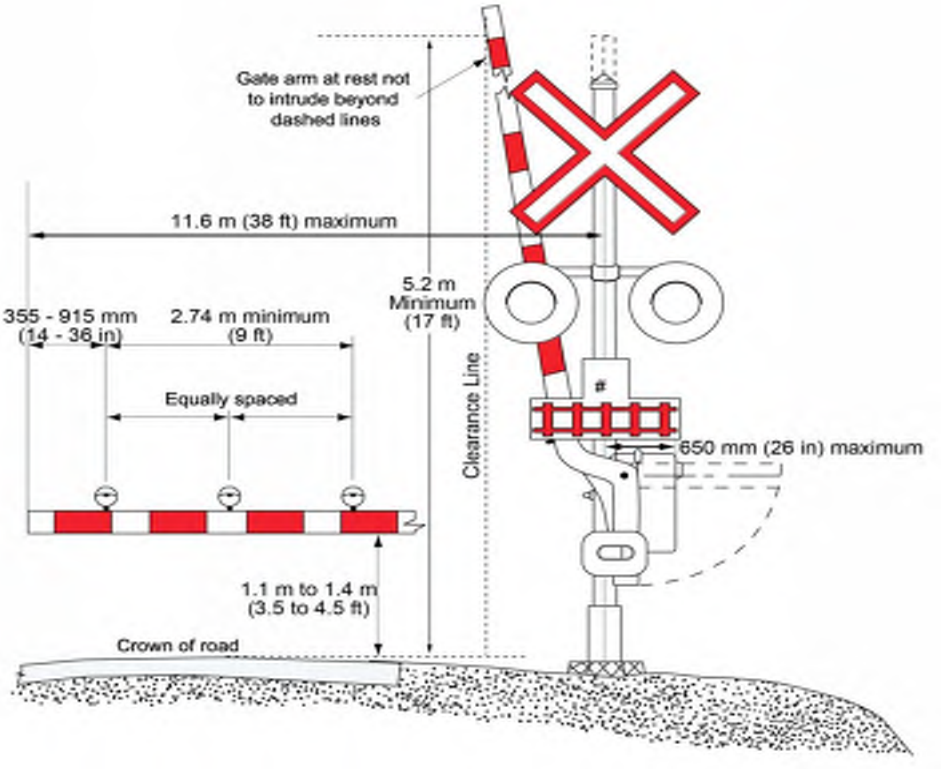
Comments Following Site Visit:

- Warning System with Gates is required due to the crossing angle being less then 70d.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted? **No**

Figure 12-2 - Gates



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Surrey, British Columbia

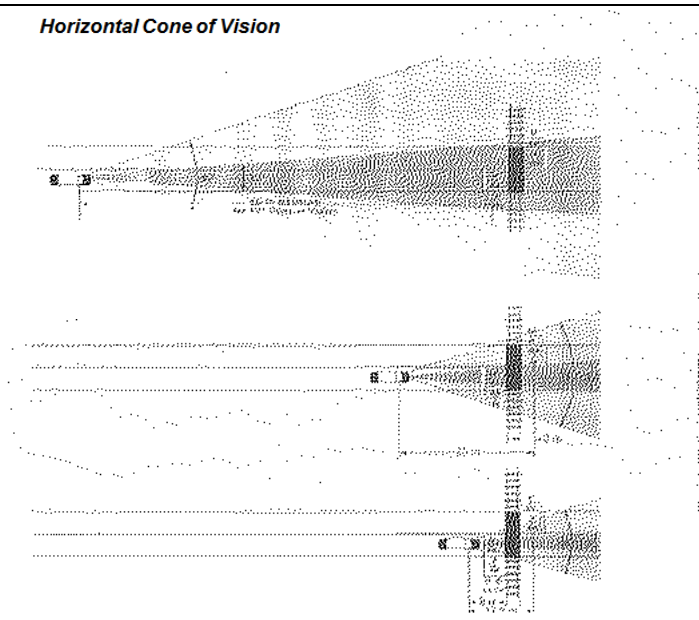
Sheet 13 **FLASHING LIGHT UNITS**

Note: Driver's cone of vision is ± 5° horizontally; limited by top of windshield vertically. GCS Sections 12-14

Source	Item is not required as warning system is not required.				u
	Number and Location				
look-up	Minimum Distance for Primary Light Units (SSD) =	109.0	m		
look-up	Recommended Distance for Primary Light Units =	133.7	m		
observe	Are flashing light units located within 5° horizontally of the centerline of the road (throughout the approach distance above)?			Yes (covered by front and back units)	
	Does horizontal/vertical curvature necessitate supplemental units?			N/A	
observe	Can back lights be seen by all stopped drivers?			N/A	
observe	Are lights obscured by vehicles stopped on adjacent intersections?			N/A	
observe	Are additional light units required for drivers as they begin to turn onto an approach road from an intersecting road/lane/pkg lot?			N/A	
	Cantilevered Light Units				
measure	Does D_R exceed 7.7m?	N/A			
measure	Does D_L exceed 8.7m?	N/A	(Assumes signal poles on both sides of road alignment, approach side of rail)		
	Multiple Lanes				
observe	Can front light units be seen by drivers in all lanes (....would T/T obscure?)?	N/A			
observe	Can back light units be seen by all stopped drivers in all lanes?	N/A			
	Sidewalks, paths, trails, etc.				
measure	Distance from path centerline to signal mast =	N/A	m (max.=3.6m)		
observe	Are separate light units required?	N/A			

Comments Following Site Visit:
- Crossing currently regulated by a passive warning system.

Horizontal Cone of Vision



Typical Light Unit Arrangement for an Adjacent Intersection

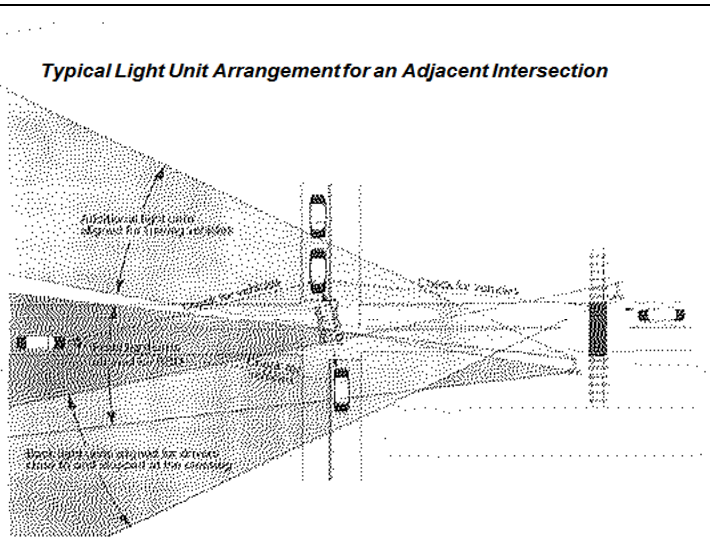
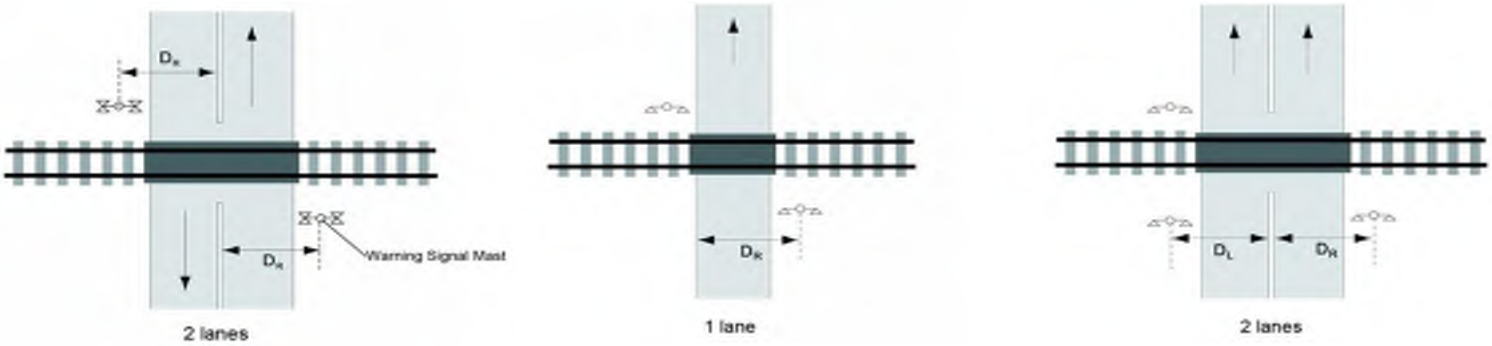


Figure 13-1 – Warning Signal Offsets Requiring Cantilevered Light Units

(a) Two-Way Road ***(b) One-Way or Divided Road***



MileX.XX (10619 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 14

PREPARE TO STOP AT RAILWAY CROSSING SIGN

GCS Sections 13 and 14

Source	Item NA				Reference
observe	Are signs present?	**No**	EB approach		SOR 67 (1), (2) GCS 18.21 & 18.2
		No	WB approach		
look-up	Minimum Distance for Primary Light Units (SSD)	**N/A**	m		Sheet 13
look-up	Recommended distance for Primary Light Units	**N/A**	m		Sheet 13
	Warrants				
observe	Are all front light units obscured within minimum distance above?	**N/A**			
look-up	Is the facility designated a "freeway" or "expressway"?	**N/A**			Sheet 3
observe	Do environmental conditions frequently obscure signal visibility?	**N/A**			
	Considering maximum prevailing speeds, geometry, and traffic composition, checkthe following:				
observe	Does sign flash during operation of grade crossing warning system?	**N/A**			
measure	Distance from the sign to 2.4m beyond the furthest rail =	**N/A**			
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?	**N/A**			
measure	Distance from the sign to the closest gate =	**N/A**	m		
observe	Does the flashing sign precede actuation of the descent of the gate arms by the time required to travel from the sign to clear closest gate?	**N/A**			
measure	Time required for all queued vehicles to resume to maximum road operating speed =	**N/A**	sec		

Comments Following Site Visit:

- **Flashing lights located on top of STOP Signs. No measurement were taken . The lights were observed to be clear and aligned correctly.**

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

Sheet 15

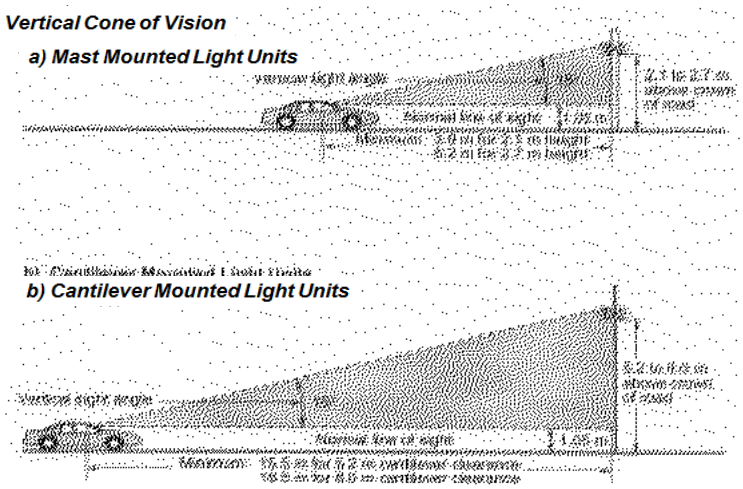
PREEMPTION OF TRAFFIC SIGNALS

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

Comments Following Site Visit:

- **No Traffic Signals located at crossing**

-functions as intended



Grade Crossings Standards, July 2014

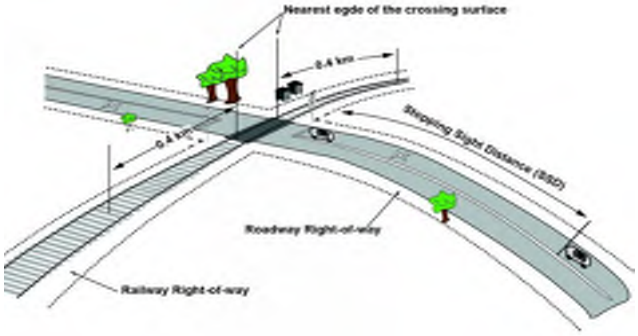
APPENDIX D – WHISTLING CESSATION

Table D-1 – Requirements for Warning Systems at Public Grade Crossings within an Area without Whistling

	Column A		Column B	
Railway Design Speed	Grade Crossings for Vehicle Use		Grade Crossings For Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Column 1	***Column 2***	***Column 3***	***Column 4***	***Column 5***
1 – 25 km/h (15 mph)	FLB	FLB	No warning system requirement	No warning system requirements
25 – 81 km/h (16 – 50 mph)	FLB	FLB & G	FLB	FLB & G
Over 81 km/h (50 mph)	FLB & G	FLB & G	FLB & G	FLB & G

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

Figure D-1 - prescribed area for whistling cessation as per article 23.1 of the RSA



RSA = Railway Safety Act of Canada

Source	Item					Reference
Rail	Is train whistling prohibited at this crossing?	**No**	24 hours?	**No**		
observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?			**No**		
observe	Are the requirements of Table D-1 met?	**No**				

Comments Following Site Visit:
- Whistle Cessation not required

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:

END OF FIELD DATA FORMS

VFPA
REPORT NUMBER: 20-0173

VFPA FSPL TRANSPORTATION IMPROVEMENTS PROJECT

01 – MILE 117.63 SPUR 2.82, 75 ROBSON ROAD,

FEBRUARY 09, 2021

REVISION HISTORY

FINAL ISSUE

2020/09/03	FIRST DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2020/10/21	SECOND DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2021/02/09	FINAL			
Prepared by	Reviewed by	Approved By		
P. McCabe, Track Designer	G. Smith, Senior Project Engineer	R. Sewell, Senior Project Engineer		

SIGNATURES

PREPARED BY

Patrick McCabe, CPEng (Aus), APEC Eng
Track Designer

09/02/2021
Date

Robert Sewell, P.Eng
Senior Project Engineer

09/02/2021
Date

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1 CROSSING OVERVIEW

WSP Canada Group Limited (WSP) has been contracted as part of the Fraser Surrey Port Lands – Transportation Improvements Preliminary Design Services project, to complete a Railway Crossing Safety Assessment on the 75 Robson Road grade crossing. The crossing is located within the Vancouver Fraser Port Authority (VFPA), Fraser Surrey Docklands. The crossing is located along the Canadian National (CN) Brownsville Spur which comes off Mile 117 of the Yale Subdivision.

A Railway Crossing Field Safety Assessment was undertaken on the 23rd of July 2020 and updates the previous Railway Crossing Assessment undertaken by WSP (formally MMM Group) on the 5th of May 2015. The Railway Crossing Assessment as conducted follows the guidelines of applicable requirements identified in the most recent edition of Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossing Standards (GCS).

The crossing is a passive protected crossing (SRCS), equipped with two RAILWAY CROSSING and STOP signs, located within an industrial area. The crossing is a two-track crossing with the newest track being installed on the north approach earlier this year. The Southern crossing track was inspected as part of the 2015 inspections. A Tractor Trailer (WB-20) is the design vehicle used to represent daily traffic on port property. The railway traffic volumes were provided by the VFPA while the Average Annual Daily Traffic (AADT) was calculated based on the realigned infrastructure.

This report aims to identify the modifications to the grade crossing since the previous inspection completed by MMM Group in 2015, as well as highlight any new or previously identified non-compliances still relevant to this crossing.

1.1 LOCATION

The Robson Road grade crossing is located within Fraser Surrey Docks jurisdiction at 75 Robson Road and crosses the VFPA spur track. The crossing is located at the latitude and longitude of 49°10'42" and 112°54'47" respectfully. Figure 1, below shows the location of the crossing.

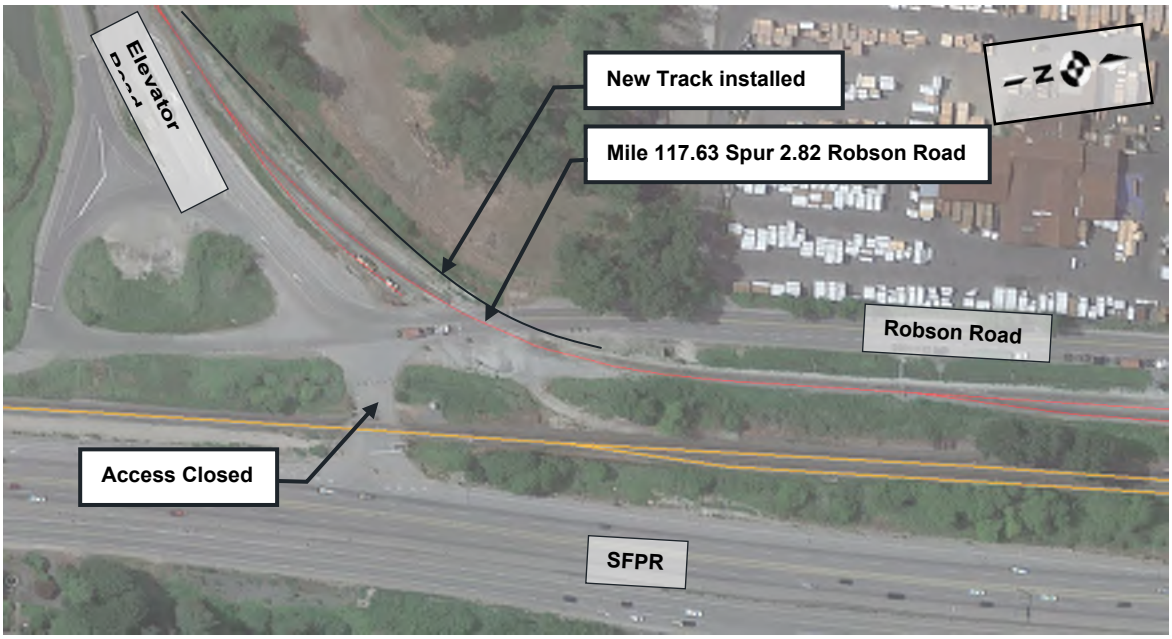


Figure 1: Crossing Location (source: Google Earth, 2020)

2 SAFETY ASSESSMENT

2.1 PREVIOUS ASSESSMENT (2015)

A previous crossing assessment was undertaken in 2015 by WSP for the 75 Robson Road crossing. The objective of the assessment was to:

- Reduce crash risk within the grade crossing environment.
- Minimize the frequency and severity of preventable crashes.
- Consider the safety of all grade crossing users.
- Verify compliance of the technical standards referred to in the Railway Safety Act / Grade Crossing Regulations and contained in the Grade Crossing Standards.
- 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 outcome of the 2015 assessment offered recommendations for consideration by the VFPA. Table 1: Previous Non-Compliances, illustrates the non-compliances and recommendations offered within the 2015 report. The recommendations were categorised within the three priority levels;

- Low - implement the measures as soon as practicable
- Medium - implement the measures by Transport Canada GCS & GCR November 2021 deadline.
- High - implement the measures forthwith

Table 1: Previous Non-Compliances

Table 1: Previous Non-Compliances

Observations	Suggested Actions	Priority	Addressed?
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Railway crossing surface does not extend at least 0.5m beyond the edge of the travelled way on either approach.	Extend railway crossing surface to extend at least 0.5m beyond the edge of the travelled way.	High	No – Concrete panels have been installed since 2015 inspection. Minimum edge of concrete panel not 0.5m from (unmarked) traveled way
GCS Section 4 – Railway Crossing and Number of Tracks Sign (Basic Requirement)			
a. RAILWAY CROSSING sign not present on south approach.	Install RAILWAY CROSSING sign on south approach as per GCS Section 8.1	High	Yes – New RAILWAY CROSSING Signs installed
b. North approach RAILWAY CROSSING sign location from edge of travelled way does not meet requirement	Relocate sign as per GCS Section 4.1.	High	Yes – New RAILWAY CROSSING Signs installed for new crossing track
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to vegetation on the northwest corner of the crossing	If minimum sightlines cannot be provided and maintained, then a warning system with gates is required	Medium	No – New crossing track installed clear embankment on north side. However, the sightlines are not met
GCS Section 8 – Signs			
a. Retroreflective strips are not provided for the back of the RAILWAY CROSSING sign and both sides of the sign supporting post for the north approach	Install retroreflective strips on the back of the RAILWAY CROSSING sign and both sides of the sign supporting post for the north approach	Medium	Yes – New compliant RAILWAY CROSSING Signs have been installed

b. RAILWAY CROSSING AHEAD sign is not present on the south approach of the crossing	Install RAILWAY CROSSING AHEAD signs on the south approach of Robson Road as per BCMoT's Signage and Pavement Manual (2000).	Medium	Yes – New RAILWAY CROSSING AHEAD signs installed on south approach
c. RAILWAY CROSSING AHEAD sign for the north approach is not standard size for vehicle and placed too close to the railway crossing	Remove existing RAILWAY CROSSING AHEAD sign and install vehicle RAILWAY CROSSING AHEAD signs on the north approach of Robson Road as per BCMoT's Signage and Pavement Manual (2000).	Medium	Yes – New RAILWAY CROSSING AHEAD signs installed on north approach
d. STOP signs are not present on either approach of the crossing.	Install STOP signs on same post as RAILWAY CROSSING signs as per GCS Section 8.4	High	Yes – STOP Signs installed below RAILWAY CROSSING Sign on both approaches
e. DO NOT STOP ON TRACKS signs are not present on either approach of the crossing	Install DO NOT STOP ON TRACKS signs as per MUTCDC A2.8.4	Low	Yes – DO NOT STOP ON TRACK signs installed below RAILWAY CROSSING AHEAD Signs on both approaches.
f. EMERGENCY NOTIFICATION signs are not present on either approach of the crossing	Install EMERGENCY NOTIFICATION sign on both approaches as per GCS Section 8.5	Medium	Yes – Installed below STOP Sign in both approaches.
g. Double stop bars are not present on the south approach and RAILWAY CROSSING symbol pavement markings are not present on either approach to the crossing for vehicles.	Paint double stop bars on the south approach and RAILWAY CROSSING symbol pavement markings on both road approaches.	Low	Yes – Compliant PAVEMENT MARKINGS have been installed on both approaches.
h. Double stop bars are faded on the north approach	Repaint double stop bars on the north approach	Low	Yes – Painted with new track crossing
i. Stopping or parking restriction is not observed within the railway right-of-way	Install NO STOPPING signs within the railway right-of-way	Low	No
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system without gates is warranted based on cross-product	Install active warning system without gates. However, Transport Canada indicated that the crossing could stay passive indefinitely unless the sightline requirements could not be met	Low	No

2.2 CROSSING MODIFICATIONS

As shown in Appendix A: Site Photographs, a number of changes have occurred at the crossing between inspections. Most changes were based on recommendations outlined in the 2015 inspection. Table 1, shows what changes have been made based on the 2015 recommendations. Below is a summarised list of all the changes observed from the site inspection:

- New track crossing installed on the North approach, which includes;
  - New crossing surface
  - New track in Northwest and Northeast quadrants
- New grade crossing signage, including;
  - RAILWAY CROSSING Signs
  - STOP Signs
  - EMERGECNY NOTIFACATION Signs
  - RAILWAY CROSSING AHEAD signs
  - DO NOT STOP ON TRACKS Signs
  - NUMBER OF TRACKS Sign

- New MUTCD compliant pavement marking
- Replacement of exiting crossing surface (Asphalt to concrete panels)
- Removal of road intersection to SFPR on south approach
- Removal of signage in Northeast quadrant obstructing sightlines

2.3 ASSESSMENT AND RECOMMENDATIONS

An updated Grade Crossing Safety Assessment was undertaken for the proposed realignment of the port road access and to determine any required crossing upgrades to ensure compliance with the GCR & GCS. **Appendix B: Site Inspection Report** provides details of the observations made during the site inspection. The inspection report also outlines outstanding safety issues, along with recommended remediations. Table 2: 2020 Crossing Recommendations, summarizes the recommendations from the field investigation.

The installation of the new track activates a warrant in the GSR and GCS to immediately comply with all requirements of the GCR and the GCS. Any grandfathered crossing rights become revoked upon completion of the track works. The client needs to insure that the crossing design plans, fully completed crossing plans (E-4) and full crossing safety assessment, which comply with the full requirements of the GCR and GCS, have been completed and filed with Canadian Transportation Agency and applicable railway.

Table 2: 2020 Crossing Recommendations

Observations	Suggested Actions	Priority	Order of Magnitude Cost
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Flangeway depth impeded due to debris	Clean debris from the flangeway.	Low	$500
b. Railway crossing surface does not extend at least 0.5m beyond the edge of the travelled way on both approaches.	Extend railway crossing surface to extend at least 0.5m beyond the edge of the travelled way	High	$750
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to vegetation on the northwest corner of the crossing	Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to vegetation on the northwest corner of the crossing	High	$15,000
GCS Section 8 – Signs			
a. Pavement markings are faded on north and south approach and require repainting	Repaint double stop bars and RAILWAY CROSSING symbol pavement markings and all line work on north and south road approaches.	Low	$800
b. No pavement markings are located within the crossing surface.	Paint MUTCD compliant pavement markings across the crossing surface.	Low	$750
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system with gates is warranted based on cross-product and sightlines	**Install active warning system with gates as soon as possible.**	High	$600,000

APPENDIX

A SITE PHOTOGRAPHS

APPENDIX

A - North Approach Drivers View Left

B - North Approach

C - North Approach Drivers View Right

D - South Approach Drivers View Left

E - South Approach

F - South Approach Drivers View Right

APPENDIX

G – North Approach Driver View Left (At Stopped Position)

H - North Approach (At Stopped Position)

I – North Approach Drivers View Right (At Stopped Position)

J- South Approach Drivers View Left (At Stopped Position)

K - South Approach (At Stopped Position)

L - South Approach Drivers View Right (At Stopped Position)

APPENDIX

M – East Facing Crossing Surface

N – General Crossing Photo

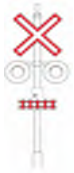
O – West Facing Crossing Surface

APPENDIX

B SITE INSPECTION REPORT

CANADIAN ROAD / RAILWAY GRADE CROSSING DETAILED SAFETY ASSESSMENT FIELD GUIDE (2005)*

Appendix C2: Field Data Forms



Passive & Active Crossings

Mile117.63 Spur 2.82 (75 Robson Road),VFPA/ BNFS
Surrey, British Columbia
For Vancouver Fraser Port Authority

Legend:

calculate	Formula	Spreadsheet cell has formula
look up		User to look up value in table or chart.
		User to input value here for conditional formatting or formulas in other cells to function
		Warning! Value beyond acceptable limits.
		Warning! Value beyond acceptable limits for certain conditions (i.e. for people using assistive devices).
	Rail	Information to be provided by Railway Company
	Road	Information to be provided by Roadway Authority
measure	observe	Information to be obtained during Site Investigation
	√	Information provided by others to be verified in the field

* Updated to reflect Transport Canada's Grade Crossing Standards (GCS) July 2014 and Grade Crossing Regulations (GCR)(SOR-2014-275 Feb 2016)

Mile117.63 Spur 2.82 (75 Robson Road),VFPA/ BNFS
Surrey, British Columbia

Sheet 1 | **Grade Crossing Safety Assessment** | **Passive Crossings**

Date of Assessment: **23-Jul-20** Site Investigation

Assessment Team Members & Affiliations: **Patrick McCabe**
Rob Sewell

Reason for Assessment: **New Proposed Pedestrian Crossing**

____	periodic assessment	**X**	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: **Vancouver Frasier Port Authority (VFPA)/ BNFS Railway**

Crossing Location: **Robson Road and Elevator Road**

Location Number: **N/A**

Municipality: **City of Surrey, BC**

Railway: **VFPA/ BNFS** Mile: **117.63**

Sub-division: **Yale Sub/ Brownsville Spur** Spur: **2.82**

Type of Grade Crossing [private/public; warning devices]: **SRSC**

Track Type: [mainline, etc.] **Yard**

Road Authority: **City of Surrey**

Road Name/Number: **Robson Road and Elevator Road**

Province: **British Columbia**

Location Reference (control section, etc.): **DP Surrey Docks**

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

Roadway East/West (yes/ no) No
Roadway North/ South (yes/ no) No

*Urban Local Undivided

Collision History (5-year period):

Property Damage collisions:	1		
+ Personal Injury collisions:	UNKNOWN	Number of Persons Injured:	UNKNOWN
+ Fatal Injury Collisions:	NIL	Number of Persons Killed:	NIL
= Total Collisions in last 5 year period:	1		

Provide Details of the collisions if available:
Sources: VFPA

One truck/train accident on Robson Rd/ Elevator Road crossing. The incident likely took place 2016-2017 due to a truck stalling on the railway crossing

- identify main contributing factors - attach collision diagrams if available

Mile117.63 Spur 2.82 (75 Robson Road),VFPA/ BNFS
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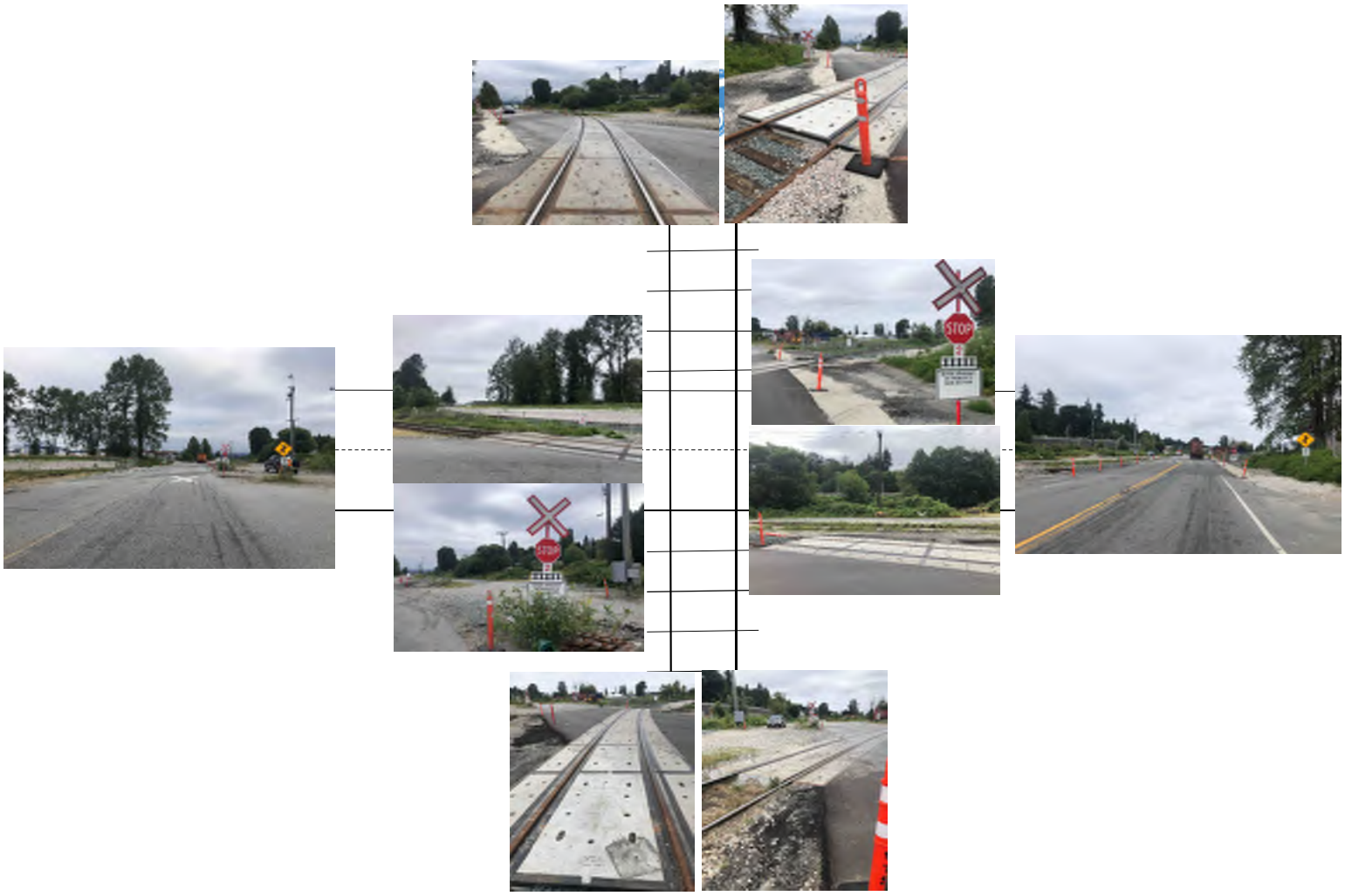
Sheet 2a **SCENE PHOTOGRAPHS**



For the full set of photos taken, see the Appendix to the Safety Assessment Report.

Mile117.63 Spur 2.82 (75 Robson Road),VFPA/ BNFS
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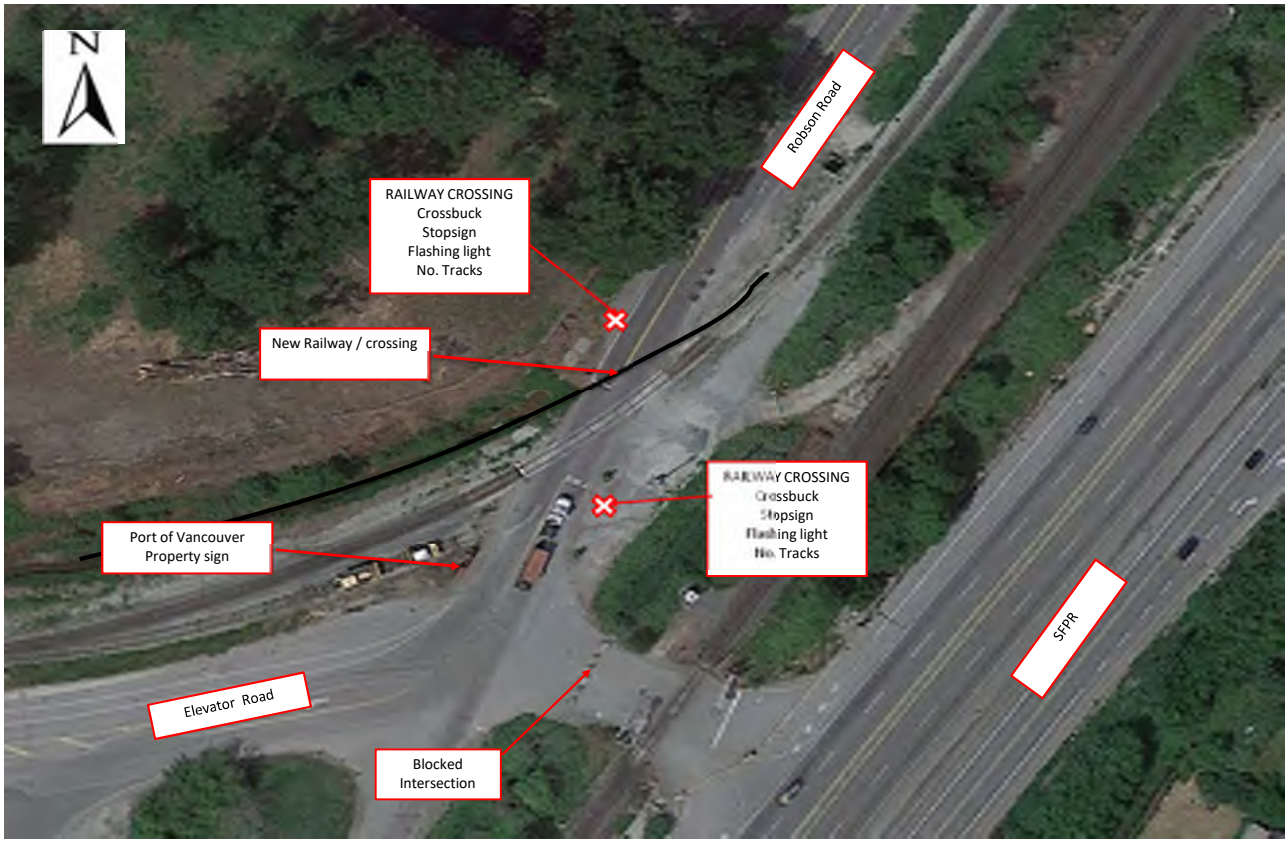
Sheet 2b **SCENE SKETCH**

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



Notes: Images from Google Earth

Include:
- directions to nearby municipalities for both road & rail approaches (use arrows)
- adjacent intersections
- relevant road signs/signals
- signal warning systems hardware
- landmarks
- crosswalks/paths
- geographical features
- bus stops, etc.

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Sheet 3 **GENERAL INFORMATION**

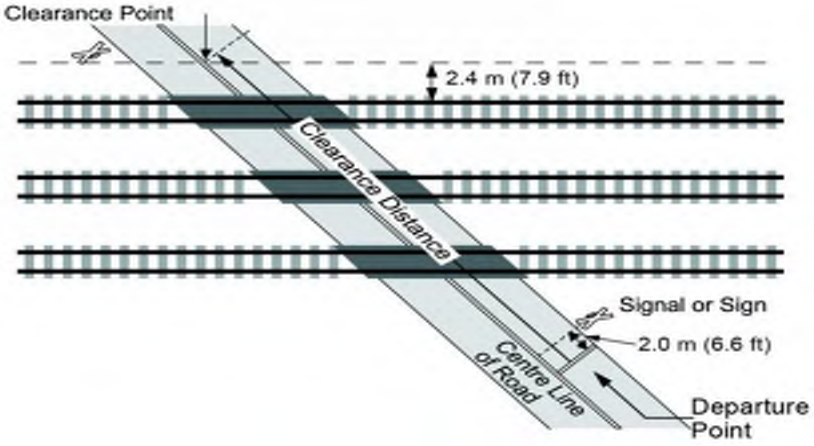
Source	Item							Reference
Rail	Maximum Railway Operating Speed, V_T	=	**10**	(mph)				
Rail	Daily Train Volume:	=	**30**	(freight trains/day)				
		=	**0**	(passenger trains/day)				
Rail	Switching during daytime? Y/N	**No**			nighttime? Y/N	**No**		
Road	Avg. Annual Daily Traffic, AADT:	=	**1,780**	(vpd)	Year of count:	**2020**		
Road	High seasonal fluctuation in volumes?		**No**					
Road	Pedestrian Volumes	=	**0**	(ped./day)				
Road √	Is crossing on a School Bus route?		**No**					
Road √	Do Dangerous Goods trucks use this roadway?		**Yes**					
Road	Cyclist Volumes	=	**0**	(cyclists/day)	**Cyclist not anticipated**			
Road √	Regular use of crossing by persons with Assistive Devices?				**Pedestrians using Assistive Devices not anticipated**			
Road √	Other special road users?	type	**Unknown**	daily volume	**None**			
Road	Forecasted AADT[2]	=	**980**	(vpd)	Forecasted Year:	**2022**		
Road √	Design Speed:		**30**	km/h	Posted Speed:	**30**	km/h	
	Maximum Operating Speed:		**30**	km/h				
	note: provide details if all approaches are not the same							
Road √	Road Surface Type (asphalt, concrete, gravel, etc.):		**Asphalt**					
observe	Surrounding Land Use (urban/rural)?:		**Industrial**					
observe	Any schools, retirement homes, etc. nearby?		**No**					

Notes:
1. Road Authority should provided plans if available.
2. AADT is based upon modelled future traffic counts for the Realigned infrastrucutre.

From GCS Section 7.1.2:

Column 1	*Column 2*	*Column 3*
Class of Track	***The maximum allowable operating speed for freight trains is -***	***The maximum allowable operating speed for passenger trains is -***
Class 1 track	17 km/h (10 mph)	25 km/h (15 mph)
Class 2 track	41 km/h (25 mph)	49 km/h (30 mph)
Class 3 track	65 km/h (40 mph)	97 km/h (60 mph)
Class 4 track	97 km/h (60 mph)	129 km/h (80 mph)
Class 5 track	129 km/h (80 mph)	153 km/h (95 mph)

Figure 10-1 - Clearance Distance (cd) for Grade Crossings
(a) For Grade Crossings with a Warning System or Railway Crossing Sign



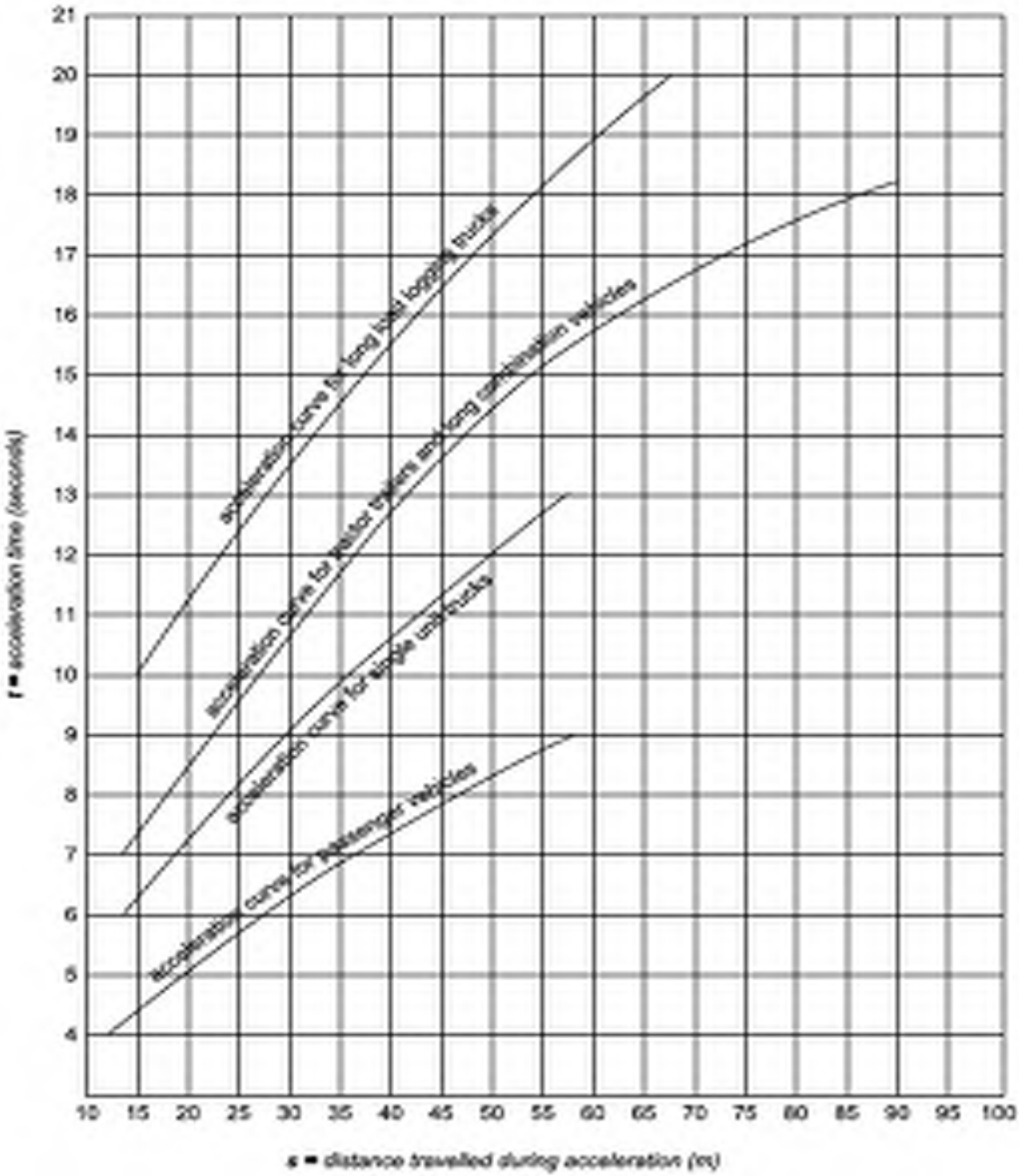
Grade Crossings Standards, July 2014

Table 10-1 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 & Buses	0.8	0.9	1.0	1.1	1.3
Tractor-Semitrailer	0.8	0.9	1.0	1.2	1.7

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 10-2 Assumed Acceleration Curves



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Sheet 4 **DESIGN CONSIDERATIONS**

Source	Item						SB Approach		NB Approach		Reference
	Design Vehicle										
Road	Type:	6	WB-20 Tractor-Semitrailers (WB-20)								Table 1* SOR 57
look-up	Length, **L:**		22.7	m							Table 1*
look-up	**Stopping Sight Distance, SSD**		45	m (round to 1.0% of grade)		=	10	m	45	m	Table 3*
measure	**Clearance Distance, cd**					=	50.3	m	50.3	m	GCS 16.1.1
calculate	**Vehicle Travel Distance, S**	**S= L+cd**	73.0	max <---		=	73.0	m	73.0	m	
look-up	**Vehicle Departure Time, t**					=	17.3	sec	17.3	sec	GCS Figure 10-2
Road V	Road Grade Effect:	maximum approach grade within 'S':				=	0.00	%	1.30	%	Sheet 7
look-up	grade adjustment factor (anto calc assumes Truck)(manual input from Table 10-1 if other)					=	1.00		1.10		GCS Table 10-1
calculate	**T**= t x adjustment factor					=	17.3	sec	19.0	sec	
	Design Vehicle Departure Time, T_D = J + T (where J = 2 sec (min.) perception & reaction)						2.0	sec	2.0	sec	
calculate	$T_{G\ stop} = T_D$=	21.0	sec			<-	19.3	sec	21.0	sec	GCS 10.3.2
observe	Do field acceleration times exceed T_D?	**Acceleration measurement beyond the scope of this assessment.**									
measure	**Pedestrian , cyclist & Assistive Devices Departure Time**			pedestrian **cd** distance		=	0.0	m	0.0	m	GCS 10.3.3
calculate	walking speed 1.22m/s max.	T_P =	0.0	sec	(1.0m/s used)	<-	0.0	sec	0.0	sec	
calculate	T_{SSD}	= (SSD+cd+L)/(0.277837 x $V_{road\ design}$) =	14.2	sec							

Comments Following Site Visit:

- **New crossing track installed recently on North approach (Turnout is still to be connected to track in Norhteast quadrant).**
- **Crossing now a 2 track crossing.**

Table 1 – Design vehicle Lengths/Class

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

Source: *Geometric Design Guide for Canadian Roads*, TAC; September 1999.

Table 6 – Minimum Sightlines along the Rail Line ($D_{stopped}$) (as illustrated in Figure 3)

Railway Design Speed V_r (mph)	$T_{stopped}$ = Departure Time (greater of T_d or T_p) (seconds)											If greater of T_d or T_p > 20 sec., add for each additional second (m)
	≤ 10	11	12	13	14	15	16	17	18	19	20	
WARNING: Railway design speed in mph!	Minimum Sightlines along Rail Line ($D_{stopped}$) (m)											
STOP	30	30	30	30	30	30	30	30	30	30	30	+0
1-10	45	50	55	60	65	70	72	76	80	85	90	+5
11-20	90	100	110	120	125	135	145	155	165	170	180	+10
21-30	135	150	165	175	190	205	215	230	245	255	270	+15
31-40	180	200	220	235	250	270	285	305	325	340	360	+20
41-50	225	250	270	290	315	335	360	380	405	425	450	+25
51-60	270	300	325	350	380	405	430	460	485	510	540	+30
61-70	315	350	380	415	445	470	505	535	565	595	630	+35
71-80	360	395	435	465	505	540	580	610	650	680	720	+40
81-90	405	445	490	535	570	605	650	685	730	765	810	+45
91-100	450	500	540	580	630	670	715	760	805	850	895	+50

Table 3 – Determine SSD for Truck Class

Road Crossing Design Speed V (km/hr)	Truck Class Stopping Sight Distance (SSD) (m)																				
	Road Approach Gradient																				
	-10%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
20	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	24	24	24	24	24
30	48	48	47	47	47	46	46	46	45	45	45	45	45	44	44	44	44	44	44	43	43
40	76	75	74	74	73	73	72	71	71	70	70	70	69	69	68	68	68	67	67	67	67
50	121	120	118	117	116	115	114	113	112	111	110	109	108	108	107	106	106	105	105	104	104
60	149	146	144	142	140	138	136	134	133	131	130	129	128	126	125	124	123	122	122	121	120
70	210	205	202	198	195	192	189	187	184	182	180	178	176	175	173	171	170	169	167	166	165
80	252	246	241	236	231	227	223	219	216	213	210	207	205	202	200	198	196	194	192	191	189
90	318	311	304	297	292	286	281	277	273	269	265	262	258	255	252	250	247	245	243	240	238
100	401	391	382	373	365	358	352	346	340	335	330	325	321	317	314	310	307	304	301	298	295
110	455	441	428	417	406	397	388	380	373	366	360	354	349	344	339	334	330	326	322	319	315

* Source: Transport Canada's "Determining Minimum Sightlines at Grade Crossings: A Guide for Road Authorities and Railway Companies"

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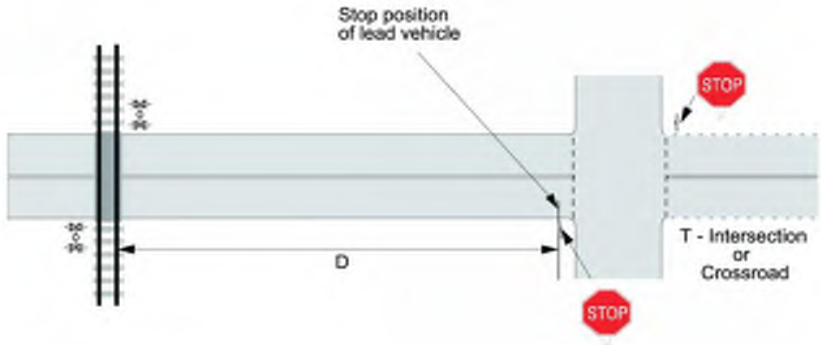
Sheet 5 **LOCATION of GRADE CROSSING**

Source	Item		Reference
observe	"D" should not be less than 30m for either approach if the train speed exceeds 15 mph. D = 24.4m,		GCS Section 9.1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	No	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks?	Yes	
	Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing?	No	

Comments Following Site Visit:
- The minimum "D" diminsion to the edge of Elevator Road. The Northern "D" is 25.9m.
- RAILWAY CROSSING AHEAD sign installed from previous inspection (2015)
- Railwayspeed = 10mph - Access to the SFPR in now blocked (south east of crossing)

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals

(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

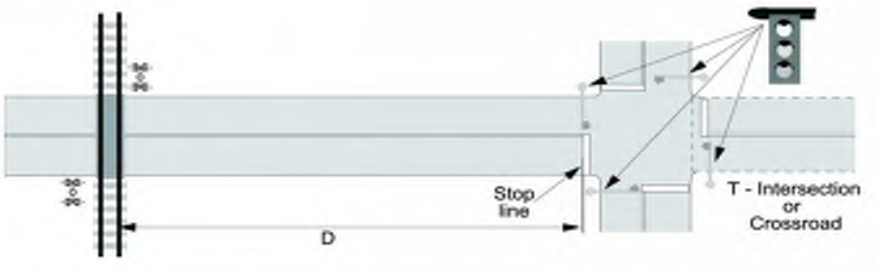
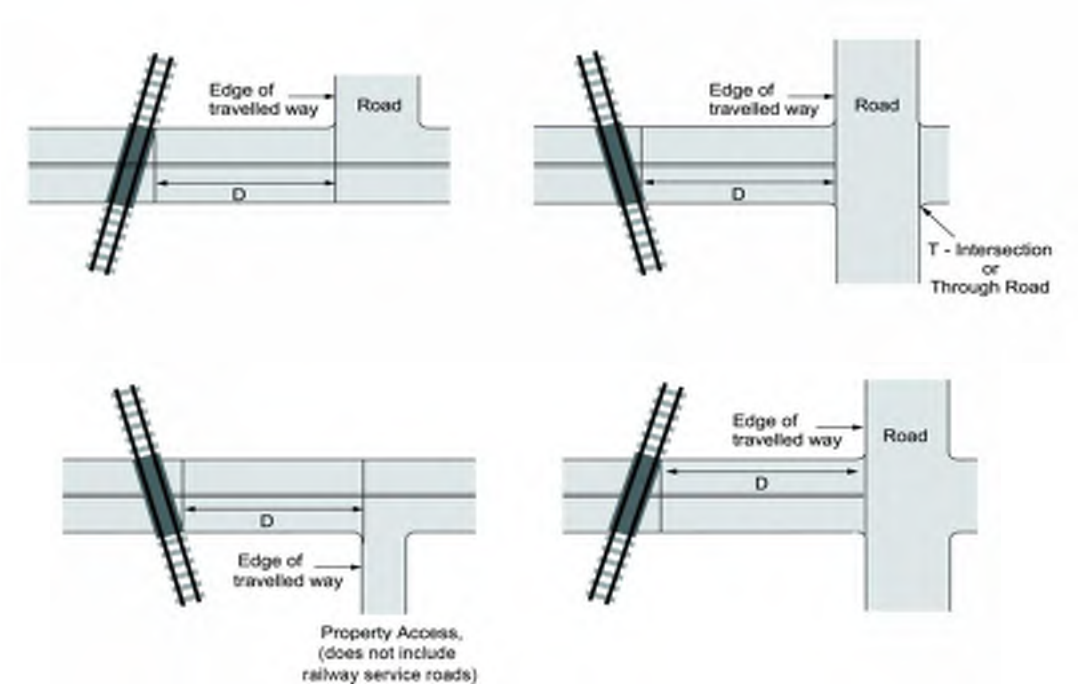


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings



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Sheet 6 **GRADE CROSSING SURFACE**

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? **Yes**								SOR 60; GCS 5
observe	Grade Crossing Surface Material: **Concrete Panels** Grade Crossing Surface Condition: **Good**								SOR 60; GCS 5
observe	Approach Road Surface Type: **Ashpalt** Approach Road Surface Condition: **Fair to Good** Roadway Illumination?: **No**								SOR 60; GCS 5
		SB Approach			**NB Approach**				
measure	Road Surface crossing width (perp. C.L. min. = 8.0m)		**9.8**	m					GCS 5.1
measure	Road Surface extension beyond travel lanes (min. = 0.5m)	**0.0**	m		**0.0**	m	Panels End within Road surface		GCS 5.1
measure	Sidewalk/Path/Trail crossing width (min. = 1.5m)		**NA**	m	**NA**	m			GCS 5.1
measure	Sidewalk/Path/Trail extension beyond sidewalk (min. = 0.5m)	**NA**	m		**NA**	m			GCS 5.1
measure	Distance Between Travel Lane and C.L. of Trail		**NA**	m					
	Cross-Section:		**South (Right) Rail:**			**North (Left) Rail:**			GCS Table 5-1
measure	Flangeway width (min. = 65mm; max.= 120mm or 75mm[1])		**75**	mm		**70**	mm		GCS Table 5-1
measure	Flangeway depth (min. = 50mm; max.= no limit or 75mm[1])		**40**	mm		**25**	mm		GCS Table 5-1
	Rural Field Side Gap:								GCS Table 5-1
measure	Side Gap width (max.= 120mm or 0[1])		**0**	mm		**0**	mm		GCS Table 5-1
measure	Side Gap depth (max.= no limit or 0[1])		**0**	mm		**0**	mm		GCS Table 5-1
	Wear Limits:								GCS Table 5-1
measure	Elevation of Top Rail above road surface (max. = 13mm[1], 25mm, or 50mm)		**0**	mm		**0**	mm		GCS Table 5-1
measure	Elevation of Top Rail below road surface (min. = -7mm[1],-25mm, or -50mm)		**0**	mm		**0**	mm		GCS Table 5-1

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Flangeway and field side gap constructed out of rubber. Some areas rubber is coming off.
- Crossing panels do not extend 0.5m past Asphalt
- Cracking of asphalt observed at the edges of the new crossing panels.

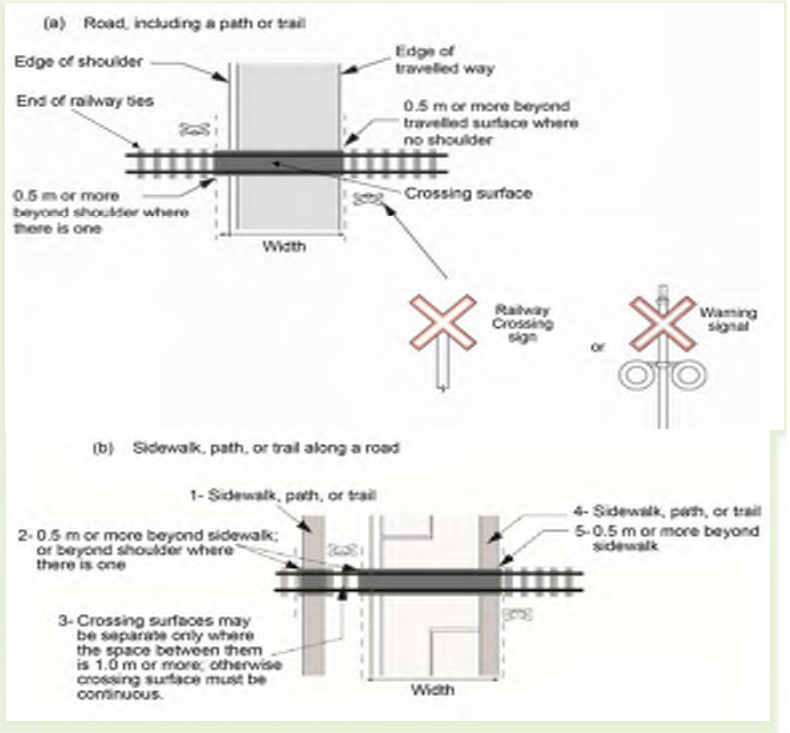
-rough crossing surface, loose timbers, etc. - difference between road grade and rail superelevation -surface distress of roadway approaches -photos

Grade Crossings Standards, July 2014

Table 5-1 – Grade Crossing Surface – Cross Section

a) Flangeway:		
Width	**Minimum**	65 mm
	Maximum for:	
	Public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	120 mm
Depth	**Minimum**	50 mm
	Maximum for:	
	Public sidewalks, paths and trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	No limit
(b) Field side gap A space is permitted on the outer side of the rail at rural locations, except for public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices		
	Maximum width	120 mm
	Maximum depth	No limit
(c) Elevation of the top of the rail with respect to the crossing surface The top of the crossing surface must be installed as close as possible to the top of the rail within the wear limits below:		
Wear limits:		
Public sidewalk, path or trail designated by the road authority for use by persons using assistive devices		
	Maximum distance of the top of the rail above crossing surface	13 mm
	Maximum distance of the top of the rail below crossing surface	7 mm
All other public grade crossings; the maximum distance of the top of the rail above or below the crossing surface		25 mm
Private grade crossings; the maximum distance of the top of the rail above or below the crossing surface		50 mm

Figure 5-1 - Grade Crossing Surface Dimensions



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Sheet 7 **ROAD GEOMETRY**

Source	Item									Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Are the road lanes at least the same width on the crossing as on the road approaches? WB Approach: **Yes** EB Approach: **Yes**									
	Grades		**SB Approach**		**NB Approach**		Difference: rail e & rd grade (GCS 6.1)			GCS Sect. 6
measure	Slope within 8m of nearest rail (max. = 2%)		**0.80**	%	**1.40**	%	**0.40%**	%	**0.70%**	Diff in Grade Max
measure	Slope between 8m & 18m of nearest rail (max. = 5%)		**0.00**	%	**1.30**	%				3%
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices (max. = 1[1] or 2%): slope within 5m of nearest rail =		**N/A**	%	**N/A**	%				
Road √	General approach grade (max. = +/- 5%)		**0.50**	%	**1.30**	%				
	measured over the SSD distance of:		**10**	m	**45**	m				Sheet 4
Rail √	Are rail tracks super-elevated?	**No**	Rate of s/e:	**0.00**	m/m Sdg	**0.00**	m/m ML			GCS Sect. 6.1 & 6.2
Road √	If train speeds exceed 15mph (70° minimum w/o warning system; 30° minimum with warning system): What is the angle between the crossing and the roadway?		=	**154.0**	degrees					
observe	**Condition of Road Approaches:** **Fair to Good** (e.g., anything that might affect stopping or acceleration)									SOR 60
observe	NA									

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- New track crossing has been install on north approach.

- New asphalt surface has been installed between crossings and north approach.

Grade Crossings Standards, July 2014

Table 6-1 – Difference in Gradient

Classification	Difference in Gradient (%)
RLU	2
RCU	1
RCD	1
RAU	0
RAD	0
RFD	-
ULU	3
UCU	2
UCD	2
UAU	0

*Legend

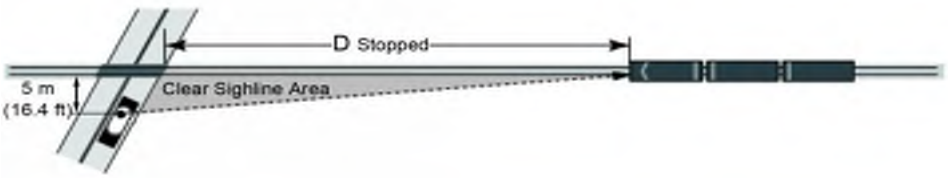
Urban (U) Rural (R) Local (L) Collector (C) Arterial(A) Expressway (E) Freeway(F)

Divided (D) Undivided (U)

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 7-1 - Minimum Sightlines - Grade Crossings

(a) Sightlines for Users Stopped at a Grade Crossing (applicable to all quadrants)



(b) Sightlines for Users Approaching Grade Crossing (applicable to all quadrants)

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Sheet 8 **SIGHTLINES**

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 **Yes**							
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location **Yes**							
				SB Approach		**NB Approach**		
look-up	**SSD** minimum =			**10**	m	**45**	m	Sheet 4
measure	**SSD Actual** (not including turning movements)**:**			**250.0**	m	**60.0**	m	
calculate	D_{SSD}	=	$0.277837 \times V_{train\ km/h} \times T_{SSD}$	**63**	m	**63**	m	1.609 convert mph to km/h
calculate	$D_{STOPPED}$ minimum (m)	=	$0.277837 \times V_{train\ km/h} \times T_D$ =	**86**	m	**94**	m	T_D from Sheet 4
measure	$D_{STOPPED}$ **Actual**:		Driver looking LEFT	**200**	m (ne)	**175**	m (sw)	
			Driver looking RIGHT	**30**	m (nw)	**110**	m (se)	
calculate	**Ped./Cyclist** $D_{STOPPED}$ **(m)**			**0**	m	**0**	m	T_P from Sheet 4
measure	**Ped./Cyclist** $D_{STOPPED}$ **Actual:**		Person looking LEFT	**N/A**	m	**N/A**	m	
	note: measured from a point 2m in advance of sign/signals		Person looking RIGHT	**N/A**	m	**N/A**	m	
observe	Are there any obstacles within the sight triangles other than traffic signs/utility poles that might affect visibility? **Minor vegetatin. Construction material located within new northern crossing.**							

Comments Following Site Visit:
- Minor vegetatin in all sight trianlges.
- Northwest Quadrent impacted by embankment and vegetation
- East sightlines clear down yard tracks.

-can sightlines be maintained on an ongoing basis? (snow) -photos

Figure 8-3 - Location of Railway Crossing Signs and Number of Tracks Signs (public grade crossings without warning systems)

a) **b)**

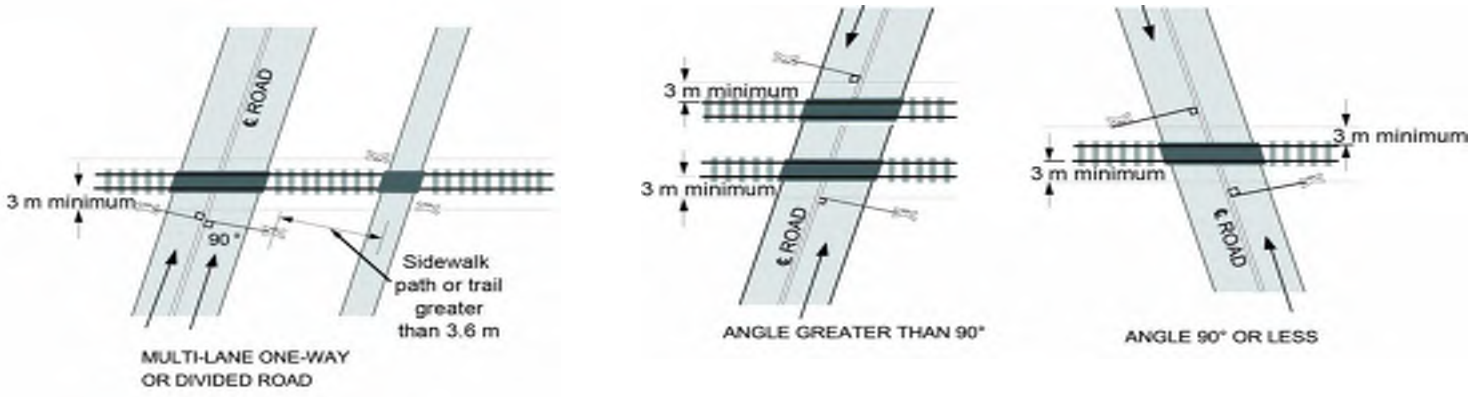
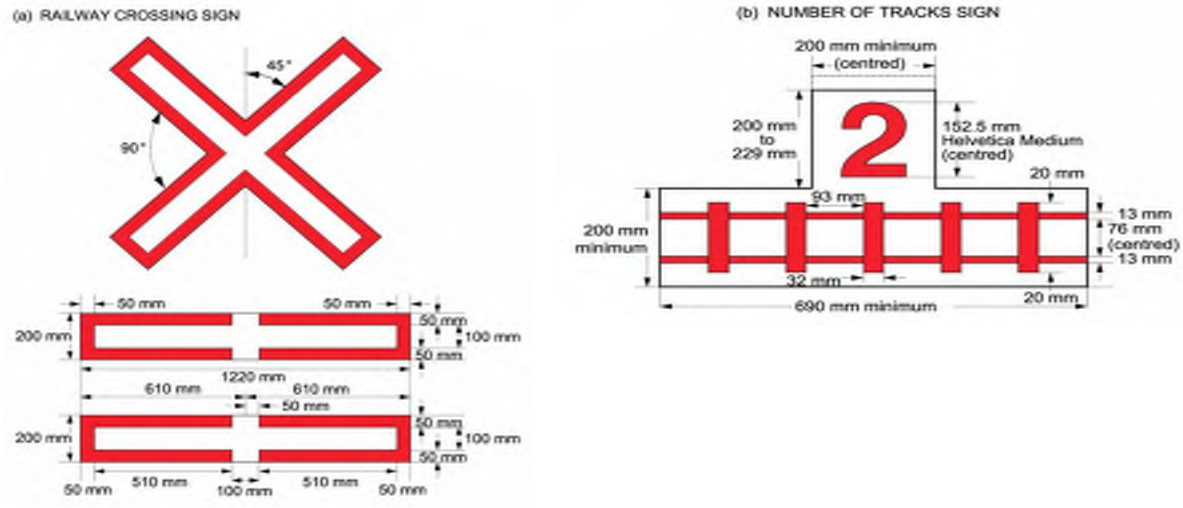


Figure 8-1 - Railway Crossing Sign and Number of Tracks Sign



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Sheet 9a **SIGNS AND PAVEMENT MARKINGS**

Source	Item							Reference
	Railway Crossing Sign  **These signs will be required**							MUTCD
		SB Approach		**NB Approach**				
measure	distance from nearest rail:	**12.8**	m	**6.4**	m			
measure	distance from edge of road:	**1.6**	m	**2.0**	m			
measure	height of centre of crossbucks:	**2.5**	m	**2.5**	m			
measure	retroreflectivity readings:	**N/A**	cd/lux/m^2	**N/A**	cd/lux/m^2			
observe	Number of Tracks sign? **Yes**							
observe	A Stop Sign must be installed at grade crossing without a warning system if the road design speed is less than 15mph					Yes/ No/ NA	**Yes**	SOR 64
observe	A Stop Ahead sign must be installed if the Stop Sigh is not clearly cvisable within the Stopping Distance					Yes/ No/ NA	**N/A**	SOR 65

Comments Following Site Visit:

- New RAILWAY CROSSING signs installed in 2015.

- The back of poles and signs have reflective strips (reflectivity not measured).

- NUMBER OF TRACKS Sign not required as only 1 track.

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

Source	Item		Reference
	DO NOT STOP ON TRACKS 		MUTCD
Road V	Does queued traffic routinely encroach closer than 5m from the crossing surface?	**No**	
observe	Are these signs present on either approach?	**No**	

Comments Following Site Visit:

- DO NOT STOP ON TRACKS Sign installed below RAILWAY CROSSING AHEAD sign.

-general condition -posts -photos

Source	Item					Reference
	Railway Crossing Ahead Sign (WA 18-20) 					MUTCD & SOR 66
look-up	Is AADT > 100? **Yes**		**SB Approach**	**NB Approach**		Sheet 3
observe	Is area urban such that WA 18-20 is not required?		**Yes**	**Yes**		
measure	Distance from nearest rail to sign	=	**29.7** m	**50+** m		MUTCD
observe	height:		**2.2**	**2.2**		
observe	appropriate orientation of symbol		**Yes**	**Yes**		

Comments Following Site Visit:

- RAILWAY CROSSING AHEAD Sign has been installed correctly since the previous inspection.

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

Source	Item			Reference
	ADVISORY SPEED SIGN 			MUTCD & SOR 66 (2)
observe	Are they present on both approaches?	**Yes**		
	Posted speed limit?	**30**	km/h	
look-up	Are they required on either approach?	**No**		check SSD (Sheet 8)

Comments Following Site Visit:

- ADVISORY SPEED Sign installed on the North approach

-general condition -posts -photos

Mile117.63 Spur 2.82 (75 Robson Road),VFPA/ BNFS
Surrey, British Columbia

Sheet 9b **SIGNS AND PAVEMENT MARKINGS**

Source	Item		Reference
	EMERGENCY NOTIFICATION		GCS Sect. 8.5
observe	Are these signs present on both approaches?	**Yes**	
observe	Is the information complete and legible?	**Yes**	

Comments Following Site Visit:
- EMERGENCY NOTIFICATION Sign installed below RAILWAY CROSSING Sign
- Vegetation slighly blocking South approach sign.

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

Source	Item		Reference
	PAVEMENT MARKINGS		
observe	Are pavement markings consistent with those from the MUTCD Manual?	**Yes**	Fig C1-6 MUTCD
observe	Are there lines to delineate sidewalks/paths?	**N/A**	

Comments Following Site Visit:
- Road markings and DOUBLE STOP BARS have been repainted since the 2015 inspection.
- Roadway "X" marking REQUIRED on North Approach as per MUTCD. South Approach needs repainted.
- MUTCD compliant pavement markings need to painted across new crossing surface.

-special sign required? -missing signs -visual clutter -obscured view/sightlines -retroreflectivty levels at night
-general condition of markings -are centrelines or stop lines present? -width of markings? -provincial practice not to use *X* ?

GENERAL ASPECTS C1

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA

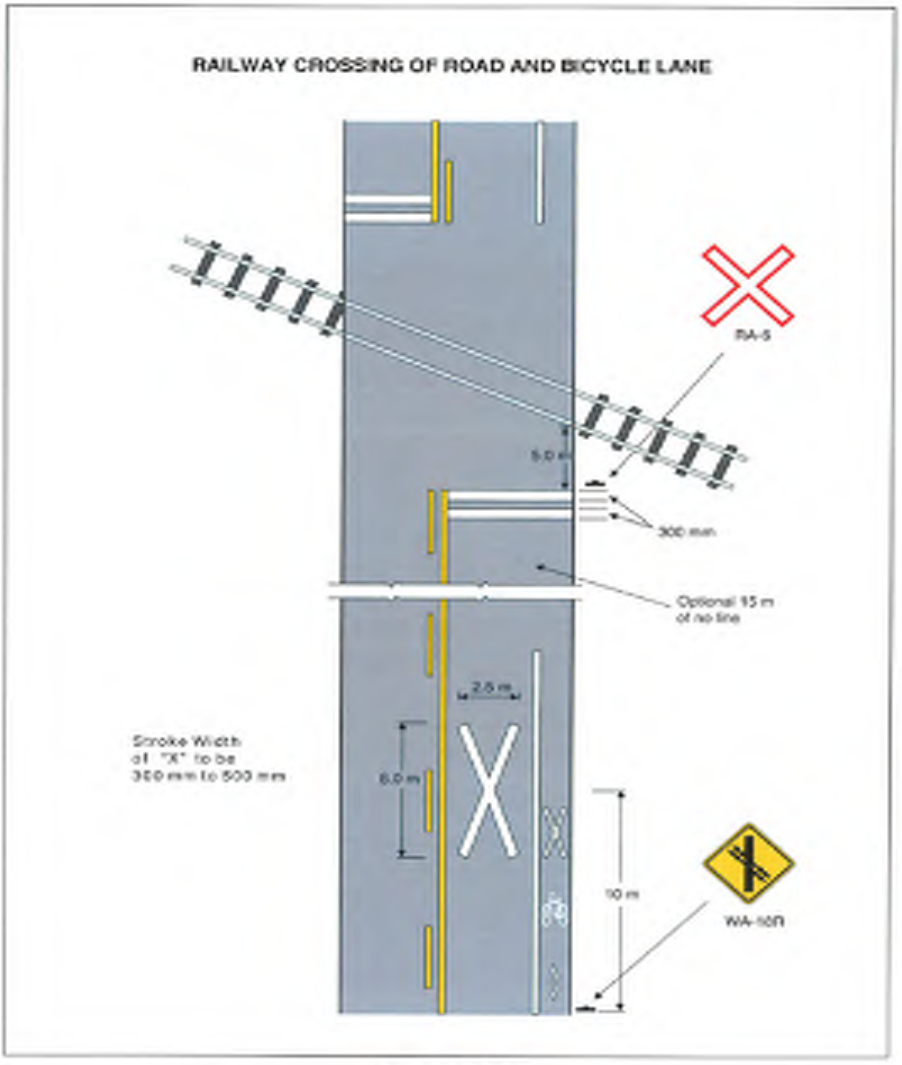
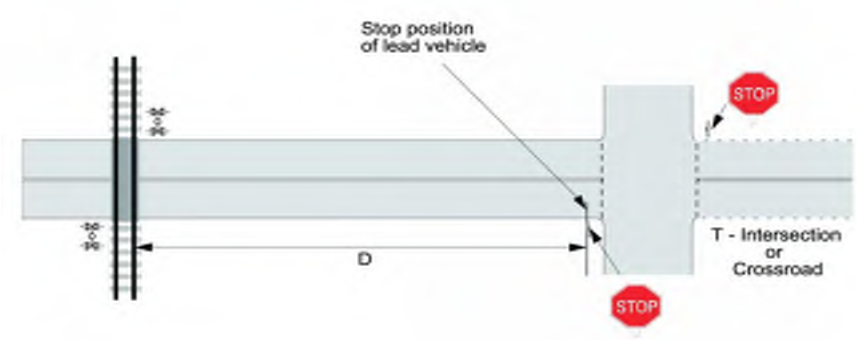


FIGURE C1-6

JANUARY 2014

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings

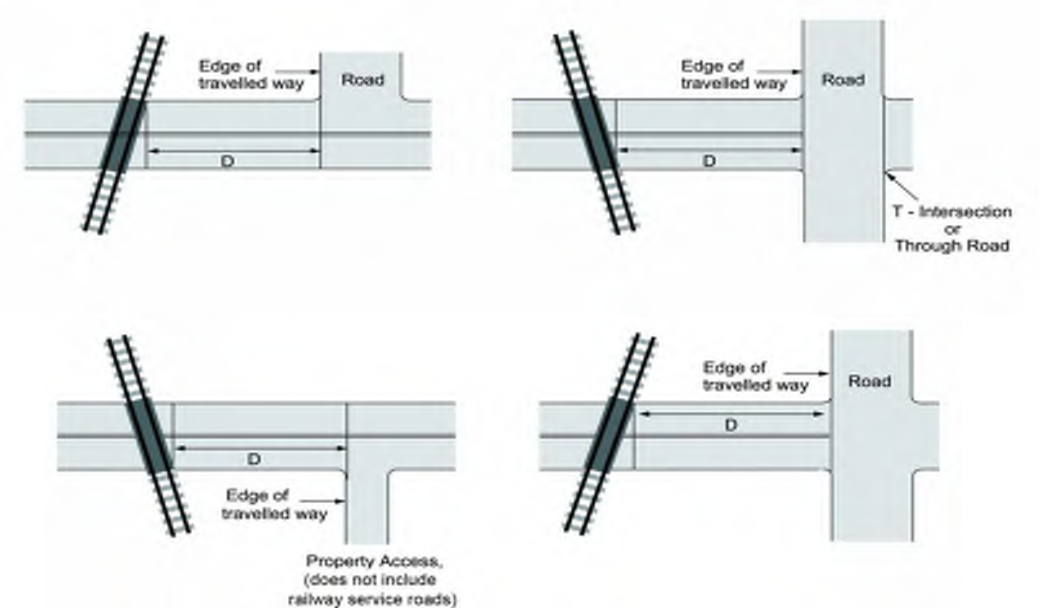
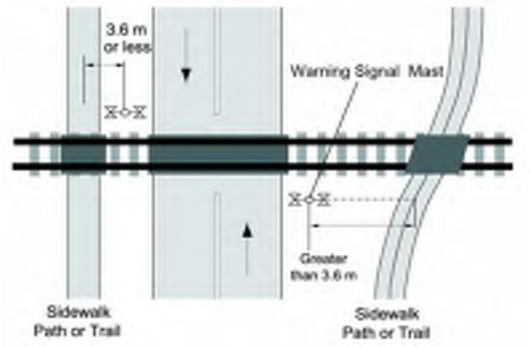
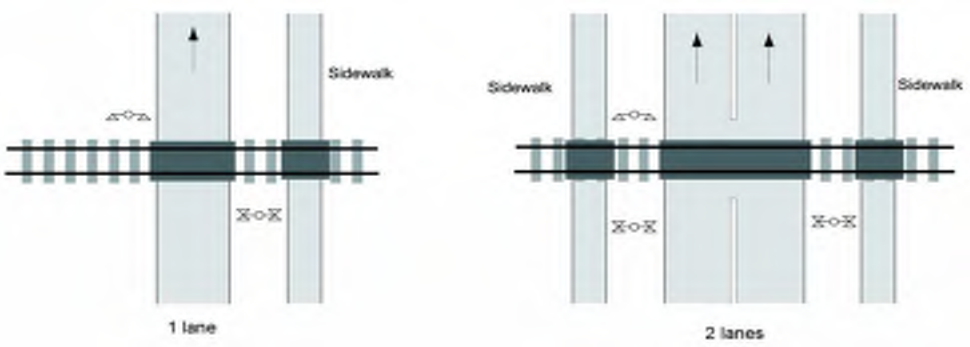


Figure 13-2 - Sidewalks, Paths and Trails
(a) Two Way



(b) One-Way



Sheet 10 eliminated in the new GCS

Mile117.63 Spur 2.82 (75 Robson Road),VFPA/ BNFS
Surrey, British Columbia

Sheet 11 — **GRADE CROSSING WARNING SYSTEMS** — **GCS Section 9**

Source	Item is not required.									Reference
	Warning System Warrants if any of A through E below are met, then a warning system is warranted									
	Question							**Warrant for Warning System**		
look-up	Existing AADT =	1,780	Forecast AADT =	980						Sheet 3
look-up	Daily Train Volume =	30			trains					Sheet 3
calculate	**A. Cross-Product =**	29,400						> 2,000 FLB req'd	**> 50,000 requires gates**	
look-up	**B. Maximum Rail Operating Speed =**		10		mph			(max = 80mph or 50 mph with crosswalk)		Sheet 3
Rail	**C. Number of Tracks =**		2							
	if ≥ 2, can trains pass one another?		Yes					if ≥ 2 and trains can pass one another -> FLB req'd		
look-up	**D. Are Sightlines obscured?**		Yes					if "Yes" -> FLB req'd: If Fig 7.1 applies --> add G		Sheet 8 & Fig 7.1
observe	**E. Are any proximity conditions met?**		Yes					if "Yes" -> FLB required.		GCS Sect 9 & 11
look-up	Is a Warning System warranted?		Yes					If any of A through E above meet the Warrant		
	Field Visit	**Present? (Y/N)**	**Condition / Alignment:**							GCS 13
observe	Light Units,	N								GCS 13
observe	Bells,	N								GCS 13
observe	Gates,	N								GCS 13
observe	Cantilever Lights,	N								GCS 13
observe	Check that warning signal assemblies and cantilevers are in accordance with GCS Figures.									GCS Sect. 12
observe	Is warning system housing at least 9m from traveled way of the road and 8m from the nearest rail?									
observe	If there is a sidewalk, is a bell on the adjacent assembly?									
Rail √	Have all light units been aligned?	**NA**	Date?	**NA**						
Rail	Design Approach Warning Time (greatest of):			20sec OR [20+((cd-11)/3)] if cd>11m	Td	Tp	Gate Clearance Time + Descent Time + 5 seconds	Traffic Signal Clearance Time (=0 if no traffic signal)	(SSD + cd + L)/(0.277837xVv)	
	SB Approach	38.0	sec	33.1	19.3	0.0	38.0	0.0	10.0	
	NB Approach	38.0	sec	33.1	21.0	0.0	38.0	0.0	14.2	
observe	Is warning time less than 35 sec (without gates) or 55 sec (with gates)			**N/A**						

Comments Following Site Visit:

- Based on the AADT, Rail traffic volumes and sightlines an active warning system with gates is required for this crossing.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted?

Figure 12-1 - Warning Signal Assemblies

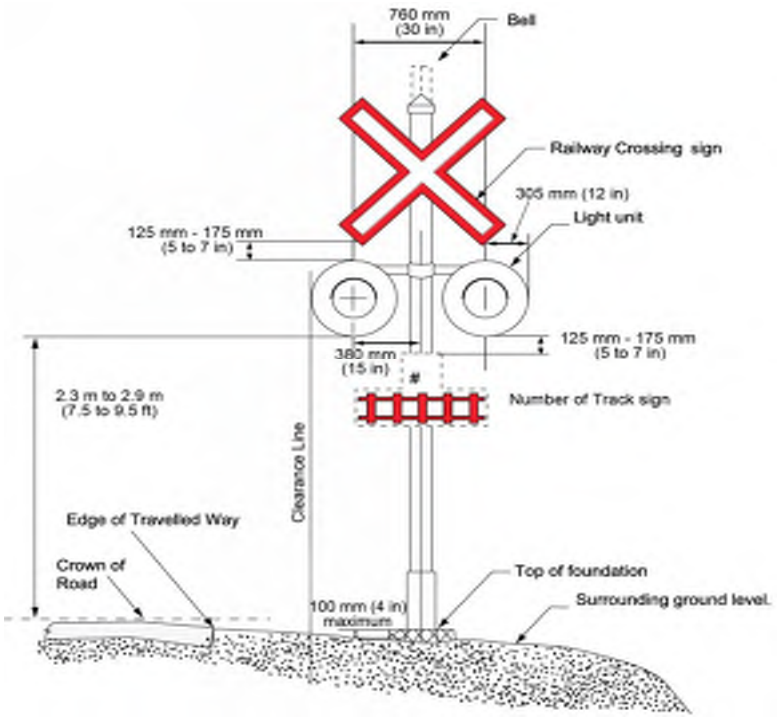
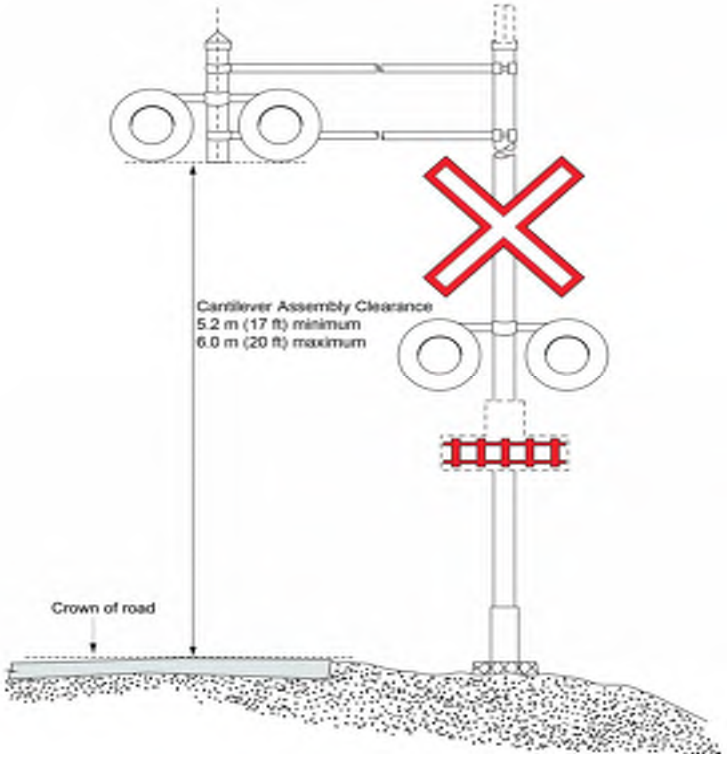


Figure 12-3 - Cantilevers



Mile117.63 Spur 2.82 (75 Robson Road),VFPA/ BNFS
Surrey, British Columbia

Sheet 12  **GATES FOR GRADE CROSSING WARNING SYSTEMS** **GCS Section 9**

Source	Item							Reference
	Warning System Warrants -if any of A through E below are met then a warning system with gates is warranted. **Not required as qwarning system is not necessary**							
calculate	**A. Cross-Product =**	**29400**	(50,000 min)					
look-up	**B. Maximum Rail Operating Speed =**	**10**	mph (max = 50mph)					Sheet 3
Rail v	**C. Number of Tracks =**	**2**						
	.....if ≥ 2 , can trains pass one another?	**N/A**						
look-up	**D. Is $D_{STOPPED}$ Insufficient?**	**Yes**	**Minor vegetation work required on Northwest and Southwest quadrants.**					Sheet 8
observe	**E. Are any proximity conditions met?**	**Yes**						
calculate	Gate clearance distance: eq 10.4b	**24.7**	m cd $_{G\ stop}$	**34.7**	m cd SSD SB	**69.7**	m cd SSD NB	GCS Sect. 10.4
look-up	travel time =	**21.0**	sec $_{G\ stop}$					
calculate	Gate arm clearance times:	**19.3**	sec SB from stop	$T_{G\ ssd}$ = **4.2**	sec SB from SSD			
		21.0	sec NB from stop	$T_{G\ ssd}$ = **8.4**	sec NB from SSD			
look-up	Gate arm delay time: **21.0**	sec (greatest value from above)						
calculate	effect of grade =	**0.0**	sec (SB from Stop)	**-4.2**	sec SB from SSD			
		2.0	sec (NB from Stop)	**0.0**	sec NB from SSD			
measure	Measure gate arm delay and compare with above:	**N/A**						
observe	Do gates conform to standards depicted in GCS Figures?	**N/A**						
observe	Check gate descent (10 to 15 sec) and ascent (6 to 12 sec)	**N/A**						
observe	Is gate striping vertical as depicted in GCS Figures?	**N/A**						
observe	Where railway equipment regularly stops, or railway equipment is left standing, within the activating limits of a warning system, the warning system must be equipped with a control feature to minimize the operation of the warning system.				Yes/No/NA	**NA**		GCS 16.3.1

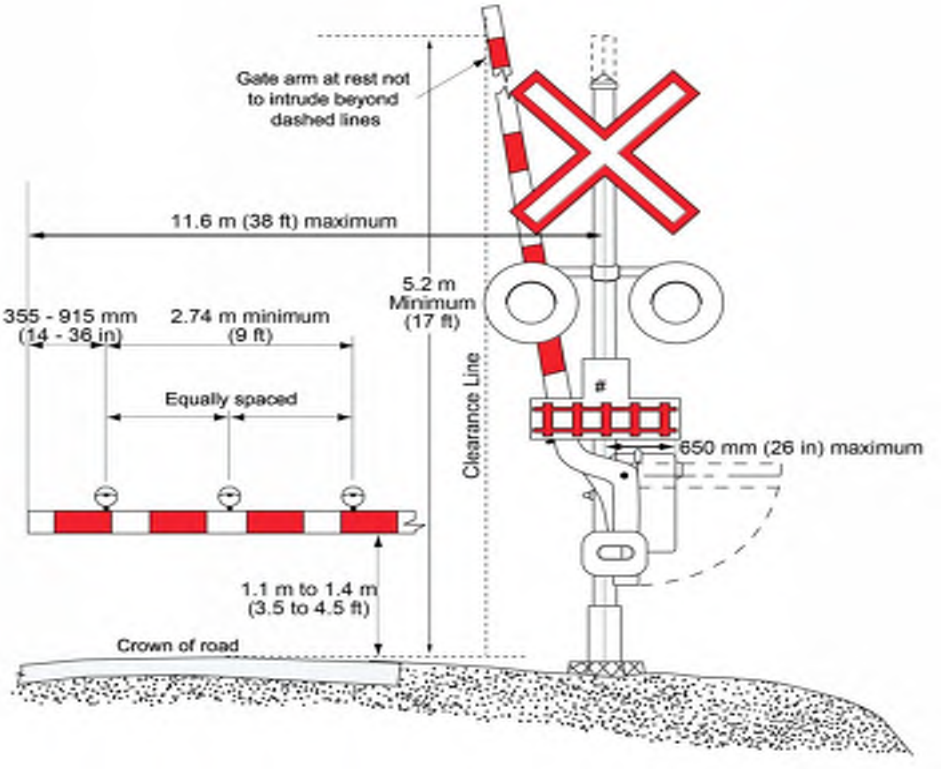
Comments Following Site Visit:

- An active warning system with gates is required ate this crossing.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted? **No**

Figure 12-2 - Gates



Mile117.63 Spur 2.82 (75 Robson Road),VFPA/ BNFS
Surrey, British Columbia

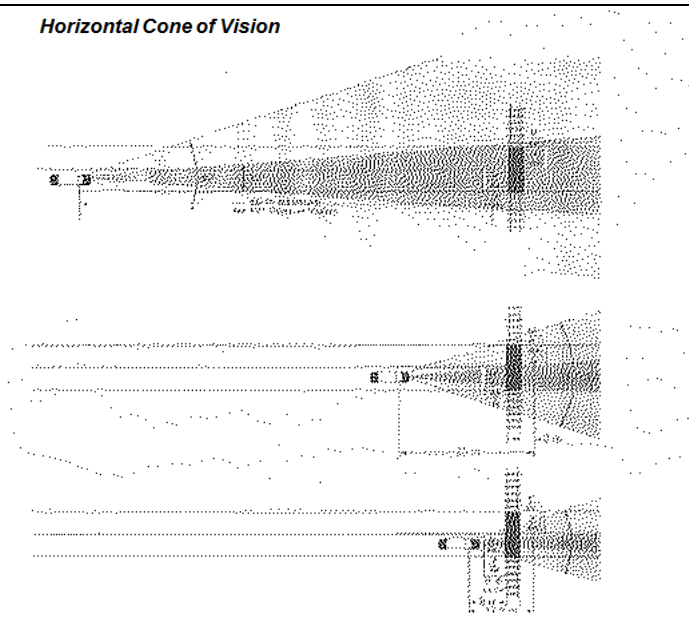
Sheet 13 **FLASHING LIGHT UNITS**

Note: Driver's cone of vision is ± 5° horizontally; limited by top of windshield vertically. GCS Sections 12-14

Source	Item is not required as warning system is not required.				u
	Number and Location				
look-up	Minimum Distance for Primary Light Units (SSD) =	45.0	m		
look-up	Recommended Distance for Primary Light Units =	69.7	m		
observe	Are flashing light units located within 5° horizontally of the centerline of the road (throughout the approach distance above)?			Yes (covered by front and back units)	
	Does horizontal/vertical curvature necessitate supplemental units?			N/A	
observe	Can back lights be seen by all stopped drivers?			N/A	
observe	Are lights obscured by vehicles stopped on adjacent intersections?			N/A	
observe	Are additional light units required for drivers as they begin to turn onto an approach road from an intersecting road/lane/pkg lot?			N/A	
	Cantilevered Light Units				
measure	Does D_R exceed 7.7m?	N/A			
measure	Does D_L exceed 8.7m?	N/A	(Assumes signal poles on both sides of road alignment, approach side of rail)		
	Multiple Lanes				
observe	Can front light units be seen by drivers in all lanes (….would T/T obscure?)?	N/A			
observe	Can back light units be seen by all stopped drivers in all lanes?	N/A			
	Sidewalks, paths, trails, etc.				
measure	Distance from path centerline to signal mast =	N/A	m (max.=3.6m)		
observe	Are separate light units required?	N/A			

Comments Following Site Visit:
- FLASHING LIGHTS were not observed at the crossing.

Horizontal Cone of Vision



Typical Light Unit Arrangement for an Adjacent Intersection

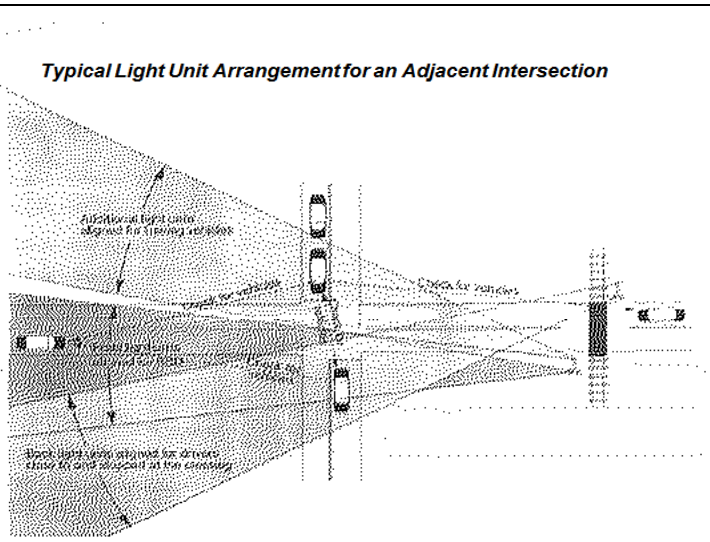
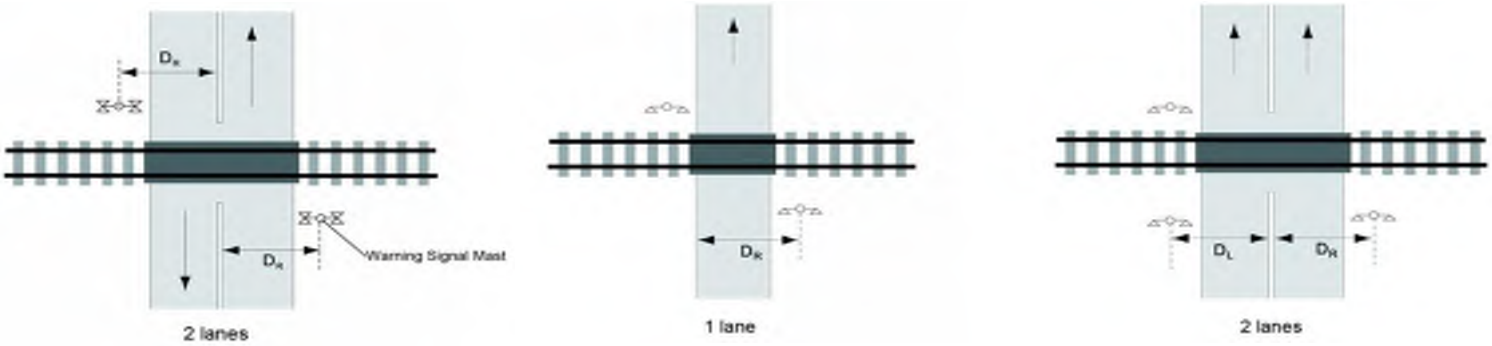


Figure 13-1 – Warning Signal Offsets Requiring Cantilevered Light Units

(a) Two-Way Road ***(b) One-Way or Divided Road***



Mile117.63 Spur 2.82 (75 Robson Road),VFPA/ BNFS
Surrey, British Columbia

Sheet 14

PREPARE TO STOP AT RAILWAY CROSSING SIGN

GCS Sections 13 and 14

Source	Item NA			Reference
observe	Are signs present?	**No** EB approach **No** WB approach		SOR 67 (1), (2) GCS 18.21 & 18.2
look-up	Minimum Distance for Primary Light Units (SSD)	**N/A**	m	Sheet 13
look-up	Recommended distance for Primary Light Units	**N/A**	m	Sheet 13
	Warrants			
observe	Are all front light units obscured within minimum distance above?	**N/A**		
look-up	Is the facility designated a "freeway" or "expressway"?	**N/A**		Sheet 3
observe	Do environmental conditions frequently obscure signal visibility?	**N/A**		
	Considering maximum prevailing speeds, geometry, and traffic composition, checkthe following:			
observe	Does sign flash during operation of grade crossing warning system?	**N/A**		
measure	Distance from the sign to 2.4m beyond the furthest rail =	**N/A**		
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?	**N/A**		
measure	Distance from the sign to the closest gate =	**N/A**	m	
observe	Does the flashing sign precede actuation of the descent of the gate arms by the time required to travel from the sign to clear closest gate?	**N/A**		
measure	Time required for all queued vehicles to resume to maximum road operating speed =	**N/A**	sec	

Comments Following Site Visit:

- No PREPARE TO STOP AT RAILWAY CROSSING Signs were observed at crossing.

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

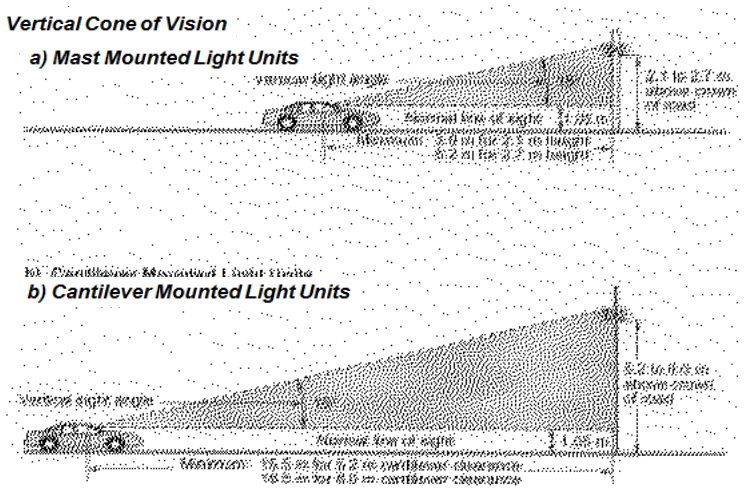
Sheet 15

PREEMPTION OF TRAFFIC SIGNALS

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

Comments Following Site Visit:

-functions as intended



Grade Crossings Standards, July 2014

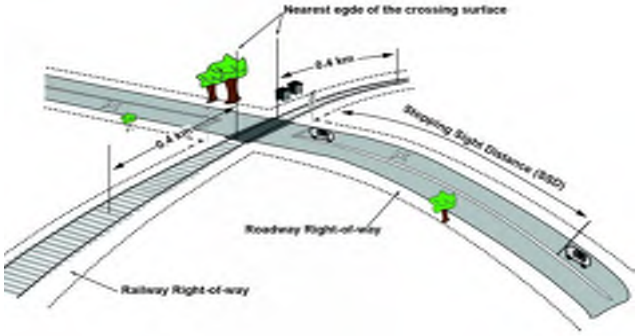
APPENDIX D – WHISTLING CESSATION

Table D-1 – Requirements for Warning Systems at Public Grade Crossings within an Area without Whistling

	Column A		Column B	
Railway Design Speed	Grade Crossings for Vehicle Use		Grade Crossings For Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Column 1	*Column 2*	*Column 3*	*Column 4*	*Column 5*
1 – 25 km/h (15 mph)	FLB	FLB	No warning system requirement	No warning system requirements
25 – 81 km/h (16 – 50 mph)	FLB	FLB & G	FLB	FLB & G
Over 81 km/h (50 mph)	FLB & G	FLB & G	FLB & G	FLB & G

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

Figure D-1 - prescribed area for whistling cessation as per article 23.1 of the RSA



RSA = Railway Safety Act of Canada

Source	Item					Reference
Rail	Is train whistling prohibited at this crossing?	**No**	24 hours?	**No**		
observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?			**No**		
observe	Are the requirements of Table D-1 met?	**No**				

Comments Following Site Visit:
- Whistle Cessation not required

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:

END OF FIELD DATA FORMS

VFPA
REPORT NUMBER: 20-0173

VFPA FSPL TRANSPORTATION IMPROVEMENTS PROJECT

02 – MILE 117.63 SPUR 0.04, 65 ROBSON ROAD,

FEBRUARY 09, 2021

REVISION HISTORY

FINAL ISSUE

2020/09/03	FIRST DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2020/10/21	SECOND DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2021/02/09	FINAL			
Prepared by	Reviewed by	Approved By		
P. McCabe, Track Designer	G. Smith, Senior Project Engineer	R. Sewell, Senior Project Engineer		

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PREPARED BY

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Track Designer

09/02/2021
Date

Robert Sewell, P.Eng
Senior Project Engineer

09/02/2021
Date

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TABLE OF CONTENTS

1 CROSSING OVERVIEW

WSP Canada Group Limited (WSP) has been contracted as part of the Fraser Surrey Port Lands – Transportation Improvements Preliminary Design Services project, to complete a Railway Crossing Safety Assessment on the 65 Robson Road grade crossing. The Vancouver Fraser Port Authority (VFPA) owned crossing is located within the Vancouver Frasier Port Authority (VFPA), Fraser Surrey Docklands. The crossing is located along the Canadian National (CN) Brownsville Spur which comes off Mile 117 of the Yale Subdivision.

A Railway Crossing Field Safety Assessment was undertaken on the 23rd of July 2020 and updates the previous Railway Crossing Assessment undertaken by WSP (formally MMM Group) on the 5th of May 2015. The Railway Crossing Assessment as conducted follows the guidelines of applicable requirements identified in the most recent edition of Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossing Standards (GCS).

The crossing is a passive protected crossing (SRCS), equipped with two RAILWAY CROSSING and STOP signs, located within an industrial area. A Tractor Trailer (WB-20) is the design vehicle used to represent daily traffic on port property. The Railway traffic volumes were provided by the VFPA while the Average Annual Daily Traffic (AADT) was calculated based on the realigned infrastructure.

This report aims to identify the modifications to the grade crossing since the previous inspection completed by MMM Group in 2015, as well as highlight any new or previously identified non-compliances still relevant to this crossing.

1.1 LOCATION

The Robson Road grade crossing is located within Fraser Surrey Docks jurisdiction at 65 Robson Road and crosses the VFPA spur track. The crossing is located at the latitude and longitude of 49°10'58" and 112°54'32" respectfully. Figure 1, below shows the location of the crossing.

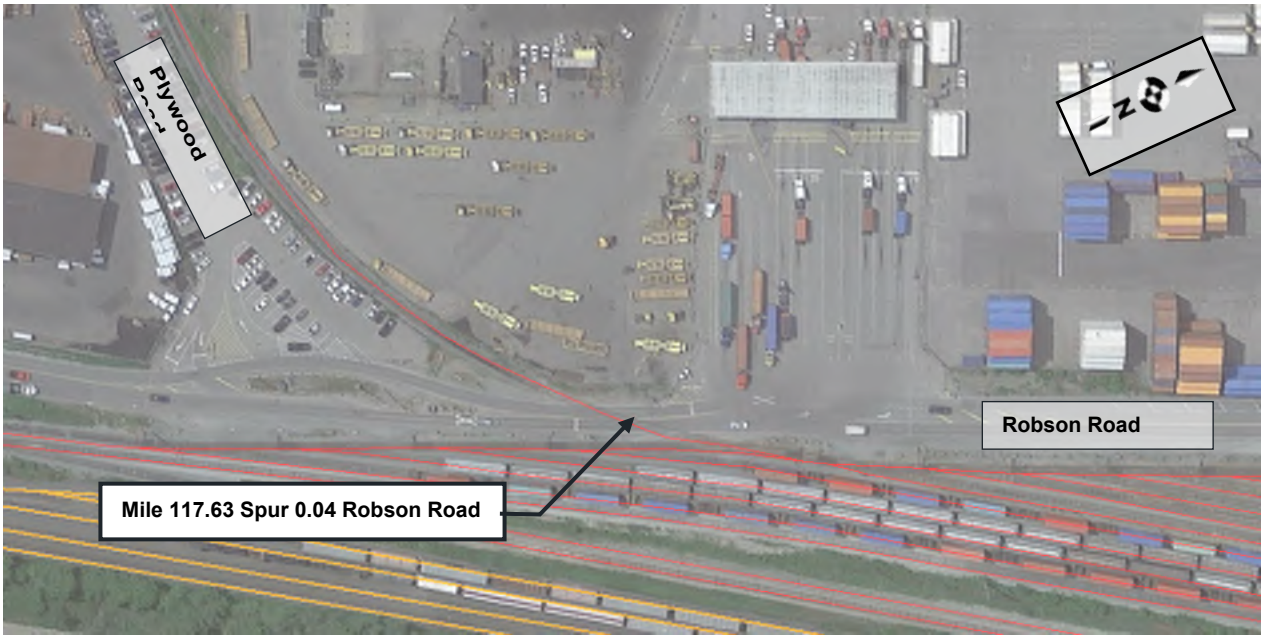


Figure 1: Crossing Location (source: Google Earth, 2020)

2 SAFETY ASSESSMENT

2.1 PREVIOUS ASSESSMENT (2015)

A previous crossing assessment was undertaken in 2015 by WSP for the 65 Robson Road crossing. The objective of the assessment was to:

- Reduce crash risk within the grade crossing environment.
- Minimize the frequency and severity of preventable crashes.
- Consider the safety of all grade crossing users.
- Verify compliance of the technical standards referred to in the Railway Safety Act / Grade Crossing Regulations and contained in the Grade Crossing Standards.
- 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 outcome of the 2015 assessment offered recommendations for consideration by the VFPA.

Table 1: Previous Non-Compliances, illustrates the non-compliances and recommendations offered within the 2015 report. The recommendations were categorised within the three priority levels;

- Low - implement the measures as soon as practicable
- Medium - implement the measures by Transport Canada GCS & GCR November 2021 deadline.
- High - implement the measures forthwith

Table 1: Previous Non-Compliances

Observations	Suggested Actions	Priority	Addressed?
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Railway crossing surface does not extend at least 0.5m beyond the edge of the travelled way on both approaches.	Extend railway crossing surface to extend at least 0.5m beyond the edge of the travelled way	High	No – Asphalt has been added since 2015 inspection. However, the extension is breaking and insufficient
b. Flangeway depth does not meet the requirement due to debris.	Clean debris from the flangeway. Once debris is removed from the flangeway, the railway company is to ensure the minimum depth is met.	High	No – Debris remains within flangeway
GCS Section 4 – Railway Crossing and Number of Tracks Sign (Basic Requirement)			
a. RAILWAY CROSSING sign not present on south approach.	Install RAILWAY CROSSING sign on south approach as per GCS Section 8.1	High	Yes –New RAILWAY CROSSING Signs has been installed.
b. RAILWAY CROSSING sign is faded on the north approach and is located too close to the edge of travelled way	Replace RAILWAY CROSSING sign on the north approach as per GCS Section 8.1 and relocate sign as per GCS Section 4.1.	High	Yes – New RAILWAY CROSSING Sign installed in compliance with GCS
GCS Section 5 – Crossing Surface			
a. The approach road surface at the grade crossing has cracks	Repave crossing surface of the grade crossing such that it is smooth and continuous	Medium	No – Cracks have worsened between inspections.
GCS Section 7 – Sightlines			

a. Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to fences and an equipment yard on the northwest corner, and track geometry of the southwest corner of the crossing	If minimum sightlines cannot be provided and maintained, then a warning system with gates is required.	Medium	No – Fence/ storage yard remain
GCS Section 8 – Signs			
a. Retroreflective strips are not provided on the back of the RAILWAY CROSSING sign and both sides of the sign supporting post	Mount retroreflective strips on the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Medium	Yes – retroreflective strips installed on back of both RAILWAY CROSSING Signs and poles
b. RAILWAY CROSSING AHEAD signs are not present on either approach of the crossing.	Install RAILWAY CROSSING AHEAD signs on both approaches of Robson Road as per BCMoT's Signage and Pavement Manual (2000).	Medium	Yes – RAILWAY CROSSING AHEAD Signs installed on both approaches.
c. STOP signs are not present on either approach of the crossing.	Install STOP signs on same post as RAILWAY CROSSING signs as per GCS Section 8.4.	Medium	Yes – STOP Signs installed below RAILWAY CROSSING Signs.
d. EMERGENCY NOTIFICATION signs are not present on either approach of the crossing	Install EMERGENCY NOTIFICATION sign on both approaches as per GCS Section 8.5	Medium	Yes – EMERGENCY NOTIFICATION Signs installed below STOP Signs.
e. Double stop bars and RAILWAY CROSSING symbol pavement markings are not present on either approach to the crossing for vehicles.	Paint double stop bars and RAILWAY CROSSING symbol pavement markings on both road approaches	Low	Yes - Double stop bars have been installed but need repainting.
f. Stopping or parking restriction is not observed at the railway right-of-way	Install NO STOPPING signs within the railway right-of-way	Low	Yes – DO NOT STOP ON TRACKS Sign installed below RAILWAY AHEAD Sign on both approaches.
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system without gates is warranted based on cross-product	Install active warning system without gates. However, Transport Canada indicated that the crossing could stay passive indefinitely unless the sightline requirements could not be met.	Low	No

2.2 CROSSING MODIFICATIONS

As shown in Appendix A: Site Photographs, a number of changes have occurred at the crossing between inspections. Most changes were based on recommendations outlined in the 2015 inspection.

Table 1, shows what changes have been made based on the 2015 recommendations. Below is a summarised list of all the changes observed from the site inspection:

- New grade crossing signage, including;
  - RAILWAY CROSSING Signs
  - STOP Signs
  - EMERGECNY NOTIFACATION Signs
  - RAILWAY CROSSING AHEAD signs
  - DO NOT STOP ON TRACKS Signs
- New MUTCD compliant pavement marking
- A small amount of asphalt installed on both sides of crossing.

2.3 ASSESSMENT AND RECOMMENDATIONS

An updated Grade Crossing Safety Assessment was undertaken for the proposed realignment of the port road access and to determine any required crossing upgrades to ensure compliance with the GCR & GCS. **Appendix B: Site Inspection Report** provides details of the observations made during the site inspection. The inspection report also outlines outstanding safety issues, along with recommended remediations. Table 2: 2020 Crossing Recommendations, summarizes the recommendations from the field investigation.

The installation of the new track activates a warrant in the GSR and GCS to immediately comply with all requirements of the GCR and the GCS. Any grandfathered crossing rights become revoked upon completion of the new roadworks and crossing expansion. The client needs to ensure that the crossing design plans, fully completed crossing plans (E-4) and full crossing safety assessment, which comply with the full requirements of the GCR and GCS, have been completed and filed with Canadian Transportation Agency and applicable railway.

Table 2: 2020 Crossing Recommendations

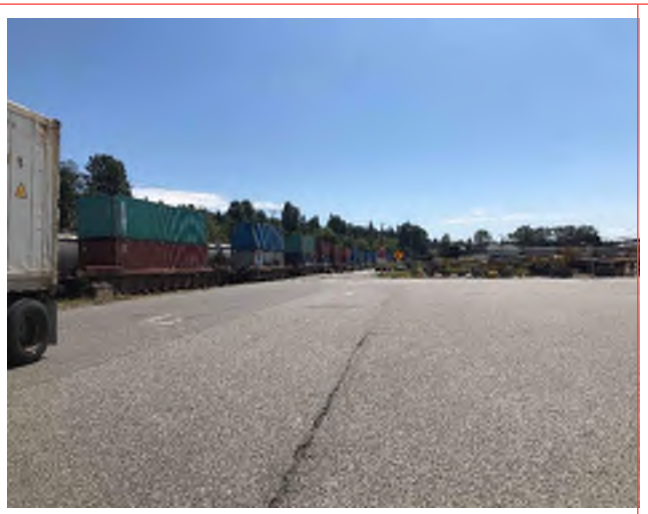
Observations	Suggested Actions	Priority	Order of Magnitude
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Flangeway depth impeded due to debris	Clean debris from the flangeway.	Low	$500
b. Railway crossing surface does not extend at least 0.5m beyond the edge of the travelled way on both approaches.	Extend railway crossing surface to extend at least 0.5m beyond the edge of the travelled way	High	$750
GCS Section 5 – Crossing Surface			
a. The approach road surface at the grade crossing has cracks	Repave crossing surface of the grade crossing such that it is smooth and continuous	Low	$20,000
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to fences and an equipment yard on the northwest corner, and track geometry of the southwest corner of the crossing	If minimum sightlines cannot be provided and maintained, then a warning system with gates is required.	High	$15,000
GCS Section 8 – Signs			
a. Pavement markings are faded across the crossing and approaches.	Repaint double stop bars and RAILWAY CROSSING symbol pavement markings and all line work on both road approaches.	Low	$800
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system with gates is warranted based on cross-product and crossing angle	**Install active warning system with gates.**	High	$600,000

APPENDIX

A SITE PHOTOGRAPHS

APPENDIX

A - North Approach Drivers View Left



B - North Approach

C - North Approach Drivers View Right

D - South Approach Drivers View Left

E - South Approach

F - South Approach Drivers View Right

APPENDIX

G – North Approach Driver View Left
(At Stopped Position)

H - North Approach (At Stopped Position)

I – North Approach Drivers Right
(At Stopped Position)

J- South Approach Drivers View Left
(At Stopped Position)

K - South Approach (At Stopped Position)

L - South Approach Drivers View Right
(At Stopped Position)

APPENDIX

M – East Facing Crossing Surface

N – General Crossing Photo

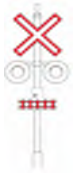
O – West Facing Crossing Surface

APPENDIX

B SITE INSPECTION REPORT

CANADIAN ROAD / RAILWAY GRADE CROSSING DETAILED SAFETY ASSESSMENT FIELD GUIDE (2005)*

Appendix C2: Field Data Forms



Passive & Active Crossings

Mile117.63 Spur 0.04 (65 Robson Road),VFPA
Surrey, British Columbia
For Vancouver Fraser Port Authority

Legend:

calculate	**Formula**	Spreadsheet cell has formula
look up		User to look up value in table or chart.
		User to input value here for conditional formatting or formulas in other cells to function
		Warning! Value beyond acceptable limits.
		Warning! Value beyond acceptable limits for certain conditions (i.e. for people using assistive devices).
	Rail	Information to be provided by Railway Company
	Road	Information to be provided by Roadway Authority
measure	observe	Information to be obtained during Site Investigation
	√	Information provided by others to be verified in the field

* Updated to reflect Transport Canada's Grade Crossing Standards (GCS) July 2014 and Grade Crossing Regulations (GCR)(SOR-2014-275 Feb 2016)

Mile117.63 Spur 0.04 (65 Robson Road),VFPA
Surrey, British Columbia

Sheet 1 | **Grade Crossing Safety Assessment** | **Passive Crossings**

Date of Assessment: **22-Jul-20** Site Investigation

Assessment Team Members & Affiliations: **Patrick McCabe**
Rob Sewell

Reason for Assessment: **New Proposed Pedestrian Crossing**

____	periodic assessment	**X**	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: **Vancouver Fraser Port Authority**

Crossing Location: **Robson Road and Plywood Road**

Location Number: **N/A**

Municipality: **City of Surrey, BC**

Railway: **VFPA** Mile: **117.63**

Sub-division: **Yale Sub/ Brownsville Spur** Spur: **0.04**

Type of Grade Crossing [private/public; warning devices]: **SRSC**

Track Type: [mainline, etc.] **Yard**

Road Authority: **Vancouver Fraser Port Authority (VFPA)**

Road Name/Number: **Robson Road and Elevator Road**

Province: **British Columbia**

Location Reference (control section, etc.): **DP Surrey Docks**

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

Roadway East/West (yes/ no) No
Roadway North/ South (yes/ no) Yes

*Urban Local Undivided

Collision History (5-year period): **No record of accitents at the subject railway crossing within the past five years**

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

Provide Details of the collisions if available:
Sources:

- identify main contributing factors

- attach collision diagrams if available

Mile117.63 Spur 0.04 (65 Robson Road),VFPA
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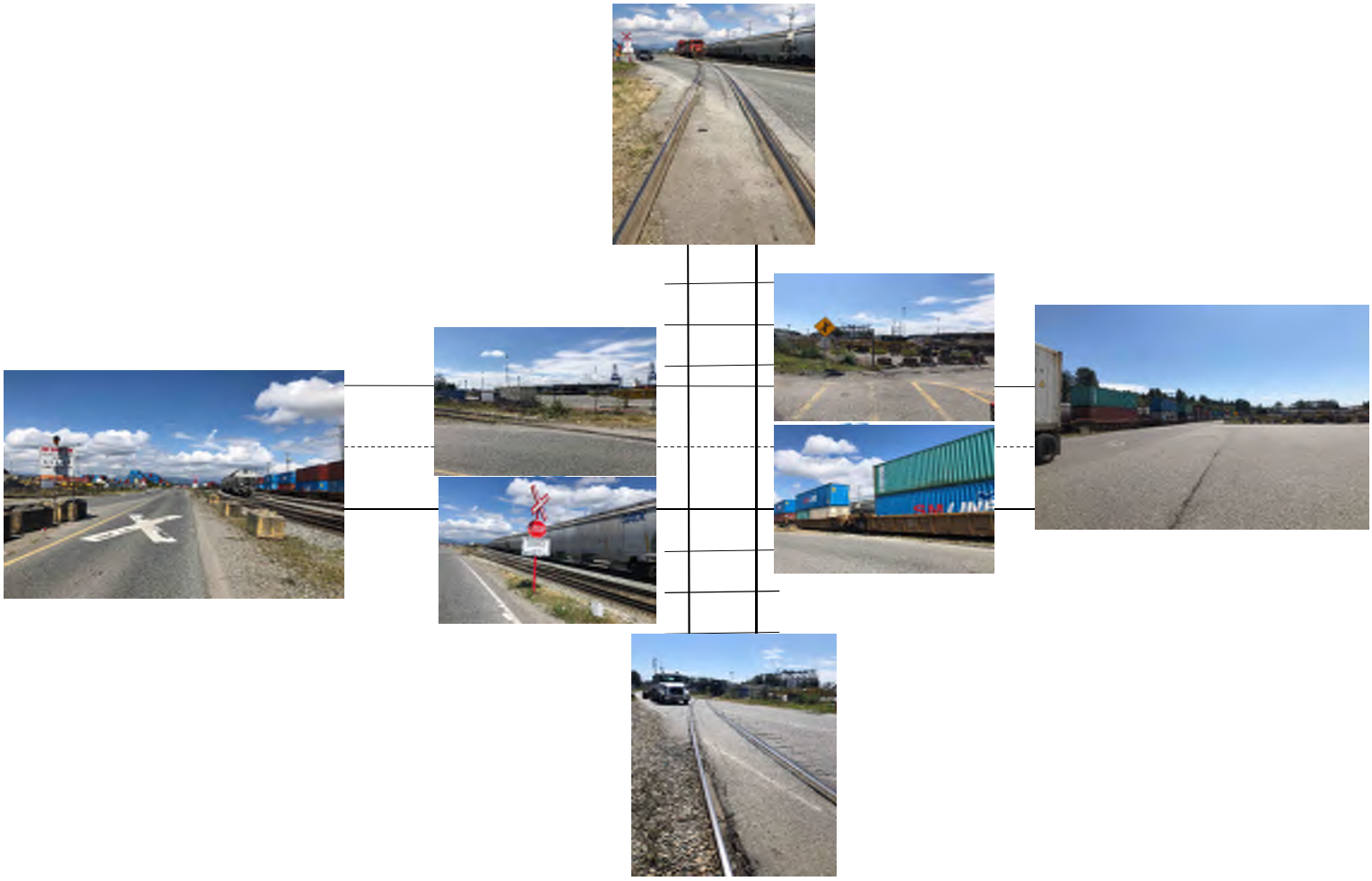
Sheet 2a **SCENE PHOTOGRAPHS**



For the full set of photos taken, see the Appendix to the Safety Assessment Report.

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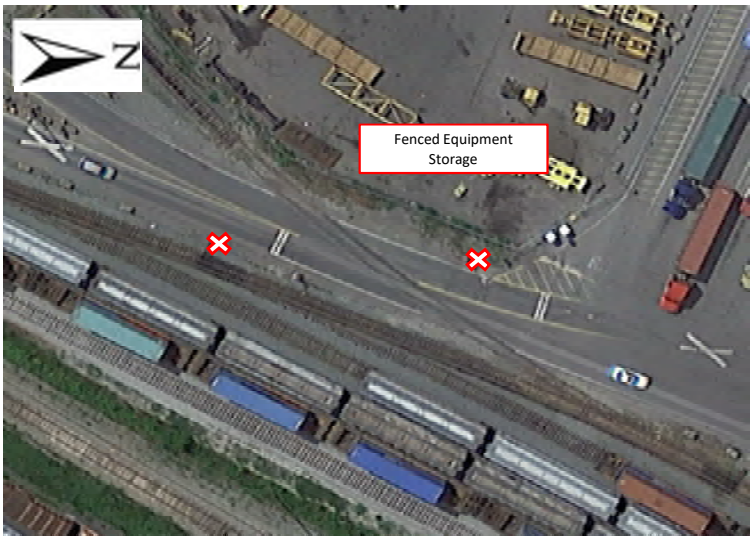
Sheet 2b **SCENE SKETCH**

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



Notes: Images from Google Earth

Include: - directions to nearby municipalities for both road & rail approaches (use arrows)
- adjacent intersections
- relevant road signs/signals
- signal warning systems hardware
- landmarks
- crosswalks/paths
- geographical features
- bus stops, etc.

Mile117.63 Spur 0.04 (65 Robson Road),VFPA
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Sheet 3 **GENERAL INFORMATION**

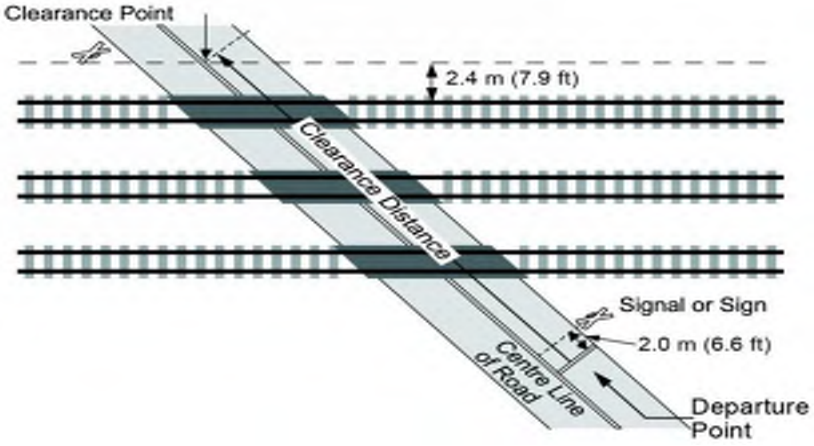
Source	Item							Reference
Rail	Maximum Railway Operating Speed, V_T	=	10	(mph)				
Rail	Daily Train Volume:	=	30	(freight trains/day)				
		=	0	(passenger trains/day)				
Rail	Switching during daytime? Y/N	Yes			nighttime? Y/N	Yes		
Road	Avg. Annual Daily Traffic, AADT:	=	2,830	(vpd)	Year of count:	2020		
Road	High seasonal fluctuation in volumes?		No					
Road	Pedestrian Volumes	=	0	(ped./day)				
Road V	Is crossing on a School Bus route?		No					
Road V	Do Dangerous Goods trucks use this roadway?		Yes					
Road	Cyclist Volumes	=	0	(cyclists/day)	Cyclist not anticipated			
Road V	Regular use of crossing by persons with Assistive Devices?				Pedestrians using Assistive Devices not anticipated			
Road V	Other special road users?	type	Unknown	daily volume	None			
Road	Forecasted AADT[2]	=	2,250	(vpd)	Forecasted Year:	2022		
Road V	Design Speed:		30	km/h	Posted Speed:	30	km/h	
	Maximum Operating Speed:		30	km/h				
	note: provide details if all approaches are not the same							
Road V	Road Surface Type (asphalt, concrete, gravel, etc.):		Asphalt					
observe	Surrounding Land Use (urban/rural)?:		Industrial					
observe	Any schools, retirement homes, etc. nearby?		No					

Notes:
1. Road Authority should provided plans if available.
2. AADT is based upon modelled future traffic counts for the Realigned infrastrucutre.

From GCS Section 7.1.2:

Column 1	*Column 2*	*Column 3*
Class of Track	***The maximum allowable operating speed for freight trains is -***	***The maximum allowable operating speed for passenger trains is -***
Class 1 track	17 km/h (10 mph)	25 km/h (15 mph)
Class 2 track	41 km/h (25 mph)	49 km/h (30 mph)
Class 3 track	65 km/h (40 mph)	97 km/h (60 mph)
Class 4 track	97 km/h (60 mph)	129 km/h (80 mph)
Class 5 track	129 km/h (80 mph)	153 km/h (95 mph)

Figure 10-1 - Clearance Distance (cd) for Grade Crossings
(a) For Grade Crossings with a Warning System or Railway Crossing Sign



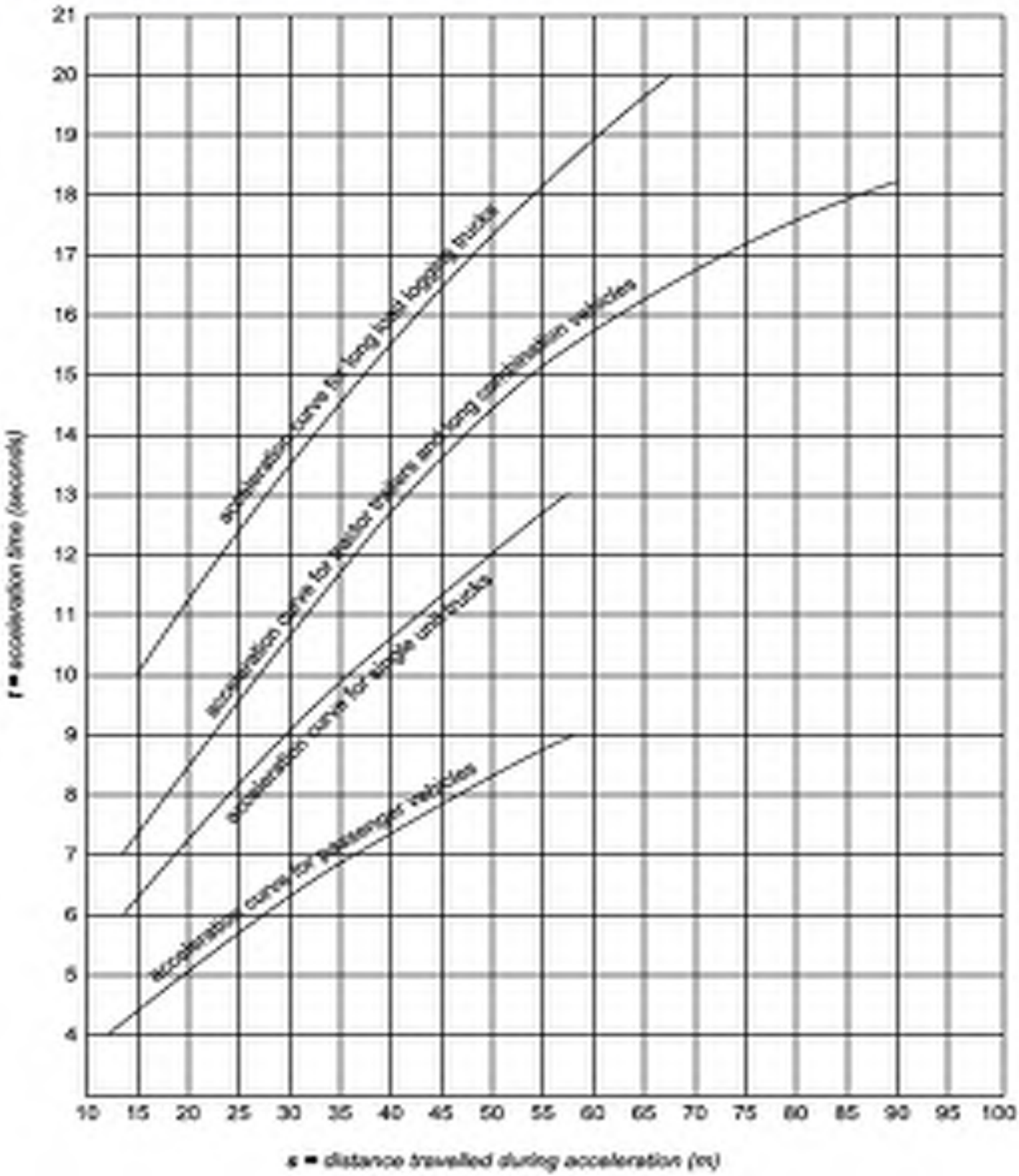
Grade Crossings Standards, July 2014

Table 10-1 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 & Buses	0.8	0.9	1.0	1.1	1.3
Tractor-Semitrailer	0.8	0.9	1.0	1.2	1.7

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 10-2 Assumed Acceleration Curves



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Sheet 4 **DESIGN CONSIDERATIONS**

Source	Item						SB Approach		NB Approach		Reference
	Design Vehicle										
Road	Type:	6	WB-20 Tractor-Semitrailers (WB-20)								Table 1* SOR 57
look-up	Length, **L:**		22.7	m							Table 1*
look-up	**Stopping Sight Distance, SSD**		45	m (round to 1.0% of grade)		=	10	m	45	m	Table 3*
measure	**Clearance Distance, cd**					=	34.2	m	34.2	m	GCS 16.1.1
calculate	**Vehicle Travel Distance, S**	**S= L+cd**	56.9	max <---		=	56.9	m	56.9	m	
look-up	**Vehicle Departure Time, t**					=	15.5	sec	15.5	sec	GCS Figure 10-2
Road V	Road Grade Effect:	maximum approach grade within 'S':				=	0.60	%	0.70	%	Sheet 7
look-up	grade adjustment factor (anto calc assumes Truck)(manual input from Table 10-1 if other)					=	1.03		1.04		GCS Table 10-1
calculate	**T**= t x adjustment factor					=	15.9	sec	16.0	sec	
	Design Vehicle Departure Time, T_D = J + T (where J = 2 sec (min.) perception & reaction)						2.0	sec	2.0	sec	
calculate	$T_{G\ stop} = T_D$=	18.0	sec			<-	17.9	sec	18.0	sec	GCS 10.3.2
observe	Do field acceleration times exceed T_D?	**Acceleration measurement beyond the scope of this assessment.**									
measure	**Pedestrian , cyclist & Assistive Devices Departure Time**			pedestrian **cd** distance		=	0.0	m	0.0	m	GCS 10.3.3
calculate	walking speed 1.22m/s max.	T_P =	0.0	sec	(1.0m/s used)	<-	0.0	sec	0.0	sec	
calculate	T_{SSD}	= (SSD+cd+L)/(0.277837 x $V_{road\ design}$) =	12.2	sec							

Comments Following Site Visit:

Table 1 – Design vehicle Lengths/Class

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

Source: *Geometric Design Guide for Canadian Roads*, TAC; September 1999.

Table 6 – Minimum Sightlines along the Rail Line ($D_{stopped}$) (as illustrated in Figure 3)

Railway Design Speed V_r (mph)	$T_{stopped}$ = Departure Time (greater of T_d or T_p) (seconds)											If greater of T_d or T_p > 20 sec., add for each additional second (m)
	≤ 10	11	12	13	14	15	16	17	18	19	20	
WARNING: Railway design speed in mph!	Minimum Sightlines along Rail Line ($D_{stopped}$) (m)											
STOP	30	30	30	30	30	30	30	30	30	30	30	+0
1-10	45	50	55	60	65	70	72	76	80	85	90	+5
11-20	90	100	110	120	125	135	145	155	165	170	180	+10
21-30	135	150	165	175	190	205	215	230	245	255	270	+15
31-40	180	200	220	235	250	270	285	305	325	340	360	+20
41-50	225	250	270	290	315	335	360	380	405	425	450	+25
51-60	270	300	325	350	380	405	430	460	485	510	540	+30
61-70	315	350	380	415	445	470	505	535	565	595	630	+35
71-80	360	395	435	465	505	540	580	610	650	680	720	+40
81-90	405	445	490	535	570	605	650	685	730	765	810	+45
91-100	450	500	540	580	630	670	715	760	805	850	895	+50

Table 3 – Determine SSD for Truck Class

Road Crossing Design Speed V (km/hr)	Truck Class Stopping Sight Distance (SSD) (m)																				
	Road Approach Gradient																				
	-10%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
20	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	24	24	24	24	24
30	48	48	47	47	47	46	46	46	45	45	45	45	45	44	44	44	44	44	44	43	43
40	76	75	74	74	73	73	72	71	71	70	70	70	69	69	68	68	68	67	67	67	67
50	121	120	118	117	116	115	114	113	112	111	110	109	108	108	107	106	106	105	105	104	104
60	149	146	144	142	140	138	136	134	133	131	130	129	128	126	125	124	123	122	122	121	120
70	210	205	202	198	195	192	189	187	184	182	180	178	176	175	173	171	170	169	167	166	165
80	252	246	241	236	231	227	223	219	216	213	210	207	205	202	200	198	196	194	192	191	189
90	318	311	304	297	292	286	281	277	273	269	265	262	258	255	252	250	247	245	243	240	238
100	401	391	382	373	365	358	352	346	340	335	330	325	321	317	314	310	307	304	301	298	295
110	455	441	428	417	406	397	388	380	373	366	360	354	349	344	339	334	330	326	322	319	315

* Source: Transport Canada's "Determining Minimum Sightlines at Grade Crossings: A Guide for Road Authorities and Railway Companies"

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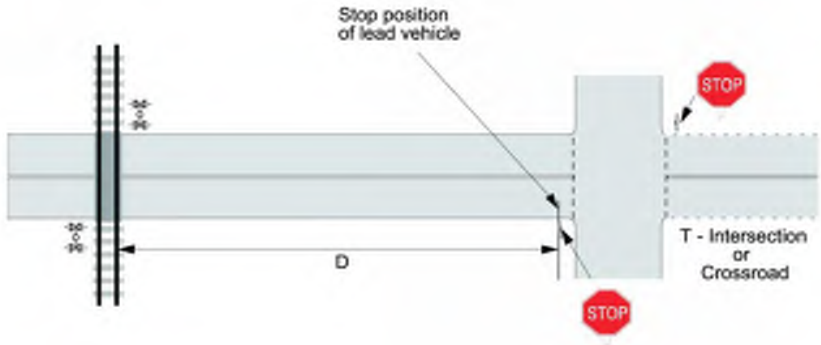
Sheet 5 **LOCATION of GRADE CROSSING**

Source	Item		Reference
observe	"D" should not be less than 30m for either approach if the train speed exceeds 15 mph.		
	D = 22.5m		GCS Section 9.1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	**No**	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks?	**No**	
	Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing?	**No**	

Comments Following Site Visit:
- The minimum "D" dimension to the edge of the entrance to Facility in north The Southern "D" is 91.5m
- RAILWAY CROSSING AHEAD sign installed from previous inspection (2015)
- Queuing lanes to access the container facility located in north approach - Railwayspeed = 10mph

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

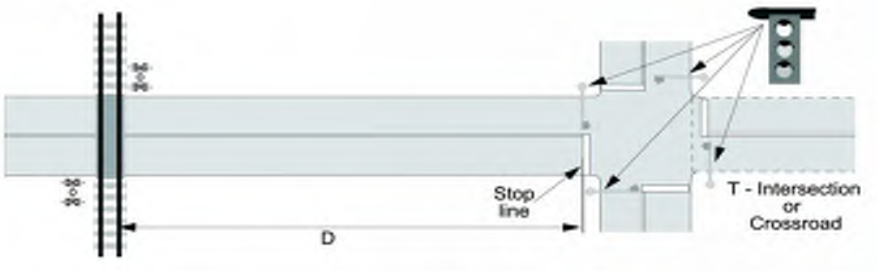
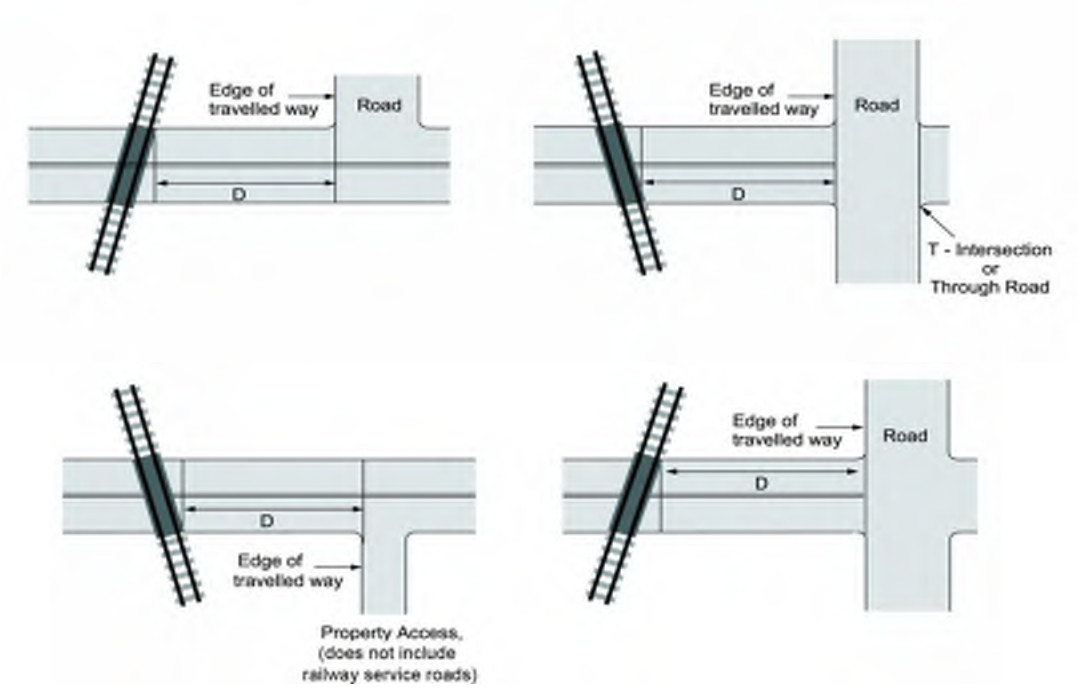


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings



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Surrey, British Columbia

Sheet 6 **GRADE CROSSING SURFACE**

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? **Yes**								SOR 60; GCS 5
observe	Grade Crossing Surface Material: **Asphalt** Grade Crossing Surface Condition: **Poor**								SOR 60; GCS 5
observe	Approach Road Surface Type: **Ashpalt** Approach Road Surface Condition: **Poor** Roadway Illumination?: **No**								SOR 60; GCS 5
		SB Approach			**NB Approach**				
measure	Road Surface crossing width (perp. C.L. min. = 8.0m)		**8.6**	m					GCS 5.1
measure	Road Surface extension beyond travel lanes (min. = 0.5m)	**0.0**	m		**0.5**	m			GCS 5.1
measure	Sidewalk/Path/Trail crossing width (min. = 1.5m)		**NA**	m	**NA**	m			GCS 5.1
measure	Sidewalk/Path/Trail extension beyond sidewalk (min. = 0.5m)	**NA**	m		**NA**	m			GCS 5.1
measure	Distance Between Travel Lane and C.L. of Trail		**NA**	m					
	Cross-Section:		**South (Right) Rail:**			**North (Left) Rail:**			GCS Table 5-1
measure	Flangeway width (min. = 65mm; max.= 120mm or 75mm[1])		**85**	mm		**85**	mm		GCS Table 5-1
measure	Flangeway depth (min. = 50mm; max.= no limit or 75mm[1])		**25**	mm		**25**	mm		GCS Table 5-1
	Rural Field Side Gap:								GCS Table 5-1
measure	Side Gap width (max.= 120mm or 0[1])		**25**	mm		**25**	mm		GCS Table 5-1
measure	Side Gap depth (max.= no limit or 0[1])		**25**	mm		**25**	mm		GCS Table 5-1
	Wear Limits:								GCS Table 5-1
measure	Elevation of Top Rail above road surface (max. = 13mm[1], 25mm, or 50mm)		**0**	mm		**0**	mm		GCS Table 5-1
measure	Elevation of Top Rail below road surface (min. = -7mm[1],-25mm, or -50mm)		**0**	mm		**0**	mm		GCS Table 5-1

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Flangeway and field side gap constructed out of rubber. Rubber is breaking apart. Train running on rubber not rail in certain sections
- Asphalt not extending 0.5m on east side
- Significant cracking/ wrapping of asphalt

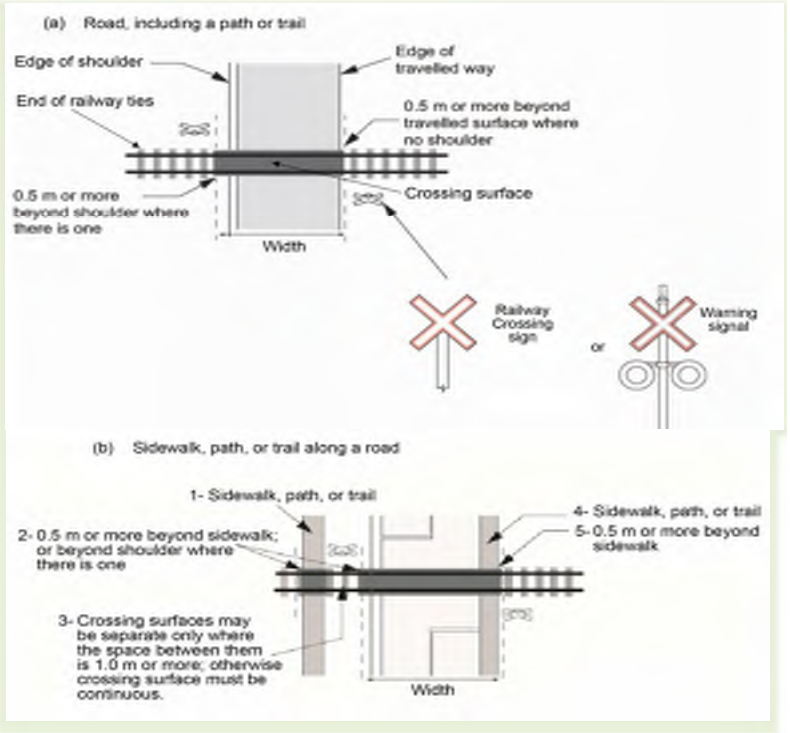
-rough crossing surface, loose timbers, etc. - difference between road grade and rail superelevation -surface distress of roadway approaches -photos

Grade Crossings Standards, July 2014

Table 5-1 – Grade Crossing Surface – Cross Section

a) Flangeway:		
Width	**Minimum**	65 mm
	Maximum for:	
	Public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	120 mm
Depth	**Minimum**	50 mm
	Maximum for:	
	Public sidewalks, paths and trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	No limit
(b) Field side gap A space is permitted on the outer side of the rail at rural locations, except for public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices		
	Maximum width	120 mm
	Maximum depth	No limit
(c) Elevation of the top of the rail with respect to the crossing surface The top of the crossing surface must be installed as close as possible to the top of the rail within the wear limits below:		
Wear limits:		
Public sidewalk, path or trail designated by the road authority for use by persons using assistive devices		
	Maximum distance of the top of the rail above crossing surface	13 mm
	Maximum distance of the top of the rail below crossing surface	7 mm
All other public grade crossings; the maximum distance of the top of the rail above or below the crossing surface		25 mm
Private grade crossings; the maximum distance of the top of the rail above or below the crossing surface		50 mm

Figure 5-1 - Grade Crossing Surface Dimensions



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Sheet 7 **ROAD GEOMETRY**

Source	Item									Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Are the road lanes at least the same width on the crossing as on the road approaches? WB Approach: **Yes** EB Approach: **Yes**									
	Grades		**SB Approach**		**NB Approach**		Difference: rail e & rd grade (GCS 6.1)			GCS Sect. 6
measure	Slope within 8m of nearest rail (max. = 2%)		**0.20**	%	**0.70**	%	**0.10%**	%	**0.35%**	Diff in Grade Max
measure	Slope between 8m & 18m of nearest rail (max. = 5%)		**0.60**	%	**0.70**	%				3%
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices (max. = 1[1] or 2%): slope within 5m of nearest rail =		**N/A**	%	**N/A**	%				
Road √	General approach grade (max. = +/- 5%)		**0.50**	%	**0.70**	%				
	measured over the SSD distance of:		**10**	m	**45**	m				Sheet 4
Rail √	Are rail tracks super-elevated?	**No**	Rate of s/e:	**0.00**	m/m Sdg	**0.00**	m/m ML			GCS Sect. 6.1 & 6.2
Road √	If train speeds exceed 15mph (70° minimum w/o warning system; 30° minimum with warning system): What is the angle between the crossing and the roadway? =		**102.0**	degrees						
observe	**Condition of Road Approaches:** **Fair** (e.g., anything that might affect stopping or acceleration)									SOR 60
observe	NA									

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Cracks observed within both approach.
- Crossing angle is withing 110 degrees for passive crossings

Grade Crossings Standards, July 2014

Table 6-1 – Difference in Gradient

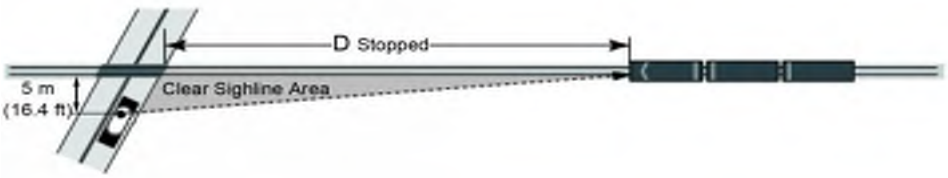
Classification	Difference in Gradient (%)
RLU	2
RCU	1
RCD	1
RAU	0
RAD	0
RFD	-
ULU	3
UCU	2
UCD	2
UAU	0

*Legend
Urban (U) Rural (R) Local (L) Collector (C) Arterial(A) Expressway (E) Freeway(F)
Divided (D) Undivided (U)

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 7-1 - Minimum Sightlines - Grade Crossings

(a) Sightlines for Users Stopped at a Grade Crossing (applicable to all quadrants)



(b) Sightlines for Users Approaching Grade Crossing (applicable to all quadrants)

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Sheet 8 **SIGHTLINES**

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			SB Approach		NB Approach		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 **Yes**							
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location **Yes**							
				SB Approach		**NB Approach**		
look-up	**SSD** minimum =			10	m	45	m	Sheet 4
measure	**SSD Actual** (not including turning movements)**:**			150.0	m	150.0	m	
calculate	D_{SSD}	=	$0.277837 \times V_{train\ km/h} \times T_{SSD}$	55	m	55	m	1.609 convert mph to km/h
calculate	$D_{STOPPED}$ minimum (m)	=	$0.277837 \times V_{train\ km/h} \times T_D$ =	80	m	81	m	T_D from Sheet 4
measure	$D_{STOPPED}$ **Actual**:		Driver looking LEFT	110	m (ne)	200	m (sw)	
			Driver looking RIGHT	200	m (nw)	30	m (se)	
calculate	**Ped./Cyclist** $D_{STOPPED}$ **(m)**			0	m	0	m	T_P from Sheet 4
measure	**Ped./Cyclist** $D_{STOPPED}$ **Actual:**		Person looking LEFT	N/A	m	N/A	m	
	note: measured from a point 2m in advance of sign/signals		Person looking RIGHT	N/A	m	N/A	m	
observe	Are there any obstacles within the sight triangles other than traffic signs/utility poles that might affect visibility? **Fencing and equipment within NW approach**							

Comments Following Site Visit:

- Northwest Quadrentsightlines impacted by fencing and equipment

- If clear sightlines cannot be maintained, an active warning system will be required.

-special considerations for large trucks?

-special design vehicle?

-can sightlines be maintained on an ongoing basis? (snow)

-photos

Figure 8-3 - Location of Railway Crossing Signs and Number of Tracks Signs (public grade crossings without warning systems)

a) **b)**

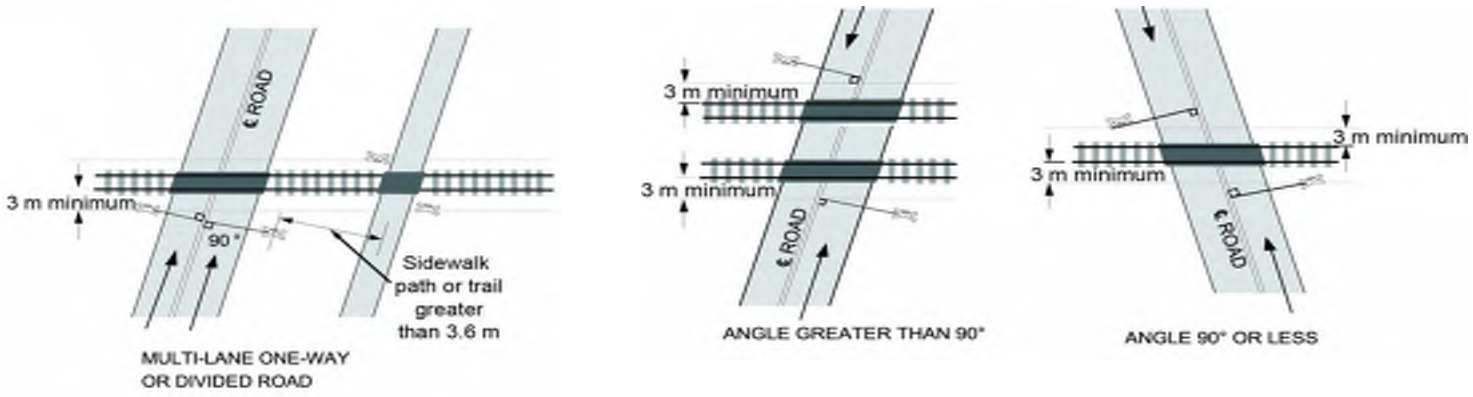
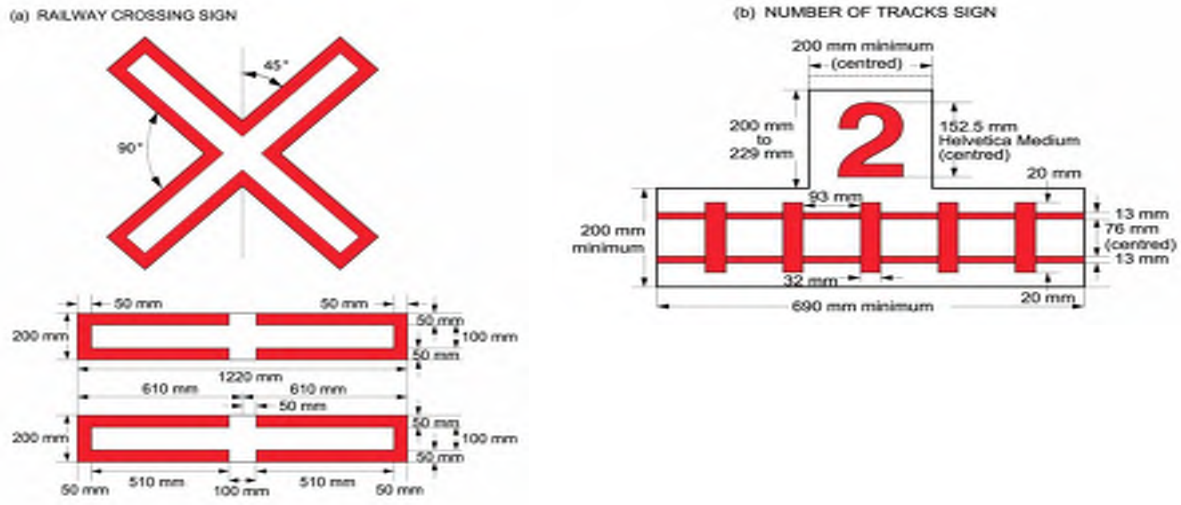


Figure 8-1 - Railway Crossing Sign and Number of Tracks Sign



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Sheet 9a **SIGNS AND PAVEMENT MARKINGS**

Source	Item							Reference
	Railway Crossing Sign  **These signs will be required**							MUTCD
		SB Approach		**NB Approach**				
measure	distance from nearest rail:	**16.5**	m	**20.8**	m			
measure	distance from edge of road:	**2.0**	m	**1.2**	m			
measure	height of centre of crossbucks:	**3.0**	m	**3.0**	m			
measure	retroreflectivity readings:	**N/A**	cd/lux/m^2	**N/A**	cd/lux/m^2			
observe	Number of Tracks sign? **No**							
observe	A Stop Sign must be installed at grade crossing without a warning system if the road design speed is less than 15mph					Yes/ No/ NA	**Yes**	SOR 64
observe	A Stop Ahead sign must be installed if the Stop Sigh is not clearly cvisable within the Stopping Distance					Yes/ No/ NA	**N/A**	SOR 65

Comments Following Site Visit:
- New RAILWAY CROSSING signs installed in 2017.
- The back of poles and signs have reflective strips (reflectivity not measured).
- NUMBER OF TRACKS Sign not required as only 1 track.

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

Source	Item		Reference
	DO NOT STOP ON TRACKS 		MUTCD
Road V	Does queued traffic routinely encroach closer than 5m from the crossing surface?	**No**	
observe	Are these signs present on either approach?	**Yes**	

Comments Following Site Visit:
- DO NOT STOP ON TRACKS Sign installed below RAILWAY CROSSING AHEAD signs.

-general condition -posts -photos

Source	Item					Reference
	Railway Crossing Ahead Sign (WA 18-20) 					MUTCD & SOR 66
look-up	Is AADT > 100? **Yes**		**SB Approach**	**NB Approach**		Sheet 3
observe	Is area urban such that WA 18-20 is not required?		**Yes**	**Yes**		
measure	Distance from nearest rail to sign	=	**24.1** m	**18.5** m		MUTCD
observe	height:		**2.5**	**2.5**		
observe	appropriate orientation of symbol		**Yes**	**Yes**		

Comments Following Site Visit:
- RAILWAY CROSSING AHEAD Sign has been installed since the previous inspection.
- Two signs installed on the North approach. Either side of truck facility entrance.
- RAILWAY CROSSING AHEAD Sign installed Min. Approx 18.5m from crossing

Source	Item			Reference
	ADVISORY SPEED SIGN 			MUTCD & SOR 66 (2)
observe	Are they present on both approaches?	**No**		
	Posted speed limit?	**N/A**	km/h	
look-up	Are they required on either approach?	**No**		check SSD (Sheet 8)

Comments Following Site Visit:

- ADVISORY SPEED Sign not installed.

-general condition -posts -photos

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Sheet 9b **SIGNS AND PAVEMENT MARKINGS**

Source	Item		Reference
	EMERGENCY NOTIFICATION		GCS Sect. 8.5
observe	Are these signs present on both approaches?	**Yes**	
observe	Is the information complete and legible?	**Yes**	

Comments Following Site Visit:
- EMERGENCY NOTIFICATION Sign present, below STOP Sign

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

Source	Item		Reference
	PAVEMENT MARKINGS		
observe	Are pavement markings consistent with those from the MUTCD Manual?	**Yes**	Fig C1-6 MUTCD
observe	Are there lines to delineate sidewalks/paths?	**N/A**	

Comments Following Site Visit:
- Road markings and DOUBLE STOP BARS and Roadway "X" marking have been installed since the 2015 inspection.
- PAVEMENT MARKINGS needs to be repainted

-special sign required? -missing signs -visual clutter -obscured view/sightlines -retroreflectivty levels at night
-general condition of markings -are centrelines or stop lines present? -width of markings? -provincial practice not to use *X* ?

GENERAL ASPECTS C1

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA

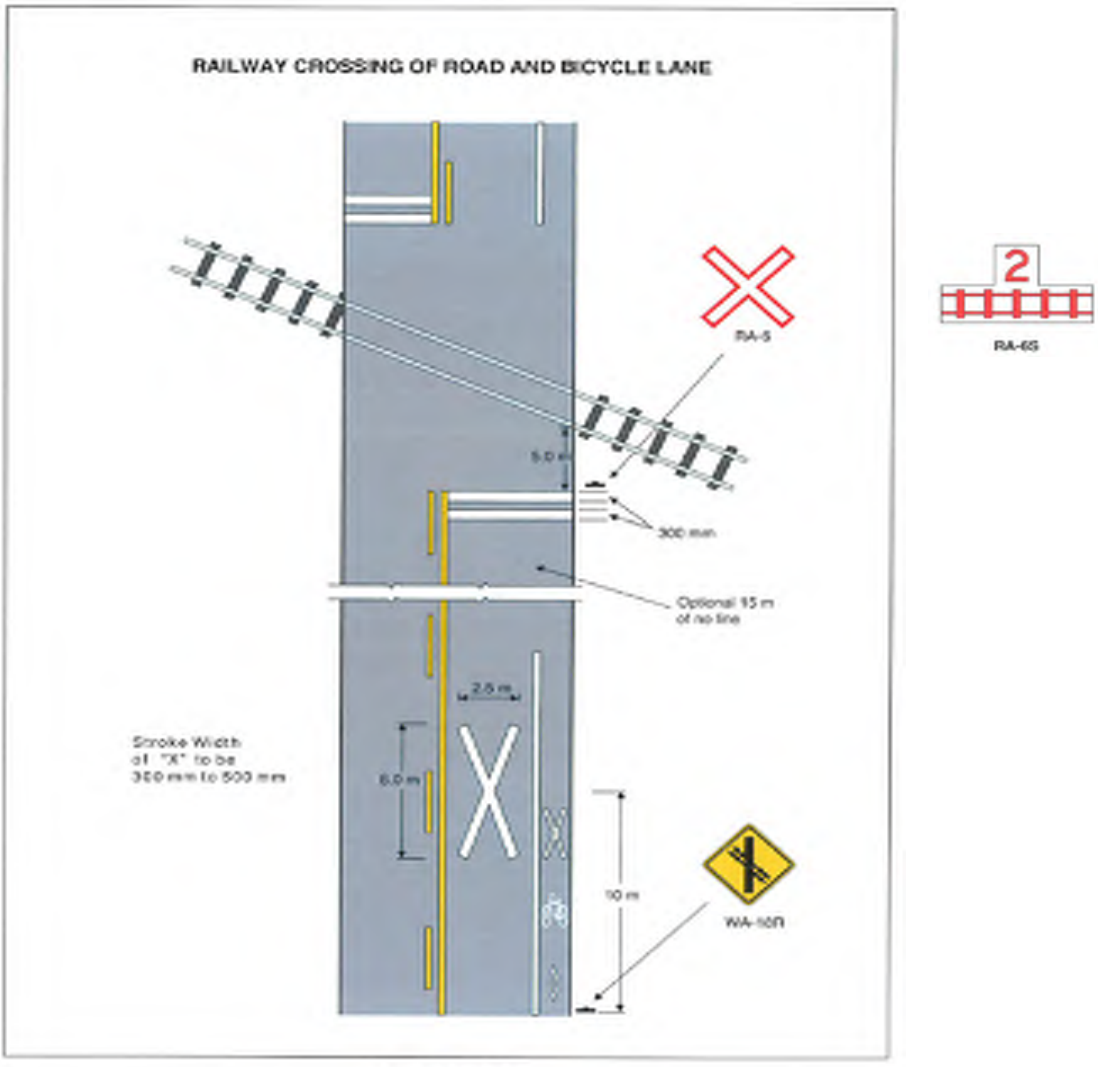
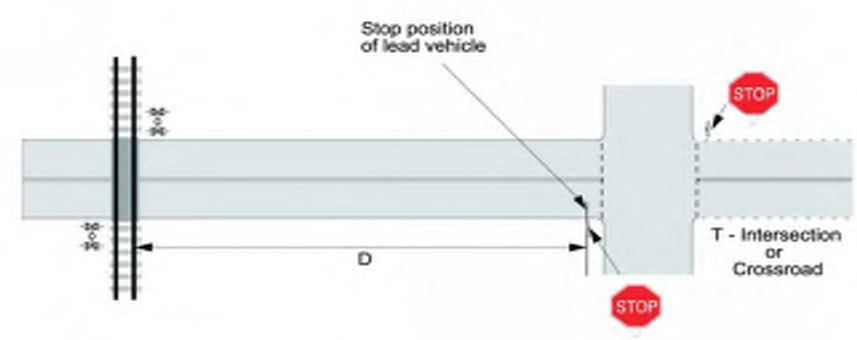


FIGURE C1-6

JANUARY 2014

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

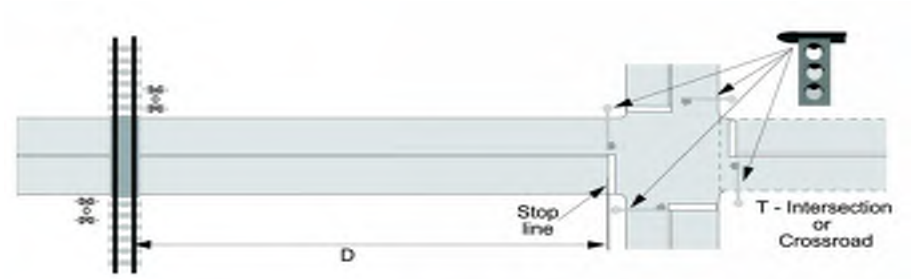


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings

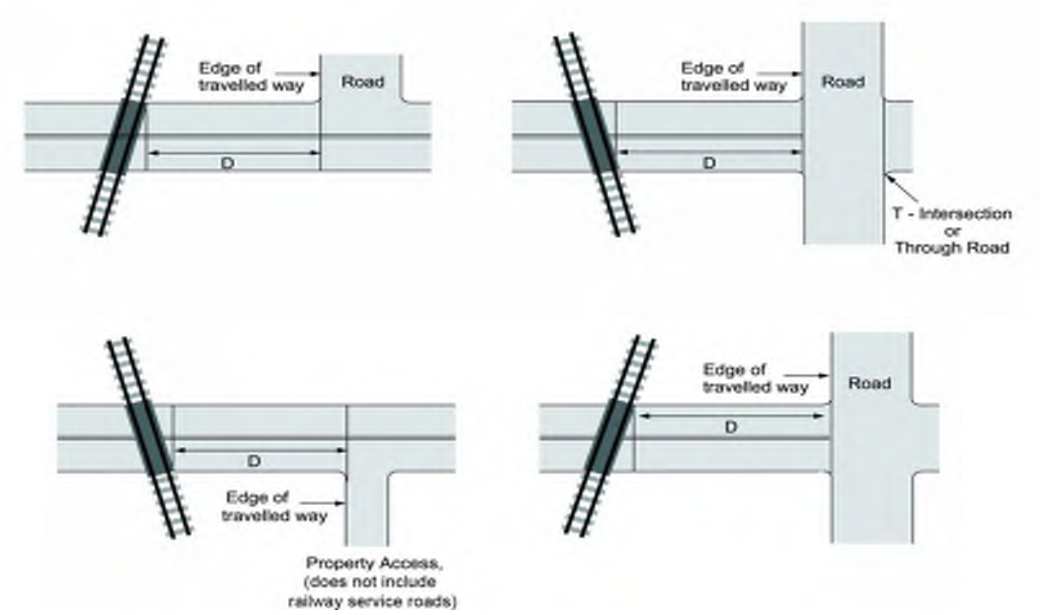
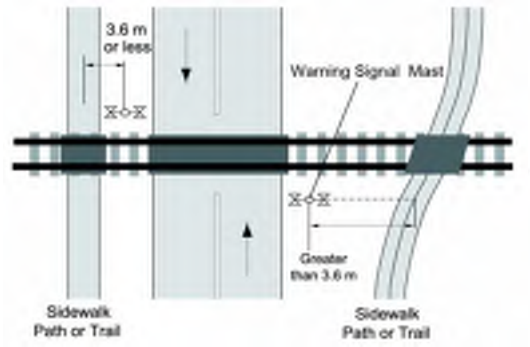
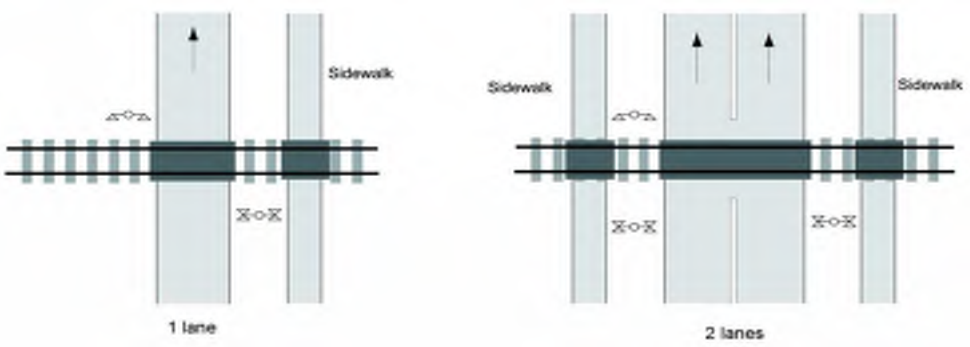


Figure 13-2 - Sidewalks, Paths and Trails
(a) Two Way



(b) One-Way



Sheet 10 eliminated in the new GCS

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Sheet 11 — **GRADE CROSSING WARNING SYSTEMS** — **GCS Section 9**

Source	Item is not required.									Reference
	Warning System Warrants if any of A through E below are met, then a warning system is warranted									
	Question							**Warrant for Warning System**		
look-up	Existing AADT =	2,830	Forecast AADT =	2,250						Sheet 3
look-up	Daily Train Volume =	30			trains					Sheet 3
calculate	**A. Cross-Product =**	67,500						> 2,000 FLB req'd	**> 50,000 requires gates**	
look-up	**B. Maximum Rail Operating Speed =**		10		mph			(max = 80mph or 50 mph with crosswalk)		Sheet 3
Rail	**C. Number of Tracks =**		1							
	if ≥ 2, can trains pass one another?		No					if ≥ 2 and trains can pass one another -> FLB req'd		
look-up	**D. Are Sightlines obscured?**		Yes					if "Yes" -> FLB req'd: If Fig 7.1 applies --> add G		Sheet 8 & Fig 7.1
observe	**E. Are any proximity conditions met?**		Yes					if "Yes" -> FLB required.		GCS Sect 9 & 11
look-up	Is a Warning System warranted?		Yes					If any of A through E above meet the Warrant		
	Field Visit	**Present? (Y/N)**	**Condition / Alignment:**							GCS 13
observe	Light Units,	N								GCS 13
observe	Bells,	N								GCS 13
observe	Gates,	N								GCS 13
observe	Cantilever Lights,	N								GCS 13
observe	Check that warning signal assemblies and cantilevers are in accordance with GCS Figures.									GCS Sect. 12
observe	Is warning system housing at least 9m from traveled way of the road and 8m from the nearest rail?									
observe	If there is a sidewalk, is a bell on the adjacent assembly?									
Rail √	Have all light units been aligned?	**NA**	Date?	**NA**						
Rail	Design Approach Warning Time (greatest of):			20sec OR [20+((cd-11)/3)] if cd>11m	Td	Tp	Gate Clearance Time + Descent Time + 5 seconds	Traffic Signal Clearance Time (=0 if no traffic signal)	(SSD + cd + L)/(0.277837xVv)	
	SB Approach	35.0	sec	27.7	17.9	0.0	35.0	0.0	8.0	
	NB Approach	35.0	sec	27.7	18.0	0.0	35.0	0.0	12.2	
observe	Is warning time less than 35 sec (without gates) or 55 sec (with gates)			**N/A**						

Comments Following Site Visit:

- An Active Warning System without Gates is required due to the increase in AADT, proximity to intersection and sightlines

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted?

Figure 12-1 - Warning Signal Assemblies

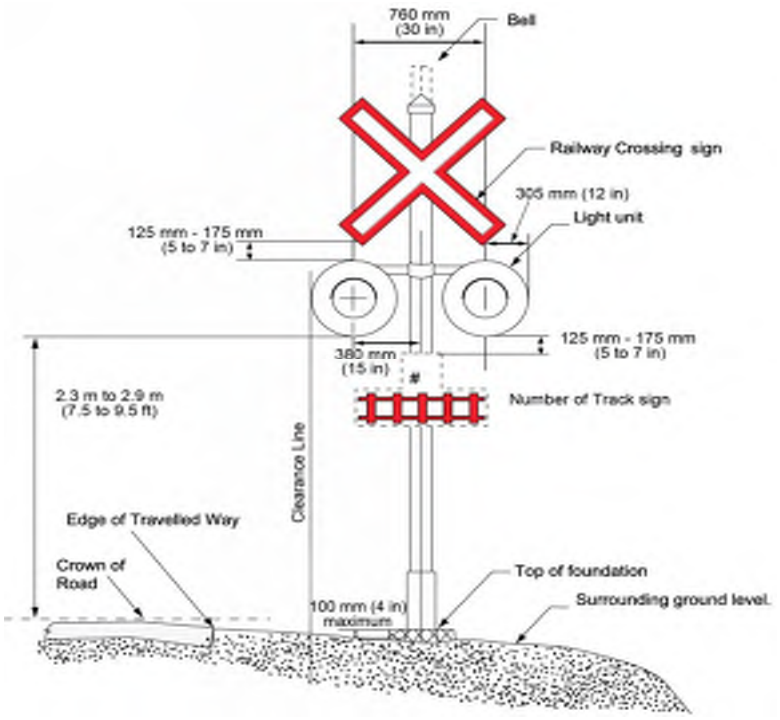
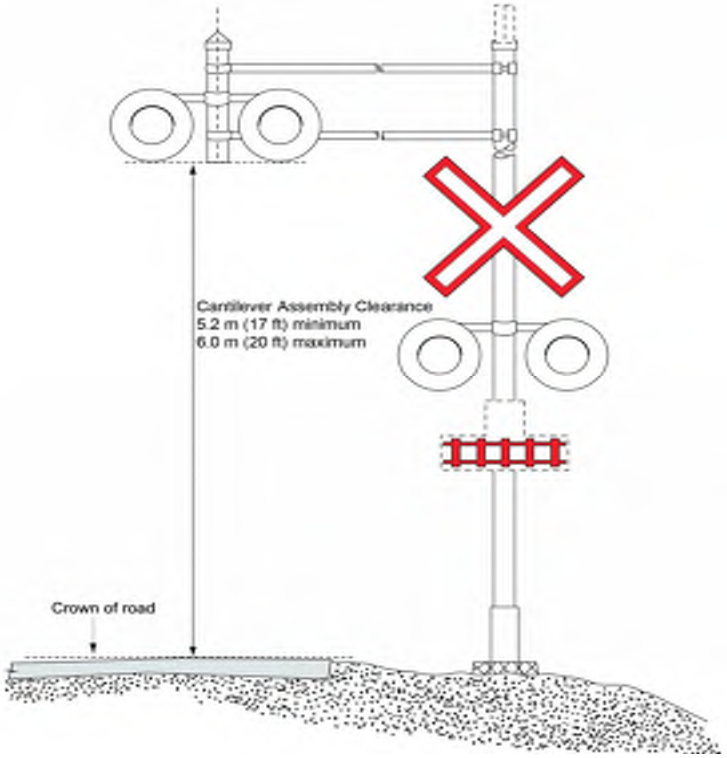


Figure 12-3 - Cantilevers



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Sheet 12  **GATES FOR GRADE CROSSING WARNING SYSTEMS** **GCS Section 9**

Source	Item							Reference
	Warning System Warrants -if any of A through E below are met then a warning system with gates is warranted. **Not required as qwarning system is not necessary**							
calculate	**A. Cross-Product =**	67500	(50,000 min)					
look-up	**B. Maximum Rail Operating Speed =**	10	mph (max = 50mph)					Sheet 3
Rail v	**C. Number of Tracks =**	1						
	.....if ≥ 2 , can trains pass one another?	N/A						
look-up	**D. Is $D_{STOPPED}$ Insufficient?**	No						Sheet 8
observe	**E. Are any proximity conditions met?**	N/A						
calculate	Gate clearance distance: eq 10.4b	24.7	m cd $_{G\ stop}$	34.7	m cd SSD SB	69.7	m cd SSD NB	GCS Sect. 10.4
look-up	travel time =	18.0	sec $_{G\ stop}$					
calculate	Gate arm clearance times:	17.9	sec SB from stop	$T_{G\ ssd}$ = 4.2	sec SB from SSD			
		18.0	sec NB from stop	$T_{G\ ssd}$ = 8.4	sec NB from SSD			
look-up	Gate arm delay time: 18.0	sec (greatest value from above)						
calculate	effect of grade =	0.5	sec (SB from Stop)	-4.2	sec SB from SSD			
		0.6	sec (NB from Stop)	0.0	sec NB from SSD			
measure	Measure gate arm delay and compare with above:	N/A						
observe	Do gates conform to standards depicted in GCS Figures?	N/A						
observe	Check gate descent (10 to 15 sec) and ascent (6 to 12 sec)	N/A						
observe	Is gate striping vertical as depicted in GCS Figures?	N/A						
observe	Where railway equipment regularly stops, or railway equipment is left standing, within the activating limits of a warning system, the warning system must be equipped with a control feature to minimize the operation of the warning system.					Yes/No/NA	NA	GCS 16.3.1

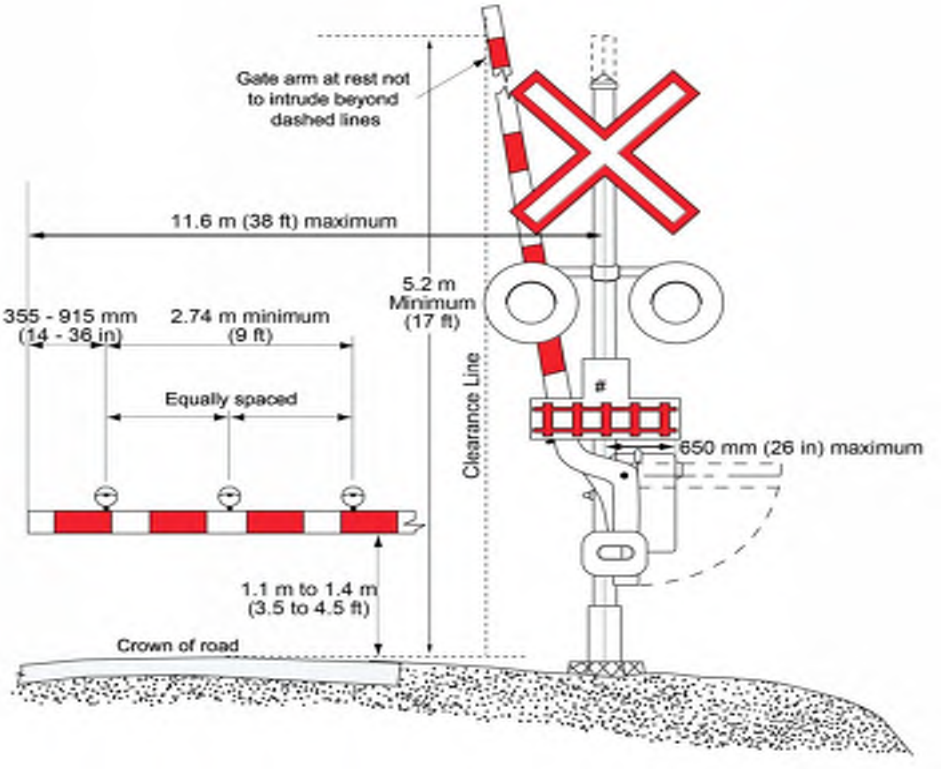
Comments Following Site Visit:

- Warning System with Gates is not equired unless the railway volume is increase or Dstopped is insufficient.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted? **No**

Figure 12-2 - Gates



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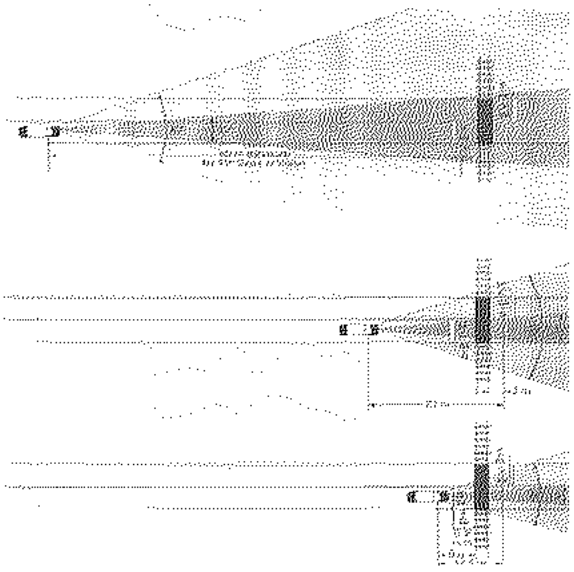
Sheet 13 **FLASHING LIGHT UNITS**

Note: Driver's cone of vision is ± 5° horizontally; limited by top of windshield vertically. GCS Sections 12-14

Source	Item is not required as warning system is not required.				u
	Number and Location				
look-up	Minimum Distance for Primary Light Units (SSD) =	45.0	m		
look-up	Recommended Distance for Primary Light Units =	69.7	m		
observe	Are flashing light units located within 5° horizontally of the centerline of the road (throughout the approach distance above)?			**Yes (covered by front and back units)**	
	Does horizontal/vertical curvature necessitate supplemental units?			**N/A**	
observe	Can back lights be seen by all stopped drivers?			**N/A**	
observe	Are lights obscured by vehicles stopped on adjacent intersections?			**N/A**	
observe	Are additional light units required for drivers as they begin to turn onto an approach road from an intersecting road/lane/pkg lot?			**N/A**	
	Cantilevered Light Units				
measure	Does D_R exceed 7.7m?	**N/A**			
measure	Does D_L exceed 8.7m?	**N/A**	(Assumes signal poles on both sides of road alignment, approach side of rail)		
	Multiple Lanes				
observe	Can front light units be seen by drivers in all lanes (….would T/T obscure?)?	**N/A**			
observe	Can back light units be seen by all stopped drivers in all lanes?	**N/A**			
	Sidewalks, paths, trails, etc.				
measure	Distance from path centerline to signal mast =	**N/A**	m (max.=3.6m)		
observe	Are separate light units required?	**N/A**			

Comments Following Site Visit:
- Crossing currently regulated by a passive warning system.

Horizontal Cone of Vision



Typical Light Unit Arrangement for an Adjacent Intersection

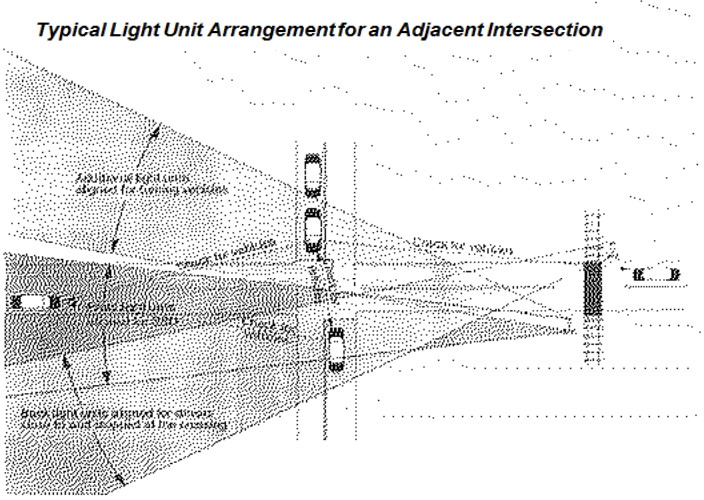
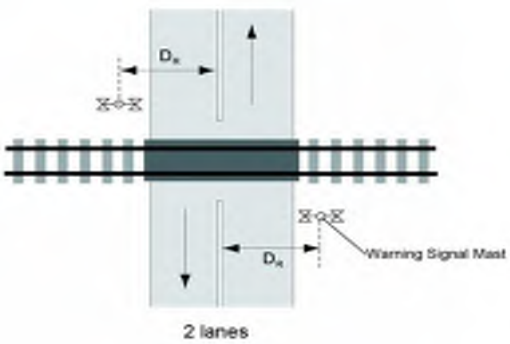
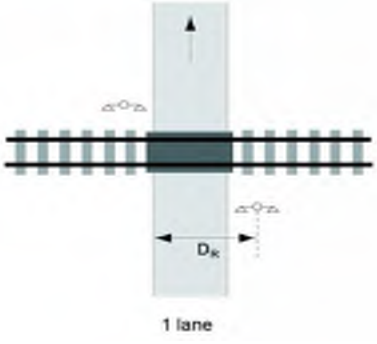


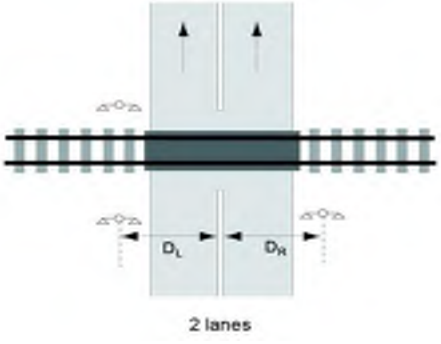
Figure 13-1 – Warning Signal Offsets Requiring Cantilevered Light Units

(a) Two-Way Road



(b) One-Way or Divided Road





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Sheet 14

PREPARE TO STOP AT RAILWAY CROSSING SIGN

GCS Sections 13 and 14

Source	Item NA			Reference
observe	Are signs present?	**No** EB approach **No** WB approach		SOR 67 (1), (2) GCS 18.21 & 18.2
look-up	Minimum Distance for Primary Light Units (SSD)	**N/A**	m	Sheet 13
look-up	Recommended distance for Primary Light Units	**N/A**	m	Sheet 13
	Warrants			
observe	Are all front light units obscured within minimum distance above?	**N/A**		
look-up	Is the facility designated a "freeway" or "expressway"?	**N/A**		Sheet 3
observe	Do environmental conditions frequently obscure signal visibility?	**N/A**		
	Considering maximum prevailing speeds, geometry, and traffic composition, checkthe following:			
observe	Does sign flash during operation of grade crossing warning system?	**N/A**		
measure	Distance from the sign to 2.4m beyond the furthest rail =	**N/A**		
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?	**N/A**		
measure	Distance from the sign to the closest gate =	**N/A**	m	
observe	Does the flashing sign precede actuation of the descent of the gate arms by the time required to travel from the sign to clear closest gate?	**N/A**		
measure	Time required for all queued vehicles to resume to maximum road operating speed =	**N/A**	sec	

Comments Following Site Visit:

- No PREPARE TO STOP AT RAILWAY CROSSING was observerd or required.

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

Sheet 15

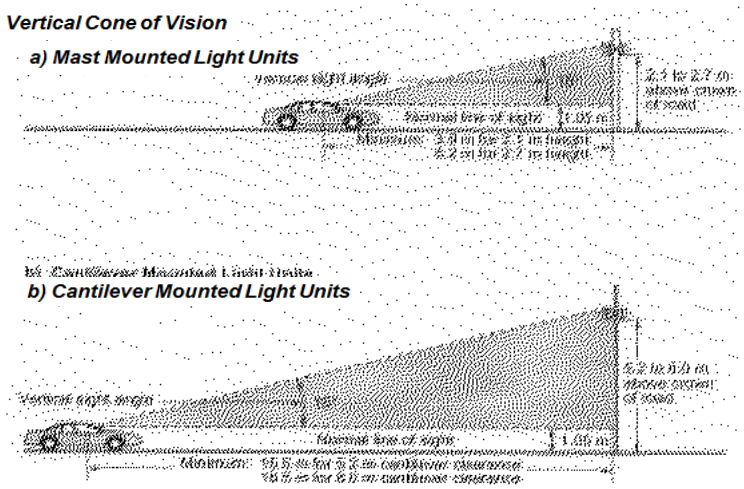
PREEMPTION OF TRAFFIC SIGNALS

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

Comments Following Site Visit:

- No Traffic Signals located at crossing

-functions as intended



Mile117.63 Spur 0.04 (65 Robson Road),VFPA
Surrey, British Columbia

Sheet 16 **AREAS WITHOUT TRAIN WHISTLING**

Grade Crossings Standards, July 2014

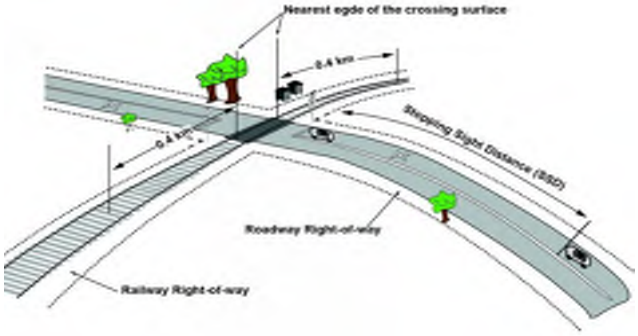
APPENDIX D – WHISTLING CESSATION

Table D-1 – Requirements for Warning Systems at Public Grade Crossings within an Area without Whistling

	Column A		Column B	
Railway Design Speed	Grade Crossings for Vehicle Use		Grade Crossings For Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Column 1	*Column 2*	*Column 3*	*Column 4*	*Column 5*
1 – 25 km/h (15 mph)	FLB	FLB	No warning system requirement	No warning system requirements
25 – 81 km/h (16 – 50 mph)	FLB	FLB & G	FLB	FLB & G
Over 81 km/h (50 mph)	FLB & G	FLB & G	FLB & G	FLB & G

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

Figure D-1 - prescribed area for whistling cessation as per article 23.1 of the RSA



RSA = Railway Safety Act of Canada

Source	Item					Reference
Rail	Is train whistling prohibited at this crossing?	**No**	24 hours?	**No**		
observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?			**No**		
observe	Are the requirements of Table D-1 met?	**No**				

Comments Following Site Visit:
- Whistle Cessation not required

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:

END OF FIELD DATA FORMS

VFPA
REPORT NUMBER: 20-0173

VFPA FSPL TRANSPORTATION IMPROVEMENTS PROJECT

03 – 10203, 59 TIMBERLAND ROAD,

FEBRUARY 09, 2021

REVISION HISTORY

FINAL ISSUE

2020/09/03	FIRST DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2020/10/21	SECOND DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2021/02/09	FINAL			
Prepared by	Reviewed by	Approved By		
P. McCabe, Track Designer	G. Smith, Senior Project Engineer	R. Sewell, Senior Project Engineer		

SIGNATURES

PREPARED BY

09/02/2021

Patrick McCabe, CPEng (Aus), APEC Eng
Track Designer

Date

09/02/2021

Robert Sewell, P.Eng
Senior Project Engineer

Date

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TABLE OF CONTENTS

1 CROSSING OVERVIEW

WSP Canada Group Limited (WSP) has been contracted as part of the Fraser Surrey Port Lands – Transportation Improvements Preliminary Design Services project, to complete a Railway Crossing Safety Assessment on the 10203, 59 Timberland Road grade crossing. The SRY owned crossing is located within the Vancouver Fraser Port Authority (VFPA), Fraser Surrey Docklands near to the Canadian National (CN) Brownsville Spur which comes off Mile 117 of the Yale Subdivision.

A Railway Crossing Field Safety Assessment was undertaken on the 22nd of July 2020 and updates the previous Railway Crossing Assessment undertaken by WSP (formally MMM Group) on the 5th of May 2015. The Railway Crossing Assessment as conducted follows the guidelines of applicable requirements identified in the most recent edition of Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossing Standards (GCS).

The crossing is a passive protected crossing (SRCS), equipped with two RAILWAY CROSSING and STOP signs, located within an industrial area. A Tractor Trailer (WB-20) is the design vehicle used to represent daily traffic on port property. The Railway traffic volumes were provided by the SRY while the Average Annual Daily Traffic (AADT) was calculated based on the realigned infrastructure.

This report aims to identify the modifications to the grade crossing since the previous inspection completed by MMM Group in 2015, as well as highlight any new or previously identified non-compliances still relevant to this crossing.

1.1 LOCATION

The Timberland Road grade crossing is located within Fraser Surrey Docks jurisdiction at 10203, 59 Timberland Road and crosses the SRY spur track. The crossing is located at the latitude and longitude of 49°11'19" and 112°54'25" respectfully. Figure 1, below shows the location of the crossing.

Figure 1: Crossing Location (source: Google Earth, 2020)

2 SAFETY ASSESSMENT

2.1 PREVIOUS ASSESSMENT (2015)

A previous crossing assessment was undertaken in 2015 by WSP for the 10203, 59 Timberland Road crossing. The objective of the assessment was to:

- Reduce crash risk within the grade crossing environment.
- Minimize the frequency and severity of preventable crashes.
- Consider the safety of all grade crossing users.
- Verify compliance of the technical standards referred to in the Railway Safety Act / Grade Crossing Regulations and contained in the Grade Crossing Standards.
- 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 outcome of the 2015 assessment offered recommendations for consideration by the VFPA. Table 1: Previous Non-Compliances, illustrates the non-compliances and recommendations offered within the 2015 report. The recommendations were categorised within the three priority levels;

- Low - implement the measures as soon as practicable
- Medium - implement the measures by Transport Canada GCS & GCR November 2021 deadline.
- High - implement the measures forthwith

Table 1: Previous Non-Compliances

Observations	Suggested Actions	Priority	Addressed?
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Railway crossing surface does not extend at least 0.5m beyond the edge of the travel lanes on both approaches	Extend railway crossing surface to extend at least 0.5m beyond the travel lanes	High	Yes
GCS Section 4 – Railway Crossing and Number of Tracks Sign (Basic Requirement)			
a. West approach RAILWAY CROSSING sign located too close to edge of travelled way	Relocate west approach RAILWAY CROSSING sign so that it is at least 2.0m from edge of traveled way.	High	No – RAILWAY CROSSING Sign relocated 1.8m from travelled way and is not compliant with GCS.
b. NUMBER OF TRACKS sign not present on both approaches.	Install NUMBER OF TRACKS sign on both approaches as per GCS Section 4.1.	High	Yes – NUMBER OF TRACK Sign installed below STOP sign
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to fences on the northeast and northwest corners	If minimum sightlines cannot be provided and maintained, then a warning system with gates is required.	Medium	No – Fence/ storage yard remain
GCS Section 8 – Signs			
a. Retroreflective strips are not provided for the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Install retroreflective strips on the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Medium	Yes – retroreflective strips installed on back of both RAILWAY CROSSING Signs and poles

b. RAILWAY CROSSING AHEAD signs are not present on either approach of the crossing.	Install RAILWAY CROSSING AHEAD signs on both approaches of Timberland Road as per BCMoT's *Signage and Pavement Manual* (2000).	Medium	Yes – RAILWAY CROSSING AHEAD Signs installed on both approaches.
c. STOP signs on both road approaches are heavily faded.	Replace STOP signs as per GCS Section 8.4.	High	Yes – STOP Signs installed below RAILWAY CROSSING Signs.
d. EMERGENCY NOTIFICATION signs are not present on either approach of the crossing	Install EMERGENCY NOTIFICATION sign on both approaches as per GCS Section 8.5	Medium	Yes – EMERGENCY NOTIFICATION Signs installed below RAILWAY CROSSING Signs.
e. Double stop bars and RAILWAY CROSSING symbol pavement markings are not present on either approach to the crossing for vehicles.	Paint double stop bars and RAILWAY CROSSING symbol pavement markings on both road approaches.	Low	Yes - Double stop bars have been installed but need repainting.
f. Stopping restriction is not observed at the railway right-of-way.	Install NO STOPPING signs within the railway right-of-way	Low	Yes – NO STOPPING Signs installed along Timberland Road
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system without gates is warranted based on cross-product	Install active warning system without gates. However, Transport Canada indicated that the crossing could stay passive indefinitely unless the sightline requirements could not be met.	Low	No

2.2 CROSSING MODIFICATIONS

As shown in Appendix A: Site Photographs, a number of changes have occurred at the crossing between inspections. Most changes were based on recommendations outlined in the 2015 inspection. Table 1, shows what changes have been made based on the 2015 recommendations. Below is a summarised list of all the changes observed from the site inspection:

- New grade crossing signage, including;
    - RAILWAY CROSSING Signs
    - STOP Signs
    - EMERGECNY NOTIFACATION Signs
    - RAILWAY CROSSING AHEAD signs
    - DO NOT STOP ON TRACKS Signs
    - PARKING RESTRICTION Signs
- New MUTCD compliant pavement marking
- Asphalt has been installed on both sides to extend the crossing 0.5m beyond the travelled way
- Facility entrance gate in Northwest quadrant relocated away from crossing.

2.3 ASSESSMENT AND RECOMMENDATIONS

An updated Grade Crossing Safety Assessment was undertaken for the proposed realignment of the port road access and to determine any required crossing upgrades to ensure compliance with the GCR & GCS. **Appendix B: Site Inspection Report** provides details of the observations made during the site inspection. The inspection report also outlines outstanding safety issues, along with recommended remediations. Table 2: 2020 Crossing Recommendations, summarizes the recommendations from the field investigation.

Table 2: 2020 Crossing Recommendations

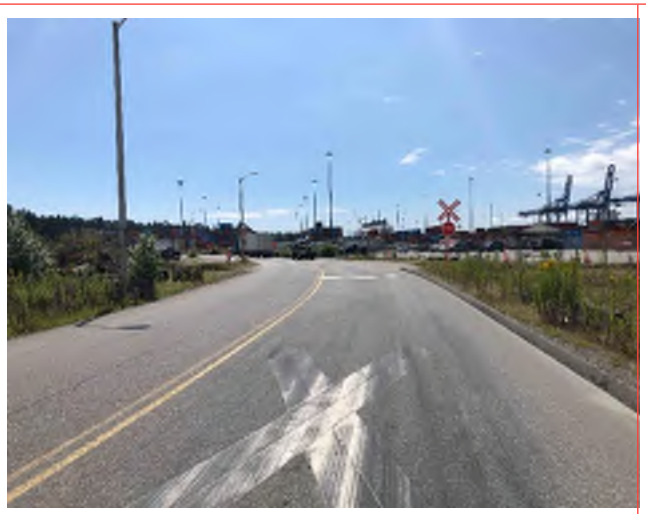
Observations	Suggested Actions	Priority	Order of Magnitude Cost
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Flangeway depth impeded due to debris	Clean debris from the flangeway	Low	$500
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to fences on the northeast and northwest corners	If the sightlines cannot be met by removing fencing or obstructions, then signal system with gates are required. *However, manual flagging of railway movements is an alternative lower-cost solution to a gated warning system.	High	$500,000*
GCS Section 8 – Signs			
a. Double stop bars and RAILWAY CROSSING symbol pavement markings are faded.	Repaint double stop bars and RAILWAY CROSSING symbol on both road approaches as per MUTCD.	Medium	$800

APPENDIX

A SITE PHOTOGRAPHS

APPENDIX

A - East Approach Drivers View Left

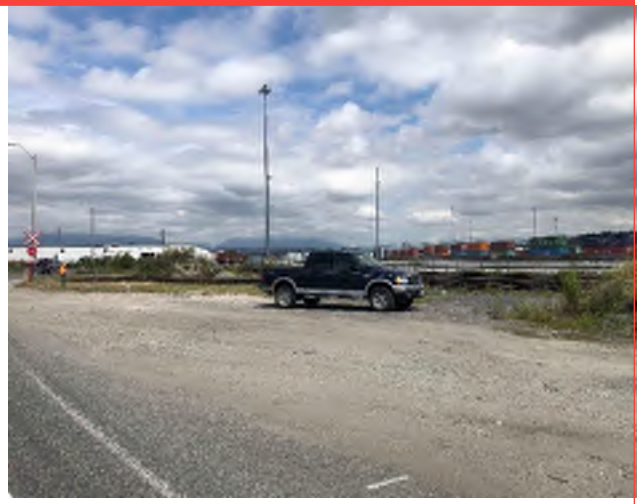


B - East Approach

C - East Approach Drivers View Right

D - West Approach Drivers View Left

E - West Approach



F - West Approach Drivers View Right

APPENDIX

G – East Approach Driver View Left
(At Stopped Position)

H - East Approach (At Stopped Position)

I – East Approach Drivers View Right
(At Stopped Position)

J- West Approach Drivers View Left
(At Stopped Position)

K - West Approach (At Stopped Position)

L - West Approach Drivers View Right
(At Stopped Position)

APPENDIX

M – North Facing Crossing Surface

N – General Crossing Photo

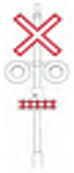
O – South Facing Crossing Surface

APPENDIX

B SITE INSPECTION REPORT

CANADIAN ROAD / RAILWAY GRADE CROSSING DETAILED SAFETY ASSESSMENT FIELD GUIDE (2005)*

Appendix C2: Field Data Forms



Passive & Active Crossings

MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia
For Vancouver Fraser Port Authority

Legend:

calculate	**Formula**	Spreadsheet cell has formula
look up		User to look up value in table or chart.
		User to input value here for conditional formatting or formulas in other cells to function
		Warning! Value beyond acceptable limits.
		Warning! Value beyond acceptable limits for certain conditions (i.e. for people using assistive devices).
	Rail	Information to be provided by Railway Company
	Road	Information to be provided by Roadway Authority
measure	observe	Information to be obtained during Site Investigation
	√	Information provided by others to be verified in the field

* Updated to reflect Transport Canada's Grade Crossing Standards (GCS) July 2014 and Grade Crossing Regulations (GCR)(SOR-2014-275 Feb 2016)

MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 1 | **Grade Crossing Safety Assessment** | **Passive Crossings**

Date of Assessment: **22-Jul-20** Site Investigation

Assessment Team Members & Affiliations: **Patrick McCabe**
Rob Sewell

Reason for Assessment: **New Proposed Pedestrian Crossing**

____	periodic assessment	**X**	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: **Southern Railway of BC**

Crossing Location: **10203 Timberland Road**

Location Number: **N/A**

Municipality: **City of Surrey, BC**

Railway: **SRY** Mile: **N/A**

Sub-division: **N/A** Spur: **N/A**

Type of Grade Crossing [private/public; warning devices]: **SRSC**

Track Type: [mainline, etc.] **Yard**

Road Authority: **Vancouver Frasier Port Authority (VFPA)**

Road Name/Number: **Timberland Road, DP world Facility**

Province: **British Columbia**

Location Reference (control section, etc.): **DP Surrey Docks**

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

Roadway East/West (yes/ no) Yes
Roadway North/ South (yes/ no) No

*Urban Local Undivided

Collision History (5-year period): **No record of accitents at the subject railway crossing within the past five years**

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

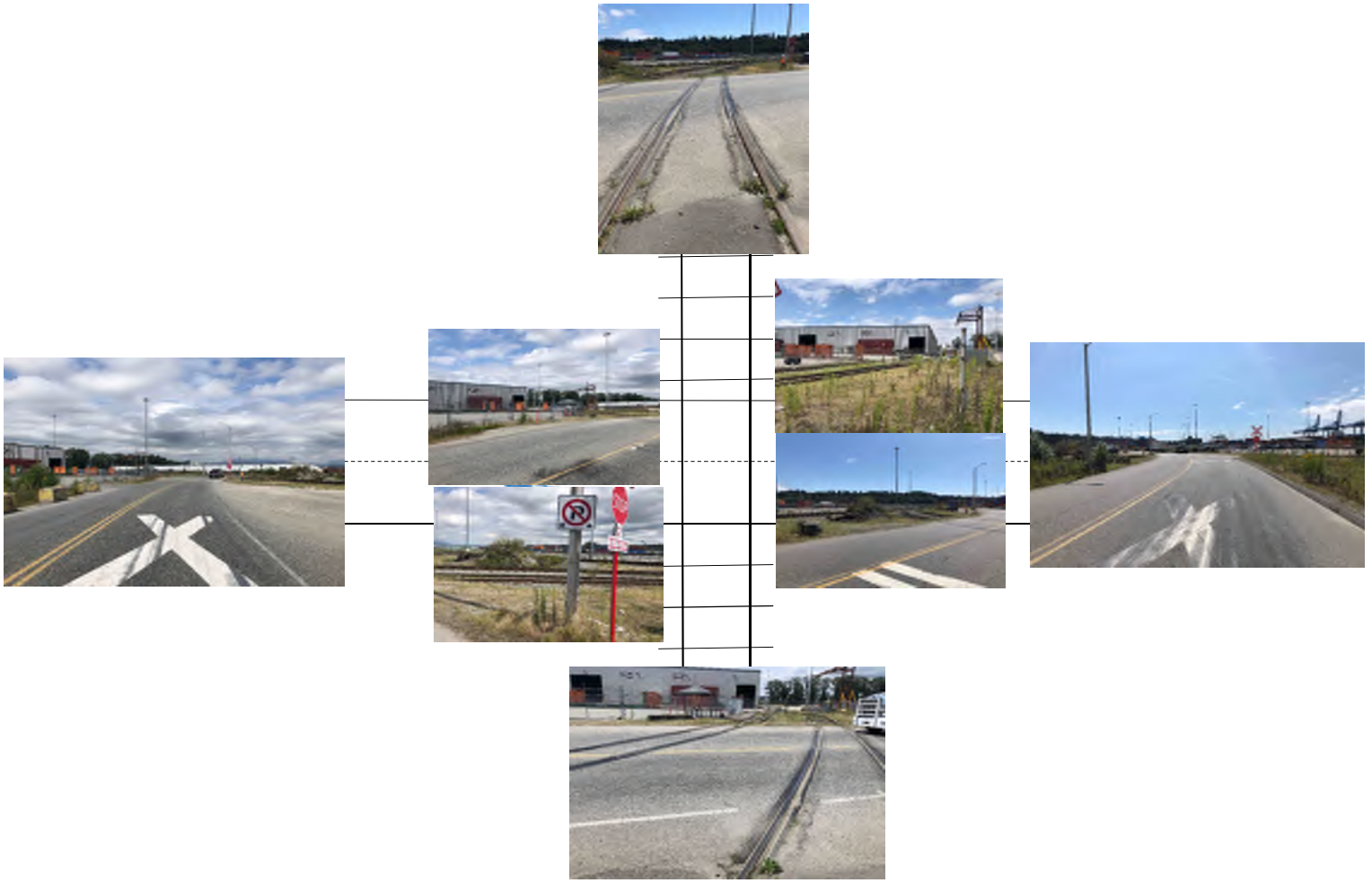
Provide Details of the collisions if available:
Sources:

- identify main contributing factors

- attach collision diagrams if available

MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 2a **SCENE PHOTOGRAPHS**



For the full set of photos taken, see the Appendix to the Safety Assessment Report.

MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 2b **SCENE SKETCH**

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

Notes: Images from Google Earth

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

MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 3 **GENERAL INFORMATION**

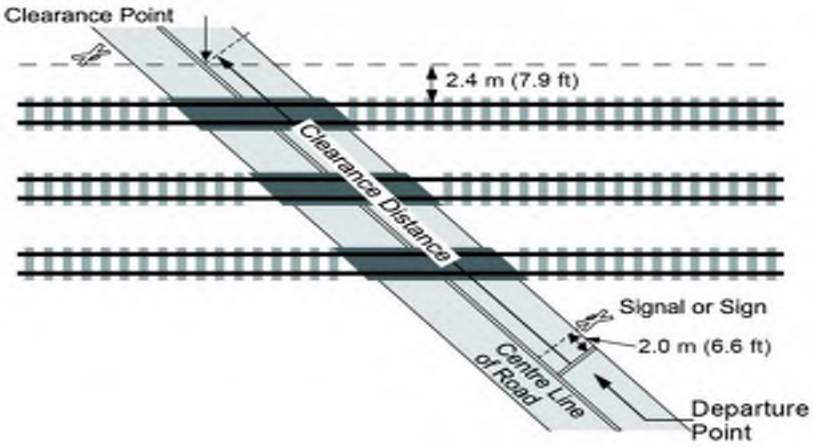
Source	Item							Reference
Rail	Maximum Railway Operating Speed, V_T	=	10	(mph)				
Rail	Daily Train Volume:	=	1	(freight trains/day)				
		=	0	(passenger trains/day)				
Rail	Switching during daytime? Y/N	Yes			nighttime? Y/N	Yes		
Road	Avg. Annual Daily Traffic, AADT:	=	2,140	(vpd)	Year of count:	2020		
Road	High seasonal fluctuation in volumes?		No					
Road	Pedestrian Volumes	=	0	(ped./day)				
Road √	Is crossing on a School Bus route?		No					
Road √	Do Dangerous Goods trucks use this roadway?		Yes					
Road	Cyclist Volumes	=	0	(cyclists/day)	Cyclist not anticipated			
Road √	Regular use of crossing by persons with Assistive Devices?				Pedestrians using Assistive Devices not anticipated			
Road √	Other special road users?	type	Unknown	daily volume	None			
Road	Forecasted AADT[2]	=	140	(vpd)	Forecasted Year:	2022		
Road √	Design Speed:		30	km/h	Posted Speed:	30	km/h	
	Maximum Operating Speed:		30	km/h				
	note: provide details if all approaches are not the same							
Road √	Road Surface Type (asphalt, concrete, gravel, etc.):		Asphalt					
observe	Surrounding Land Use (urban/rural)?:		Industrial					
observe	Any schools, retirement homes, etc. nearby?		No					

Notes:
1. Road Authority should provided plans if available.
2. AADT is based upon modelled future traffic counts for the Realigned infrastrucutre.

From GCS Section 7.1.2:

Column 1	*Column 2*	*Column 3*
Class of Track	***The maximum allowable operating speed for freight trains is -***	***The maximum allowable operating speed for passenger trains is -***
Class 1 track	17 km/h (10 mph)	25 km/h (15 mph)
Class 2 track	41 km/h (25 mph)	49 km/h (30 mph)
Class 3 track	65 km/h (40 mph)	97 km/h (60 mph)
Class 4 track	97 km/h (60 mph)	129 km/h (80 mph)
Class 5 track	129 km/h (80 mph)	153 km/h (95 mph)

Figure 10-1 - Clearance Distance (cd) for Grade Crossings
(a) For Grade Crossings with a Warning System or Railway Crossing Sign



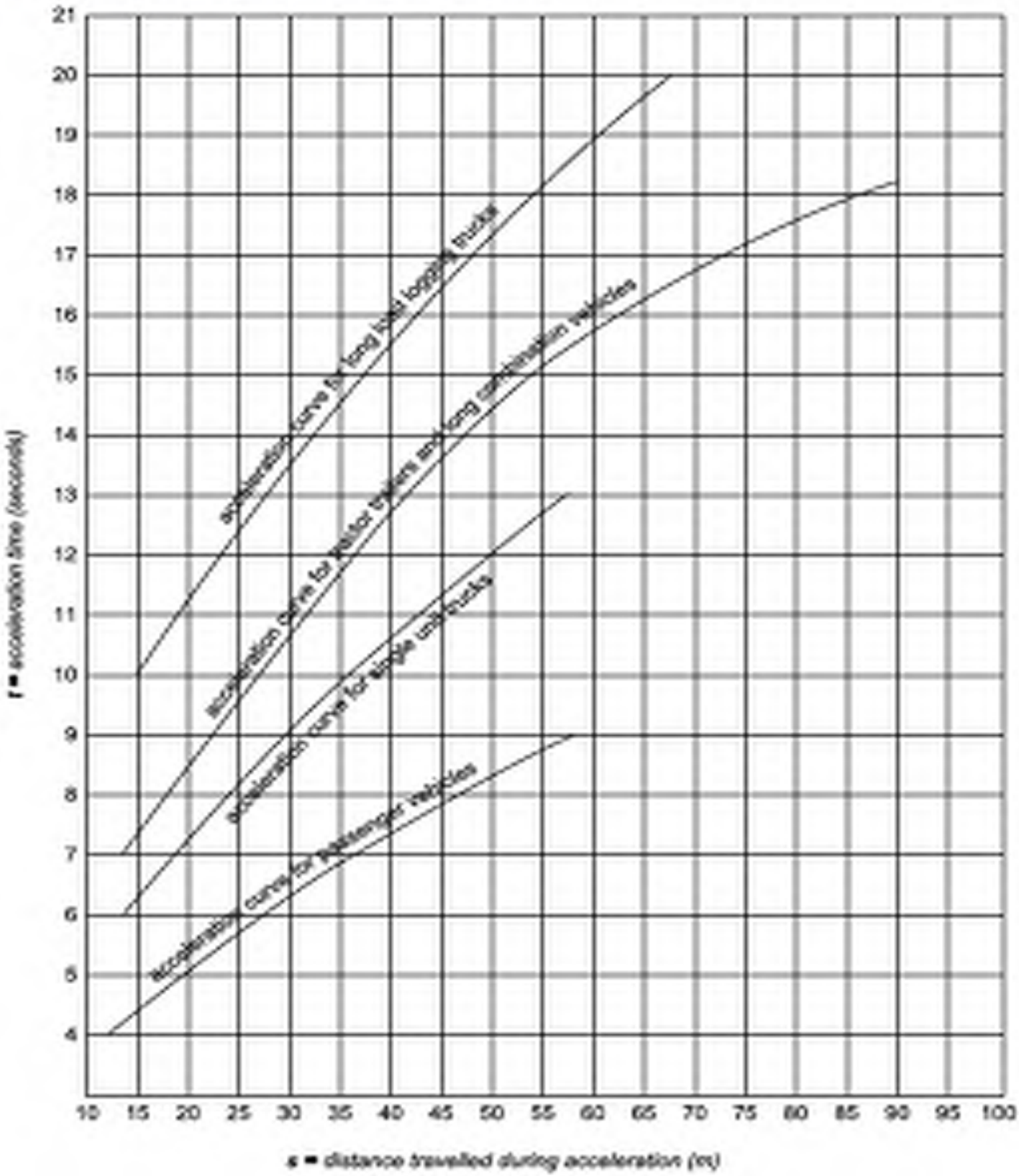
Grade Crossings Standards, July 2014

Table 10-1 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 & Buses	0.8	0.9	1.0	1.1	1.3
Tractor-Semitrailer	0.8	0.9	1.0	1.2	1.7

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 10-2 Assumed Acceleration Curves



MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 4 **DESIGN CONSIDERATIONS**

Source	Item						EB Approach		WB Approach		Reference
	Design Vehicle										
Road	Type:	6	WB-20 Tractor-Semitrailers (WB-20)								Table 1* SOR 57
look-up	Length, **L:**		22.7	m							Table 1*
look-up	**Stopping Sight Distance, SSD**		45	m (round to 1.0% of grade)		=	10	m	45	m	Table 3*
measure	**Clearance Distance, cd**					=	31.4	m	31.4	m	GCS 16.1.1
calculate	**Vehicle Travel Distance, S**	**S= L+cd**	54.1	max <---		=	54.1	m	54.1	m	
look-up	**Vehicle Departure Time, t**					=	15.1	sec	15.1	sec	GCS Figure 10-2
Road V	Road Grade Effect:	maximum approach grade within 'S':				=	0.40	%	0.70	%	Sheet 7
look-up	grade adjustment factor (anto calc assumes Truck)(manual input from Table 10-1 if other)					=	1.02		1.04		GCS Table 10-1
calculate	**T**= t x adjustment factor					=	15.3	sec	15.6	sec	
	Design Vehicle Departure Time, T_D = J + T (where J = 2 sec (min.) perception & reaction)						2.0	sec	2.0	sec	
calculate	**$T_{G\ stop}$ = T_D=**		17.6	sec		<-	17.3	sec	17.6	sec	GCS 10.3.2
observe	Do field acceleration times exceed T_D?	**Acceleration measurement beyond the scope of this assessment.**									
measure	**Pedestrian , cyclist & Assistive Devices Departure Time**				pedestrian **cd** distance	=	0.0	m	0.0	m	GCS 10.3.3
calculate	walking speed 1.22m/s max.	**T_P =**	0.0	sec	(1.0m/s used)	<-	0.0	sec	0.0	sec	
calculate	**T_{SSD}**	= (SSD+cd+L)/(0.277837 x $V_{road\ design}$) =	11.9	sec							

Comments Following Site Visit:

Table 1 – Design vehicle Lengths/Class

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

Source: *Geometric Design Guide for Canadian Roads*, TAC; September 1999.

Table 6 – Minimum Sightlines along the Rail Line ($D_{stopped}$) (as illustrated in Figure 3)

Railway Design Speed V_r (mph)	$T_{stopped}$ = Departure Time (greater of T_d or T_p) (seconds)											If greater of T_d or T_p > 20 sec., add for each additional second (m)
	≤ 10	11	12	13	14	15	16	17	18	19	20	
WARNING: Railway design speed in mph!	Minimum Sightlines along Rail Line ($D_{stopped}$) (m)											
STOP	30	30	30	30	30	30	30	30	30	30	30	+0
1-10	45	50	55	60	65	70	72	76	80	85	90	+5
11-20	90	100	110	120	125	135	145	155	165	170	180	+10
21-30	135	150	165	175	190	205	215	230	245	255	270	+15
31-40	180	200	220	235	250	270	285	305	325	340	360	+20
41-50	225	250	270	290	315	335	360	380	405	425	450	+25
51-60	270	300	325	350	380	405	430	460	485	510	540	+30
61-70	315	350	380	415	445	470	505	535	565	595	630	+35
71-80	360	395	435	465	505	540	580	610	650	680	720	+40
81-90	405	445	490	535	570	605	650	685	730	765	810	+45
91-100	450	500	540	580	630	670	715	760	805	850	895	+50

Table 3 – Determine SSD for Truck Class

Road Crossing Design Speed V (km/hr)	Truck Class Stopping Sight Distance (SSD) (m)																				
	Road Approach Gradient																				
	-10%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
20	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	24	24	24	24	24
30	48	48	47	47	47	46	46	46	45	45	45	45	45	44	44	44	44	44	44	43	43
40	76	75	74	74	73	73	72	71	71	70	70	70	69	69	68	68	68	67	67	67	67
50	121	120	118	117	116	115	114	113	112	111	110	109	108	108	107	106	106	105	105	104	104
60	149	146	144	142	140	138	136	134	133	131	130	129	128	126	125	124	123	122	122	121	120
70	210	205	202	198	195	192	189	187	184	182	180	178	176	175	173	171	170	169	167	166	165
80	252	246	241	236	231	227	223	219	216	213	210	207	205	202	200	198	196	194	192	191	189
90	318	311	304	297	292	286	281	277	273	269	265	262	258	255	252	250	247	245	243	240	238
100	401	391	382	373	365	358	352	346	340	335	330	325	321	317	314	310	307	304	301	298	295
110	455	441	428	417	406	397	388	380	373	366	360	354	349	344	339	334	330	326	322	319	315

* Source: Transport Canada's "Determining Minimum Sightlines at Grade Crossings: A Guide for Road Authorities and Railway Companies"

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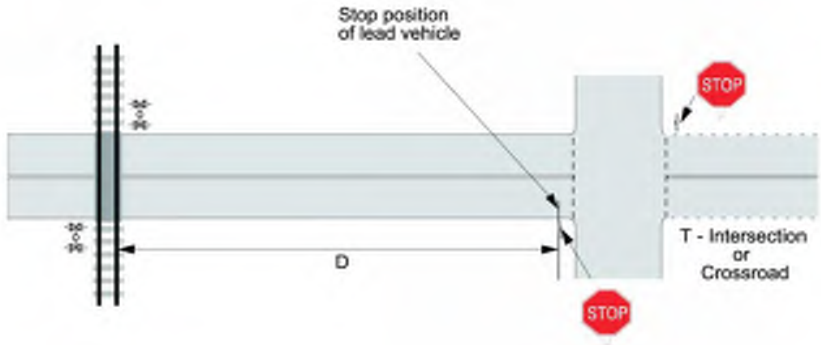
Sheet 5 **LOCATION of GRADE CROSSING**

Source	Item		Reference
observe	"D" should not be less than 30m for either approach if the train speed exceeds 15 mph. **D =24.4m**		GCS Section 9.1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	**No**	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks?	**No**	
	Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing?	**No**	

Comments Following Site Visit:
- The minimum "D" dimension to the edge of the entrance to facility in south. The Northern "D" is 33m
- Since the previous 2015 inspection was completed the southern facility gate has moved 20m south. Improving the D dimension from 4m
- Railway speed = 10mph

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

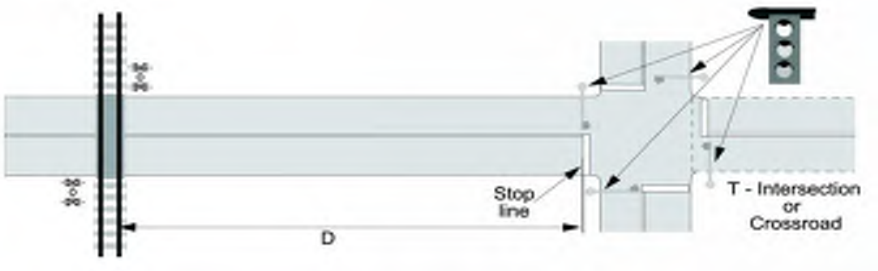
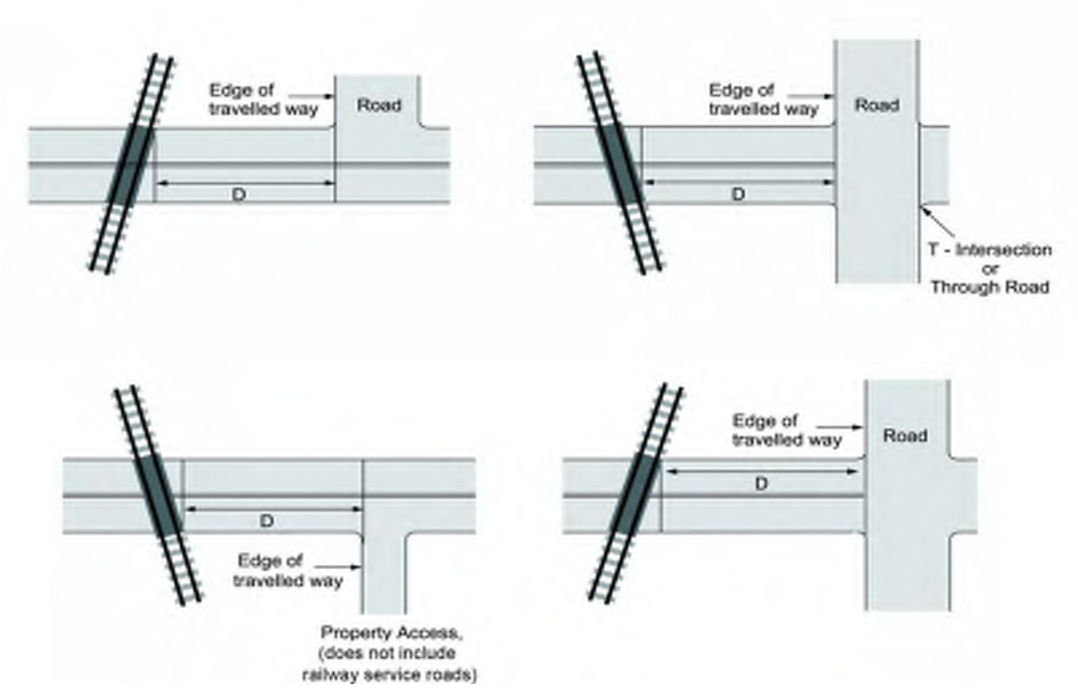


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings



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Sheet 6 **GRADE CROSSING SURFACE**

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? **Yes**							SOR 60; GCS 5
observe	Grade Crossing Surface Material: **Asphalt** Grade Crossing Surface Condition: **Fair**							SOR 60; GCS 5
observe	Approach Road Surface Type: **Ashpalt** Approach Road Surface Condition: **Fair** Roadway Illumination?: **Yes**							SOR 60; GCS 5
		EB Approach		**WB Approach**				
measure	Road Surface crossing width (perp. C.L. min. = 8.0m)		**10.5** m					GCS 5.1
measure	Road Surface extension beyond travel lanes (min. = 0.5m)	**0.5** m		**2.0** m				GCS 5.1
measure	Sidewalk/Path/Trail crossing width (min. = 1.5m)		**NA** m	**NA** m		No sidewalk		GCS 5.1
measure	Sidewalk/Path/Trail extension beyond sidewalk (min. = 0.5m)	**NA** m		**NA** m				GCS 5.1
measure	Distance Between Travel Lane and C.L. of Trail		**NA** m					
	Cross-Section:		**South (Right) Rail:**		**North (Left) Rail:**			GCS Table 5-1
measure	Flangeway width (min. = 65mm; max.= 120mm or 75mm[1])		**82** mm		**82** mm			GCS Table 5-1
measure	Flangeway depth (min. = 50mm; max.= no limit or 75mm[1])		**20** mm		**20** mm			GCS Table 5-1
	Rural Field Side Gap:							GCS Table 5-1
measure	Side Gap width (max.= 120mm or 0[1])		**20** mm		**20** mm			GCS Table 5-1
measure	Side Gap depth (max.= no limit or 0[1])		**0** mm		**0** mm			GCS Table 5-1
	Wear Limits:							GCS Table 5-1
measure	Elevation of Top Rail above road surface (max. = 13mm[1], 25mm, or 50mm)		**0** mm		**0** mm			GCS Table 5-1
measure	Elevation of Top Rail below road surface (min. = -7mm[1],-25mm, or -50mm)		**0** mm		**0** mm			GCS Table 5-1

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Flangeway and field side gap constructed out of rubber. Full of debri

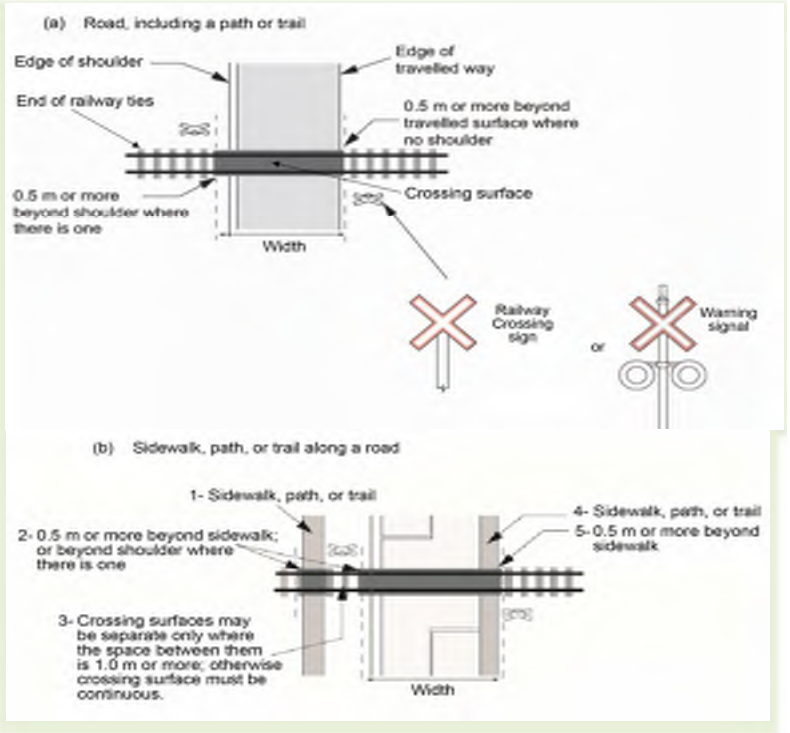
-rough crossing surface, loose timbers, etc. - difference between road grade and rail superelevation -surface distress of roadway approaches -photos

Grade Crossings Standards, July 2014

Table 5-1 – Grade Crossing Surface – Cross Section

a) Flangeway:		
Width	**Minimum**	65 mm
	Maximum for:	
	Public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	120 mm
Depth	**Minimum**	50 mm
	Maximum for:	
	Public sidewalks, paths and trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	No limit
(b) Field side gap A space is permitted on the outer side of the rail at rural locations, except for public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices		
	Maximum width	120 mm
	Maximum depth	No limit
(c) Elevation of the top of the rail with respect to the crossing surface The top of the crossing surface must be installed as close as possible to the top of the rail within the wear limits below:		
Wear limits:		
Public sidewalk, path or trail designated by the road authority for use by persons using assistive devices		
	Maximum distance of the top of the rail above crossing surface	13 mm
	Maximum distance of the top of the rail below crossing surface	7 mm
All other public grade crossings; the maximum distance of the top of the rail above or below the crossing surface		25 mm
Private grade crossings; the maximum distance of the top of the rail above or below the crossing surface		50 mm

Figure 5-1 - Grade Crossing Surface Dimensions



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Sheet 7 — **ROAD GEOMETRY**

Source	Item									Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L? WB Approach: **No** EB Approach: **No**									Sheet 4
observe	Are the road lanes at least the same width on the crossing as on the road approaches? WB Approach: **Yes** EB Approach: **Yes**									
	Grades		**EB Approach**		**WB Approach**		Difference: rail e & rd grade (GCS 6.1)			GCS Sect. 6
measure	Slope within 8m of nearest rail (max. = 2%)		**0.60**	%	**0.20**	%	**0.30%**	%	**0.10%**	Diff in Grade Max
measure	Slope between 8m & 18m of nearest rail (max. = 5%)		**0.40**	%	**0.70**	%				3%
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices (max. = 1[1] or 2%): slope within 5m of nearest rail =		**N/A**	%	**N/A**	%				
Road √	General approach grade (max. = +/- 5%)		**0.50**	%	**0.50**	%				
	measured over the SSD distance of:		**10**	m	**45**	m				Sheet 4
Rail √	Are rail tracks super-elevated?	**No**	Rate of s/e:	**0.00**	m/m Sdg	**0.00**	m/m ML			GCS Sect. 6.1 & 6.2
Road √	If train speeds exceed 15mph (70° minimum w/o warning system; 30° minimum with warning system): What is the angle between the crossing and the roadway? =		**70.0**	degrees						
observe	**Condition of Road Approaches:** **Fair** (e.g., anything that might affect stopping or acceleration)									SOR 60
observe	NA									

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Minor cracking within both approaches were observed.

Grade Crossings Standards, July 2014

Table 6-1 – Difference in Gradient

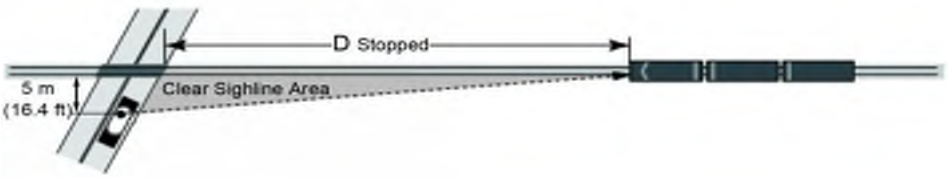
Classification	Difference in Gradient (%)
RLU	2
RCU	1
RCD	1
RAU	0
RAD	0
RFD	-
ULU	3
UCU	2
UCD	2
UAU	0

*Legend
Urban (U) Rural (R) Local (L) Collector (C) Arterial(A) Expressway (E) Freeway(F)
Divided (D) Undivided (U)

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 7-1 - Minimum Sightlines - Grade Crossings

(a) Sightlines for Users Stopped at a Grade Crossing (applicable to all quadrants)



(b) Sightlines for Users Approaching Grade Crossing (applicable to all quadrants)

MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 8 **SIGHTLINES**

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 **No, only minor (weeds) within ROW**							
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location **No, only minor (weeds) within ROW**							
				EB Approach		**WB Approach**		
look-up	**SSD** minimum =			**10**	m	**45**	m	Sheet 4
measure	**SSD Actual** (not including turning movements)**:**			**100.0**	m	**140.0**	m	
calculate	D_{SSD}	=	$0.277837 \times V_{train\ km/h} \times T_{SSD}$	**53**	m	**53**	m	1.609 convert mph to km/h
calculate	$D_{STOPPED}$ minimum (m)	=	$0.277837 \times V_{train\ km/h} \times T_D$ =	**77**	m	**79**	m	T_D from Sheet 4
measure	$D_{STOPPED}$ **Actual**:		Driver looking LEFT	**70**	m (ne)	**100**	m (sw)	
			Driver looking RIGHT	**70**	m (nw)	**150**	m (se)	
calculate	**Ped./Cyclist** $D_{STOPPED}$ **(m)**			**0**	m	**0**	m	T_P from Sheet 4
measure	**Ped./Cyclist** $D_{STOPPED}$ **Actual:**		Person looking LEFT	**N/A**	m	**N/A**	m	
	note: measured from a point 2m in advance of sign/signals		Person looking RIGHT	**N/A**	m	**N/A**	m	
observe	Are there any obstacles within the sight triangles other than traffic signs/utility poles that might affect visibility? **Fencing and equipment within DP World facility. Debri on South side**							

Comments Following Site Visit:

- Debris on southeastern quadrant causes obstruction.
- Fencing and equipment blocks sight in northeast and Northwest quadrants.
- Active Warning system may be required is sighlines cannot be met.

-special considerations for large trucks?
-special design vehicle?
-can sightlines be maintained on an ongoing basis? (snow)
-photos

Figure 8-3 - Location of Railway Crossing Signs and Number of Tracks Signs (public grade crossings without warning systems)

a) **b)**

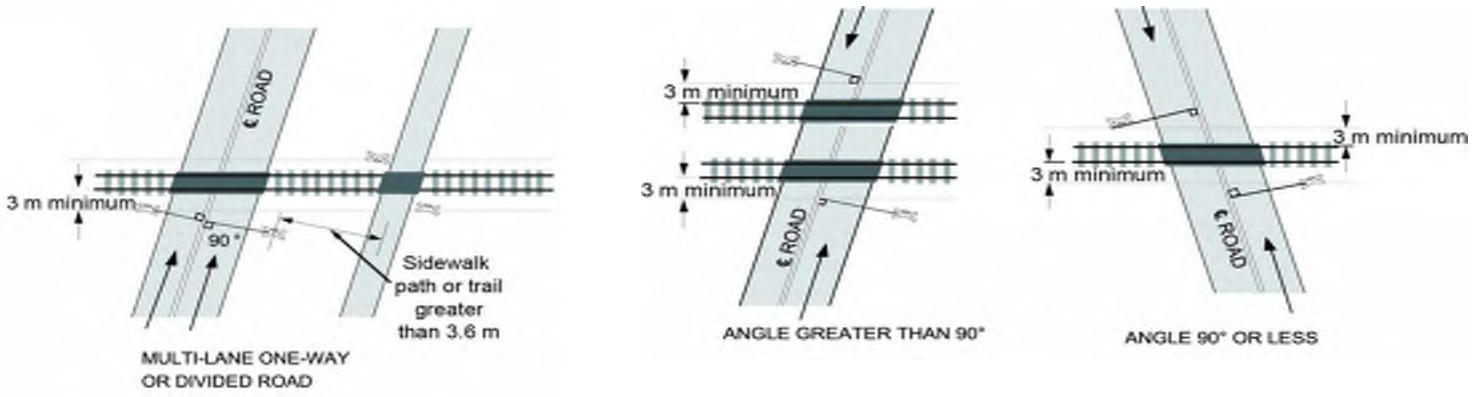
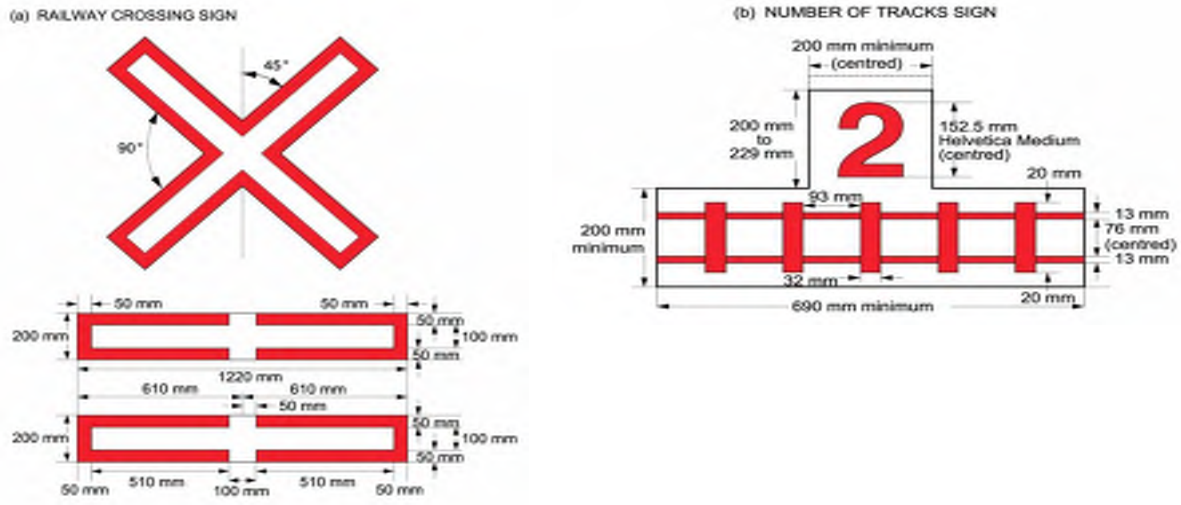


Figure 8-1 - Railway Crossing Sign and Number of Tracks Sign



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Sheet 9a — **SIGNS AND PAVEMENT MARKINGS**

Source	Item							Reference
	Railway Crossing Sign  **These signs will be required**							MUTCD
		EB Approach		**WB Approach**				
measure	distance from nearest rail:	**7.7**	m	**12.0**	m			
measure	distance from edge of road:	**1.8**	m	**1.8**	m			
measure	height of centre of crossbucks:	**3.5**	m	**3.5**	m			
measure	retroreflectivity readings:	**N/A**	cd/lux/m^2	**N/A**	cd/lux/m^2			
observe	Number of Tracks sign? **Yes**							
observe	A Stop Sign must be installed at grade crossing without a warning system if the road design speed is less than 15mph					Yes/ No/ NA	**Yes**	SOR 64
observe	A Stop Ahead sign must be installed if the Stop Sigh is not clearly cvisable within the Stopping Distance					Yes/ No/ NA	**N/A**	SOR 65

Comments Following Site Visit:
- New RAILWAY CROSSING signs installed in 2015.
- The back of poles and signs have reflective strips (reflectivity not measured).
- NUMBER OF TRACKS Sign not required as only 1 track.

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

Source	Item		Reference
	DO NOT STOP ON TRACKS 		MUTCD
Road √	Does queued traffic routinely encroach closer than 5m from the crossing surface?	**No**	
observe	Are these signs present on either approach?	**Yes**	

Comments Following Site Visit:
- DO NOT STOP ON TRACKS Signs are installed.

-general condition -posts -photos

Source	Item					Reference
	Railway Crossing Ahead Sign (WA 18-20) 					MUTCD & SOR 66
look-up	Is AADT > 100? **Yes**		**EB Approach**	**WB Approach**		Sheet 3
observe	Is area urban such that WA 18-20 is not required?		**Yes**	**Yes**		
measure	Distance from nearest rail to sign	=	**50** m	**52.0** m		MUTCD
observe	height:		**2.5**	**2.5**		
observe	appropriate orientation of symbol		**Yes**	**Yes**		

Comments Following Site Visit:
- RAILWAY CROSSING AHEAD Sign has been installed since the previous inspection.
- RAILWAY CROSSING AHEAD Sign installed Min. Approx 50m from crossing

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

Source	Item			Reference
	ADVISORY SPEED SIGN 			MUTCD & SOR 66 (2)
observe	Are they present on both approaches?	**No**		
	Posted speed limit?	**N/A**	km/h	
look-up	Are they required on either approach?	**No**		check SSD (Sheet 8)

Comments Following Site Visit:

- ADVISORY SPEED Sign not installed

-general condition -posts -photos

MileX.XX (10203, 59 Timberland Road),SRY Rail
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Sheet 9b **SIGNS AND PAVEMENT MARKINGS**

Source	Item		Reference
	EMERGENCY NOTIFICATION		GCS Sect. 8.5
observe	Are these signs present on both approaches?	**Yes**	
observe	Is the information complete and legible?	**Yes**	

Comments Following Site Visit:

- EMERGENCY NOTIFICATION Sign installed below RAILWAY CROSSING AHEAD Sign

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

Source	Item		Reference
	PAVEMENT MARKINGS		
observe	Are pavement markings consistent with those from the MUTCD Manual?	**Yes**	Fig C1-6 MUTCD
observe	Are there lines to delineate sidewalks/paths?	**N/A**	

Comments Following Site Visit:

- Road markings and DOUBLE STOP BARS have been installed since the 2015 inspection.

- Roadway "X" marking REQUIRED as per MUTCD.

- DOUBLE STOP BARS and ROAD MARKINGS needs to be repainted

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

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

GENERAL ASPECTS C1

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA

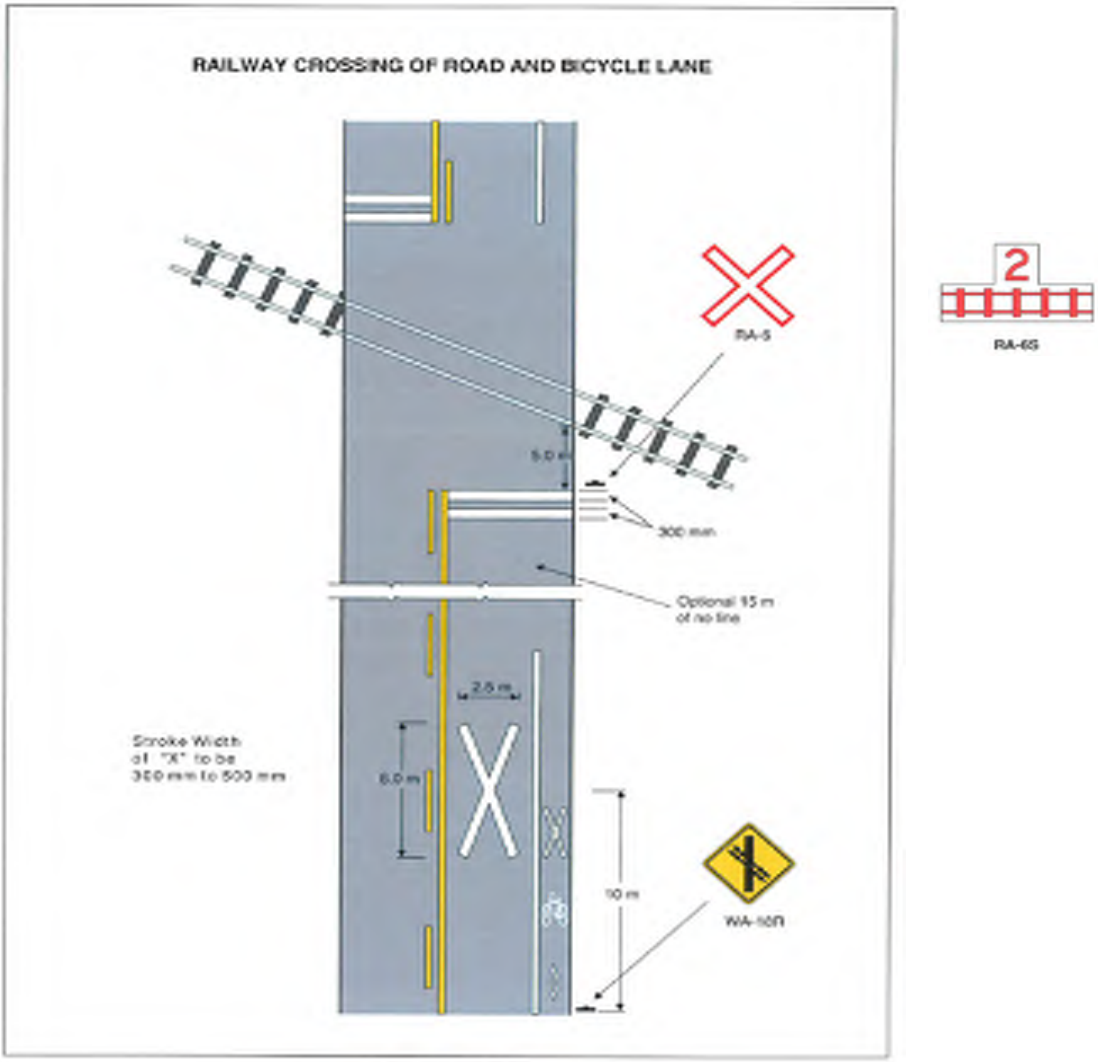
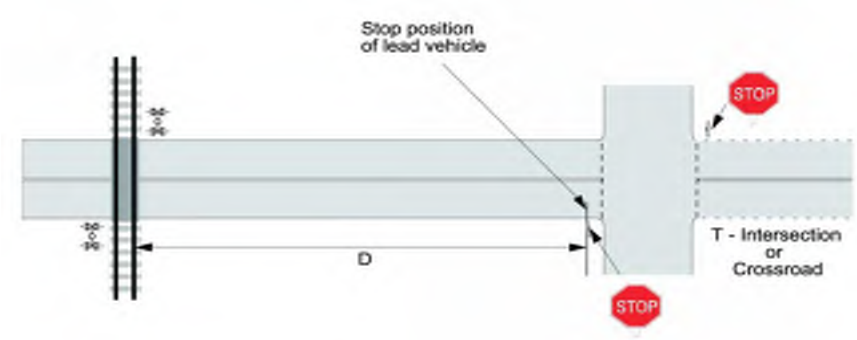


FIGURE C1-6

JANUARY 2014

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals

(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings

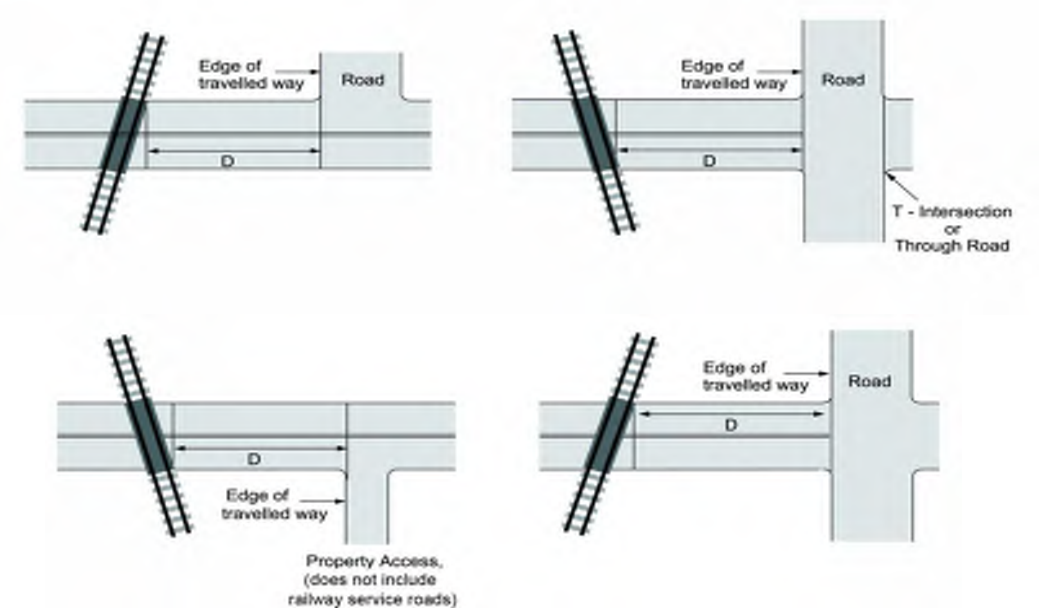
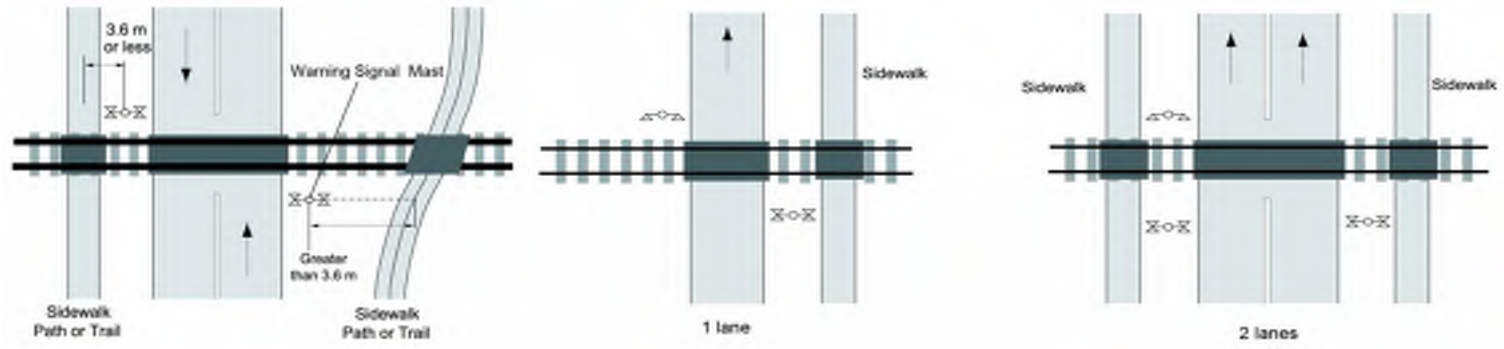


Figure 13-2 - Sidewalks, Paths and Trails

(a) Two Way

(b) One-Way



Sheet 10 eliminated in the new GCS

MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 11 — **GRADE CROSSING WARNING SYSTEMS** — **GCS Section 9**

Source	Item is not required.									Reference
	Warning System Warrants if any of A through E below are met, then a warning system is warranted									
	Question							**Warrant for Warning System**		
look-up	Existing AADT =	2,140	Forecast AADT =	140						Sheet 3
look-up	Daily Train Volume =	1			trains					Sheet 3
calculate	**A. Cross-Product =**	140						> 2,000 FLB req'd	**> 50,000 requires gates**	
look-up	**B. Maximum Rail Operating Speed =**		10		mph			(max = 80mph or 50 mph with crosswalk)		Sheet 3
Rail	**C. Number of Tracks =**		2							
	if ≥ 2, can trains pass one another?		No					if > 2 and trains can pass one another -> FLB req'd		
look-up	**D. Are Sightlines obscured?**		N/A					if "Yes" -> FLB req'd: If Fig 7.1 applies --> add G		Sheet 8 & Fig 7.1
observe	**E. Are any proximity conditions met?**		No					if "Yes" -> FLB required.		GCS Sect 9 & 11
look-up	Is a Warning System warranted?		No					If any of A through E above meet the Warrant		
	Field Visit	**Present? (Y/N)**	**Condition / Alignment:**							GCS 13
observe	Light Units,	N								GCS 13
observe	Bells,	N								GCS 13
observe	Gates,	N								GCS 13
observe	Cantilever Lights,	N								GCS 13
observe	Check that warning signal assemblies and cantilevers are in accordance with GCS Figures.									GCS Sect. 12
observe	Is warning system housing at least 9m from traveled way of the road and 8m from the nearest rail?									
observe	If there is a sidewalk, is a bell on the adjacent assembly?									
Rail √	Have all light units been aligned?	NA	Date?	NA						
Rail	Design Approach Warning Time (greatest of):			20sec OR [20+((cd-11)/3)] if cd>11m	Td	Tp	Gate Clearance Time + Descent Time + 5 seconds	Traffic Signal Clearance Time (=0 if no traffic signal)	(SSD + cd + L)/(0.277837xVv)	
	EB Approach	34.6	sec	26.8	17.3	0.0	34.6	0.0	7.7	
	WB Approach	34.6	sec	26.8	17.6	0.0	34.6	0.0	11.9	
observe	Is warning time less than 35 sec (without gates) or 55 sec (with gates)			N/A						

Comments Following Site Visit:

As the AADT has reduced since the 2015 inspection, the crossing does not meet the requirements for and active warning system

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted?

Figure 12-1 - Warning Signal Assemblies

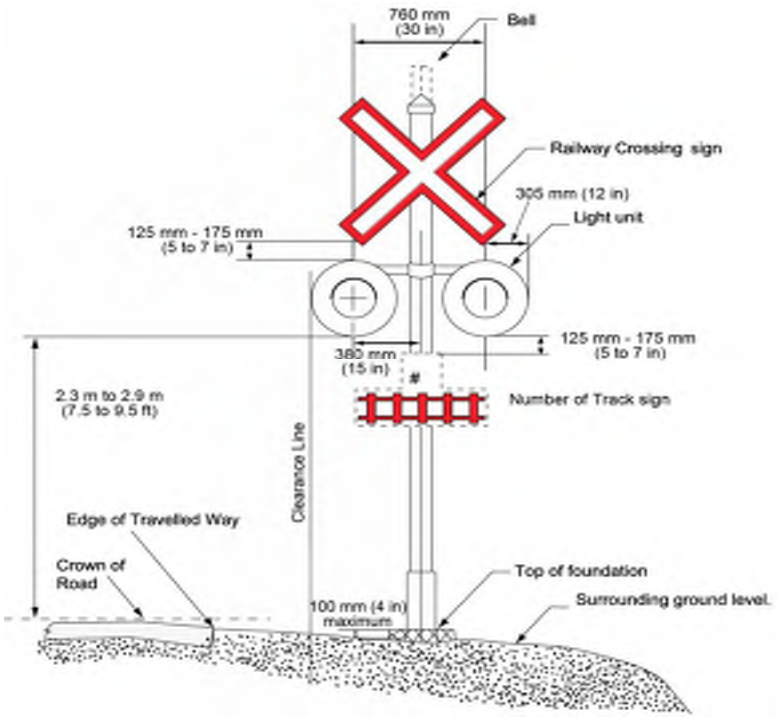
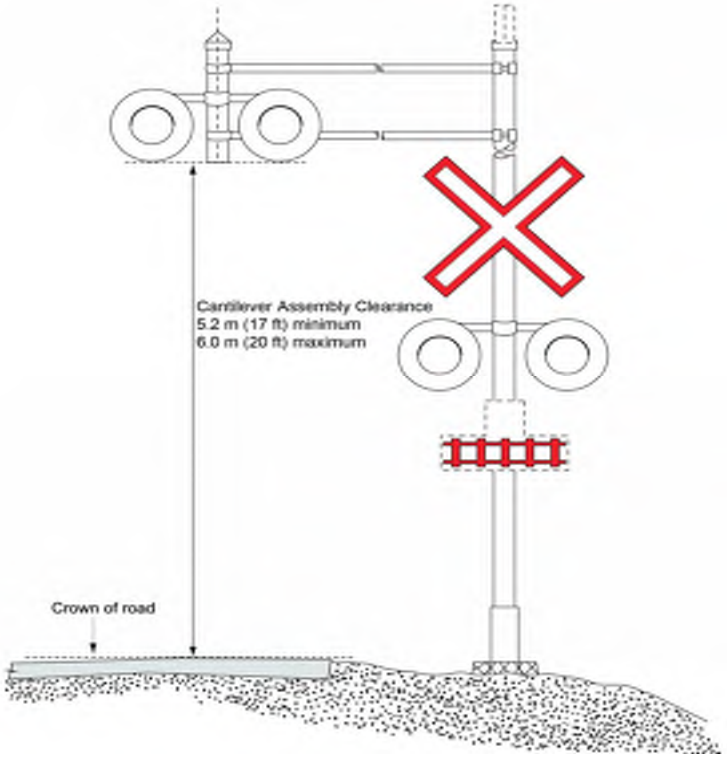


Figure 12-3 - Cantilevers



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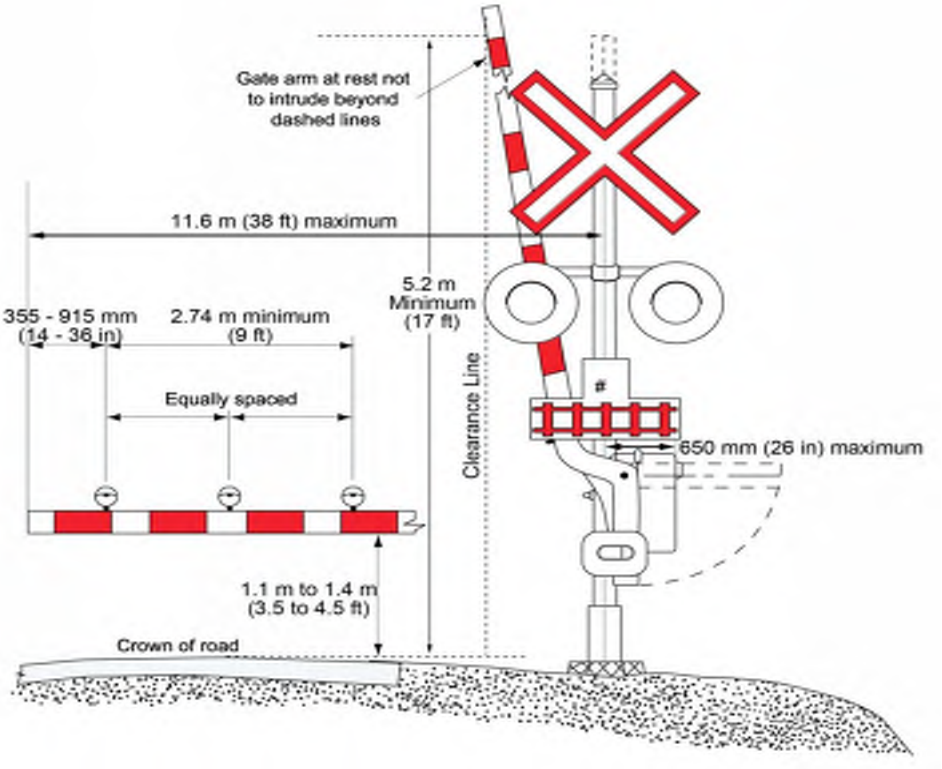
Surrey, British Columbia

Sheet 12  **GATES FOR GRADE CROSSING WARNING SYSTEMS** **GCS Section 9**

Source	Item							Reference
	Warning System Warrants -if any of A through E below are met then a warning system with gates is warranted. **Not required as qwarning system is not necessary**							
calculate	**A. Cross-Product =**	140	(50,000 min)					
look-up	**B. Maximum Rail Operating Speed =**	10	mph (max = 50mph)					Sheet 3
Rail √	**C. Number of Tracks =**	2						
	.....if ≥ 2 , can trains pass one another?	N/A						
look-up	**D. Is $D_{STOPPED}$ Insufficient?**	No	**Minor vegetation work required on Northwest and Southwest quadrants.**					Sheet 8
observe	**E. Are any proximity conditions met?**	N/A						
calculate	Gate clearance distance: eq 10.4b	24.7	m cd $_{G\ stop}$		34.7	m cd ssd EB	69.7 m cd ssd WB	GCS Sect. 10.4
look-up	travel time =	17.6	sec $_{G\ stop}$					
calculate	Gate arm clearance times:	17.3	sec EB from stop	$T_{G\ ssd}$ =	4.2	sec EB from SSD		
		17.6	sec WB from stop	$T_{G\ ssd}$ =	8.4	sec WB from SSD		
look-up	Gate arm delay time: 17.6	sec (greatest value from above)						
calculate	effect of grade =	0.3	sec (SB from Stop)		-4.2	sec EB from SSD		
		0.6	sec (NB from Stop)		0.0	sec WB from SSD		
measure	Measure gate arm delay and compare with above:		N/A					
observe	Do gates conform to standards depicted in GCS Figures?		N/A					
observe	Check gate descent (10 to 15 sec) and ascent (6 to 12 sec)		N/A					
observe	Is gate striping vertical as depicted in GCS Figures?		N/A					
observe	Where railway equipment regularly stops, or railway equipment is left standing, within the activating limits of a warning system, the warning system must be equipped with a control feature to minimize the operation of the warning system.					Yes/No/NA	NA	GCS 16.3.1
Comments Following Site Visit:								
- Warning System with Gates is not required unless sightlines cannot be obtained.								
-extraordinary conditions why warning system should be installed					-is warning system present but not warranted?		**No**	

Figure 12-2 - Gates



MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

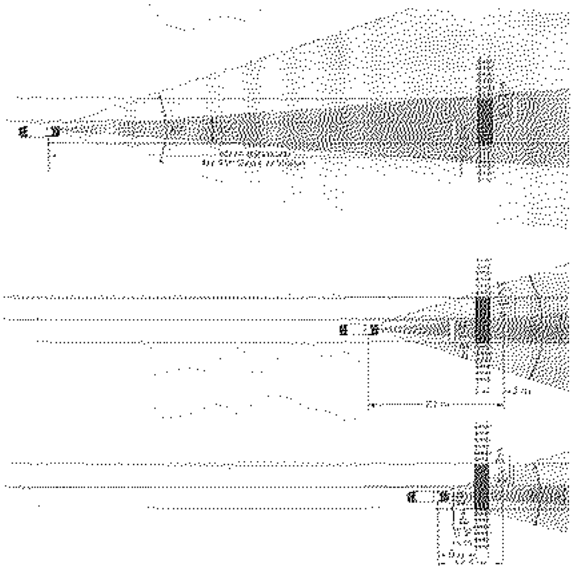
Sheet 13 **FLASHING LIGHT UNITS**

Note: Driver's cone of vision is ± 5° horizontally; limited by top of windshield vertically. GCS Sections 12-14

Source	Item is not required as warning system is not required.				u
	Number and Location				
look-up	Minimum Distance for Primary Light Units (SSD) =	45.0	m		
look-up	Recommended Distance for Primary Light Units =	69.7	m		
observe	Are flashing light units located within 5° horizontally of the centerline of the road (throughout the approach distance above)?			**Yes (covered by front and back units)**	
	Does horizontal/vertical curvature necessitate supplemental units?			**N/A**	
observe	Can back lights be seen by all stopped drivers?			**N/A**	
observe	Are lights obscured by vehicles stopped on adjacent intersections?			**N/A**	
observe	Are additional light units required for drivers as they begin to turn onto an approach road from an intersecting road/lane/pkg lot?			**N/A**	
	Cantilevered Light Units				
measure	Does D_R exceed 7.7m?	**N/A**			
measure	Does D_L exceed 8.7m?	**N/A**	(Assumes signal poles on both sides of road alignment, approach side of rail)		
	Multiple Lanes				
observe	Can front light units be seen by drivers in all lanes (….would T/T obscure?)?	**N/A**			
observe	Can back light units be seen by all stopped drivers in all lanes?	**N/A**			
	Sidewalks, paths, trails, etc.				
measure	Distance from path centerline to signal mast =	**N/A**	m (max.=3.6m)		
observe	Are separate light units required?	**N/A**			

Comments Following Site Visit:
- Crossing currently regulated by a passive warning system.

Horizontal Cone of Vision



Typical Light Unit Arrangement for an Adjacent Intersection

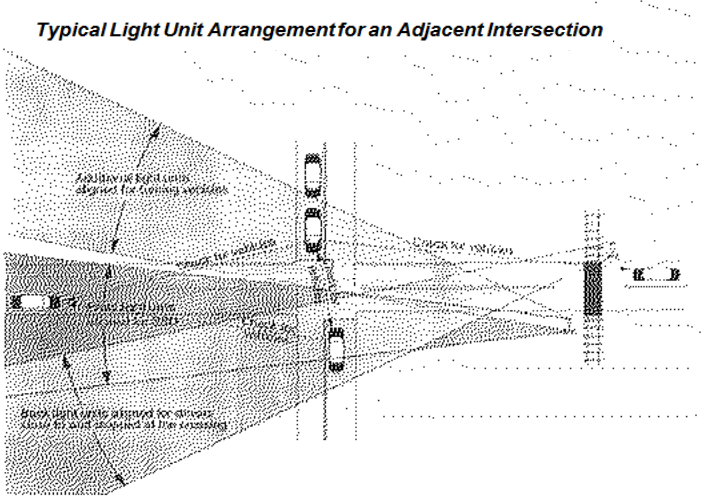
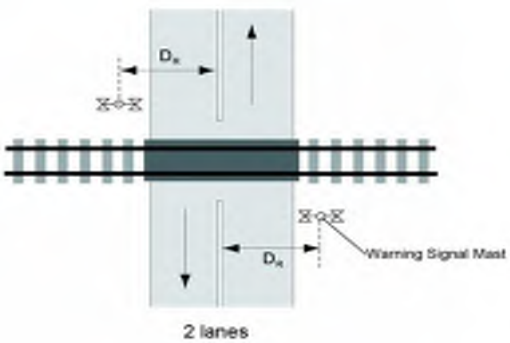
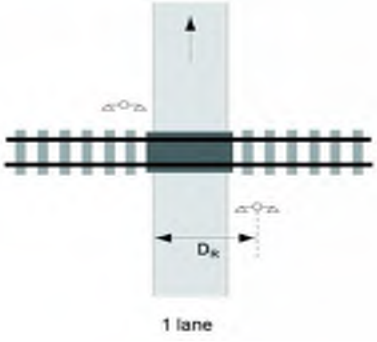


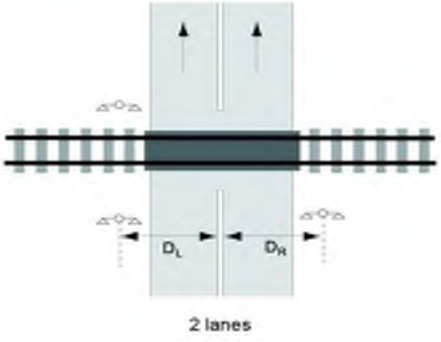
Figure 13-1 – Warning Signal Offsets Requiring Cantilevered Light Units

(a) Two-Way Road



(b) One-Way or Divided Road





MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 14

PREPARE TO STOP AT RAILWAY CROSSING SIGN

GCS Sections 13 and 14

Source	Item NA				Reference
observe	Are signs present?	**No**	EB approach		SOR 67 (1), (2) GCS 18.21 & 18.2
		No	WB approach		
look-up	Minimum Distance for Primary Light Units (SSD)	**N/A**	m		Sheet 13
look-up	Recommended distance for Primary Light Units	**N/A**	m		Sheet 13
	Warrants				
observe	Are all front light units obscured within minimum distance above?	**N/A**			
look-up	Is the facility designated a "freeway" or "expressway"?	**N/A**			Sheet 3
observe	Do environmental conditions frequently obscure signal visibility?	**N/A**			
	Considering maximum prevailing speeds, geometry, and traffic composition, checkthe following:				
observe	Does sign flash during operation of grade crossing warning system?	**N/A**			
measure	Distance from the sign to 2.4m beyond the furthest rail =	**N/A**			
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?	**N/A**			
measure	Distance from the sign to the closest gate =	**N/A**	m		
observe	Does the flashing sign precede actuation of the descent of the gate arms by the time required to travel from the sign to clear closest gate?	**N/A**			
measure	Time required for all queued vehicles to resume to maximum road operating speed =	**N/A**	sec		

Comments Following Site Visit:

- PREPARE TO STOP AT RAILWAY CROSSING Sign not required.

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

Sheet 15

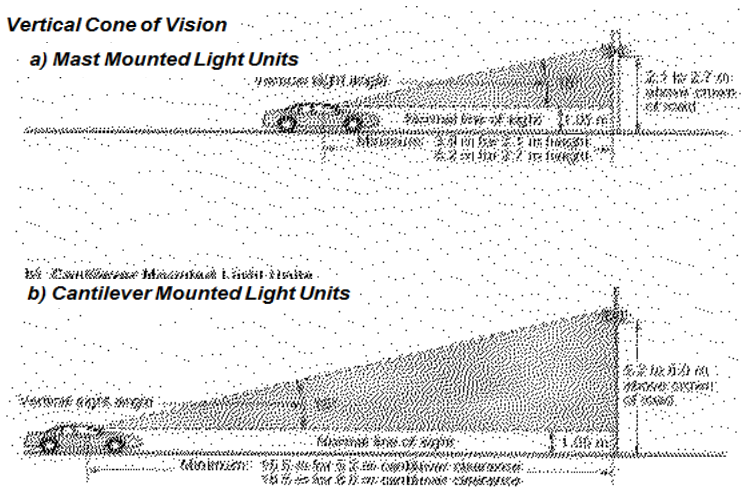
PREEMPTION OF TRAFFIC SIGNALS

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

Comments Following Site Visit:

- No Traffic Signals located at crossing

-functions as intended



MileX.XX (10203, 59 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 16 **AREAS WITHOUT TRAIN WHISTLING**

Grade Crossings Standards, July 2014

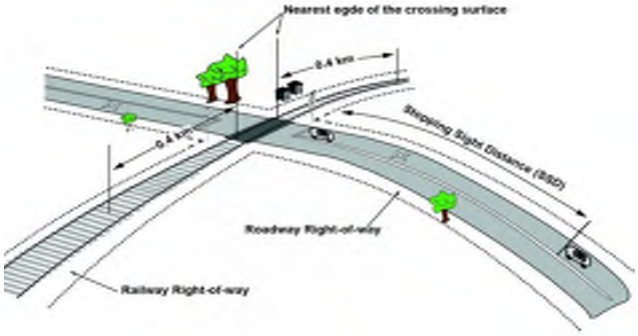
APPENDIX D – WHISTLING CESSATION

Table D-1 – Requirements for Warning Systems at Public Grade Crossings within an Area without Whistling

	Column A		Column B	
Railway Design Speed	Grade Crossings for Vehicle Use		Grade Crossings For Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Column 1	***Column 2***	***Column 3***	***Column 4***	***Column 5***
1 – 25 km/h (15 mph)	FLB	FLB	No warning system requirement	No warning system requirements
25 – 81 km/h (16 – 50 mph)	FLB	FLB & G	FLB	FLB & G
Over 81 km/h (50 mph)	FLB & G	FLB & G	FLB & G	FLB & G

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

Figure D-1 - prescribed area for whistling cessation as per article 23.1 of the RSA



RSA = Railway Safety Act of Canada

Source	Item					Reference
Rail	Is train whistling prohibited at this crossing?	**No**	24 hours?	**No**		
observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?			**No**		
observe	Are the requirements of Table D-1 met?	**No**				

Comments Following Site Visit:
- Whistle Cessation not required

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:

END OF FIELD DATA FORMS

VFPA
REPORT NUMBER: 20-0173

VFPA FSPL TRANSPORTATION IMPROVEMENTS PROJECT

04 – 10203, 57 TIMBERLAND ROAD,

FEBRUARY 09, 2021

REVISION HISTORY

FINAL ISSUE

2020/09/03	FIRST DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2020/10/21	SECOND DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2021/02/09	FINAL			
Prepared by	Reviewed by	Approved By		
P. McCabe, Track Designer	G. Smith, Senior Project Engineer	R. Sewell, Senior Project Engineer		

SIGNATURES

PREPARED BY

09/02/2021

Patrick McCabe, CPEng (Aus), APEC Eng
Track Designer

Date

09/02/2021

Robert Sewell, P.Eng
Senior Project Engineer

Date

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TABLE OF CONTENTS

1 CROSSING OVERVIEW

WSP Canada Group Limited (WSP) has been contracted as part of the Fraser Surrey Port Lands – Transportation Improvements Preliminary Design Services project, to complete a Railway Crossing Safety Assessment on the 10203, 57 Timberland Road grade crossing. The SRY owned crossing is located within the Vancouver Fraser Port Authority (VFPA), Fraser Surrey Docklands near to the Canadian National (CN) Brownsville Spur which comes off Mile 117 of the Yale Subdivision.

A Railway Crossing Field Safety Assessment was undertaken on the 22nd of July 2020 and updates the previous Railway Crossing Assessment undertaken by WSP (formally MMM Group) on the 5th of May 2015. The Railway Crossing Assessment as conducted follows the guidelines of applicable requirements identified in the most recent edition of Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossing Standards (GCS).

The crossing is a passive protected crossing (SRCS), equipped with two RAILWAY CROSSING and STOP signs, located within an industrial area. A Tractor Trailer (WB-20) is the design vehicle used to represent daily traffic on port property. The Railway traffic volumes were provided by the SRY while the Average Annual Daily Traffic (AADT) was calculated based on the realigned infrastructure.

This report aims to identify the modifications to the grade crossing since the previous inspection completed by MMM Group in 2015, as well as highlight any new or previously identified non-compliances still relevant to this crossing.

1.1 LOCATION

The Timberland Road grade crossing is located within Fraser Surrey Docks jurisdiction at 10203, 57 Timberland Road and crosses the SRY spur track. The crossing is located at the latitude and longitude of 49°11'23" and 112°54'20" respectfully. Figure 1, below shows the location of the crossing.

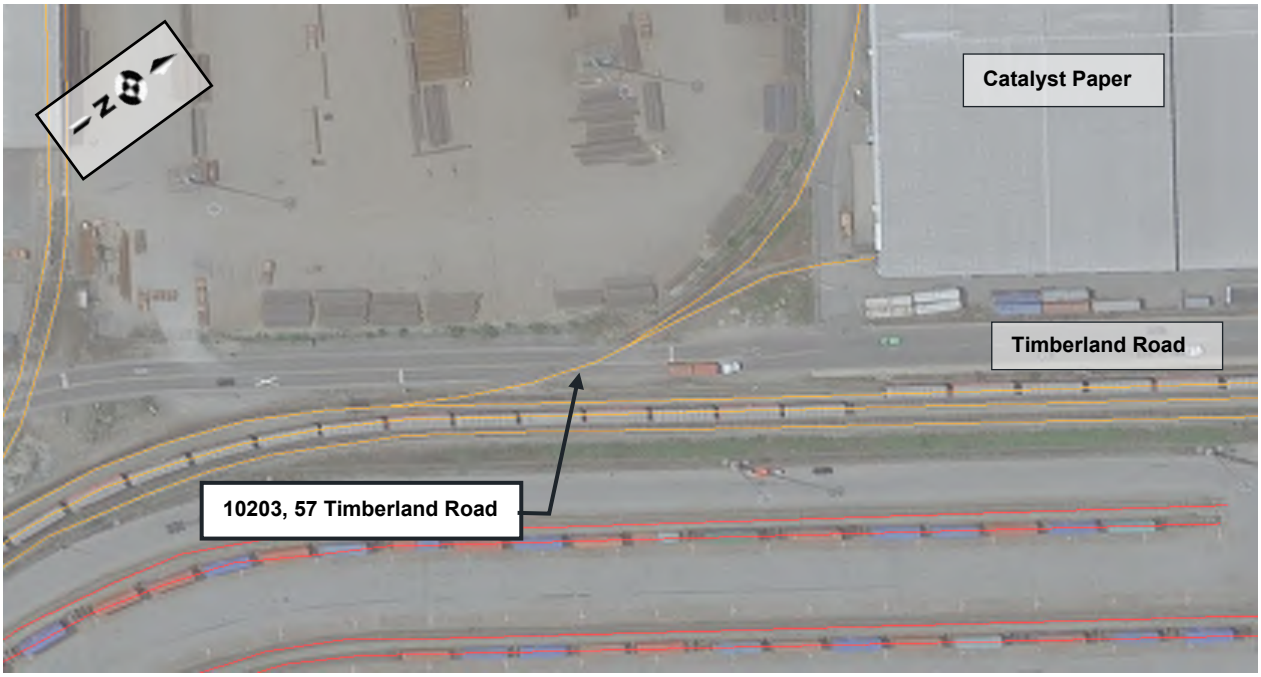


Figure 1: Crossing Location (source: Google Earth, 2020)

2 SAFETY ASSESSMENT

2.1 PREVIOUS ASSESSMENT (2015)

A previous crossing assessment was undertaken in 2015 by WSP for the 10203, 57 Timberland Road crossing. The objective of the assessment was to:

- Reduce crash risk within the grade crossing environment.
- Minimize the frequency and severity of preventable crashes.
- Consider the safety of all grade crossing users.
- Verify compliance of the technical standards referred to in the Railway Safety Act / Grade Crossing Regulations and contained in the Grade Crossing Standards.
- 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 outcome of the 2015 assessment offered recommendations for consideration by the VFPA. Table 1: Previous Non-Compliances, illustrates the non-compliances and recommendations offered within the 2015 report. The recommendations were categorised within the three priority levels;

- Low - implement the measures as soon as practicable
- Medium - implement the measures by Transport Canada GCS & GCR November 2021 deadline.
- High - implement the measures forthwith

Table 1: Previous Non-Compliances

Table 1: Previous Non-Compliances

Observations	Suggested Actions	Priority	Addressed?
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Railway crossing surface does not extend a minimum of 0.5m beyond the travel lanes on both approaches	Extend railway crossing surface to extend at least 0.5m beyond the travel lanes.	High	Partial – 0.5m extension of crossing surface has occurred on the Northern side of crossing only. Southern side limited by switch.
b. Flangeway depth does not meet the requirement due to debris	Clean debris from the flangeway. Once debris is removed from the flangeway, the railway company is to ensure the minimum depth is met.	High	No
GCS Section 4 – Railway Crossing and Number of Tracks Sign (Basic Requirement)			
a. RAILWAY CROSSING sign on west approach is located outside of the required height limits and sign location from edge of travelled way does not meet requirement	Relocate RAILWAY CROSSING sign on west approach as per GCS Section 4.1	High	Yes – New RAILWAY CROSSING Signs have been installed on both approaches.
GCS Section 5 – Crossing Surface			
a. The approach road surface at the grade crossing has cracks	Repave crossing surface so that it is smooth and continuous	Medium	Yes – Observed cracks in crossing surface approach repaired. New cracks have formed in crossing surface.
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to fences and a storage yard on the northeast corner and northwest corners of the crossing.	If minimum sightlines cannot be provided and maintained, then a warning system with gates is required.	Medium	No – Fence/ storage yard remain, and vegetation slightly increased

GCS Section 8 – Signs			
a. Retroreflective strips are not provided for the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Install retroreflective strips on the back of the RAILWAY CROSSING sign and both sides of the sign supporting post	Medium	Yes – retroreflective strips installed on back of both RAILWAY CROSSING Signs and poles
b. RAILWAY CROSSING AHEAD signs are not present on either approach of the crossing.	Install RAILWAY CROSSING AHEAD signs on both approaches to the grade crossing as per BCMoT's *Signage and Pavement Manual* (2000).	Medium	Yes – RAILWAY CROSSING AHEAD Signs installed on both approaches. South approach has sign fallen over/ removed.
c. STOP signs are not present on either approach of the crossing.	Install STOP signs on same post as RAILWAY CROSSING signs as per GCS Section 8.4	Medium	Yes – STOP Signs installed below RAILWAY CROSSING Signs.
d. EMERGENCY NOTIFICATION signs are not present on either approach of the crossing.	Install EMERGENCY NOTIFICATION sign on both approaches as per GCS Section 8.5.	Medium	Yes – EMERGENCY NOTIFICATION Signs installed below STOP Signs.
e. Double stop bars and RAILWAY CROSSING symbol pavement markings are not present on either approach to the crossing for vehicles.	Paint double stop bars on both road approaches as per MUTCD Fig.C1-6 (Jan. 2014).	Medium	Yes - Double stop bars have been installed but need repainting.
f. RAILWAY CROSSING symbol pavement markings are not present on either approach to the crossing for vehicles.	Paint double stop bars and RAILWAY CROSSING symbol pavement markings on both road approaches	Low	Yes – RAILWAY CROSSING symbol pavement marking painted as per MUTCD. Needs repainting
g. Stopping or parking restriction is not observed at the railway right-of-way.	Install NO STOPPING signs within the railway right-of-way.	Low	Yes – Parking restriction/ NO STOPPING signs installed along Timberland Road
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system without gates is warranted based on cross-product.	Install active warning system without gates. However, Transport Canada indicated that the crossing could stay passive indefinitely unless the sightline requirements could not be met.	Low	No

2.2 CROSSING MODIFICATIONS

As shown in Appendix A: Site Photographs, a number of changes have occurred at the crossing between inspections. Most changes were based on recommendations outlined in the 2015 inspection. Table 1, shows what changes have been made based on the 2015 recommendations. Below is a summarised list of all the changes observed from the site inspection:

- New grade crossing signage, including;
    - RAILWAY CROSSING Signs
    - STOP Signs
    - EMERGECNY NOTIFACATION Signs
    - RAILWAY CROSSING AHEAD signs
    - DO NOT STOP ON TRACKS Signs
    - PARKING RESTRICTION Signs
    - SPEED ADVISORY TAB sign
- New MUTCD compliant pavement marking

- Asphalt has been installed on North side to extend the crossing 0.5m beyond the travelled way
- Cracking on outer surface of the crossing surface repaired.

2.3 ASSESSMENT AND RECOMMENDATIONS

An updated Grade Crossing Safety Assessment was undertaken for the proposed realignment of the port road access and to determine any required crossing upgrades to ensure compliance with the GCR & GCS. **Appendix B: Site Inspection Report** provides details of the observations made during the site inspection. The inspection report also outlines outstanding safety issues, along with recommended remediations. Table 2: 2020 Crossing Recommendations, summarizes the recommendations from the field investigation.

Lack of sightlines is a warrant in the GSR and GCS to require installation of automatic crossing protection. The client needs to insure that the crossing design plans, fully completed crossing plans (E-4) and full crossing safety assessment, which comply with requirements of the GCR and GCS, have been completed and filed with Canadian Transportation Agency and applicable railway.

Table 2: 2020 Crossing Recommendations

Observations	Suggested Actions	Priority	Order of Magnitude Cost
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Railway crossing surface does not extend a minimum of 0.5m beyond the travel lanes on South approach	Extend railway crossing surface to extend at least 0.5m beyond the travel lanes.	High	$750
b. Flangeway depth does not meet the requirement due to debris	Clean debris from the flangeway. Once debris is removed from the flangeway, the railway company is to ensure the minimum depth is met.	High	$500
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing ($D_{STOPPED-VEH}$) cannot be provided or maintained due to fences and a storage yard on the northeast corner and northwest corners of the crossing.	If minimum sightlines cannot be provided and maintained, then a warning system with gates is required.	Medium	$15,000
GCS Section 8 – Signs			
a. Double stop bars and RAILWAY CROSSING symbol pavement markings are faded.	Repaint double stop bars and RAILWAY CROSSING symbol on both road approaches as per MUTCD.	Medium	$800
b. RAILWAY CROSSING AHEAD sign fallen over and placed on opposite side of road on West approach. East approach sign is incorrectly aligned.	Reinstall and realign RAILWAY CROSSING AHEAD Signs	High	$800
c. ADVISORY SPEED Sign incorrectly aligned.	Realign ADVISORY SPEED Sign	High	$500
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system without gates is warranted based on Sightlines.	Install active warning system without gates.	Low	$500,000

APPENDIX

A SITE PHOTOGRAPHS

APPENDIX

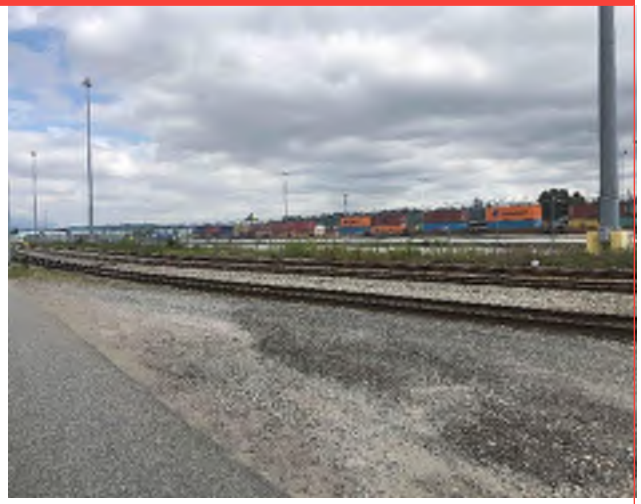
A - East Approach Drivers View Left

B - East Approach

C - East Approach Drivers View Right

D - West Approach Drivers View Left

E - West Approach



F - West Approach Drivers View Right

APPENDIX

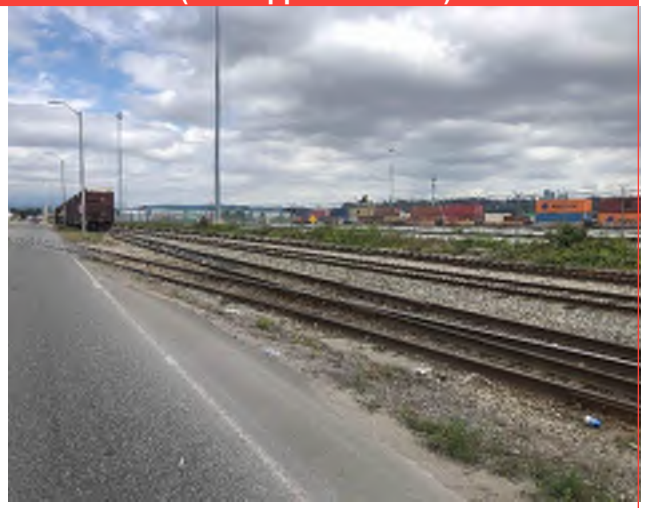
G – East Approach Driver View Left
(At Stopped Position)

H - East Approach (At Stopped Position)

I – East Approach Drivers View Right
(At Stopped Position)

J- West Approach Drivers View Left
(At Stopped Position)

K - West Approach (At Stopped Position)



L - West Approach Drivers View Right
(At Stopped Position)

APPENDIX

M – North Facing Crossing Surface

N – General Crossing Photo

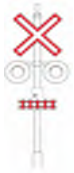
O – South Facing Crossing Surface

APPENDIX

B SITE INSPECTION REPORT

CANADIAN ROAD / RAILWAY GRADE CROSSING DETAILED SAFETY ASSESSMENT FIELD GUIDE (2005)*

Appendix C2: Field Data Forms



Passive & Active Crossings

MileX.XX (10203, 57 Timberland Road),SRY Rail
Surrey, British Columbia
For Vancouver Fraser Port Authority

Legend:

calculate	**Formula**	Spreadsheet cell has formula
look up		User to look up value in table or chart.
		User to input value here for conditional formatting or formulas in other cells to function
		Warning! Value beyond acceptable limits.
		Warning! Value beyond acceptable limits for certain conditions (i.e. for people using assistive devices).
	Rail	Information to be provided by Railway Company
	Road	Information to be provided by Roadway Authority
measure	observe	Information to be obtained during Site Investigation
	√	Information provided by others to be verified in the field

* Updated to reflect Transport Canada's Grade Crossing Standards (GCS) July 2014 and Grade Crossing Regulations (GCR)(SOR-2014-275 Feb 2016)

MileX.XX (10203, 57 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 1 | **Grade Crossing Safety Assessment** | **Passive Crossings**

Date of Assessment: **22-Jul-20** Site Investigation

Assessment Team Members & Affiliations: **Patrick McCabe**
Rob Sewell

Reason for Assessment: **New Proposed Pedestrian Crossing**

____	periodic assessment	**X**	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: **Southern Railway of BC**

Crossing Location: **10203 Timberland Road**

Location Number: **N/A**

Municipality: **City of Surrey, BC**

Railway: **SRY** Mile: **N/A**

Sub-division: **N/A** Spur: **N/A**

Type of Grade Crossing [private/public; warning devices]: **SRSC**

Track Type: [mainline, etc.] **Yard**

Road Authority: **Vancouver Frasier Port Authority (VFPA)**

Road Name/Number: **Timberland Road, Catalyst Paper**

Province: **British Columbia**

Location Reference (control section, etc.): **DP Surrey Docks**

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

Roadway East/West (yes/ no) Yes
Roadway North/ South (yes/ no) No

*Urban Local Undivided

Collision History (5-year period): **No record of accitents at the subject railway crossing within the past five years**

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

Provide Details of the collisions if available:
Sources:

- identify main contributing factors

- attach collision diagrams if available

MileX.XX (10203, 57 Timberland Road),SRY Rail
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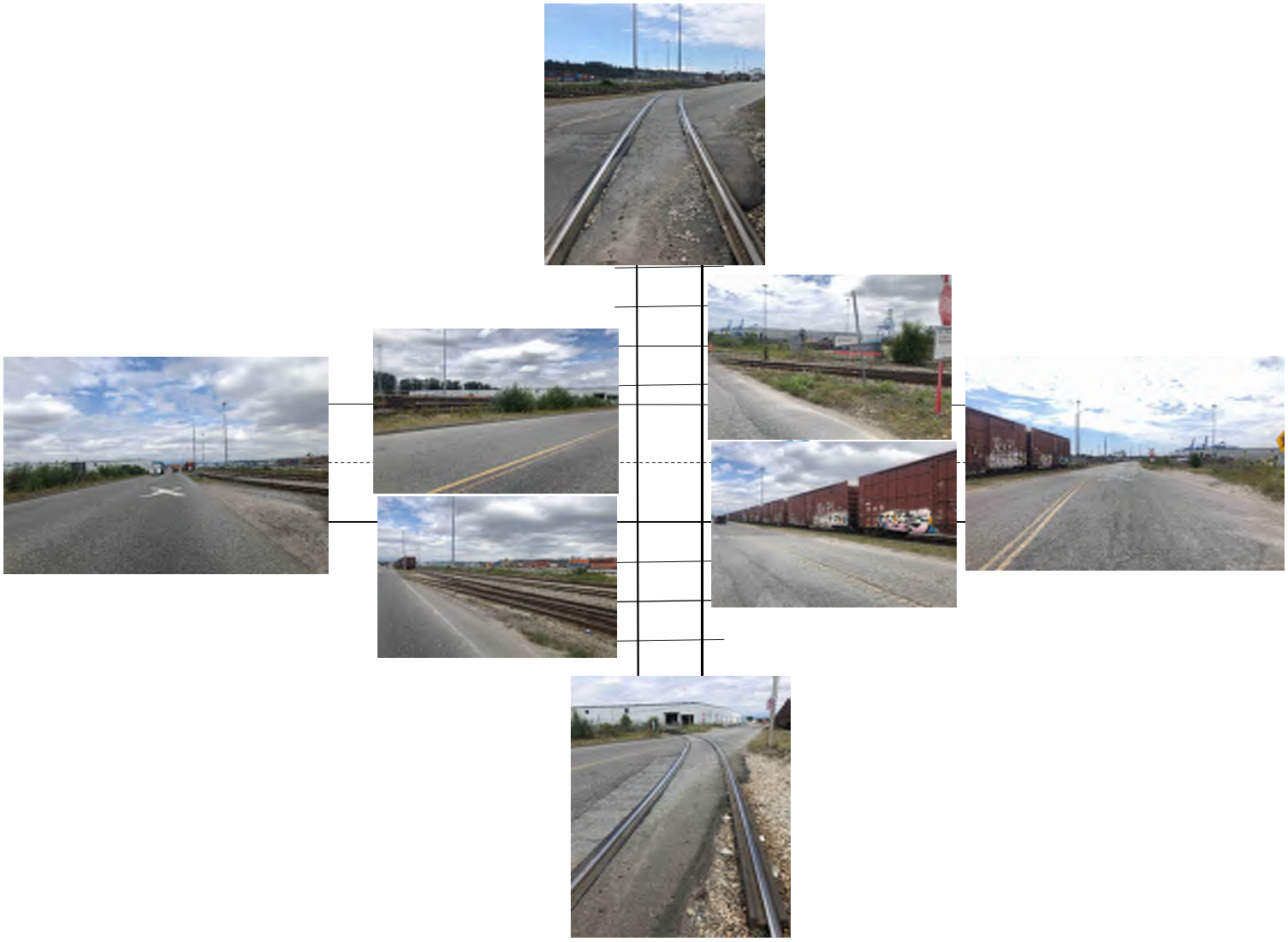
Sheet 2a **SCENE PHOTOGRAPHS**



For the full set of photos taken, see the Appendix to the Safety Assessment Report.

MileX.XX (10203, 57 Timberland Road),SRY Rail
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Sheet 2b **SCENE SKETCH**

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

Notes: Images from Google Earth

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		

MileX.XX (10203, 57 Timberland Road),SRY Rail
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Sheet 3 **GENERAL INFORMATION**

Source	Item							Reference
Rail	Maximum Railway Operating Speed, V_T	=	10	(mph)				
Rail	Daily Train Volume:	=	5	(freight trains/day)				
		=	0	(passenger trains/day)				
Rail	Switching during daytime? Y/N	Yes			nighttime? Y/N	Yes		
Road	Avg. Annual Daily Traffic, AADT:	=	2,140	(vpd)	Year of count:	2020		
Road	High seasonal fluctuation in volumes?		No					
Road	Pedestrian Volumes	=	0	(ped./day)				
Road √	Is crossing on a School Bus route?		No					
Road √	Do Dangerous Goods trucks use this roadway?		No					
Road	Cyclist Volumes	=	0	(cyclists/day)	Cyclist not anticipated			
Road √	Regular use of crossing by persons with Assistive Devices?				Pedestrians using Assistive Devices not anticipated			
Road √	Other special road users?	type	Unknown	daily volume	None			
Road	Forecasted AADT[2]	=	140	(vpd)	Forecasted Year:	2022		
Road √	Design Speed:		30	km/h	Posted Speed:	30	km/h	
	Maximum Operating Speed:		30	km/h				
	note: provide details if all approaches are not the same							
Road √	Road Surface Type (asphalt, concrete, gravel, etc.):		Asphalt					
observe	Surrounding Land Use (urban/rural)?:		Industrial					
observe	Any schools, retirement homes, etc. nearby?		No					

Notes:

1. Road Authority should provided plans if available.

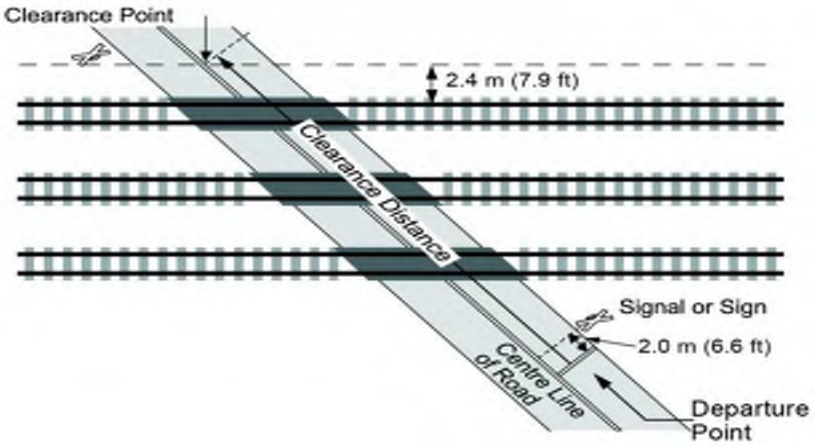
2. AADT to be verified during next scheduled safety assessment if significant developments are expected or traffic volumes increase.

From GCS Section 7.1.2:

Column 1	*Column 2*	*Column 3*
Class of Track	***The maximum allowable operating speed for freight trains is -***	***The maximum allowable operating speed for passenger trains is -***
Class 1 track	17 km/h (10 mph)	25 km/h (15 mph)
Class 2 track	41 km/h (25 mph)	49 km/h (30 mph)
Class 3 track	65 km/h (40 mph)	97 km/h (60 mph)
Class 4 track	97 km/h (60 mph)	129 km/h (80 mph)
Class 5 track	129 km/h (80 mph)	153 km/h (95 mph)

Figure 10-1 - Clearance Distance (cd) for Grade Crossings

(a) For Grade Crossings with a Warning System or Railway Crossing Sign



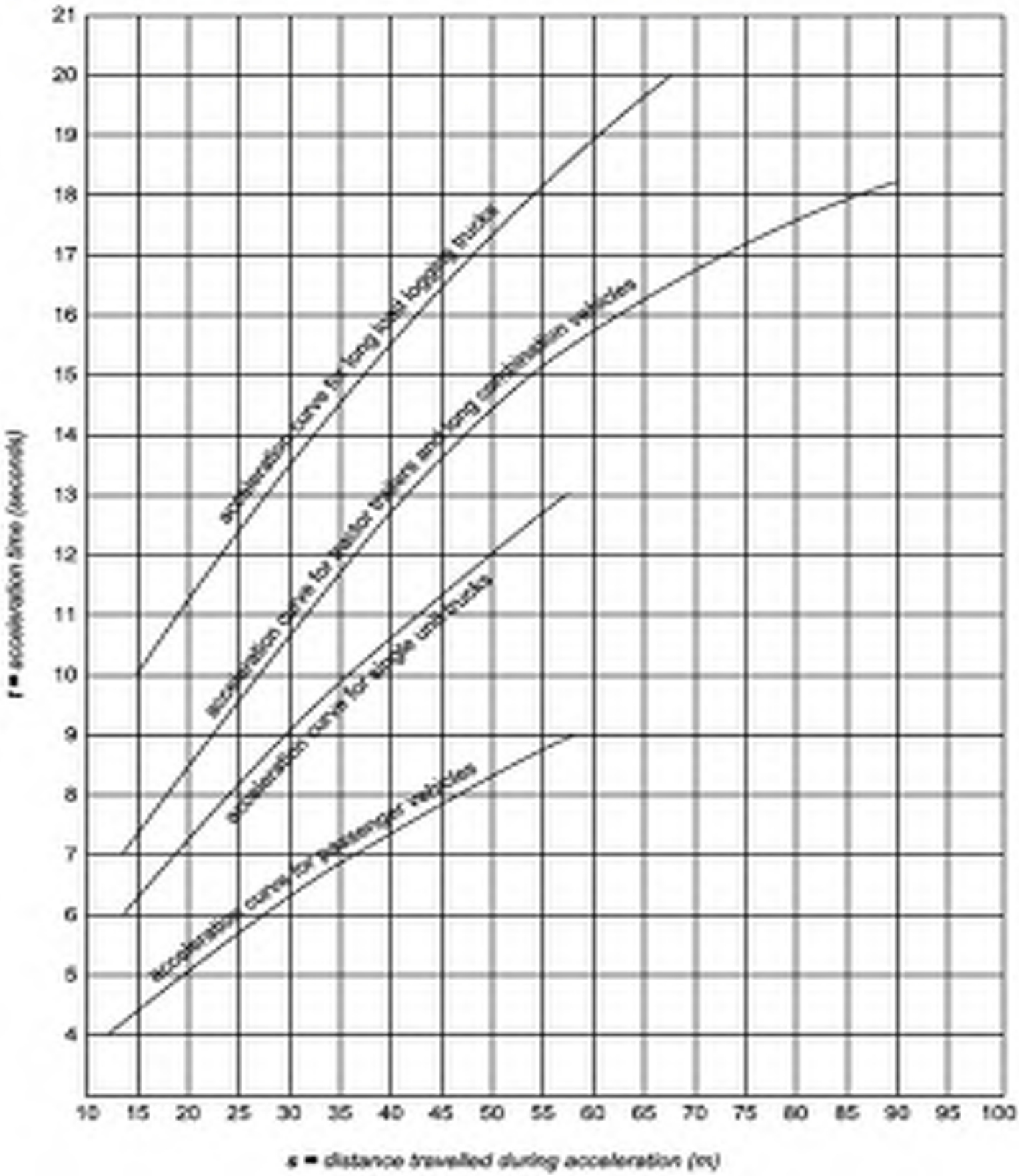
Grade Crossings Standards, July 2014

Table 10-1 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 & Buses	0.8	0.9	1.0	1.1	1.3
Tractor-Semitrailer	0.8	0.9	1.0	1.2	1.7

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 10-2 Assumed Acceleration Curves



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Sheet 4 **DESIGN CONSIDERATIONS**

Source	Item						EB Approach		WB Approach		Reference
	Design Vehicle										
Road	Type:	6	WB-20 Tractor-Semitrailers (WB-20)								Table 1* SOR 57
look-up	Length, **L:**		22.7	m							Table 1*
look-up	**Stopping Sight Distance, SSD**		45	m (round to 1.0% of grade)		=	10	m	45	m	Table 3*
measure	**Clearance Distance, cd**					=	24.0	m	37.0	m	GCS 16.1.1
calculate	**Vehicle Travel Distance, S**	**S= L+cd**	59.7	max <---		=	46.7	m	59.7	m	
look-up	**Vehicle Departure Time, t**					=	15.9	sec	15.9	sec	GCS Figure 10-2
Road V	Road Grade Effect:	maximum approach grade within 'S':				=	0.50	%	1.00	%	Sheet 7
look-up	grade adjustment factor (anto calc assumes Truck)(manual input from Table 10-1 if other)					=	1.02		1.06		GCS Table 10-1
calculate	**T**= t x adjustment factor					=	16.2	sec	16.9	sec	
	Design Vehicle Departure Time, T_D = J + T (where J = 2 sec (min.) perception & reaction)						2.0	sec	2.0	sec	
calculate	**$T_{G\ stop}$ = T_D=**	18.9	sec			<-	18.2	sec	18.9	sec	GCS 10.3.2
observe	Do field acceleration times exceed T_D?	**Acceleration measurement beyond the scope of this assessment.**									
measure	**Pedestrian , cyclist & Assistive Devices Departure Time**			pedestrian **cd** distance		=	0.0	m	0.0	m	GCS 10.3.3
calculate	walking speed 1.22m/s max.	**T_P =**	0.0	sec	(1.0m/s used)	<-	0.0	sec	0.0	sec	
calculate	**T_{SSD}** = (SSD+cd+L)/(0.277837 x $V_{road\ design}$) =		12.6	sec							

Comments Following Site Visit:

No Pedestrian crossing. Sidewalk ends before X on east approach

Table 1 – Design vehicle Lengths/Class

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

Source: *Geometric Design Guide for Canadian Roads*, TAC; September 1999.

Table 6 – Minimum Sightlines along the Rail Line ($D_{stopped}$) (as illustrated in Figure 3)

Railway Design Speed V_r (mph)	$T_{stopped}$ = Departure Time (greater of T_d or T_p) (seconds)											If greater of T_d or T_p > 20 sec., add for each additional second (m)
	≤ 10	11	12	13	14	15	16	17	18	19	20	
WARNING: Railway design speed in mph!	Minimum Sightlines along Rail Line ($D_{stopped}$) (m)											
STOP	30	30	30	30	30	30	30	30	30	30	30	+0
1-10	45	50	55	60	65	70	72	76	80	85	90	+5
11-20	90	100	110	120	125	135	145	155	165	170	180	+10
21-30	135	150	165	175	190	205	215	230	245	255	270	+15
31-40	180	200	220	235	250	270	285	305	325	340	360	+20
41-50	225	250	270	290	315	335	360	380	405	425	450	+25
51-60	270	300	325	350	380	405	430	460	485	510	540	+30
61-70	315	350	380	415	445	470	505	535	565	595	630	+35
71-80	360	395	435	465	505	540	580	610	650	680	720	+40
81-90	405	445	490	535	570	605	650	685	730	765	810	+45
91-100	450	500	540	580	630	670	715	760	805	850	895	+50

Table 3 – Determine SSD for Truck Class

Road Crossing Design Speed V (km/hr)	Truck Class Stopping Sight Distance (SSD) (m)																				
	Road Approach Gradient																				
	-10%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
20	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	24	24	24	24	24
30	48	48	47	47	47	46	46	46	45	45	45	45	45	44	44	44	44	44	44	43	43
40	76	75	74	74	73	73	72	71	71	70	70	70	69	69	68	68	68	67	67	67	67
50	121	120	118	117	116	115	114	113	112	111	110	109	108	108	107	106	106	105	105	104	104
60	149	146	144	142	140	138	136	134	133	131	130	129	128	126	125	124	123	122	122	121	120
70	210	205	202	198	195	192	189	187	184	182	180	178	176	175	173	171	170	169	167	166	165
80	252	246	241	236	231	227	223	219	216	213	210	207	205	202	200	198	196	194	192	191	189
90	318	311	304	297	292	286	281	277	273	269	265	262	258	255	252	250	247	245	243	240	238
100	401	391	382	373	365	358	352	346	340	335	330	325	321	317	314	310	307	304	301	298	295
110	455	441	428	417	406	397	388	380	373	366	360	354	349	344	339	334	330	326	322	319	315

* Source: Transport Canada's "Determining Minimum Sightlines at Grade Crossings: A Guide for Road Authorities and Railway Companies"

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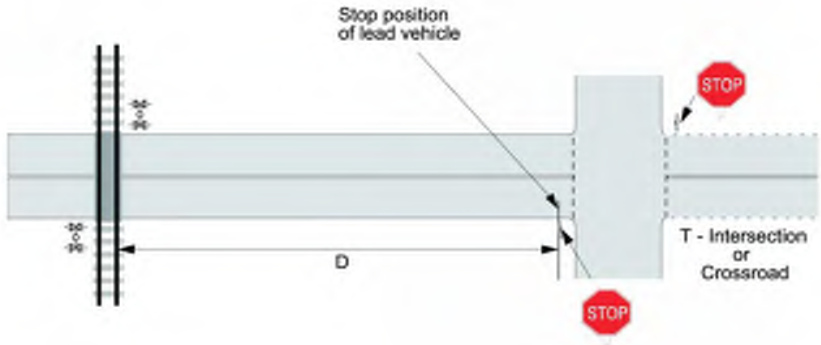
Sheet 5 **LOCATION of GRADE CROSSING**

Source	Item		Reference
observe	"D" should not be less than 30m for either approach if the train speed exceeds 15 mph. **D =53.4m**		GCS Section 9.1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	**No**	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks?	**No**	
	Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing?	**No**	

Comments Following Site Visit:
The minimum "D" dimension to the edge of the entrance to facility in East. The West "D" is 110m

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

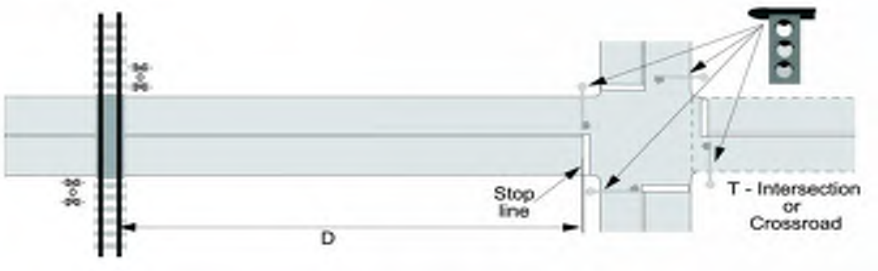
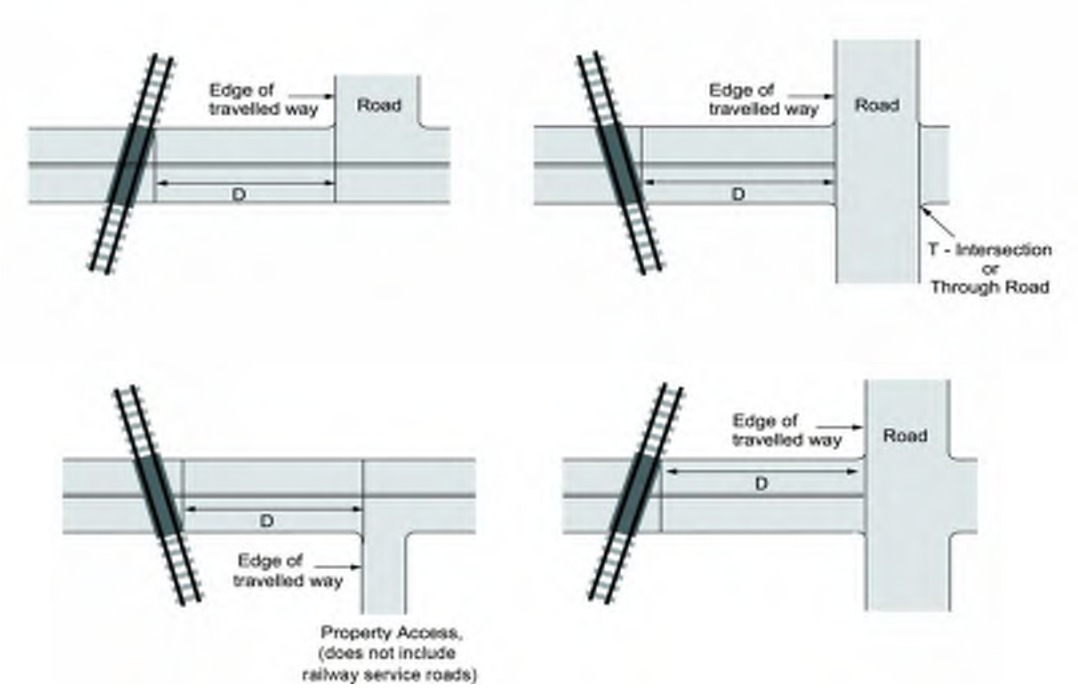


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings



MileX.XX (10203, 57 Timberland Road),SRY Rail
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Sheet 6 **GRADE CROSSING SURFACE**

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? **Yes**							SOR 60; GCS 5
observe	Grade Crossing Surface Material: **Asphalt** Grade Crossing Surface Condition: **Poor**							SOR 60; GCS 5
observe	Approach Road Surface Type: **Ashpalt** Approach Road Surface Condition: **Poor** Roadway Illumination?: **Yes**							SOR 60; GCS 5
		EB Approach		**WB Approach**				
measure	Road Surface crossing width (perp. C.L. min. = 8.0m)		**7.6** m					GCS 5.1
measure	Road Surface extension beyond travel lanes (min. = 0.5m)	**0.5** m		**0.5** m				GCS 5.1
measure	Sidewalk/Path/Trail crossing width (min. = 1.5m)		**NA** m	**NA** m		No sidewalk		GCS 5.1
measure	Sidewalk/Path/Trail extension beyond sidewalk (min. = 0.5m)	**NA** m		**NA** m				GCS 5.1
measure	Distance Between Travel Lane and C.L. of Trail		**NA** m					
	Cross-Section:		**South (Right) Rail:**		**North (Left) Rail:**			GCS Table 5-1
measure	Flangeway width (min. = 65mm; max.= 120mm or 75mm[1])		**75** mm		**75** mm			GCS Table 5-1
measure	Flangeway depth (min. = 50mm; max.= no limit or 75mm[1])		**25** mm		**20** mm			GCS Table 5-1
	Rural Field Side Gap:							GCS Table 5-1
measure	Side Gap width (max.= 120mm or 0[1])		**2** mm		**2** mm			GCS Table 5-1
measure	Side Gap depth (max.= no limit or 0[1])		**0** mm		**0** mm			GCS Table 5-1
	Wear Limits:							GCS Table 5-1
measure	Elevation of Top Rail above road surface (max. = 13mm[1], 25mm, or 50mm)		**10** mm		**10** mm			GCS Table 5-1
measure	Elevation of Top Rail below road surface (min. = -7mm[1],-25mm, or -50mm)		**0** mm		**0** mm			GCS Table 5-1

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Flangeway and field side gap constructed out of rubber. Flangeways need cleared
- Crossing surface needs to be resurfaced due to cracking.
- North Rail Raised slightly higher then South

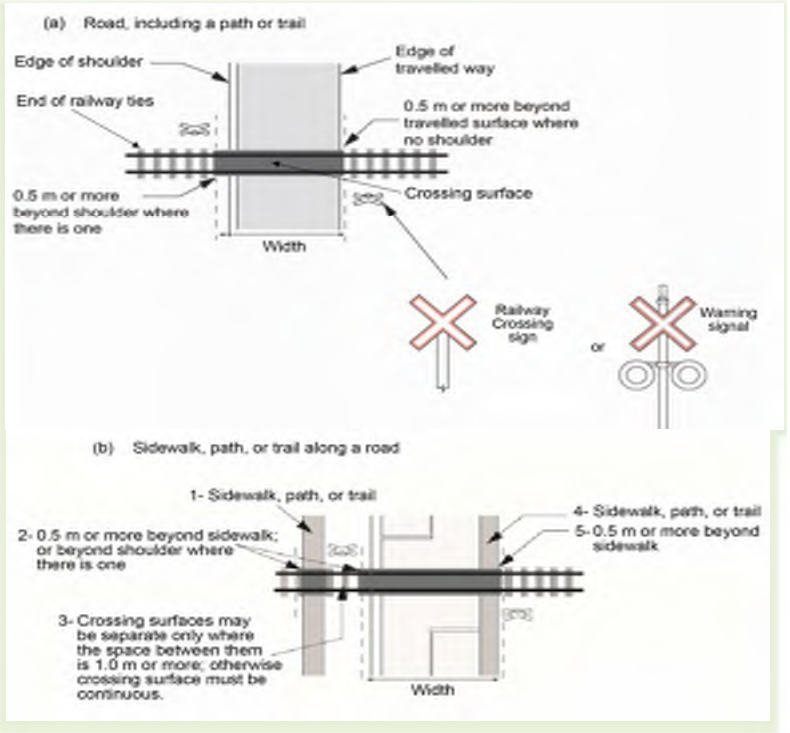
-rough crossing surface, loose timbers, etc. - difference between road grade and rail superelevation -surface distress of roadway approaches -photos

Grade Crossings Standards, July 2014

Table 5-1 – Grade Crossing Surface – Cross Section

a) Flangeway:		
Width	**Minimum**	65 mm
	Maximum for:	
	Public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	120 mm
Depth	**Minimum**	50 mm
	Maximum for:	
	Public sidewalks, paths and trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	No limit
(b) Field side gap A space is permitted on the outer side of the rail at rural locations, except for public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices		
	Maximum width	120 mm
	Maximum depth	No limit
(c) Elevation of the top of the rail with respect to the crossing surface The top of the crossing surface must be installed as close as possible to the top of the rail within the wear limits below:		
Wear limits:		
Public sidewalk, path or trail designated by the road authority for use by persons using assistive devices		
	Maximum distance of the top of the rail above crossing surface	13 mm
	Maximum distance of the top of the rail below crossing surface	7 mm
All other public grade crossings; the maximum distance of the top of the rail above or below the crossing surface		25 mm
Private grade crossings; the maximum distance of the top of the rail above or below the crossing surface		50 mm

Figure 5-1 - Grade Crossing Surface Dimensions



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Sheet 7 — **ROAD GEOMETRY**

Source	Item									Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Are the road lanes at least the same width on the crossing as on the road approaches? WB Approach: **Yes** EB Approach: **Yes**									
	Grades		**EB Approach**		**WB Approach**		Difference: rail e & rd grade (GCS 6.1)			GCS Sect. 6
measure	Slope within 8m of nearest rail (max. = 2%)		**0.30**	%	**0.20**	%	**0.15%**	%	**0.10%**	Diff in Grade Max
measure	Slope between 8m & 18m of nearest rail (max. = 5%)		**0.50**	%	**1.00**	%				3%
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices (max. = 1[1] or 2%): slope within 5m of nearest rail =		**N/A**	%	**N/A**	%				
Road √	General approach grade (max. = +/- 5%)		**0.50**	%	**0.50**	%				
	measured over the SSD distance of:		**10**	m	**45**	m				Sheet 4
Rail √	Are rail tracks super-elevated?	**No**	Rate of s/e:	**0.00**	m/m Sdg	**0.00**	m/m ML			GCS Sect. 6.1 & 6.2
Road √	If train speeds exceed 15mph (70° minimum w/o warning system; 30° minimum with warning system): What is the angle between the crossing and the roadway? =		**75.0**	degrees						
observe	**Condition of Road Approaches:** (e.g., anything that might affect stopping or acceleration)	**Poor to Fair. Some aligator cracking observed**								SOR 60
observe	NA									

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Cracking within both approaches observed. Reparis needed.
- No Side walk on either side of crossing.
- Switches located on either side of crossing.

Grade Crossings Standards, July 2014

Table 6-1 – Difference in Gradient

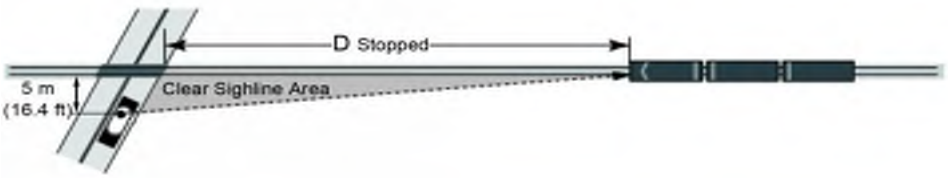
Classification	Difference in Gradient (%)
RLU	2
RCU	1
RCD	1
RAU	0
RAD	0
RFD	-
ULU	3
UCU	2
UCD	2
UAU	0

*Legend
Urban (U) Rural (R) Local (L) Collector (C) Arterial(A) Expressway (E) Freeway(F)
Divided (D) Undivided (U)

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 7-1 - Minimum Sightlines - Grade Crossings

(a) Sightlines for Users Stopped at a Grade Crossing (applicable to all quadrants)



(b) Sightlines for Users Approaching Grade Crossing (applicable to all quadrants)

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Sheet 8 **SIGHTLINES**

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			EB Approach		WB Approach		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 **Yes**							
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location **Yes**							
look-up	**SSD** minimum =			10	m	45	m	Sheet 4
measure	**SSD Actual** (not including turning movements)**:**			95.0	m	150.0	m	
calculate	D_{SSD}	=	$0.277837 \times V_{train\ km/h} \times T_{SSD}$	56	m	56	m	1.609 convert mph to km/h
calculate	$D_{STOPPED}$ minimum (m)	=	$0.277837 \times V_{train\ km/h} \times T_D$ =	81	m	84	m	T_D from Sheet 4
measure	$D_{STOPPED}$ **Actual**:		Driver looking LEFT	100	m (ne)	95	m (sw)	
			Driver looking RIGHT	80	m (nw)	150	m (se)	
calculate	**Ped./Cyclist $D_{STOPPED}$ (m)**			0	m	0	m	T_P from Sheet 4
measure	**Ped./Cyclist $D_{STOPPED}$ Actual:**		Person looking LEFT	N/A	m	N/A	m	
	note: measured from a point 2m in advance of sign/signals		Person looking RIGHT	N/A	m	N/A	m	
observe	Are there any obstacles within the sight triangles other than traffic signs/utility poles that might affect visibility? **Fencing and equipment within facility.**							

Comments Following Site Visit:

- Fencing and equipment obstructs sightlines in the Northwest and Northeast quadrants.

-special considerations for large trucks?

-can sightlines be maintained on an ongoing basis? (snow)

-special design vehicle?

-photos

Figure 8-3 - Location of Railway Crossing Signs and Number of Tracks Signs (public grade crossings without warning systems)

a) **b)**

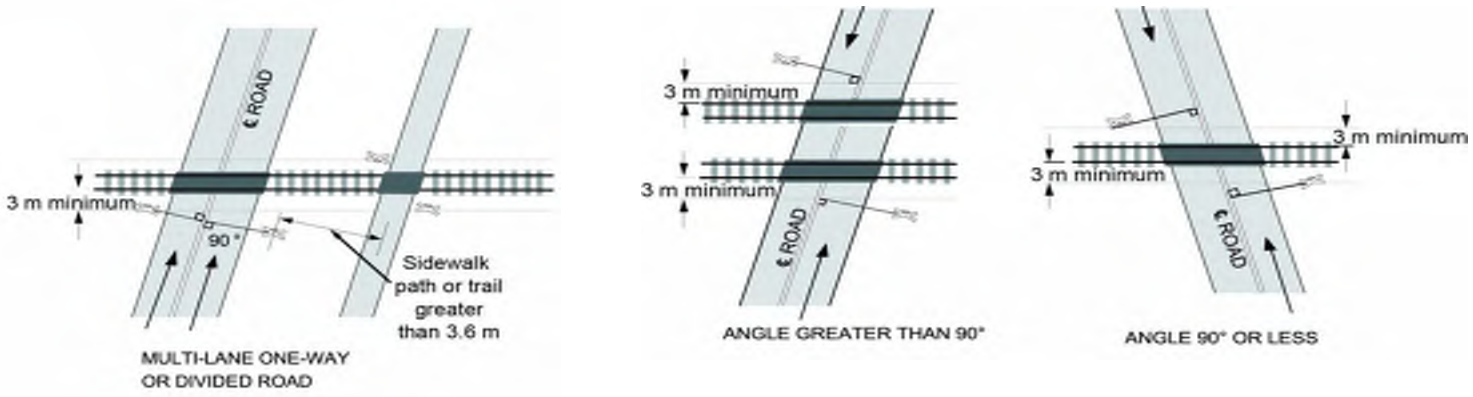
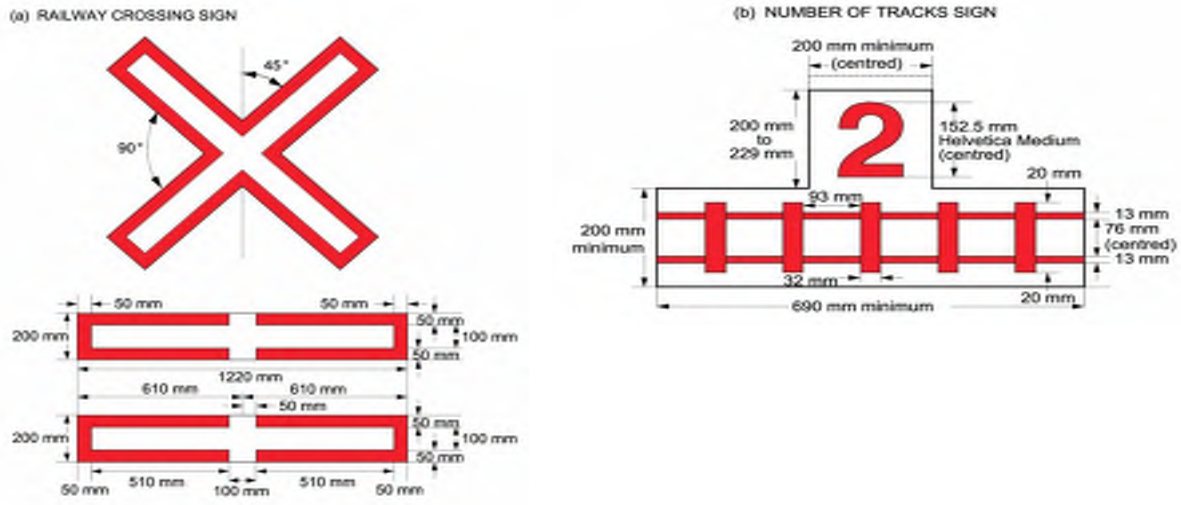


Figure 8-1 - Railway Crossing Sign and Number of Tracks Sign



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Sheet 9a — **SIGNS AND PAVEMENT MARKINGS**

Source	Item							Reference
	Railway Crossing Sign  **These signs will be required**							MUTCD
		EB Approach		**WB Approach**				
measure	distance from nearest rail:	**15.0**	m	**27.2**	m			
measure	distance from edge of road:	**1.0**	m	**1.5**	m			
measure	height of centre of crossbucks:	**2.5**	m	**2.5**	m			
measure	retroreflectivity readings:	**N/A**	cd/lux/m^2	**N/A**	cd/lux/m^2			
observe	Number of Tracks sign? **No**							
observe	A Stop Sign must be installed at grade crossing without a warning system if the road design speed is less than 15mph					Yes/ No/ NA	**Yes**	SOR 64
observe	A Stop Ahead sign must be installed if the Stop Sigh is not clearly cvisable within the Stopping Distance					Yes/ No/ NA	**N/A**	SOR 65

Comments Following Site Visit:
- **New RAILWAY CROSSING signs installed in 2015.**
- **The back of poles and signs have reflective strips (reflectivity not measured).**
- **NUMBER OF TRACKS Sign not required as only 1 track.**

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

Source	Item			Reference
	DO NOT STOP ON TRACKS 			MUTCD
Road √	Does queued traffic routinely encroach closer than 5m from the crossing surface?	**No**		
observe	Are these signs present on either approach?	**No**		

Comments Following Site Visit:
- **DO NOT STOP ON TRACKS Sign installed on RAILWAY CROSSING AHEAD Sign**

-general condition -posts -photos

Source	Item					Reference
	Railway Crossing Ahead Sign (WA 18-20) 					MUTCD & SOR 66
look-up	Is AADT > 100? **Yes**		**EB Approach**	**WB Approach**		Sheet 3
observe	Is area urban such that WA 18-20 is not required?		**Yes**	**No, fallen over and moved**		
measure	Distance from nearest rail to sign	=	**4.5** m	**70.0** m		MUTCD
observe	height:		**2.5**	**2.5**		
observe	appropriate orientation of symbol		**Yes**	**Yes**		

Comments Following Site Visit:
- **RAILWAY CROSSING AHEAD Sign has been installed since the previous inspection.**
- **RAILWAY CROSSING AHEAD Sign installed Min. Approx 38m from crossing**
- **Westbound sign not aligned correctly. Eastbound sign and pole removed and placed on opposite side of road.**

Source	Item			Reference
	ADVISORY SPEED SIGN 			MUTCD & SOR 66 (2)
observe	Are they present on both approaches?	**No**		
	Posted speed limit?	**N/A**	km/h	
look-up	Are they required on either approach?	**No**		check SSD (Sheet 8)

Comments Following Site Visit:

- **ADVISORY SPEED Sign installed on the East approach only. Sign not aligned correctly.**

-general condition -posts -photos

MileX.XX (10203, 57 Timberland Road),SRY Rail
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Sheet 9b **SIGNS AND PAVEMENT MARKINGS**

Source	Item		Reference
	EMERGENCY NOTIFICATION		GCS Sect. 8.5
observe	Are these signs present on both approaches?	**Yes**	
observe	Is the information complete and legible?	**Yes**	

Comments Following Site Visit:

- EMERGENCY NOTIFICATION Sign is present and installed below STOP sign

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

Source	Item		Reference
	PAVEMENT MARKINGS		
observe	Are pavement markings consistent with those from the MUTCD Manual?	**Yes**	Fig C1-6 MUTCD
observe	Are there lines to delineate sidewalks/paths?	**N/A**	

Comments Following Site Visit:

- Road markings and DOUBLE STOP BARS have been installed since the 2015 inspection.

- Roadway "X" marking REQUIRED as per MUTCD.

- DOUBLE STOP BARS and ROAD MARKINGS needs to be repainted

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

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

GENERAL ASPECTS C1

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA

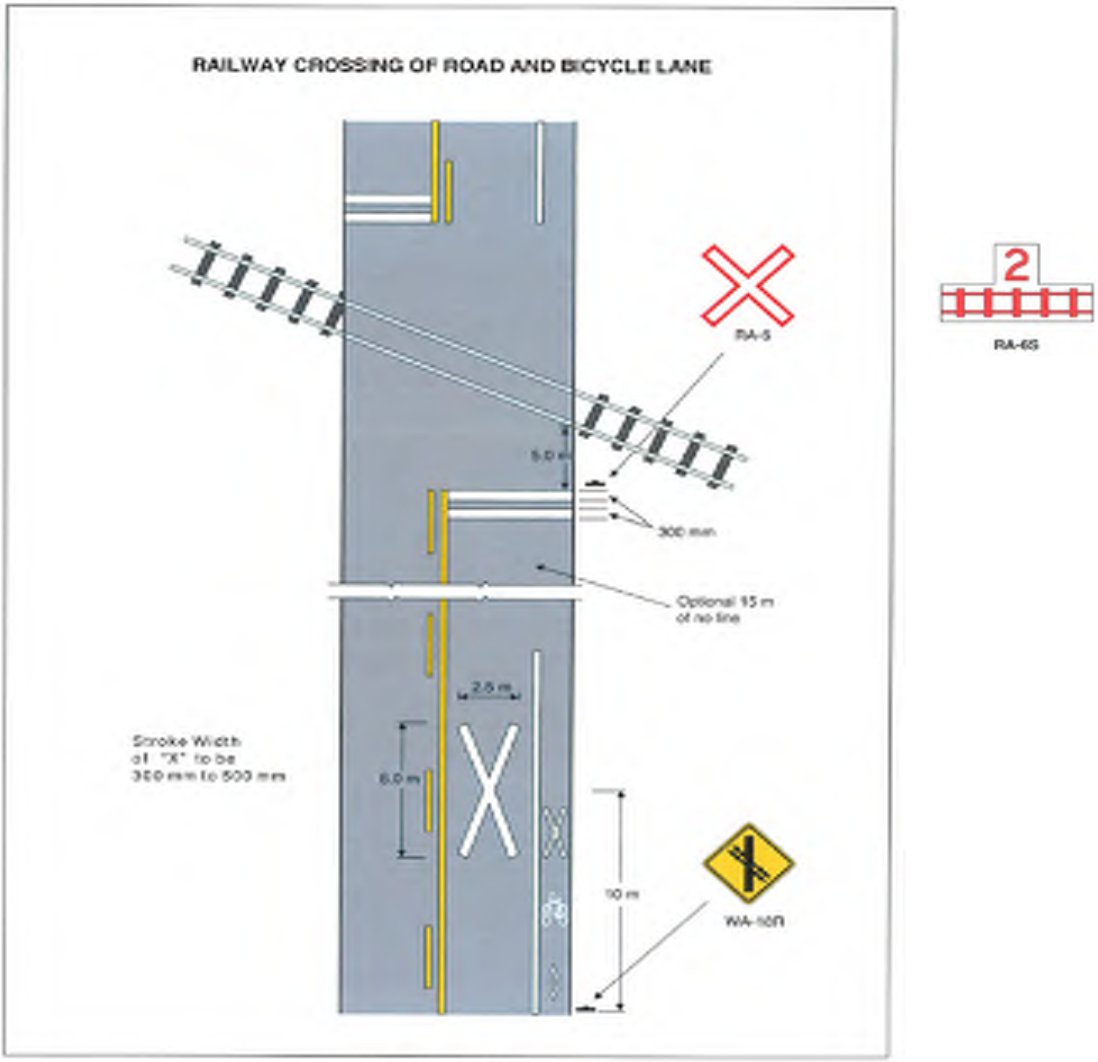
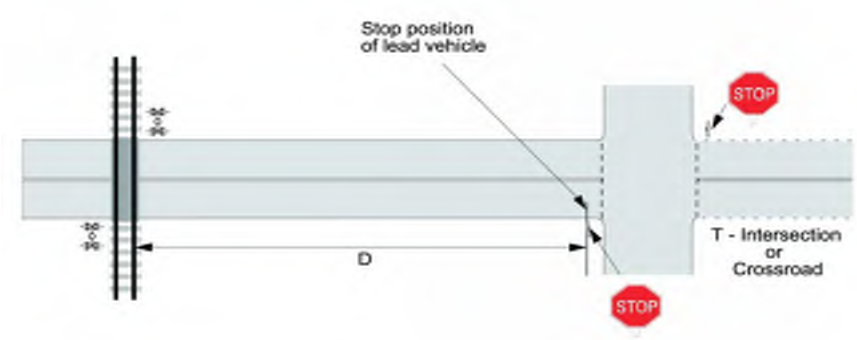


FIGURE C1-6

JANUARY 2014

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals

(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings

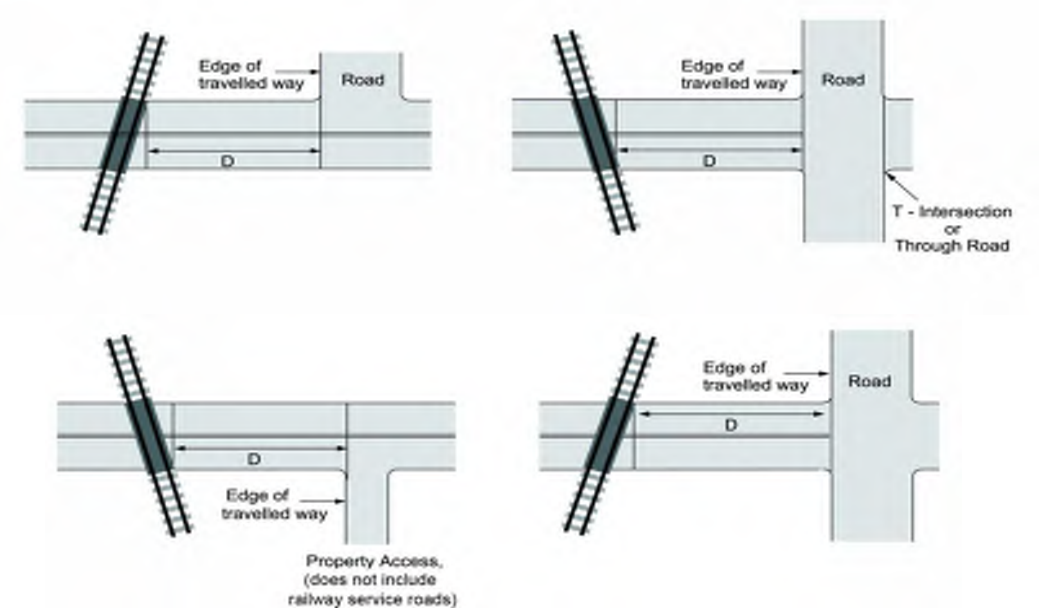
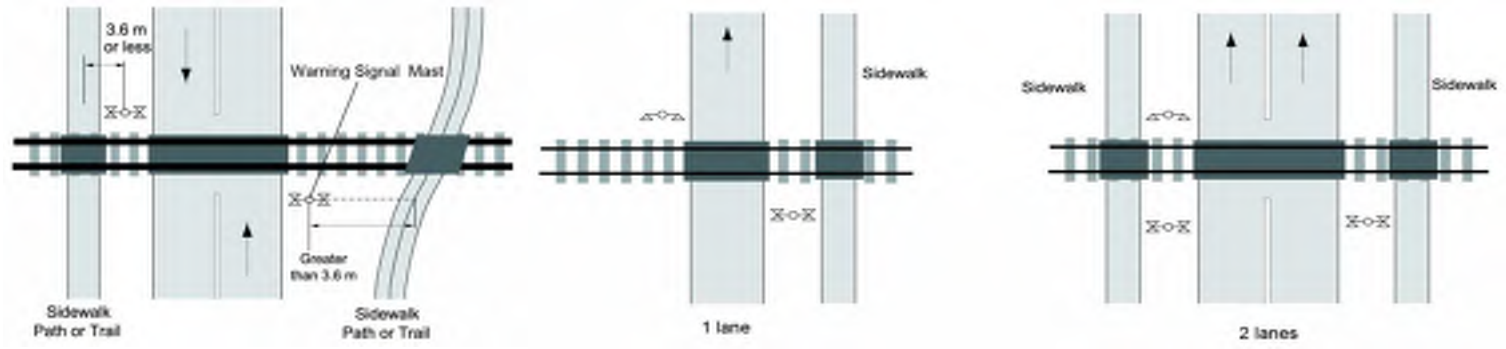


Figure 13-2 - Sidewalks, Paths and Trails

(a) Two Way

(b) One-Way



Sheet 10 eliminated in the new GCS

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Sheet 11 — **GRADE CROSSING WARNING SYSTEMS** — **GCS Section 9**

Source	Item is not required.										Reference
	Warning System Warrants if any of A through E below are met, then a warning system is warranted										
	Question								**Warrant for Warning System**		
look-up	Existing AADT =	2,140	Forecast AADT =	140							Sheet 3
look-up	Daily Train Volume =	5.000			trains						Sheet 3
calculate	**A. Cross-Product =**	700							> 2,000 FLB req'd	**> 50,000 requires gates**	
look-up	**B. Maximum Rail Operating Speed =**		10		mph				(max = 80mph or 50 mph with crosswalk)		Sheet 3
Rail	**C. Number of Tracks =**		1								
	if ≥ 2, can trains pass one another?		N/A						if ≥ 2 and trains can pass one another -> FLB req'd		
look-up	**D. Are Sightlines obscured?**		Yes						if "Yes" -> FLB req'd: If Fig 7.1 applies --> add G		Sheet 8 & Fig 7.1
observe	**E. Are any proximity conditions met?**		No						if "Yes" -> FLB required.		GCS Sect 9 & 11
look-up	Is a Warning System warranted?		Yes						If any of A through E above meet the Warrant		
	Field Visit	**Present? (Y/N)**	**Condition / Alignment:**								GCS 13
observe	Light Units,	N									GCS 13
observe	Bells,	N									GCS 13
observe	Gates,	N									GCS 13
observe	Cantilever Lights,	N									GCS 13
observe	Check that warning signal assemblies and cantilevers are in accordance with GCS Figures.										GCS Sect. 12
observe	Is warning system housing at least 9m from traveled way of the road and 8m from the nearest rail?										
observe	If there is a sidewalk, is a bell on the adjacent assembly?										
Rail √	Have all light units been aligned?	**NA**	Date?	**NA**							
Rail	Design Approach Warning Time (greatest of):			20sec OR [20+((cd-11)/3)] if cd>11m	Td	Tp	Gate Clearance Time + Descent Time + 5 seconds	Traffic Signal Clearance Time (=0 if no traffic signal)	(SSD + cd + L)/(0.277837xVv)		
	EB Approach	35.9	sec	24.3	18.2	0.0	35.9	0.0	6.8		
	WB Approach	35.9	sec	28.7	18.9	0.0	35.9	0.0	12.6		
observe	Is warning time less than 35 sec (without gates) or 55 sec (with gates)			**N/A**							

Comments Following Site Visit:

- Based on the sightlines and the above requirements, an active warning system is required.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted?

Figure 12-1 - Warning Signal Assemblies

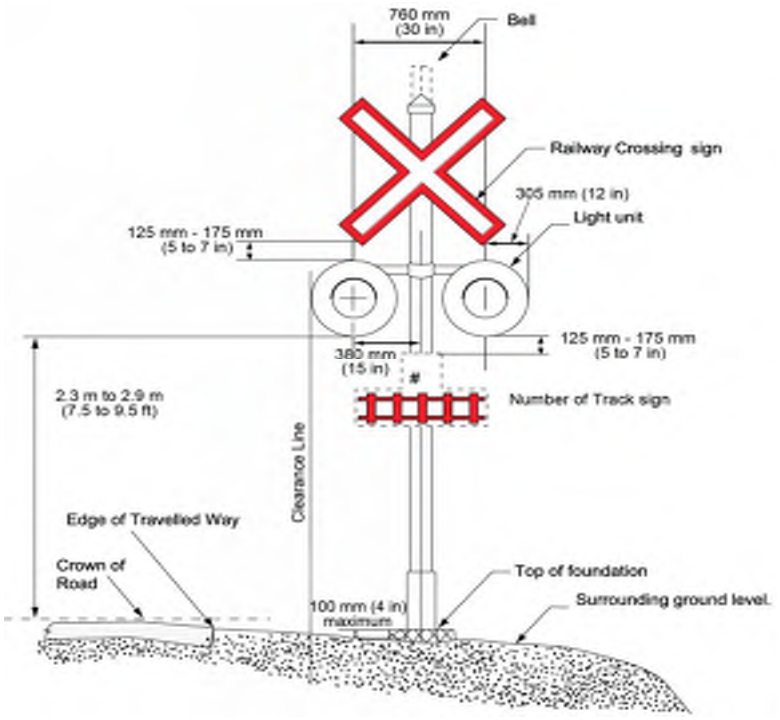
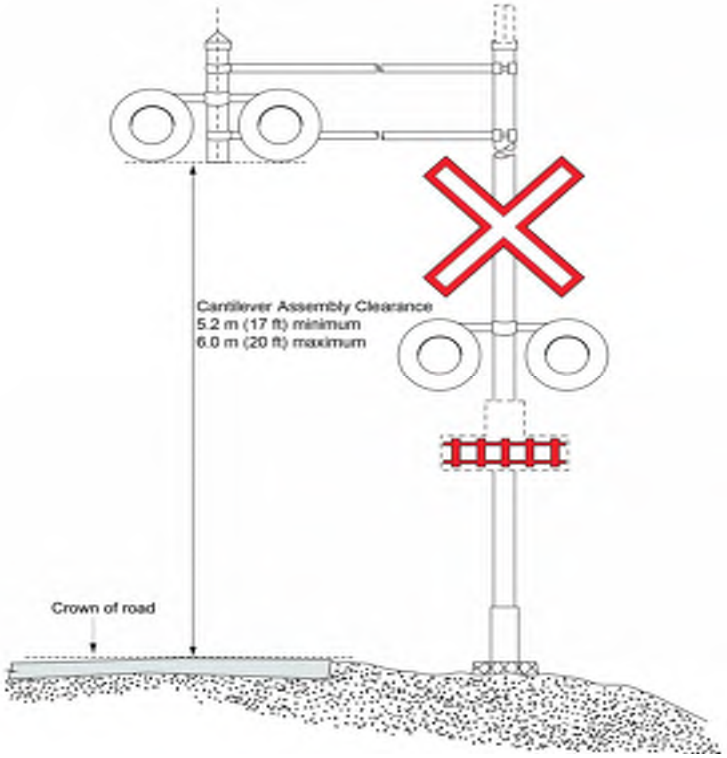


Figure 12-3 - Cantilevers



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Sheet 12  **GATES FOR GRADE CROSSING WARNING SYSTEMS** **GCS Section 9**

Source	Item							Reference
	Warning System Warrants -if any of A through E below are met then a warning system with gates is warranted. **Not required as qwarning system is not necessary**							
calculate	**A. Cross-Product =**	**700**	(50,000 min)					
look-up	**B. Maximum Rail Operating Speed =**	**10**	mph (max = 50mph)					Sheet 3
Rail √	**C. Number of Tracks =**	**1**						
	.....if ≥ 2 , can trains pass one another?	**N/A**						
look-up	**D. Is $D_{STOPPED}$ Insufficient?**	**No**						Sheet 8
observe	**E. Are any proximity conditions met?**	**N/A**						
calculate	Gate clearance distance: eq 10.4b	**24.7**	m cd $_{G\ stop}$	**34.7**	m cd ssd EB	**69.7**	m cd ssd WB	GCS Sect. 10.4
look-up	travel time =	**18.9**	sec $_{G\ stop}$					
calculate	Gate arm clearance times:	**18.2**	sec EB from stop	$T_{G\ ssd}$ = **4.2**	sec EB from SSD			
		18.9	sec WB from stop	$T_{G\ ssd}$ = **8.4**	sec WB from SSD			
look-up	Gate arm delay time: **18.9**	sec (greatest value from above)						
calculate	effect of grade =	**0.4**	sec (SB from Stop)	**-4.2**	sec EB from SSD			
		1.2	sec (NB from Stop)	**0.0**	sec WB from SSD			
measure	Measure gate arm delay and compare with above:	**N/A**						
observe	Do gates conform to standards depicted in GCS Figures?	**N/A**						
observe	Check gate descent (10 to 15 sec) and ascent (6 to 12 sec)	**N/A**						
observe	Is gate striping vertical as depicted in GCS Figures?	**N/A**						
observe	Where railway equipment regularly stops, or railway equipment is left standing, within the activating limits of a warning system, the warning system must be equipped with a control feature to minimize the operation of the warning system.					Yes/No/NA	**NA**	GCS 16.3.1

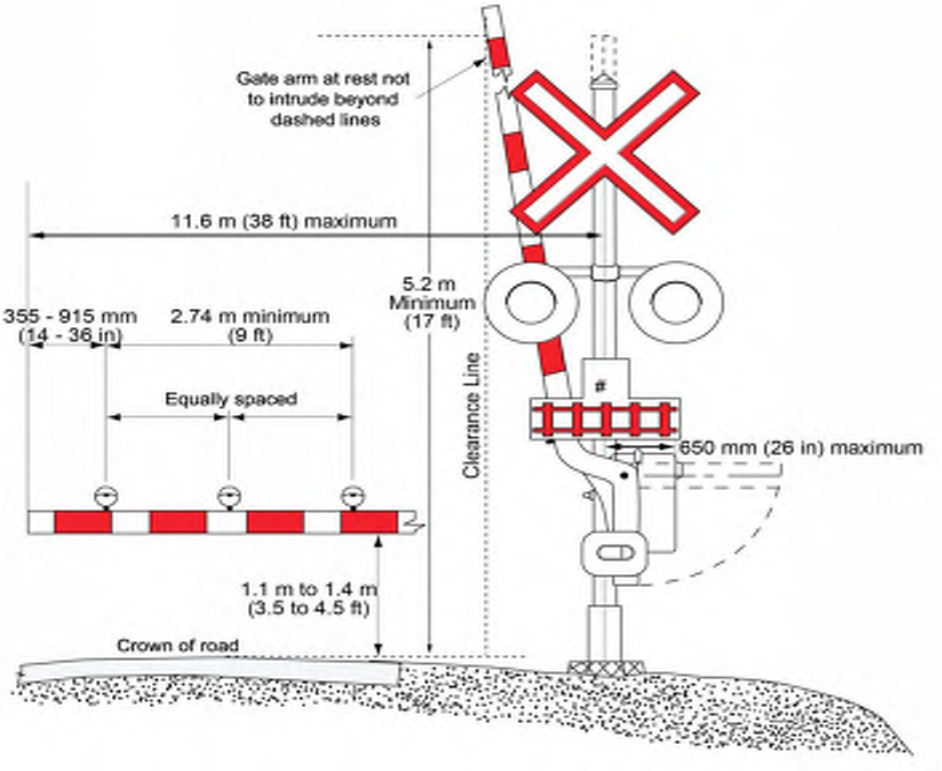
Comments Following Site Visit:

- If the sightline requirements are not met, ann active warning system with gates is required.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted? **No**

Figure 12-2 - Gates



MileX.XX (10203, 57 Timberland Road),SRY Rail
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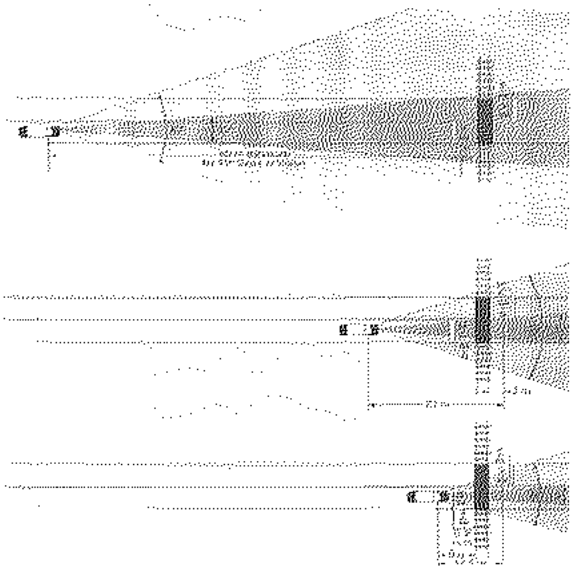
Sheet 13 **FLASHING LIGHT UNITS**

Note: Driver's cone of vision is ± 5° horizontally; limited by top of windshield vertically. GCS Sections 12-14

Source	Item is not required as warning system is not required.				u
	Number and Location				
look-up	Minimum Distance for Primary Light Units (SSD) =	45.0	m		
look-up	Recommended Distance for Primary Light Units =	69.7	m		
observe	Are flashing light units located within 5° horizontally of the centerline of the road (throughout the approach distance above)?			Yes (covered by front and back units)	
	Does horizontal/vertical curvature necessitate supplemental units?			N/A	
observe	Can back lights be seen by all stopped drivers?			N/A	
observe	Are lights obscured by vehicles stopped on adjacent intersections?			N/A	
observe	Are additional light units required for drivers as they begin to turn onto an approach road from an intersecting road/lane/pkg lot?			N/A	
	Cantilevered Light Units				
measure	Does D_R exceed 7.7m?	N/A			
measure	Does D_L exceed 8.7m?	N/A	(Assumes signal poles on both sides of road alignment, approach side of rail)		
	Multiple Lanes				
observe	Can front light units be seen by drivers in all lanes (….would T/T obscure?)?	N/A			
observe	Can back light units be seen by all stopped drivers in all lanes?	N/A			
	Sidewalks, paths, trails, etc.				
measure	Distance from path centerline to signal mast =	N/A	m (max.=3.6m)		
observe	Are separate light units required?	N/A			

Comments Following Site Visit:
- Crossing currently regulated by a passive warning system.

Horizontal Cone of Vision



Typical Light Unit Arrangement for an Adjacent Intersection

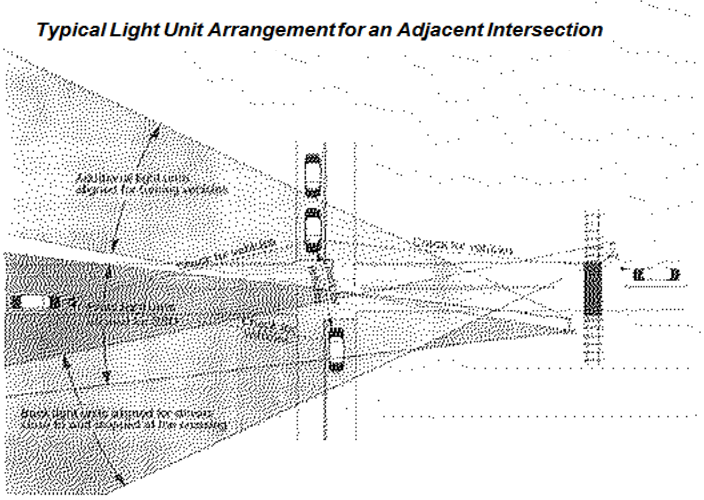
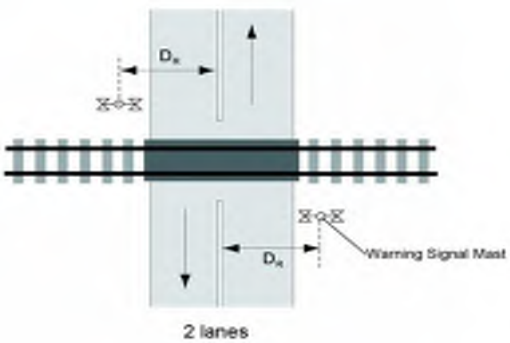
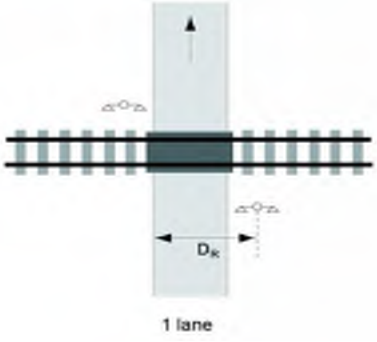


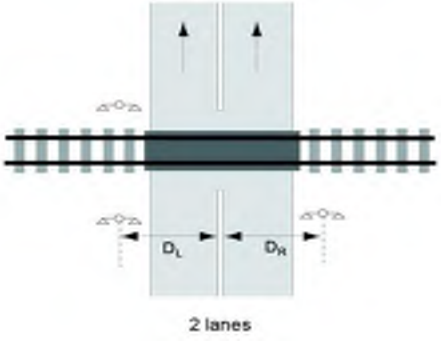
Figure 13-1 – Warning Signal Offsets Requiring Cantilevered Light Units

(a) Two-Way Road



(b) One-Way or Divided Road





MileX.XX (10203, 57 Timberland Road),SRY Rail
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Sheet 14

PREPARE TO STOP AT RAILWAY CROSSING SIGN

GCS Sections 13 and 14

Source	Item NA				Reference
observe	Are signs present?	**No**	EB approach		SOR 67 (1), (2) GCS 18.21 & 18.2
		No	WB approach		
look-up	Minimum Distance for Primary Light Units (SSD)	**N/A**	m		Sheet 13
look-up	Recommended distance for Primary Light Units	**N/A**	m		Sheet 13
	Warrants				
observe	Are all front light units obscured within minimum distance above?	**N/A**			
look-up	Is the facility designated a "freeway" or "expressway"?	**N/A**			Sheet 3
observe	Do environmental conditions frequently obscure signal visibility?	**N/A**			
	Considering maximum prevailing speeds, geometry, and traffic composition, checkthe following:				
observe	Does sign flash during operation of grade crossing warning system?	**N/A**			
measure	Distance from the sign to 2.4m beyond the furthest rail =	**N/A**			
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?	**N/A**			
measure	Distance from the sign to the closest gate =	**N/A**	m		
observe	Does the flashing sign precede actuation of the descent of the gate arms by the time required to travel from the sign to clear closest gate?	**N/A**			
measure	Time required for all queued vehicles to resume to maximum road operating speed =	**N/A**	sec		

Comments Following Site Visit:

No PREPARE TO STOP AT RAILWAY CROSSING Signs were observed on site nor required.

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

Sheet 15

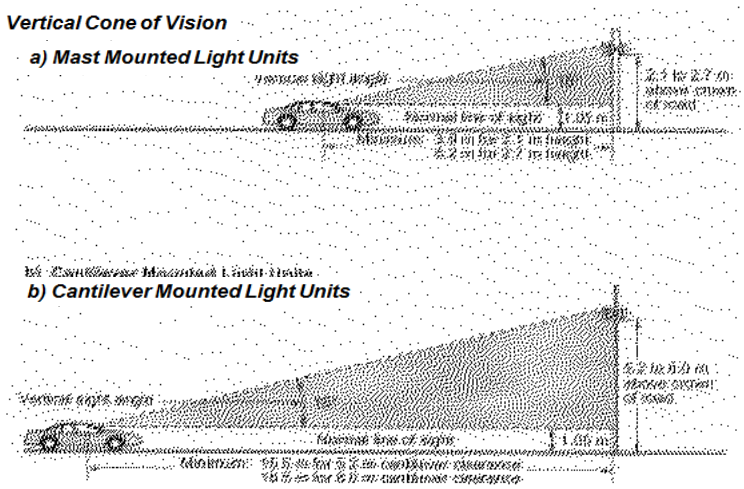
PREEMPTION OF TRAFFIC SIGNALS

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

Comments Following Site Visit:

- No Traffic Signals located at crossing

-functions as intended



Sheet 16

AREAS WITHOUT TRAIN WHISTLING

Grade Crossings Standards, July 2014

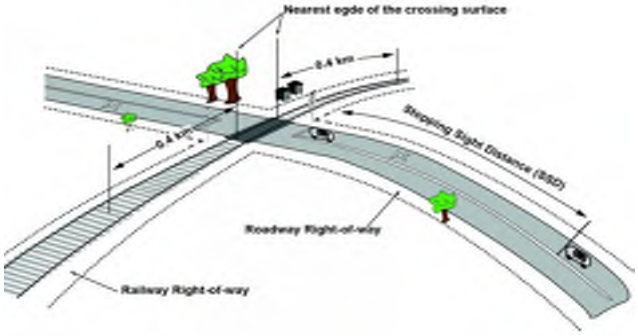
APPENDIX D – WHISTLING CESSATION

Table D-1 – Requirements for Warning Systems at Public Grade Crossings within an Area without Whistling

	Column A		Column B	
Railway Design Speed	Grade Crossings for Vehicle Use		Grade Crossings For Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Column 1	*Column 2*	*Column 3*	*Column 4*	*Column 5*
1 – 25 km/h (15 mph)	FLB	FLB	No warning system requirement	No warning system requirements
25 – 81 km/h (16 – 50 mph)	FLB	FLB & G	FLB	FLB & G
Over 81 km/h (50 mph)	FLB & G	FLB & G	FLB & G	FLB & G

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

Figure D-1 - prescribed area for whistling cessation as per article 23.1 of the RSA



RSA = Railway Safety Act of Canada

Source	Item					Reference
Rail	Is train whistling prohibited at this crossing?	No	24 hours?	No		
observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?			No		
observe	Are the requirements of Table D-1 met?	No				

Comments Following Site Visit:
- Whistle Cessation not required

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:

END OF FIELD DATA FORMS

VFPA
REPORT NUMBER: 20-0173

VFPA FSPL TRANSPORTATION IMPROVEMENTS PROJECT

05 – 10550 TIMBERLAND ROAD, CROSSING ASSESSMENT REPORT

FEBRUARY 09, 2021

REVISION HISTORY

FINAL ISSUE

2020/09/03	FIRST DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2020/10/21	SECOND DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2021/02/09	FINAL			
Prepared by	Reviewed by	Approved By		
P. McCabe, Track Designer	G. Smith, Senior Project Engineer	R. Sewell, Senior Project Engineer		

SIGNATURES

PREPARED BY

Patrick McCabe, CPEng (Aus), APEC Eng
Track Designer

09/02/2021
Date

Robert Sewell, P.Eng
Senior Project Engineer

09/02/2021
Date

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1 CROSSING OVERVIEW

WSP Canada Group Limited (WSP) has been contracted as part of the Fraser Surrey Port Lands – Transportation Improvements Preliminary Design Services project, to complete a Railway Crossing Safety Assessment on the 10550 Timberland Road grade crossing. The SRY owned crossing is located within the Vancouver Fraser Port Authority (VFPA), Fraser Surrey Docklands near to the Canadian National (CN) Brownsville Spur which comes off Mile 117 of the Yale Subdivision.

A Railway Crossing Field Safety Assessment was undertaken on the 22nd of July 2020 and updates the previous Railway Crossing Assessment undertaken by WSP (formally MMM Group) on the 5th of May 2015. The Railway Crossing Assessment as conducted follows the guidelines of applicable requirements identified in the most recent edition of Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossing Standards (GCS).

The crossing is a passive protected crossing (SRCS), equipped with two RAILWAY CROSSING and STOP signs, located within an industrial area. A Tractor Trailer (WB-20) is the design vehicle used to represent daily traffic on port property. The Railway traffic volumes were provided by the SRY, while the Average Annual Daily Traffic (AADT) was calculated based on the realigned infrastructure.

This report aims to identify the modifications to the grade crossing since the previous inspection completed by MMM Group in 2015, as well as highlight any new or previously identified non-compliances still relevant to this crossing.

1.1 LOCATION

The Timberland Road grade crossing is located within Fraser Surrey Docks jurisdiction at 10550 Timberland Road and crosses the SRY spur track SW03. The crossing is located at the latitude and longitude of 49°11'31" and 112°54'10" respectfully. Figure 1, below shows the location of the crossing.

Figure 1: Crossing Location (source: Google Earth, 2020)

2 SAFETY ASSESSMENT

2.1 PREVIOUS ASSESSMENT (2015)

A previous crossing assessment was undertaken in 2015 by WSP for the 10550 Timberland Road crossing. The objective of the assessment was to:

- Reduce crash risk within the grade crossing environment.
- Minimize the frequency and severity of preventable crashes.
- Consider the safety of all grade crossing users.
- Verify compliance of the technical standards referred to in the Railway Safety Act / Grade Crossing Regulations and contained in the Grade Crossing Standards.
- 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 outcome of the 2015 assessment offered recommendations for consideration by the VFPA. Table 1: Previous Non-Compliances, illustrates the non-compliances and recommendations offered within the 2015 report. The recommendations were categorised within the three priority levels;

- Low - implement the measures as soon as practicable
- Medium - implement the measures by Transport Canada GCS & GCR November 2021 deadline.
- High - implement the measures forthwith

Table 1: Previous Non-Compliances

Observations	Suggested Actions	Priority	Addressed?
GCS Section 3 – Crossing Surface			
a. The railway crossing surface does not extend a minimum of 0.5m beyond the sidewalk on the south approach.	Extend railway crossing surface to at least 0.5m beyond the sidewalk on the south approach.	High	Yes – Asphalt has been installed on either end of the concrete panels
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing (DSTOPPED-VEH) cannot be provided or maintained due to fences and equipment on the southwest and southeast corners of the crossing.	Install active warning system with gates if DSTOPPED cannot be provided and maintained.	High	No – Fence/ gate remain, and vegetation increased
GCS Section 8 – Signs			
a. Retroreflective strips are not provided for the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Install retroreflective strips on the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Medium	Yes – retroreflective strips installed on back of both RAILWAY CROSSING Signs and poles
b. RAILWAY CROSSING AHEAD signs are not present on either approach of the crossing.	Install RAILWAY CROSSING AHEAD signs 45m +/- 10m in advance of the double stop bar on both approaches.	Medium	Yes – RAILWAY CROSSING AHEAD Signs installed on both approaches. North approach has vegetation partially obstructing sign.
c. STOP signs are not present on either approach of the crossing.	STOP signs should be installed on the same post as the RAILWAY CROSSING signs on both approaches.	Medium	Yes – STOP Signs installed below RAILWAY CROSSING Signs.

d. EMERGENCY NOTIFICATION signs are not present on either approach of the crossing.	Install EMERGENCY NOTIFICATION sign on both approaches as per GCS Section 8.5.	Medium	Yes – EMERGENCY NOTIFICATION Signs installed below STOP Signs.
e. Double stop bar pavement markings are not present on either approach to the crossing for vehicles.	Paint double stop bars on both road approaches as per MUTCD Fig.C1-6 (Jan. 2014).	Medium	Yes - Double stop bars have been installed.
f. RAILWAY CROSSING symbol pavement markings are not present on either approach to the crossing for vehicles.	Paint RAILWAY CROSSING symbol pavement markings on both road approaches as per MUTCD Fig.C1-6 (Jan. 2014).	High	Yes – RAILWAY CROSSING symbol pavement marking painted as per MUTCD
g. Stopping or parking restriction not observed along the railway right-of-way.	Install NO STOPPING signs within the railway right-of-way	Medium	Yes – Parking restriction/ NO STOPPING signs installed along Timberland Road
GCS Sections 9, 12 to 17 – Warning System Design			
h. An active warning system without gates is warranted based on cross-product.	Install active warning system without gates. However, Transport Canada indicated that the crossing could stay passive indefinitely unless the sightline requirements could not be met.	Low	No

2.2 CROSSING MODIFICATIONS

As shown in Appendix A: Site Photographs, a number of changes have occurred at the crossing between inspections. Most changes were based on recommendations outlined in the 2015 inspection. Table 1, shows what changes have been made based on the 2015 recommendations. Below is a summarised list of all the changes observed from the site inspection:

- New grade crossing signage, including;
  - RAILWAY CROSSING Signs
  - STOP Signs
  - EMERGECNY NOTIFACATION Signs
  - RAILWAY CROSSING AHEAD signs
  - PARKING RESTRICTION Signs
- New MUTCD compliant pavement marking
  - Hatching across facility entrance.
- Vegetation in North West Quadrant increased
- Asphalt has been installed to extend the crossing 0.5m beyond the travelled way

2.3 ASSESSMENT AND RECOMMENDATIONS

An updated Grade Crossing Safety Assessment was undertaken for the proposed realignment of the port road access and to determine any required crossing upgrades to ensure compliance with the GCR & GCS. **Appendix B: Site Inspection Report** provides details of the observations made during the site inspection. The inspection report also outlines outstanding safety issues, along with recommended remediations. Table 2: 2020 Crossing Recommendations, summarizes the recommendations from the field investigation.

Lack of sightlines is a warrant in the GSR and GCS to require installation of automatic crossing protection. The client needs to ensure that the crossing design plans, fully completed crossing plans (E-4) and full crossing safety assessment, which comply with requirements of the GCR and GCS, have been completed and filed with Canadian Transportation Agency and applicable railway.

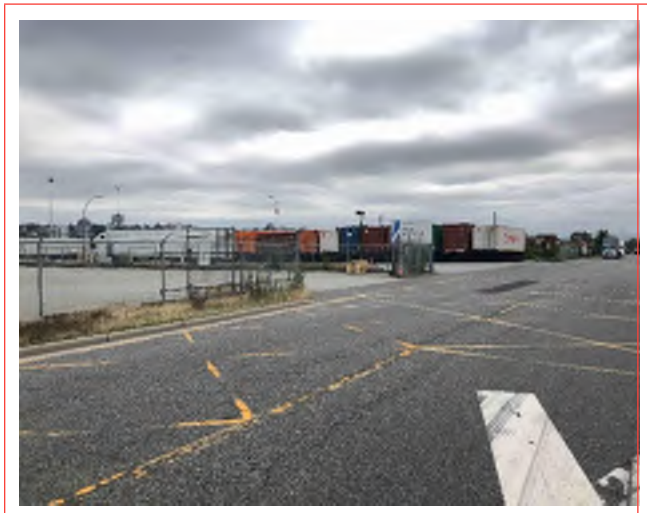
Table 2: 2020 Crossing Recommendations

Observations	Suggested Actions	Priority	Order of Magnitude Cost
GCS Section 5 – Crossing Surface			
a. Vertical movement of rails with in the Crossing Surface when vehicles cross.	Undertake appropriate maintenance of the substructure of the crossing surface.	Low	$5000
GCS Section 7 – Sightlines			
a. Clear sightline areas where drivers stopped at the crossing (DSTOPPED-VEH) cannot be provided or maintained due to fences and equipment on the southwest and North west corners of the crossing.	Install active warning system with gates if DSTOPPED cannot be provided and maintained	Medium	$15,000
GCS Section 8 – Signs			
a. RAILWAY CROSSING symbol and HATCHING pavement markings are faded.	Repaint RAILWAY CROSSING symbol and HATCHING pavement markings on road approaches as per MUTCD	High	$750
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system without gates is warranted based on Sightlines.	Install active warning system without gates. DTM crossing activation to be implemented and coordinated with the SRY	Medium	$500,000

APPENDIX

A SITE PHOTOGRAPHS

APPENDIX



A - North Approach Drivers View Left

B - North Approach

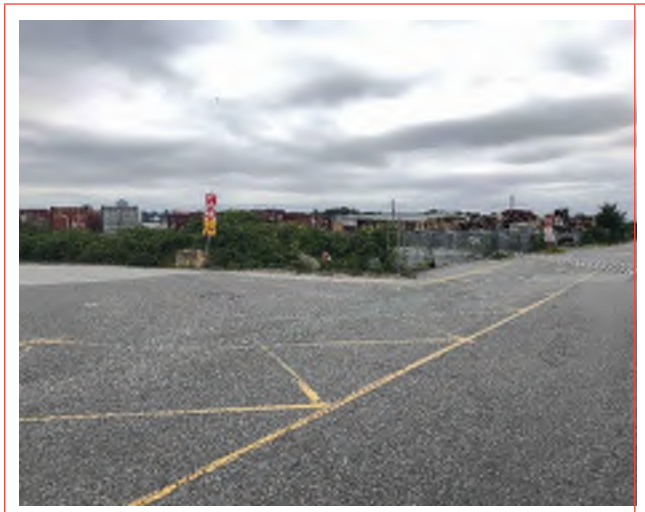
C - North Approach Drivers View Right

D - South Approach Drivers View Left

E - South Approach

F - South Approach Drivers View Right

APPENDIX



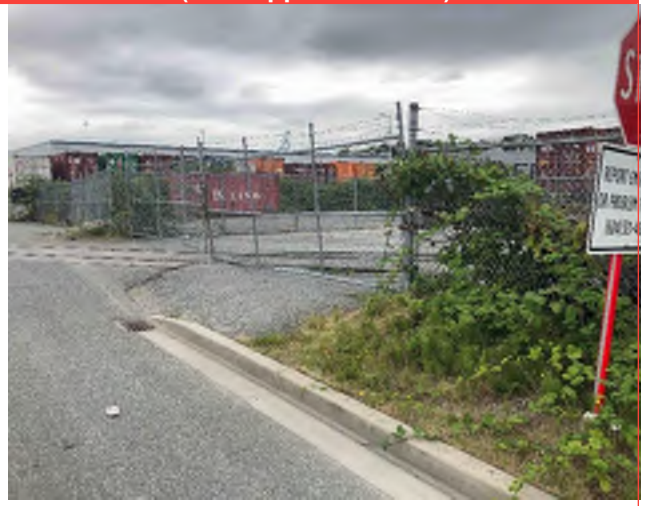
G – North Approach Driver View Left
(At Stopped Position)

H - North Approach (At Stopped Position)

I – North Approach Drivers View Right
(At Stopped Position)

J- South Approach Drivers View Left
(At Stopped Position)

K - South Approach (At Stopped Position)



L - South Approach Drivers View Right
(At Stopped Position)

APPENDIX

M – East Facing Crossing Surface

N – General Crossing Photo

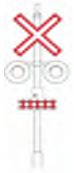
O – West Facing Crossing Surface

APPENDIX

B SITE INSPECTION REPORT

CANADIAN ROAD / RAILWAY GRADE CROSSING DETAILED SAFETY ASSESSMENT FIELD GUIDE (2005)*

Appendix C2: Field Data Forms



Passive & Active Crossings

MileX.XX (10550 Timberland Road),SRY Rail
Surrey, British Columbia
For Vancouver Fraser Port Authority

Legend:

calculate	**Formula**	Spreadsheet cell has formula
look up		User to look up value in table or chart.
		User to input value here for conditional formatting or formulas in other cells to function
		Warning! Value beyond acceptable limits.
		Warning! Value beyond acceptable limits for certain conditions (i.e. for people using assistive devices).
	Rail	Information to be provided by Railway Company
	Road	Information to be provided by Roadway Authority
measure	observe	Information to be obtained during Site Investigation
	√	Information provided by others to be verified in the field

* Updated to reflect Transport Canada's Grade Crossing Standards (GCS) July 2014 and Grade Crossing Regulations (GCR)(SOR-2014-275 Feb 2016)

MileX.XX (10550 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 1 | **Grade Crossing Safety Assessment** | **Passive Crossings**

Date of Assessment: **22-Jul-20** Site Investigation

Assessment Team Members & Affiliations: **Patrick McCabe**
Rob Sewell

Reason for Assessment: **New Proposed Pedestrian Crossing**

____	periodic assessment	**X**	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:	**Vancouver Fraser Port Authority**		
Crossing Location:	**10550 Timberland Road**		
Location Number:	**N/A**		
Municipality:	**City of Surrey, BC**		
Railway:	**SRY**	Mile:	**N/A**
Sub-division:	**N/A**	Spur:	**N/A**
Type of Grade Crossing [private/public; warning devices]:	**SRSC**		
Track Type: [mainline, etc.]			**Yard**

Road Authority:	**Vancouver Fraser Port Authority (VFPA)**
Road Name/Number:	**10550 Timberland Road**
Province:	**British Columbia**
Location Reference (control section, etc.):	**DP Surrey Docks**
Road Classification: (freeway/expressway arterial, collector, local, etc):	**ULU**
Roadway East/West (yes/ no)	No
Roadway North/ South (yes/ no)	Yes

*Urban Local Undivided

Collision History (5-year period): **No record of accitents at the subject railway crossing within the past five years**

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

Provide Details of the collisions if available:
Sources:

- identify main contributing factors

- attach collision diagrams if available

MileX.XX (10550 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 2a **SCENE PHOTOGRAPHS**

For the full set of photos taken, see the Appendix to the Safety Assessment Report.

MileX.XX (10550 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 2b **SCENE SKETCH**

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

Notes: Images from Google Earth

Include:
- directions to nearby municipalities for both road & rail approaches (use arrows)
- adjacent intersections
- relevant road signs/signals
- signal warning systems hardware
- landmarks
- crosswalks/paths
- geographical features
- bus stops, etc.

MileX.XX (10550 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 3 **GENERAL INFORMATION**

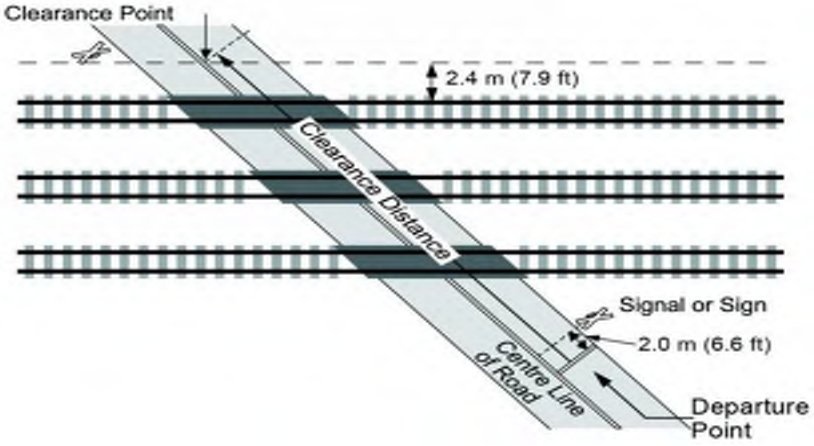
Source	Item								Reference
Rail	Maximum Railway Operating Speed, V_T	=	10	(mph)					
Rail	Daily Train Volume:	=	1	(freight trains/day)					
		=	0	(passenger trains/day)					
Rail	Switching during daytime? Y/N	Yes			nighttime? Y/N	Yes			
Road	Avg. Annual Daily Traffic, AADT:	=	2,390	(vpd)	Year of count:	2020			
Road	High seasonal fluctuation in volumes?		No						
Road	Pedestrian Volumes	=	0	(ped./day)					
Road √	Is crossing on a School Bus route?		No						
Road √	Do Dangerous Goods trucks use this roadway?		Yes						
Road	Cyclist Volumes	=	0	(cyclists/day)	Cyclist not anticipated				
Road √	Regular use of crossing by persons with Assistive Devices?				None				
Road √	Other special road users?	type	Unknown	daily volume	None				
Road	Forecasted AADT[2]	=	460	(vpd)	Forecasted Year:	2022			
Road √	Design Speed:		30	km/h	Posted Speed:	30	km/h		
	Maximum Operating Speed:		30	km/h					
	note: provide details if all approaches are not the same								
Road √	Road Surface Type (asphalt, concrete, gravel, etc.):		Asphalt						
observe	Surrounding Land Use (urban/rural)?:		Industrial						
observe	Any schools, retirement homes, etc. nearby?		No						

Notes:
1. Road Authority should provided plans if available.
2. AADT is based upon modelled future traffic counts for the Realigned infrastrucutre.

From GCS Section 7.1.2:

Column 1	*Column 2*	*Column 3*
Class of Track	***The maximum allowable operating speed for freight trains is -***	***The maximum allowable operating speed for passenger trains is -***
Class 1 track	17 km/h (10 mph)	25 km/h (15 mph)
Class 2 track	41 km/h (25 mph)	49 km/h (30 mph)
Class 3 track	65 km/h (40 mph)	97 km/h (60 mph)
Class 4 track	97 km/h (60 mph)	129 km/h (80 mph)
Class 5 track	129 km/h (80 mph)	153 km/h (95 mph)

Figure 10-1 - Clearance Distance (cd) for Grade Crossings
(a) For Grade Crossings with a Warning System or Railway Crossing Sign



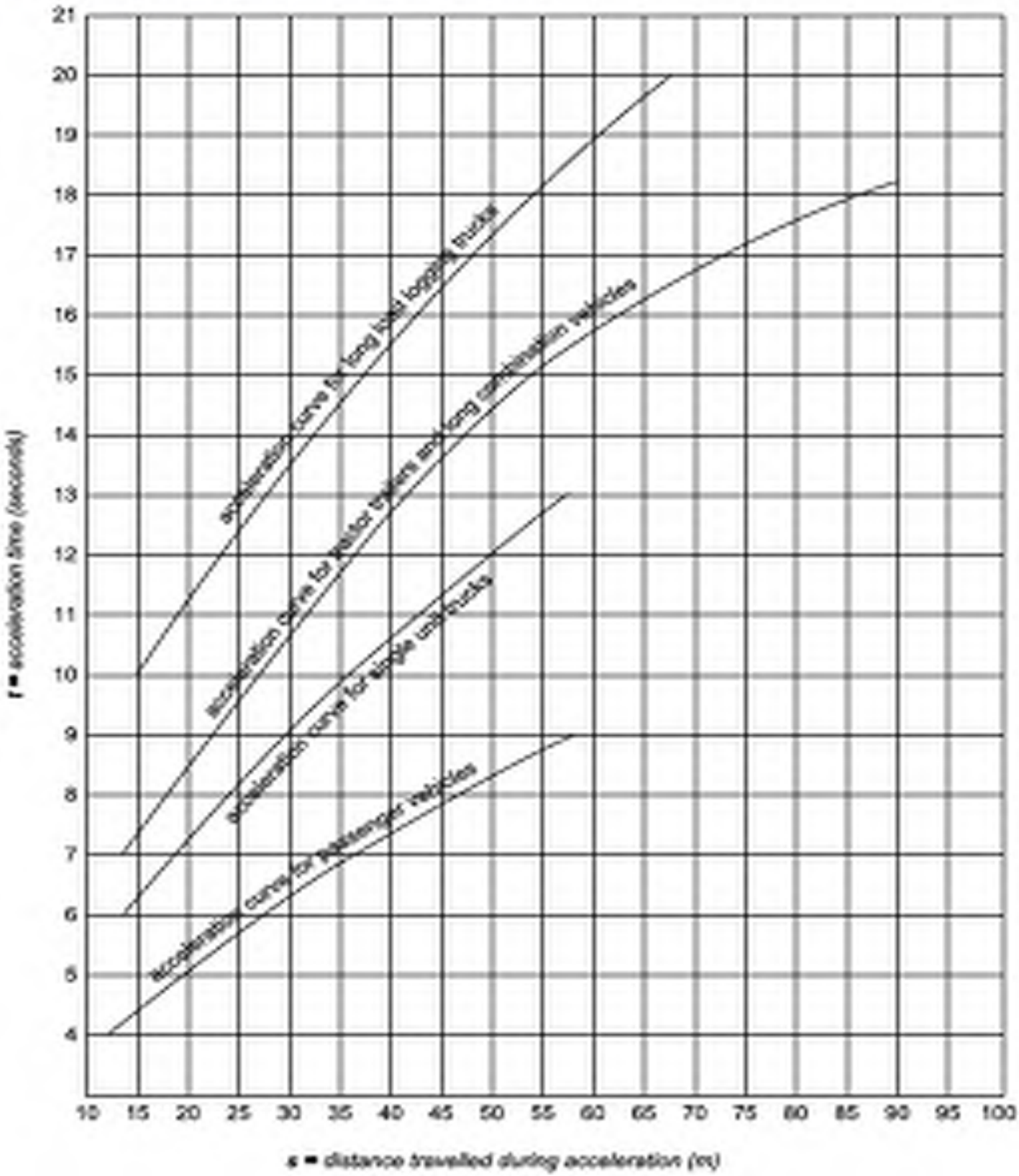
Grade Crossings Standards, July 2014

Table 10-1 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 & Buses	0.8	0.9	1.0	1.1	1.3
Tractor-Semitrailer	0.8	0.9	1.0	1.2	1.7

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 10-2 Assumed Acceleration Curves



MileX.XX (10550 Timberland Road),SRY Rail
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Sheet 4 **DESIGN CONSIDERATIONS**

Source	Item						SB Approach		NB Approach		Reference
	Design Vehicle										
Road	Type:	6	WB-20 Tractor-Semitrailers (WB-20)								Table 1* SOR 57
look-up	Length, **L:**		22.7	m							Table 1*
look-up	**Stopping Sight Distance, SSD**		45	m (round to 1.0% of grade)		=	10	m	45	m	Table 3*
measure	**Clearance Distance, cd**					=	26.3	m	26.2	m	GCS 16.1.1
calculate	**Vehicle Travel Distance, S**	**S= L+cd**	49.0	max <---		=	49.0	m	48.9	m	
look-up	**Vehicle Departure Time, t**					=	14.3	sec	14.3	sec	GCS Figure 10-2
Road V	Road Grade Effect:	maximum approach grade within 'S':				=	0.80	%	1.20	%	Sheet 7
look-up	grade adjustment factor (anto calc assumes Truck)(manual input from Table 10-1 if other)					=	1.04		1.08		GCS Table 10-1
calculate	**T**= t x adjustment factor					=	14.9	sec	15.5	sec	
	Design Vehicle Departure Time, T_D = J + T (where J = 2 sec (min.) perception & reaction)						2.0	sec	2.0	sec	
calculate	**$T_{G\ stop}$ = T_D=**		17.5	sec		<-	16.9	sec	17.5	sec	GCS 10.3.2
observe	Do field acceleration times exceed T_D?	**Acceleration measurement beyond the scope of this assessment.**									
measure	**Pedestrian , cyclist & Assistive Devices Departure Time**				pedestrian **cd** distance	=	0.0	m	0.0	m	GCS 10.3.3
calculate	walking speed 1.22m/s max.	**T_P =**	0.0	sec	(1.0m/s used)	<-	0.0	sec	0.0	sec	
calculate	**T_{SSD}**	= (SSD+cd+L)/(0.277837 x $V_{road\ design}$) =	11.3	sec							

Comments Following Site Visit:

Table 1 – Design vehicle Lengths/Class

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

Source: *Geometric Design Guide for Canadian Roads*, TAC; September 1999.

Table 6 – Minimum Sightlines along the Rail Line ($D_{stopped}$) (as illustrated in Figure 3)

Railway Design Speed V_r (mph)	$T_{stopped}$ = Departure Time (greater of T_d or T_p) (seconds)											If greater of T_d or T_p > 20 sec., add for each additional second (m)
	≤ 10	11	12	13	14	15	16	17	18	19	20	
WARNING: Railway design speed in mph!	Minimum Sightlines along Rail Line ($D_{stopped}$) (m)											
STOP	30	30	30	30	30	30	30	30	30	30	30	+0
1-10	45	50	55	60	65	70	72	76	80	85	90	+5
11-20	90	100	110	120	125	135	145	155	165	170	180	+10
21-30	135	150	165	175	190	205	215	230	245	255	270	+15
31-40	180	200	220	235	250	270	285	305	325	340	360	+20
41-50	225	250	270	290	315	335	360	380	405	425	450	+25
51-60	270	300	325	350	380	405	430	460	485	510	540	+30
61-70	315	350	380	415	445	470	505	535	565	595	630	+35
71-80	360	395	435	465	505	540	580	610	650	680	720	+40
81-90	405	445	490	535	570	605	650	685	730	765	810	+45
91-100	450	500	540	580	630	670	715	760	805	850	895	+50

Table 3 – Determine SSD for Truck Class

Road Crossing Design Speed V (km/hr)	Truck Class Stopping Sight Distance (SSD) (m)																				
	Road Approach Gradient																				
	-10%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
20	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	24	24	24	24	24
30	48	48	47	47	47	46	46	46	45	45	45	45	45	44	44	44	44	44	44	43	43
40	76	75	74	74	73	73	72	71	71	70	70	70	69	69	68	68	68	67	67	67	67
50	121	120	118	117	116	115	114	113	112	111	110	109	108	108	107	106	106	105	105	104	104
60	149	146	144	142	140	138	136	134	133	131	130	129	128	126	125	124	123	122	122	121	120
70	210	205	202	198	195	192	189	187	184	182	180	178	176	175	173	171	170	169	167	166	165
80	252	246	241	236	231	227	223	219	216	213	210	207	205	202	200	198	196	194	192	191	189
90	318	311	304	297	292	286	281	277	273	269	265	262	258	255	252	250	247	245	243	240	238
100	401	391	382	373	365	358	352	346	340	335	330	325	321	317	314	310	307	304	301	298	295
110	455	441	428	417	406	397	388	380	373	366	360	354	349	344	339	334	330	326	322	319	315

* Source: Transport Canada's "Determining Minimum Sightlines at Grade Crossings: A Guide for Road Authorities and Railway Companies"

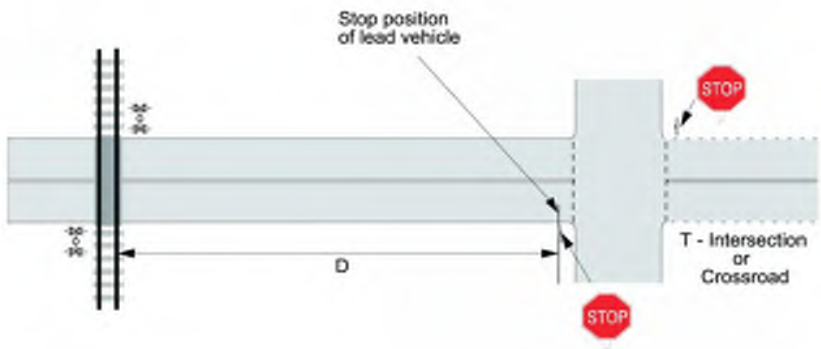
MileX.XX (10550 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 5 **LOCATION of GRADE CROSSING**

Source	Item		Reference
observe	"D" should not be less than 30m for either approach if the train speed exceeds 15 mph. **D =0m**		GCS Section 9.1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	**No**	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks?	**Yes**	
	Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing?	**Yes**	

Comments Following Site Visit:
- The minimum "D" dimension to the edge of the entrance to facility in South approach. The North approach "D" is 20.5m
- RAILWAY CROSSING AHEAD sign installed from previous inspection (2015)
- Railwayspeed = 10mph

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

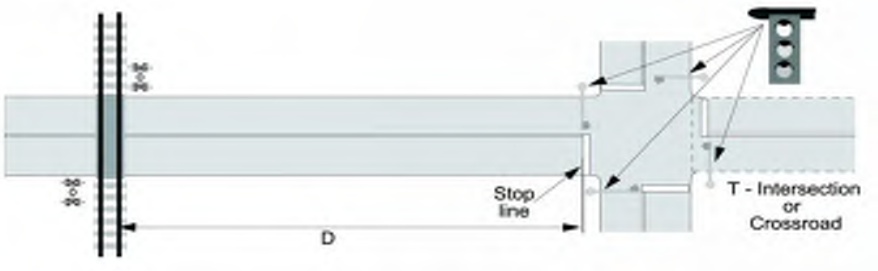
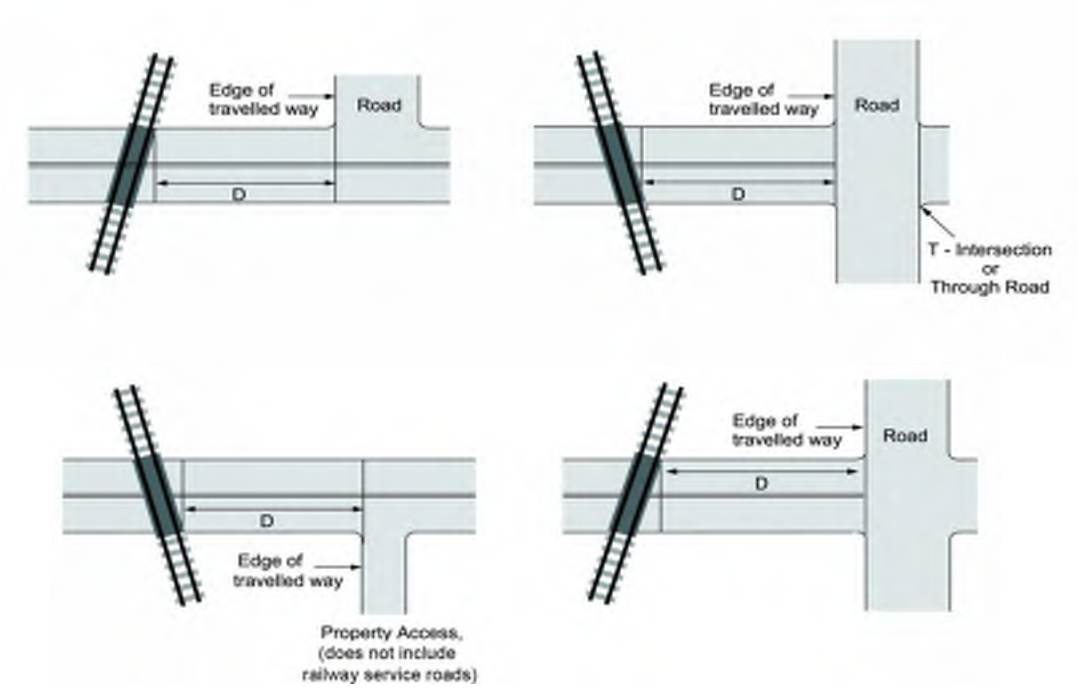


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings



MileX.XX (10550 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 6 **GRADE CROSSING SURFACE**

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? **Yes**							SOR 60; GCS 5
observe	Grade Crossing Surface Material: **Asphalt** Grade Crossing Surface Condition: **Fair**							SOR 60; GCS 5
observe	Approach Road Surface Type: **Ashpalt** Approach Road Surface Condition: **Fair** Roadway Illumination?: **Yes**							SOR 60; GCS 5
		SB Approach		**NB Approach**				
measure	Road Surface crossing width (perp. C.L. min. = 8.0m)		**12.8** m					GCS 5.1
measure	Road Surface extension beyond travel lanes (min. = 0.5m)	**0.5**	m	**1.0**	m			GCS 5.1
measure	Sidewalk/Path/Trail crossing width (min. = 1.5m)		**NA** m	**1.8**	m	Crosswalk on NB only		GCS 5.1
measure	Sidewalk/Path/Trail extension beyond sidewalk (min. = 0.5m)	**NA**	m	**0.5**	m	Crosswalk on NB only		GCS 5.1
measure	Distance Between Travel Lane and C.L. of Trail		**1.0** m					
	Cross-Section:		**South (Right) Rail:**		**North (Left) Rail:**			GCS Table 5-1
measure	Flangeway width (min. = 65mm; max.= 120mm or 75mm[1])		**63** mm		**65** mm			GCS Table 5-1
measure	Flangeway depth (min. = 50mm; max.= no limit or 75mm[1])		**50** mm		**50** mm			GCS Table 5-1
	Rural Field Side Gap:							GCS Table 5-1
measure	Side Gap width (max.= 120mm or 0[1])		**3** mm		**2** mm			GCS Table 5-1
measure	Side Gap depth (max.= no limit or 0[1])		**10** mm		**10** mm			GCS Table 5-1
	Wear Limits:							GCS Table 5-1
measure	Elevation of Top Rail above road surface (max. = 13mm[1], 25mm, or 50mm)		**12** mm		**10** mm			GCS Table 5-1
measure	Elevation of Top Rail below road surface (min. = -7mm[1],-25mm, or -50mm)		**0** mm		**0** mm			GCS Table 5-1

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Flangeway and field side gap constructed out of rubber. Flangeways need cleared

- Crossing surface panels and rail observed moving vertically. Needs to be maintained

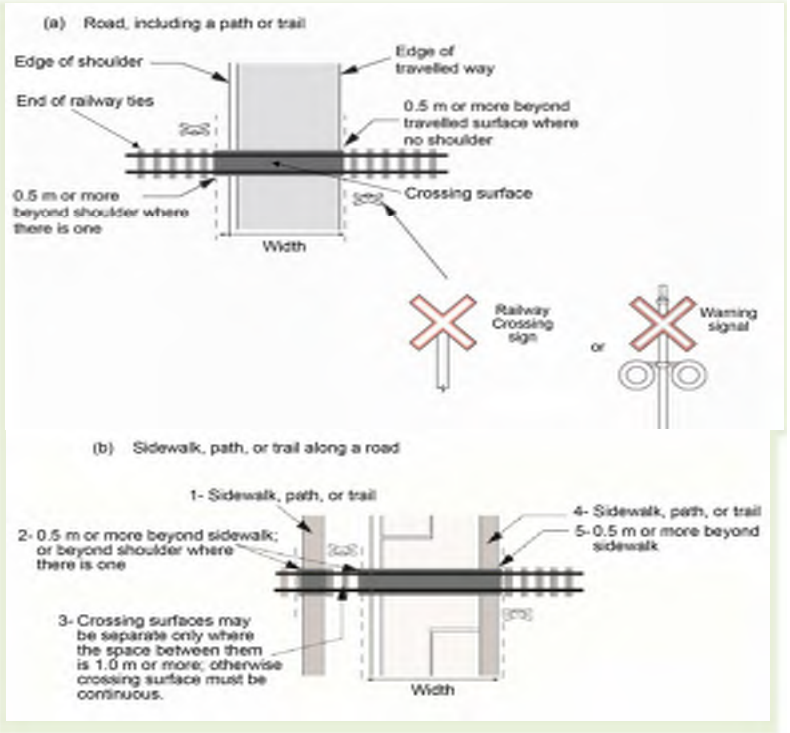
-rough crossing surface, loose timbers, etc. - difference between road grade and rail superelevation -surface distress of roadway approaches -photos

Grade Crossings Standards, July 2014

Table 5-1 – Grade Crossing Surface – Cross Section

a) Flangeway:		
Width	**Minimum**	65 mm
	Maximum for:	
	Public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	120 mm
Depth	**Minimum**	50 mm
	Maximum for:	
	Public sidewalks, paths and trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	No limit
(b) Field side gap A space is permitted on the outer side of the rail at rural locations, except for public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices		
	Maximum width	120 mm
	Maximum depth	No limit
(c) Elevation of the top of the rail with respect to the crossing surface The top of the crossing surface must be installed as close as possible to the top of the rail within the wear limits below:		
Wear limits:		
Public sidewalk, path or trail designated by the road authority for use by persons using assistive devices		
	Maximum distance of the top of the rail above crossing surface	13 mm
	Maximum distance of the top of the rail below crossing surface	7 mm
All other public grade crossings; the maximum distance of the top of the rail above or below the crossing surface		25 mm
Private grade crossings; the maximum distance of the top of the rail above or below the crossing surface		50 mm

Figure 5-1 - Grade Crossing Surface Dimensions



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Surrey, British Columbia

Sheet 7 — **ROAD GEOMETRY**

Source	Item									Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Are the road lanes at least the same width on the crossing as on the road approaches? WB Approach: **Yes** EB Approach: **Yes**									
	Grades		**SB Approach**		**NB Approach**		Difference: rail e & rd grade (GCS 6.1)			GCS Sect. 6
measure	Slope within 8m of nearest rail (max. = 2%)		**1.20**	%	**1.00**	%	**0.60%**	%	**0.50%**	Diff in Grade Max
measure	Slope between 8m & 18m of nearest rail (max. = 5%)		**0.80**	%	**1.20**	%				3%
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices (max. = 1[1] or 2%): slope within 5m of nearest rail =		**N/A**	%	**N/A**	%				
Road √	General approach grade (max. = +/- 5%)		**1.00**	%	**1.00**	%				
	measured over the SSD distance of:		**10**	m	**45**	m				Sheet 4
Rail √	Are rail tracks super-elevated?	**No**	Rate of s/e:	**0.00**	m/m Sdg	**0.00**	m/m ML			GCS Sect. 6.1 & 6.2
Road √	If train speeds exceed 15mph (70° minimum w/o warning system; 30° minimum with warning system): What is the angle between the crossing and the roadway?		=	**150.0**	degrees					
observe	**Condition of Road Approaches:** **Fair.** (e.g., anything that might affect stopping or acceleration)									SOR 60
observe	NA									

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Minor cracks within both approaches.
- Roadway hatch marking and RAILWAY AHEADSymbols need repainting.

Grade Crossings Standards, July 2014

Table 6-1 – Difference in Gradient

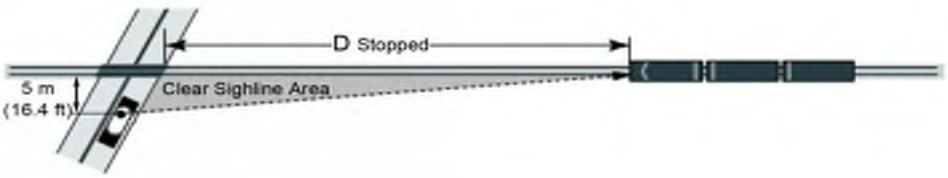
Classification	Difference in Gradient (%)
RLU	2
RCU	1
RCD	1
RAU	0
RAD	0
RFD	-
ULU	3
UCU	2
UCD	2
UAU	0

*Legend
Urban (U) Rural (R) Local (L) Collector (C) Arterial(A) Expressway (E) Freeway(F)
Divided (D) Undivided (U)

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 7-1 - Minimum Sightlines - Grade Crossings

(a) Sightlines for Users Stopped at a Grade Crossing (applicable to all quadrants)



(b) Sightlines for Users Approaching Grade Crossing (applicable to all quadrants)

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Sheet 8 **SIGHTLINES**

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 **Yes**							
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location **Yes**							
				SB Approach		**NB Approach**		
look-up	**SSD** minimum =			10	m	45	m	Sheet 4
measure	**SSD Actual** (not including turning movements)**:**			250.0	m	250.0	m	
calculate	D_{SSD}	=	$0.277837 \times V_{train\ km/h} \times T_{SSD}$	50	m	50	m	1.609 convert mph to km/h
calculate	$D_{STOPPED}$ minimum (m)	=	$0.277837 \times V_{train\ km/h} \times T_D$ =	76	m	78	m	T_D from Sheet 4
measure	$D_{STOPPED}$ **Actual**:		Driver looking LEFT	15	m (ne)	60	m (sw)	
			Driver looking RIGHT	200	m (nw)	200	m (se)	
calculate	**Ped./Cyclist $D_{STOPPED}$ (m)**			0	m	0	m	T_P from Sheet 4
measure	**Ped./Cyclist $D_{STOPPED}$ Actual:**		Person looking LEFT	N/A	m	N/A	m	
	note: measured from a point 2m in advance of sign/signals		Person looking RIGHT	N/A	m	N/A	m	
observe	Are there any obstacles within the sight triangles other than traffic signs/utility poles that might affect visibility? **Fencing and equipment within facility.**							

Comments Following Site Visit:

- Fencing and equipment blocks sightlines in the North West and South West Quadrants

- Clear Sightlines where drivers stop.

-can sightlines be maintained on an ongoing basis? (snow) -photos

Figure 8-3 - Location of Railway Crossing Signs and Number of Tracks Signs (public grade crossings without warning systems)

a) **b)**

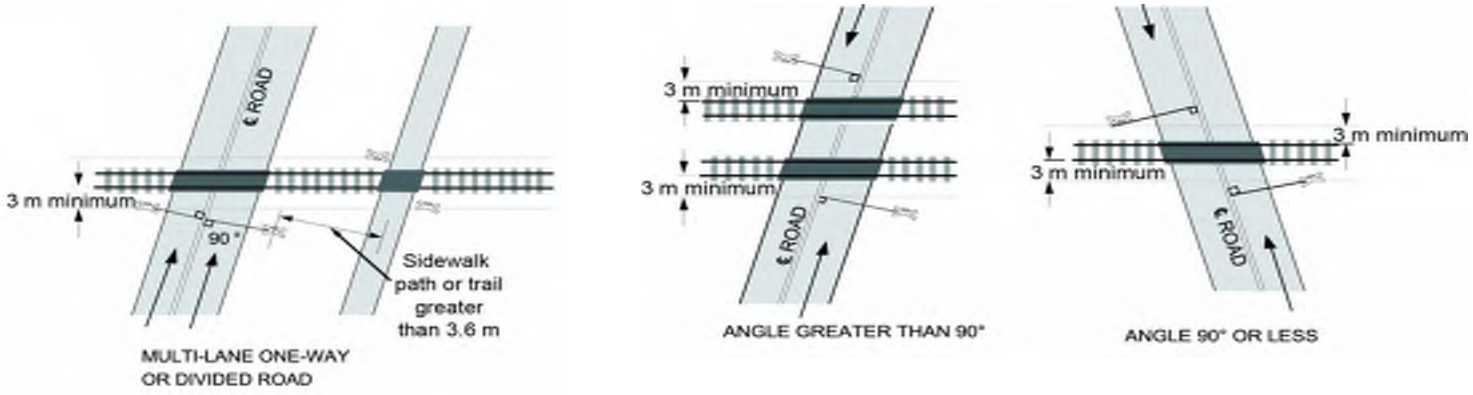
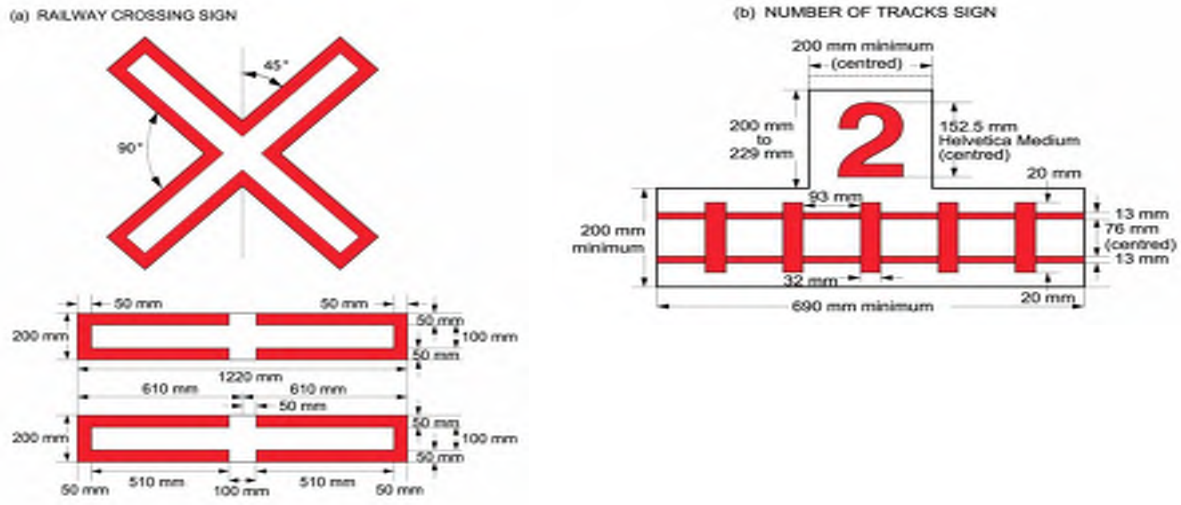


Figure 8-1 - Railway Crossing Sign and Number of Tracks Sign



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Sheet 9a — **SIGNS AND PAVEMENT MARKINGS**

Source	Item							Reference
	Railway Crossing Sign  **These signs will be required**							MUTCD
		SB Approach		**NB Approach**				
measure	distance from nearest rail:	**12.5**	m	**9.0**	m			
measure	distance from edge of road:	**1.0**	m	**1.3**	m			
measure	height of centre of crossbucks:	**3.5**	m	**3.5**	m			
measure	retroreflectivity readings:	**N/A**	cd/lux/m^2	**N/A**	cd/lux/m^2			
observe	Number of Tracks sign? **No**							
observe	A Stop Sign must be installed at grade crossing without a warning system if the road design speed is less than 15mph					Yes/ No/ NA	**Yes**	SOR 64
observe	A Stop Ahead sign must be installed if the Stop Sign is not clearly visable within the Stopping Distance					Yes/ No/ NA	**N/A**	SOR 65

Comments Following Site Visit:
- New RAILWAY CROSSING signs installed in 2017.
- The back of poles and signs only have partial reflective strips (reflectivity not measured).
- NUMBER OF TRACKS Sign not required as only 1 track.

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

Source	Item		Reference
	DO NOT STOP ON TRACKS 		MUTCD
Road V	Does queued traffic routinely encroach closer than 5m from the crossing surface?	**No**	
observe	Are these signs present on either approach?	**No**	

Comments Following Site Visit:
- DO NOT STOP ON TRACKS Sign not installed.

-general condition -posts -photos

Source	Item					Reference
	Railway Crossing Ahead Sign (WA 18-20) 					MUTCD & SOR 66
look-up	Is AADT > 100? **Yes**		**SB Approach**	**NB Approach**		Sheet 3
observe	Is area urban such that WA 18-20 is not required?		**Yes**	**Yes**		
measure	Distance from nearest rail to sign	=	**80** m	**57.0** m		MUTCD
observe	height:		**2.5**	**2.5**		
observe	appropriate orientation of symbol		**Yes**	**Yes**		

Comments Following Site Visit:
- RAILWAY CROSSING AHEAD Sign has been installed since the previous inspection.
- RAILWAY CROSSING AHEAD Sign installed Min. Approx 57m from crossing. (North approach)
- North Approach Sign obscured by vegetation.

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

Source	Item			Reference
	ADVISORY SPEED SIGN 			MUTCD & SOR 66 (2)
observe	Are they present on both approaches?	**No**		
	Posted speed limit?	**N/A**	km/h	
look-up	Are they required on either approach?	**No**		check SSD (Sheet 8)

Comments Following Site Visit:

- ADVISORY SPEED Sign installed on the North approach only (East Approach)

-general condition -posts -photos

MileX.XX (10550 Timberland Road),SRY Rail
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Sheet 9b **SIGNS AND PAVEMENT MARKINGS**

Source	Item		Reference
	EMERGENCY NOTIFICATION		GCS Sect. 8.5
observe	Are these signs present on both approaches?	**Yes**	
observe	Is the information complete and legible?	**Yes**	

Comments Following Site Visit:

- EMERGENCY NOTIFICATION Sign Installed below RAILWAY CROSSING Sign

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

Source	Item		Reference
	PAVEMENT MARKINGS		
observe	Are pavement markings consistent with those from the MUTCD Manual?	**Yes**	Fig C1-6 MUTCD
observe	Are there lines to delineate sidewalks/paths?	**N/A**	

Comments Following Site Visit:

- Road markings and DOUBLE STOP BARS and Roadway "X" marking have been installed since the 2015 inspection.

- Cross hatching on the South approach has been installed and requires repainting.

-special sign required? -missing signs -visual clutter -obscured view/sightlines -retroreflect levels at night
-general condition of markings -are centrelines or stop lines present? -width of markings? -provincial practice not to use *X* ?

GENERAL ASPECTS
C1

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA

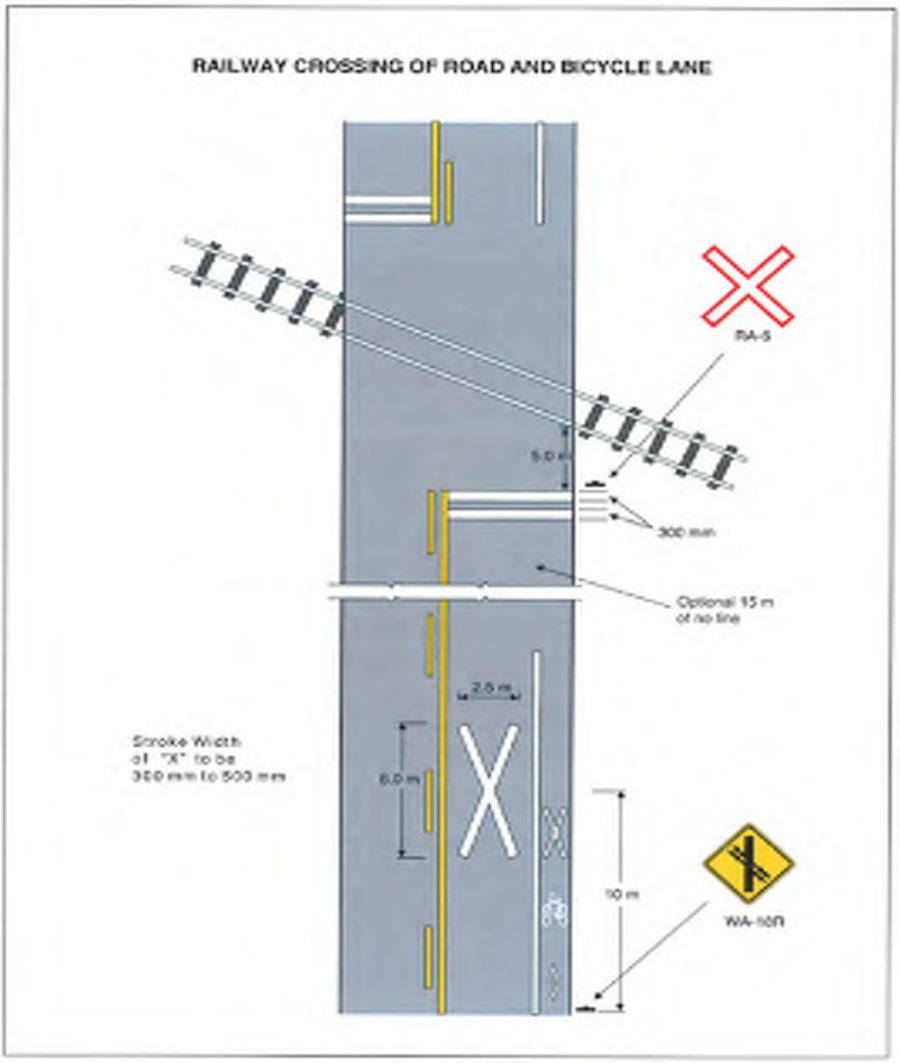
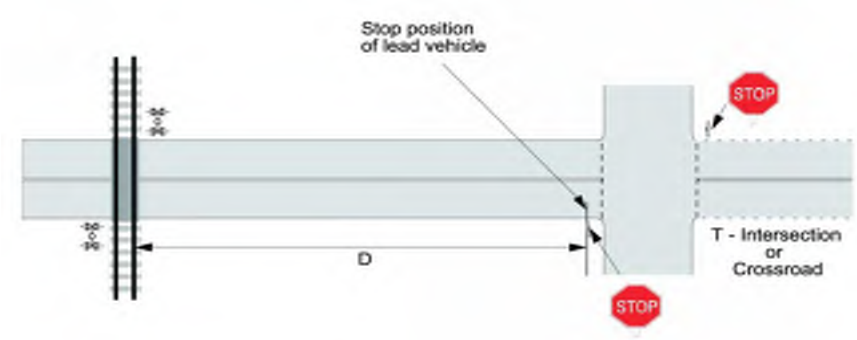


FIGURE C1-6

JANUARY 2014

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings

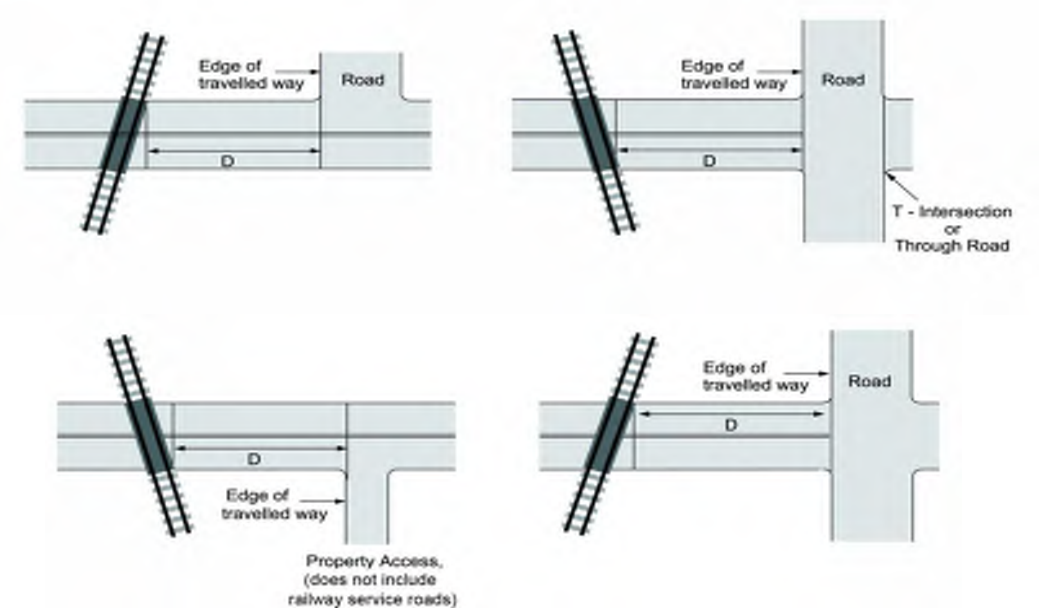
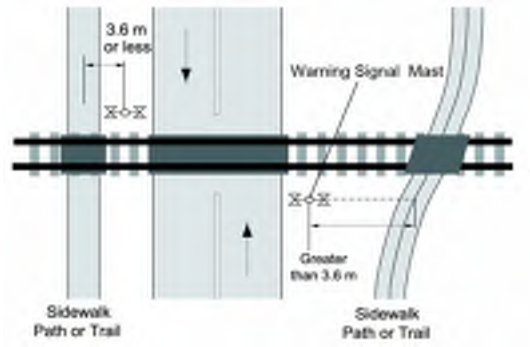
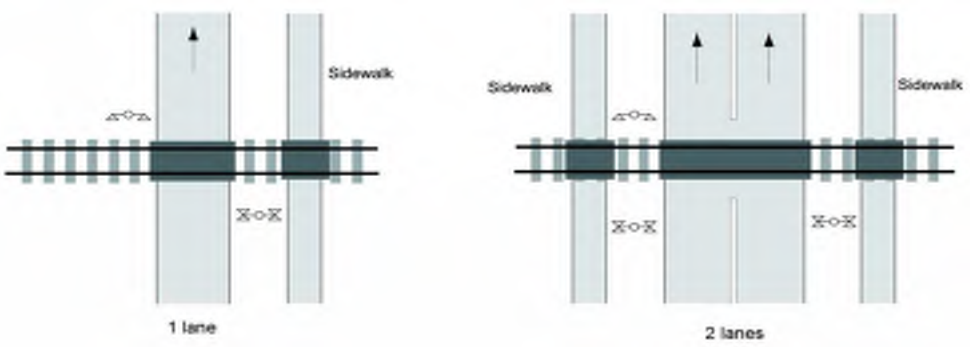


Figure 13-2 - Sidewalks, Paths and Trails
(a) Two Way



(b) One-Way



Sheet 10 eliminated in the new GCS

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Sheet 11 — **GRADE CROSSING WARNING SYSTEMS** — **GCS Section 9**

Source	Item is not required.									Reference
	Warning System Warrants if any of A through E below are met, then a warning system is warranted									
	Question							**Warrant for Warning System**		
look-up	Existing AADT =	2,390	Forecast AADT =	460						Sheet 3
look-up	Daily Train Volume =	1			trains					Sheet 3
calculate	**A. Cross-Product =**	460						> 2,000 FLB req'd	**> 50,000 requires gates**	
look-up	**B. Maximum Rail Operating Speed =**		10		mph			(max = 80mph or 50 mph with crosswalk)		Sheet 3
Rail	**C. Number of Tracks =**		1							
	if ≥ 2, can trains pass one another?		N/A					if ≥ 2 and trains can pass one another -> FLB req'd		
look-up	**D. Are Sightlines obscured?**		Yes					if "Yes" -> FLB req'd: If Fig 7.1 applies --> add G		Sheet 8 & Fig 7.1
observe	**E. Are any proximity conditions met?**		Yes					if "Yes" -> FLB required.		GCS Sect 9 & 11
look-up	Is a Warning System warranted?		Yes					If any of A through E above meet the Warrant		
	Field Visit	**Present? (Y/N)**	**Condition / Alignment:**							GCS 13
observe	Light Units,	N								GCS 13
observe	Bells,	N								GCS 13
observe	Gates,	N								GCS 13
observe	Cantilever Lights,	N								GCS 13
observe	Check that warning signal assemblies and cantilevers are in accordance with GCS Figures.									GCS Sect. 12
observe	Is warning system housing at least 9m from traveled way of the road and 8m from the nearest rail?									
observe	If there is a sidewalk, is a bell on the adjacent assembly?									
Rail √	Have all light units been aligned?	**NA**	Date?	**NA**						
Rail	Design Approach Warning Time (greatest of):			20sec OR [20+((cd-11)/3)] if cd>11m	Td	Tp	Gate Clearance Time + Descent Time + 5 seconds	Traffic Signal Clearance Time (=0 if no traffic signal)	(SSD + cd + L)/(0.277837xVv)	
	SB Approach		34.5 sec	25.1	16.9	0.0	34.5	0.0	7.1	
	NB Approach		34.5 sec	25.1	17.5	0.0	34.5	0.0	11.3	
observe	Is warning time less than 35 sec (without gates) or 55 sec (with gates)			**N/A**						

Comments Following Site Visit:

- As per previous inspection, an active warning is required due to sightlines. The reduction in AADT has not reduced the need for an active warning system.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted?

Figure 12-1 - Warning Signal Assemblies

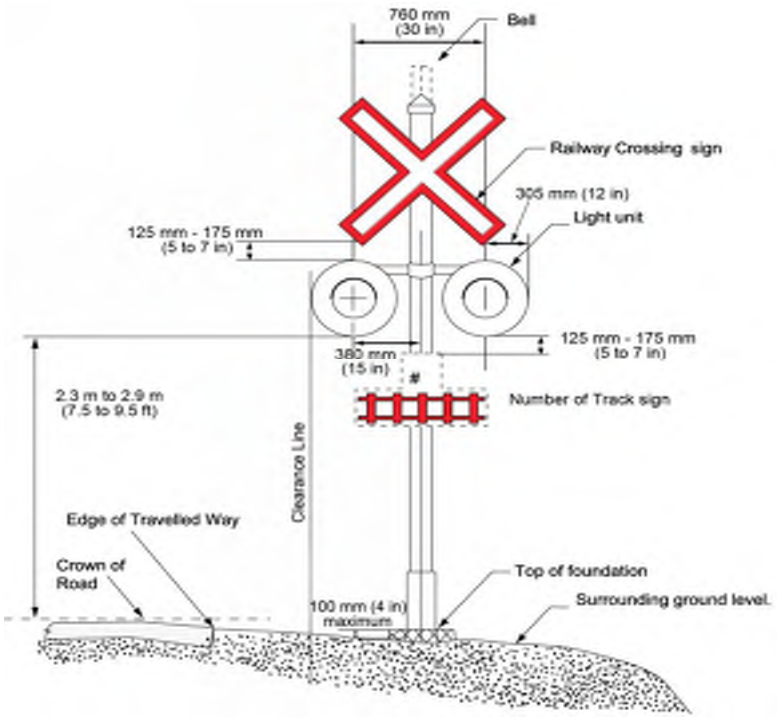
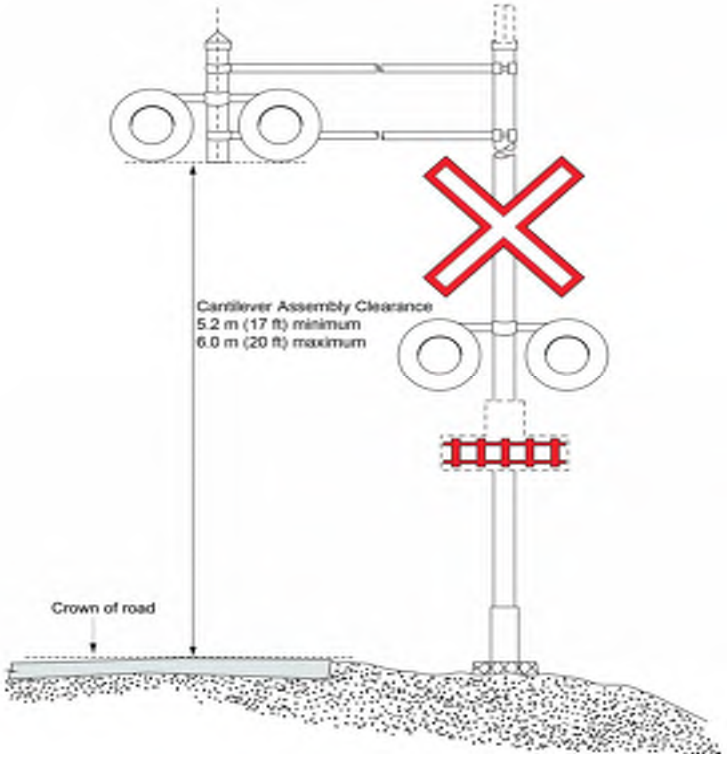


Figure 12-3 - Cantilevers



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Sheet 12  **GATES FOR GRADE CROSSING WARNING SYSTEMS** **GCS Section 9**

Source	Item							Reference
	Warning System Warrants -if any of A through E below are met then a warning system with gates is warranted. **Not required as warning system is not necessary**							
calculate	**A. Cross-Product =**	**460**	(50,000 min)					
look-up	**B. Maximum Rail Operating Speed =**	**10**	mph (max = 50mph)					Sheet 3
Rail √	**C. Number of Tracks =**	**1**						
	.....if ≥ 2 , can trains pass one another?	**N/A**						
look-up	**D. Is $D_{STOPPED}$ Insufficient?**	**NO**						Sheet 8
observe	**E. Are any proximity conditions met?**	**N/A**						
calculate	Gate clearance distance: eq 10.4b	**24.7**	m cd $_{G\ stop}$	**34.7**	m cd SSD SB	**69.7**	m cd SSD NB	GCS Sect. 10.4
look-up	travel time =	**17.5**	sec $_{G\ stop}$					
calculate	Gate arm clearance times:	**16.9**	sec SB from stop	$T_{G\ ssd}$ = **4.2**	sec SB from SSD			
		17.5	sec NB from stop	$T_{G\ ssd}$ = **8.4**	sec NB from SSD			
look-up	Gate arm delay time: **17.5**	sec (greatest value from above)						
calculate	effect of grade =	**0.8**	sec (SB from Stop)	**-4.2**	sec SB from SSD			
		1.5	sec (NB from Stop)	**0.0**	sec NB from SSD			
measure	Measure gate arm delay and compare with above:	**N/A**						
observe	Do gates conform to standards depicted in GCS Figures?	**N/A**						
observe	Check gate descent (10 to 15 sec) and ascent (6 to 12 sec)	**N/A**						
observe	Is gate striping vertical as depicted in GCS Figures?	**N/A**						
observe	Where railway equipment regularly stops, or railway equipment is left standing, within the activating limits of a warning system, the warning system must be equipped with a control feature to minimize the operation of the warning system.					Yes/No/NA	**NA**	GCS 16.3.1

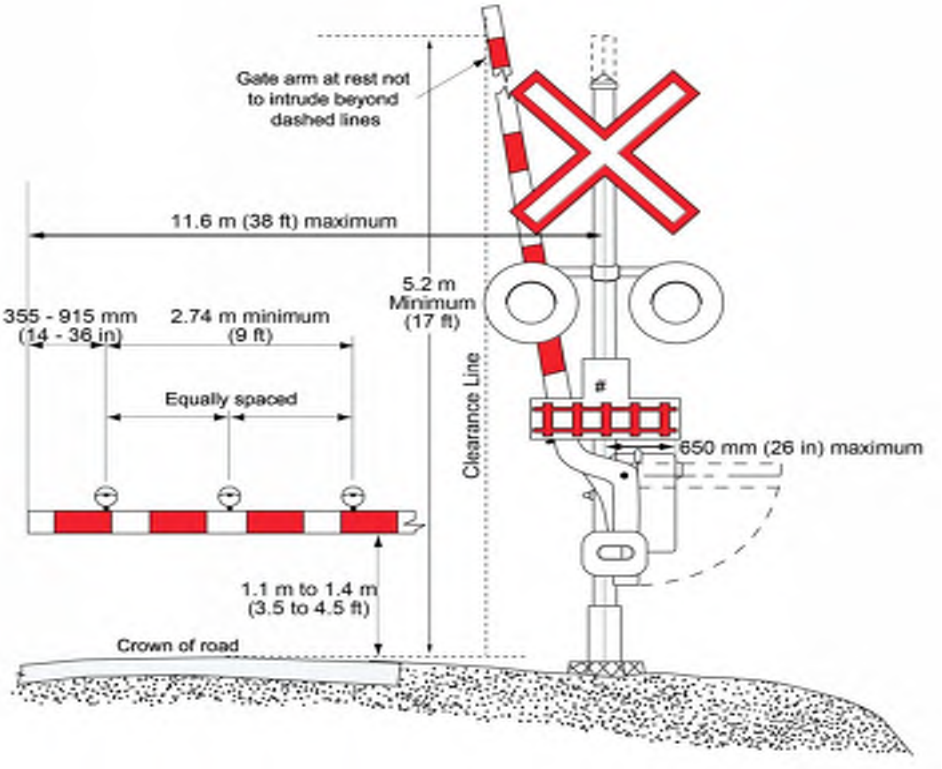
Comments Following Site Visit:

- Warning System with Gates is not required.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted? **No**

Figure 12-2 - Gates



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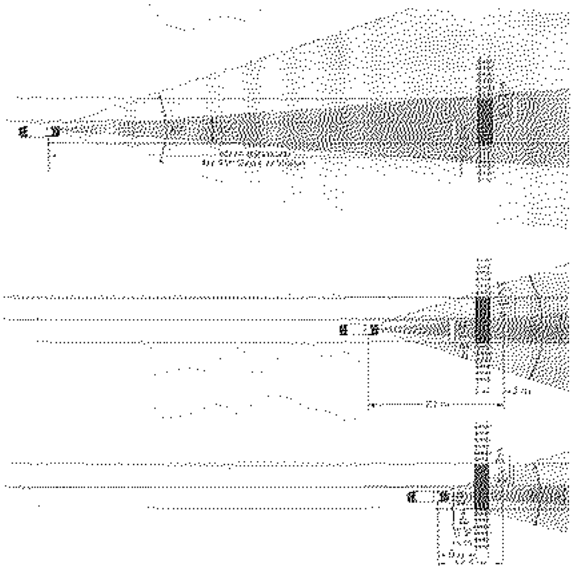
Sheet 13 **FLASHING LIGHT UNITS**

Note: Driver's cone of vision is ± 5° horizontally; limited by top of windshield vertically. GCS Sections 12-14

Source	Item is not required as warning system is not required.				u
	Number and Location				
look-up	Minimum Distance for Primary Light Units (SSD) =	45.0	m		
look-up	Recommended Distance for Primary Light Units =	69.7	m		
observe	Are flashing light units located within 5° horizontally of the centerline of the road (throughout the approach distance above)?			Yes (covered by front and back units)	
	Does horizontal/vertical curvature necessitate supplemental units?			N/A	
observe	Can back lights be seen by all stopped drivers?			N/A	
observe	Are lights obscured by vehicles stopped on adjacent intersections?			N/A	
observe	Are additional light units required for drivers as they begin to turn onto an approach road from an intersecting road/lane/pkg lot?			N/A	
	Cantilevered Light Units				
measure	Does D_R exceed 7.7m?	N/A			
measure	Does D_L exceed 8.7m?	N/A	(Assumes signal poles on both sides of road alignment, approach side of rail)		
	Multiple Lanes				
observe	Can front light units be seen by drivers in all lanes (….would T/T obscure?)?	N/A			
observe	Can back light units be seen by all stopped drivers in all lanes?	N/A			
	Sidewalks, paths, trails, etc.				
measure	Distance from path centerline to signal mast =	N/A	m (max.=3.6m)		
observe	Are separate light units required?	N/A			

Comments Following Site Visit:
- Crossing currently regulated by a passive warning system.

Horizontal Cone of Vision



Typical Light Unit Arrangement for an Adjacent Intersection

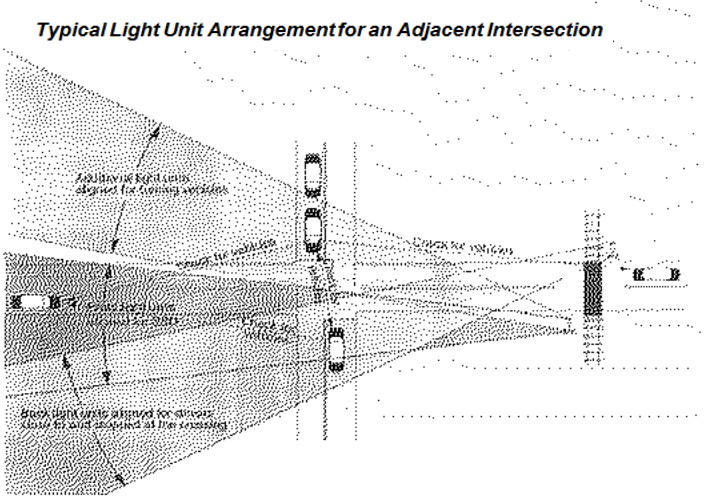
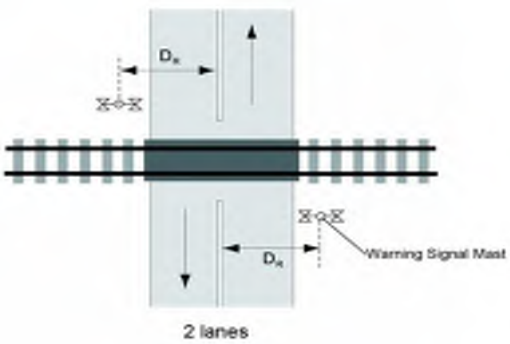
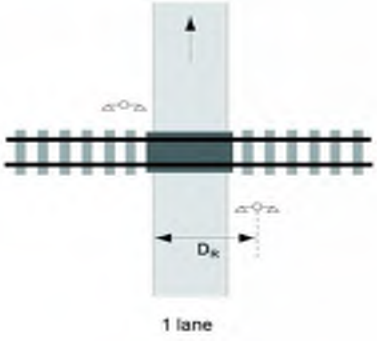


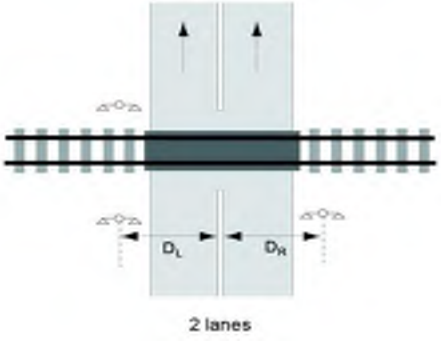
Figure 13-1 – Warning Signal Offsets Requiring Cantilevered Light Units

(a) Two-Way Road



(b) One-Way or Divided Road





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Sheet 14

PREPARE TO STOP AT RAILWAY CROSSING SIGN

GCS Sections 13 and 14

Source	Item NA				Reference
observe	Are signs present?	**No**	EB approach		SOR 67 (1), (2) GCS 18.21 & 18.2
		No	WB approach		
look-up	Minimum Distance for Primary Light Units (SSD)	**N/A**	m		Sheet 13
look-up	Recommended distance for Primary Light Units	**N/A**	m		Sheet 13
	Warrants				
observe	Are all front light units obscured within minimum distance above?	**N/A**			
look-up	Is the facility designated a "freeway" or "expressway"?	**N/A**			Sheet 3
observe	Do environmental conditions frequently obscure signal visibility?	**N/A**			
	Considering maximum prevailing speeds, geometry, and traffic composition, checkthe following:				
observe	Does sign flash during operation of grade crossing warning system?	**N/A**			
measure	Distance from the sign to 2.4m beyond the furthest rail =	**N/A**			
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?	**N/A**			
measure	Distance from the sign to the closest gate =	**N/A**	m		
observe	Does the flashing sign precede actuation of the descent of the gate arms by the time required to travel from the sign to clear closest gate?	**N/A**			
measure	Time required for all queued vehicles to resume to maximum road operating speed =	**N/A**	sec		

Comments Following Site Visit:

- No Flashing lights wee observed or required.

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

Sheet 15

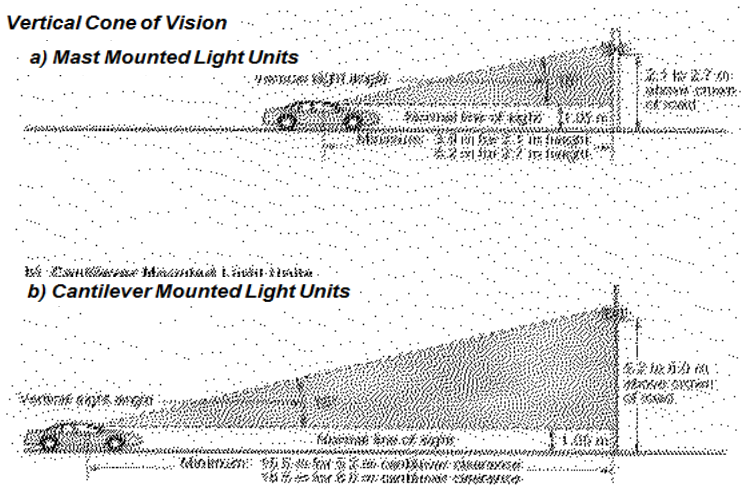
PREEMPTION OF TRAFFIC SIGNALS

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

Comments Following Site Visit:

- No Traffic Signals located at crossing

-functions as intended



Sheet 16 **AREAS WITHOUT TRAIN WHISTLING**

Grade Crossings Standards, July 2014

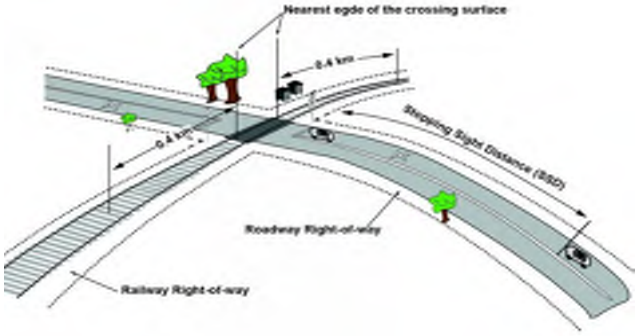
APPENDIX D – WHISTLING CESSATION

Table D-1 – Requirements for Warning Systems at Public Grade Crossings within an Area without Whistling

	Column A		Column B	
Railway Design Speed	Grade Crossings for Vehicle Use		Grade Crossings For Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Column 1	***Column 2***	***Column 3***	***Column 4***	***Column 5***
1 – 25 km/h (15 mph)	FLB	FLB	No warning system requirement	No warning system requirements
25 – 81 km/h (16 – 50 mph)	FLB	FLB & G	FLB	FLB & G
Over 81 km/h (50 mph)	FLB & G	FLB & G	FLB & G	FLB & G

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

Figure D-1 - prescribed area for whistling cessation as per article 23.1 of the RSA



RSA = Railway Safety Act of Canada

Source	Item					Reference
Rail	Is train whistling prohibited at this crossing?	**No**	24 hours?	**No**		
observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?			**No**		
observe	Are the requirements of Table D-1 met?	**No**				

Comments Following Site Visit:
- Whistle Cessation not required

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:

END OF FIELD DATA FORMS

VFPA

REPORT NUMBER: 20-0173

VFPR FSPL TRANSPORTATION IMPROVEMENTS PROJECT

06 - MILE X.XX, 357 DOCK ROAD, CROSSING ASSESSMENT REPORT

FEBRUARY 09, 2021

REVISION HISTORY

FIINAL ISSUE

2020/09/03	FIRST DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	R. Sewell, Senior Project Engineer			
2020/10/21	SECOND DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2021/02/09	FINAL			
Prepared by	Reviewed by	Approved By		
P. McCabe, Track Designer	G. Smith, Senior Project Engineer	R. Sewell, Senior Project Engineer		

SIGNATURES

PREPARED BY

Patrick McCabe, CPEng (Aus), APEC Eng
Track Designer

09/02/2021
Date

Robert Sewell, P.Eng
Senior Project Engineer

09/02/2021
Date

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TABLE OF CONTENTS

1 CROSSING OVERVIEW

WSP Canada Group Limited (WSP) has been contracted as part of the Fraser Surrey Port Lands – Transportation Improvements Preliminary Design Services project, to complete a Railway Crossing Safety Assessment on the Dock Road grade crossing. The SRY owned crossing is located within the Vancouver Fraser Port Authority (VFPA), Fraser Surrey Docklands near to the Canadian National (CN) Brownsville Spur which comes off Mile 117 of the Yale Subdivision.

A Railway Crossing Field Safety Assessment was undertaken on the 22nd of July 2020 and updates the previous Railway Crossing Assessment undertaken by WSP (formally MMM Group) on the 5th of May 2015. The Railway Crossing Assessment as conducted follows the guidelines of applicable requirements identified in the most recent edition of Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossing Standards (GCS).

The crossing is a passive protected crossing (SRCS), equipped with two RAILWAY CROSSING and STOP signs, located within an industrial area. A Tractor Trailer (WB-20) is the design vehicle used to represent daily traffic on port property. The Railway traffic volumes were provided by the SRY, while the Average Annual Daily Traffic (AADT) was calculated based on the realigned infrastructure.

This report aims to identify the modifications to the grade crossing since the previous inspection completed by MMM Group in 2015, as well as highlight any new or previously identified non-compliances still relevant to this crossing.

1.1 LOCATION

Dock Road is located within Fraser Surrey Docks jurisdiction at 357 Dock Road and crosses the SRY spur track. The crossing is located at the latitude and longitude of 49°11'38" and 112°54'05" respectfully. Figure 1, below shows the location of the crossing.

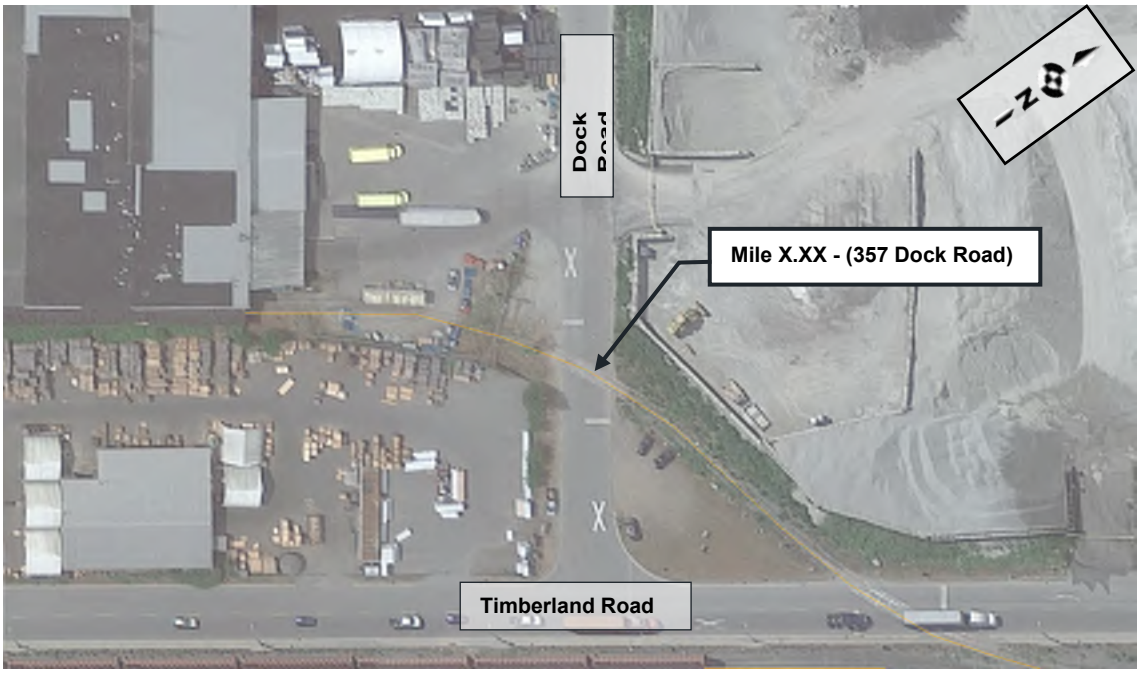


Figure 1: Crossing Location (source: Google Earth, 2020)

2 SAFETY ASSESSMENT

2.1 PREVIOUS ASSESSMENT (2015)

A previous crossing assessment was undertaken in 2015 by WSP for the 357 Dock Road crossing. The objective of the assessment was to:

- Reduce crash risk within the grade crossing environment.
- Minimize the frequency and severity of preventable crashes.
- Consider the safety of all grade crossing users.
- Verify compliance of the technical standards referred to in the Railway Safety Act / Grade Crossing Regulations and contained in the Grade Crossing Standards.
- 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 outcome of the 2015 assessment offered recommendations for consideration by the VFPA. Table 1: Previous Non-Compliances, illustrates the non-compliances and recommendations offered within the 2015 report. The recommendations were categorised within the three priority levels;

- Low - implement the measures as soon as practicable
- Medium - implement the measures by Transport Canada GCS & GCR November 2021 deadline.
- High - implement the measures forthwith

Table 1: Previous Non-Compliances

Table 1: Previous Non-Compliances

Observations	Suggested Actions	Priority	Addressed?
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Flangeway depth does not meet the requirement due to debris.	Clean debris from the flangeway. Once debris is removed from the flangeway, the railway company is to ensure the minimum depth is met.	High	No
GCS Section 4 – Railway Crossing and Number of Tracks Sign (Basic Requirement)			
a. RAILWAY CROSSING sign located on the east approach only.	Install RAILWAY CROSSING sign on the west approach.	High	No – Sign installed on East approach missing. West approach has new pole but sign missing.
GCS Section 6 – Road Geometry			
a. The slope of the crossing on the west approach within 8m of the nearest rail is up to 3.5 percent thereby exceeding the maximum gradient of 2 percent specified for routes identified for public grade crossings. Although the grades of the existing crossing do not comply with Part C of the Standards, the road geometry of the crossing as inspected complies with the Regulations	Reconstruct approaches so that slope of the crossing within 8m of the nearest rail is no more than 2 percent on the west approach. This action will need to be undertaken as soon as practicable or when the City or Railway Company alters the road geometry and/or approach of the crossing (see sections 88 and 89 of the Regulations).	High	No – West Approach grade within 8m measured between 1.5% - 3.0%. Approach steepens at edge of roadway. No evidence of road regrading/reconstruction present.
GCS Section 7 – Sightlines			

a. Clear sightline areas where drivers stopped at the crossing (DSTOPPED-VEH) cannot be provided or maintained due to fences and equipment on the southwest and southeast corners of the crossing.	Install active warning system with gates if DSTOPPED cannot be provided and maintained	Medium	No – Vegetation increased as Railway operations have ceased.
GCS Section 8 – Signs			
a. RAILWAY CROSSING sign on east approach in poor condition.	Replace RAILWAY CROSSING sign on east approach.	Medium	No – RAILWAY CROSSING Sign missing
b. Retroreflective strips are not provided for the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Install retroreflective strips on the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Medium	Partial – Reflective strips located on West approach pole. But RAILWAY CROSSING Sign missing. Both East Pole and Sign missing.
c. RAILWAY CROSSING AHEAD signs are not present on either approach of the crossing.	Install RAILWAY CROSSING AHEAD signs 45m +/- 10m in advance of the stopping location on both approaches.	Medium	Yes – RAILWAY CROSSING AHEAD Signs are installed
d. STOP signs are not present on either approach of the crossing.	STOP signs should be installed on the same post as the RAILWAY CROSSING signs on both approaches.	Medium	No
e. EMERGENCY NOTIFICATION signs are not present on either approach of the crossing.	Install EMERGENCY NOTIFICATION sign on both approaches as per GCS Section 8.5.	Medium	No
f. Double stop bar pavement markings are not present on either approach.	Paint double stop bars on both road approaches as per MUTCD Fig.C1-6 (Jan. 2014).	High	Yes – Double stop bars have been installed
g. RAILWAY CROSSING symbol pavement markings are not present on either approach	Paint RAILWAY CROSSING symbol pavement markings on both road approaches as per MUTCD Fig.C1-6 (Jan. 2014).	Medium	Yes – RAILWAY CROSSING SYMBOL painted on both approaches
h. Stopping or parking restriction is not observed on the driveway at the railway right-of-way.	Install NO STOPPING signs within the railway right-of-way.	Low	Yes – PARKING RESTRICTION Signs installed along Dock Road.
i. Vehicles are observed to park within the railway ROW.	Install NO PARKING signs on both approaches.	Low	Yes – PARKING RESTRICTION Signs installed along Dock Road
GCS Sections 9, 12 to 17 – Warning System Design			
j. An active warning system without gates is warranted based on cross-product.	Install active warning system without gates. However, Transport Canada indicated that the crossing could stay passive indefinitely unless the sightline requirements could not be met.	Low	No – Railway operations have ceased

2.2 CROSSING MODIFICATIONS

As shown in Appendix A: Site Photographs, a number of changes have occurred at the crossing between inspections. Most changes were based on recommendations outlined in the 2015 inspection. Table 1, shows what changes have been made based on the 2015 recommendations. Below is a summarised list of all the changes observed from the site inspection:

- Rail operations have ceased along the spur track

- New grade crossing signage, including;
    - RAILWAY CROSSING Signs (believed previously installed but now missing)
    - STOP Signs (believed previously installed but now missing)
    - RAILWAY CROSSING AHEAD signs
    - PARKING RESTRICTION Signs
- New MUTCD compliant pavement markings.
- Vegetation along ROW increased
- New lighting along Dock Road

2.3 ASSESSMENT AND RECOMMENDATIONS

An updated Grade Crossing Safety Assessment was undertaken for the proposed realignment of the port road access and to determine any required crossing upgrades to ensure compliance with the GCR & GCS. **Appendix B: Site Inspection Report** provides details of the observations made during the site inspection. The inspection report also outlines outstanding safety issues, along with recommended remediations. As the railway operations have ceased along the spur, limited immediate remediations are advised. Table 2: 2020 Crossing Recommendations, summarizes the updated high priority recommendations from the field investigation. However, if railway operations were to resume, an updated Grade Crossing Safety Assessment is advised.

Table 2: 2020 Crossing Recommendations

Observations	Suggested Actions	Priority	Order of Magnitude Cost
GCS Section 8 – Signs			
a. RAILWAY CROSSING signs on both East and West approach missing.	Install RAILWAY CROSSING signs on both approaches	High	$800
b. Retroreflective strips are not provided for the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Install retroreflective strips on the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	High	$800
c. EMERGENCY NOTIFICATION signs are not present on both approaches.	Install EMERGENCY NOTIFICATION sign on both approaches as per GCS Section 8.5.	High	$750
d. STOP signs are not present on either approach of the crossing.	STOP signs should be installed on the same post as the RAILWAY CROSSING signs on both approaches.	High	$750

If sightlines cannot be maintained, an active warning system might be warranted depending on road-rail volume cross-product. A crossing safety assessment would need to be undertaken should rail services resume.

APPENDIX

A SITE PHOTOGRAPHS

APPENDIX

A - East Approach Drivers View Left

B - East Approach

C - East Approach Drivers View Right

D - West Approach Drivers View Left

E - West Approach

F - West Approach Drivers View Right

APPENDIX

G – East Approach Driver View Left
(At Stopped Position)

H - East Approach (At Stopped Position)

I – East Approach Drivers View Right
(At Stopped Position)

J- West Approach Drivers View Left
(At Stopped Position)

K - West Approach (At Stopped Position)

L - West Approach Drivers View Right
(At Stopped Position)

APPENDIX

M – North Facing Crossing Surface

N – General Crossing Photo

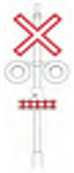
O – South Facing Crossing Surface

APPENDIX

B SITE INSPECTION REPORT

CANADIAN ROAD / RAILWAY GRADE CROSSING DETAILED SAFETY ASSESSMENT FIELD GUIDE (2005)*

Appendix C2: Field Data Forms



Passive & Active Crossings

MileX.XX (357 Dock Road),SRY Rail
Surrey, British Columbia
For Vancouver Fraser Port Authority

Legend:

calculate	**Formula**	Spreadsheet cell has formula
look up		User to look up value in table or chart.
		User to input value here for conditional formatting or formulas in other cells to function
		Warning! Value beyond acceptable limits.
		Warning! Value beyond acceptable limits for certain conditions (i.e. for people using assistive devices).
	Rail	Information to be provided by Railway Company
	Road	Information to be provided by Roadway Authority
measure	observe	Information to be obtained during Site Investigation
	√	Information provided by others to be verified in the field

* Updated to reflect Transport Canada's Grade Crossing Standards (GCS) July 2014 and Grade Crossing Regulations (GCR)(SOR-2014-275 Feb 2016)

MileX.XX (357 Dock Road),SRY Rail
Surrey, British Columbia

Sheet 1 | **Grade Crossing Safety Assessment** | **Passive Crossings**

Date of Assessment: **22-Jul-20** Site Investigation

Assessment Team Members & Affiliations: **Patrick McCabe**
Rob Sewell

Reason for Assessment: **New Proposed Pedestrian Crossing**

____	periodic assessment	**X**	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: **Southern Railway of BC**

Crossing Location: **Dock Road**

Location Number: **357 Dock Road**

Municipality: **City of Surrey, BC**

Railway: **SRY** Mile: **N/A**

Sub-division: **N/A** Spur: **N/A**

Type of Grade Crossing [private/public; warning devices]: **SRSC**

Track Type: [mainline, etc.] **Yard**

Road Authority: **Vancouver Fraser Port Authority (VFPA)**

Road Name/Number: **Dock Road**

Province: **British Columbia**

Location Reference (control section, etc.): **DP Surrey Docks**

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

Roadway East/West (yes/ no) No

Roadway North/ South (yes/ no) Yes

*Urban Local Undivided

Collision History (5-year period): **No record of accitents at the subject railway crossing within the past five years**

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

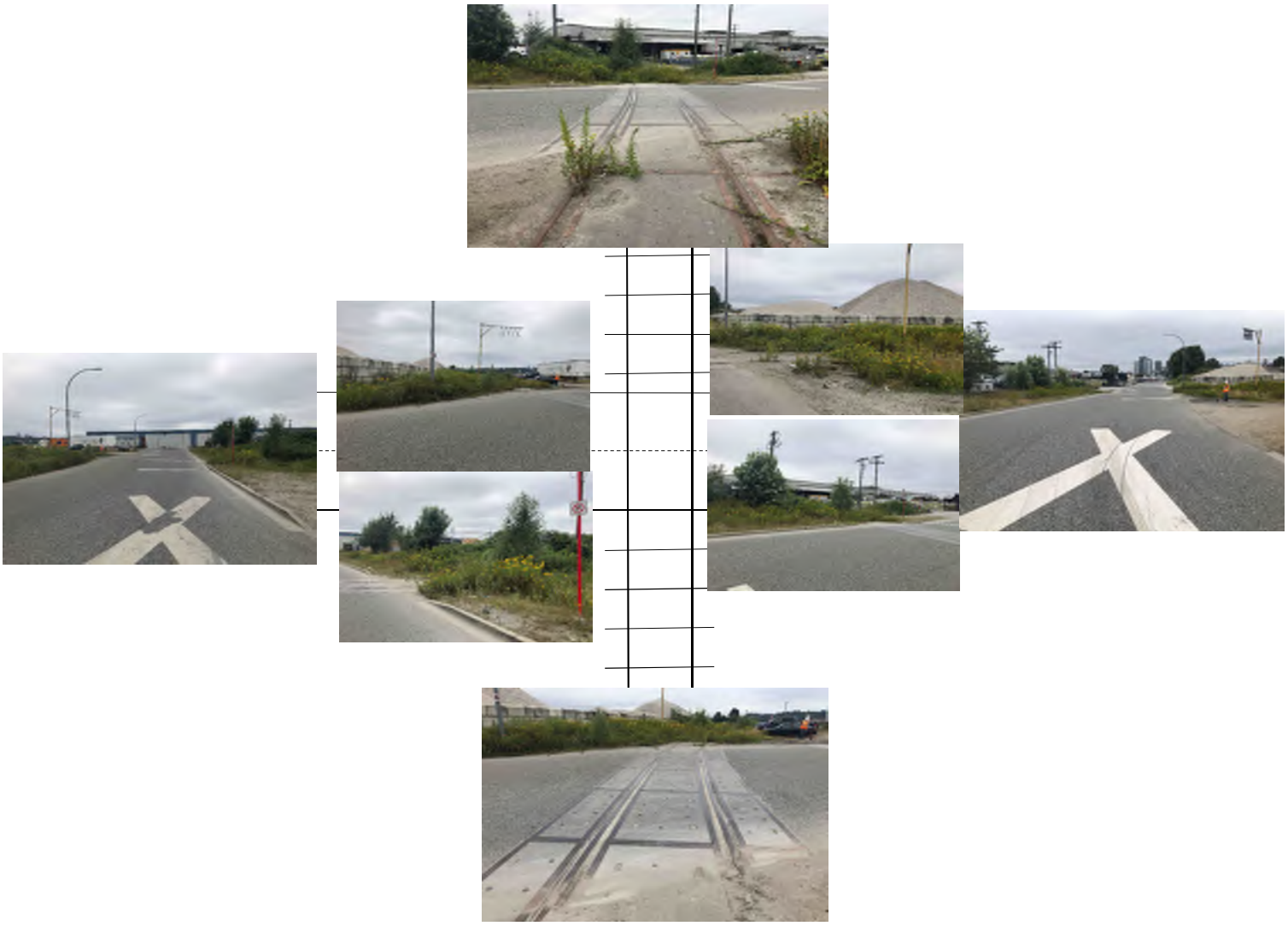
Provide Details of the collisions if available:
Sources:

- identify main contributing factors

- attach collision diagrams if available

MileX.XX (357 Dock Road),SRY Rail
Surrey, British Columbia

Sheet 2a **SCENE PHOTOGRAPHS**



For the full set of photos taken, see the Appendix to the Safety Assessment Report.

MileX.XX (357 Dock Road),SRY Rail
Surrey, British Columbia

Sheet 2b **SCENE SKETCH**

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

Notes: Images from Google Earth

Include:
- directions to nearby municipalities for both road & rail approaches (use arrows)
- adjacent intersections
- relevant road signs/signals
- signal warning systems hardware
- landmarks
- crosswalks/paths
- geographical features
- bus stops, etc.

MileX.XX (357 Dock Road),SRY Rail
Surrey, British Columbia

Sheet 3 **GENERAL INFORMATION**

Source	Item							Reference
Rail	Maximum Railway Operating Speed, V_T	=	**10**	(mph)				
Rail	Daily Train Volume:	=	**0**	(freight trains/day)				
		=	**0**	(passenger trains/day)				
Rail	Switching during daytime? Y/N	**No**			nighttime? Y/N	**No**		
Road	Avg. Annual Daily Traffic, AADT:	=	**210**	(vpd)	Year of count:	**2020**		
Road	High seasonal fluctuation in volumes?		**No**					
Road	Pedestrian Volumes	=	**0**	(ped./day)				
Road V	Is crossing on a School Bus route?		**No**					
Road V	Do Dangerous Goods trucks use this roadway?		**Yes**					
Road	Cyclist Volumes	=	**0**	(cyclists/day)	**Cyclist not anticipated**			
Road V	Regular use of crossing by persons with Assistive Devices?				**Pedestrians using Assistive Devices not anticipated**			
Road V	Other special road users?	type	**Unknown**	daily volume	**None**			
Road	Forecasted AADT[2]	=	**240**	(vpd)	Forecasted Year:	**2022**		
Road V	Design Speed:		**30**	km/h	Posted Speed:	**30**	km/h	
	Maximum Operating Speed:		**30**	km/h				
	note: provide details if all approaches are not the same							
Road V	Road Surface Type (asphalt, concrete, gravel, etc.):		**Asphalt**					
observe	Surrounding Land Use (urban/rural)?:		**Industrial**					
observe	Any schools, retirement homes, etc. nearby?		**No**					

Notes:

1. Road Authority should provided plans if available.

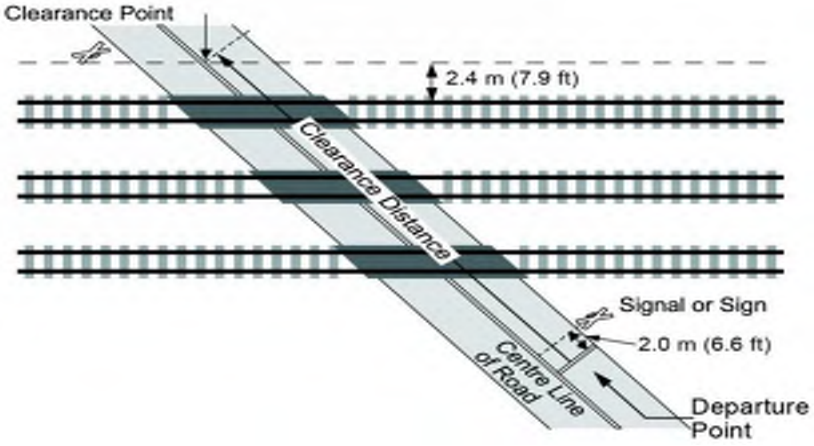
2. AADT is based upon modelled future traffic counts for the Realigned infrastrucutre.

From GCS Section 7.1.2:

Column 1	*Column 2*	*Column 3*
Class of Track	***The maximum allowable operating speed for freight trains is -***	***The maximum allowable operating speed for passenger trains is -***
Class 1 track	17 km/h (10 mph)	25 km/h (15 mph)
Class 2 track	41 km/h (25 mph)	49 km/h (30 mph)
Class 3 track	65 km/h (40 mph)	97 km/h (60 mph)
Class 4 track	97 km/h (60 mph)	129 km/h (80 mph)
Class 5 track	129 km/h (80 mph)	153 km/h (95 mph)

Figure 10-1 - Clearance Distance (cd) for Grade Crossings

(a) For Grade Crossings with a Warning System or Railway Crossing Sign



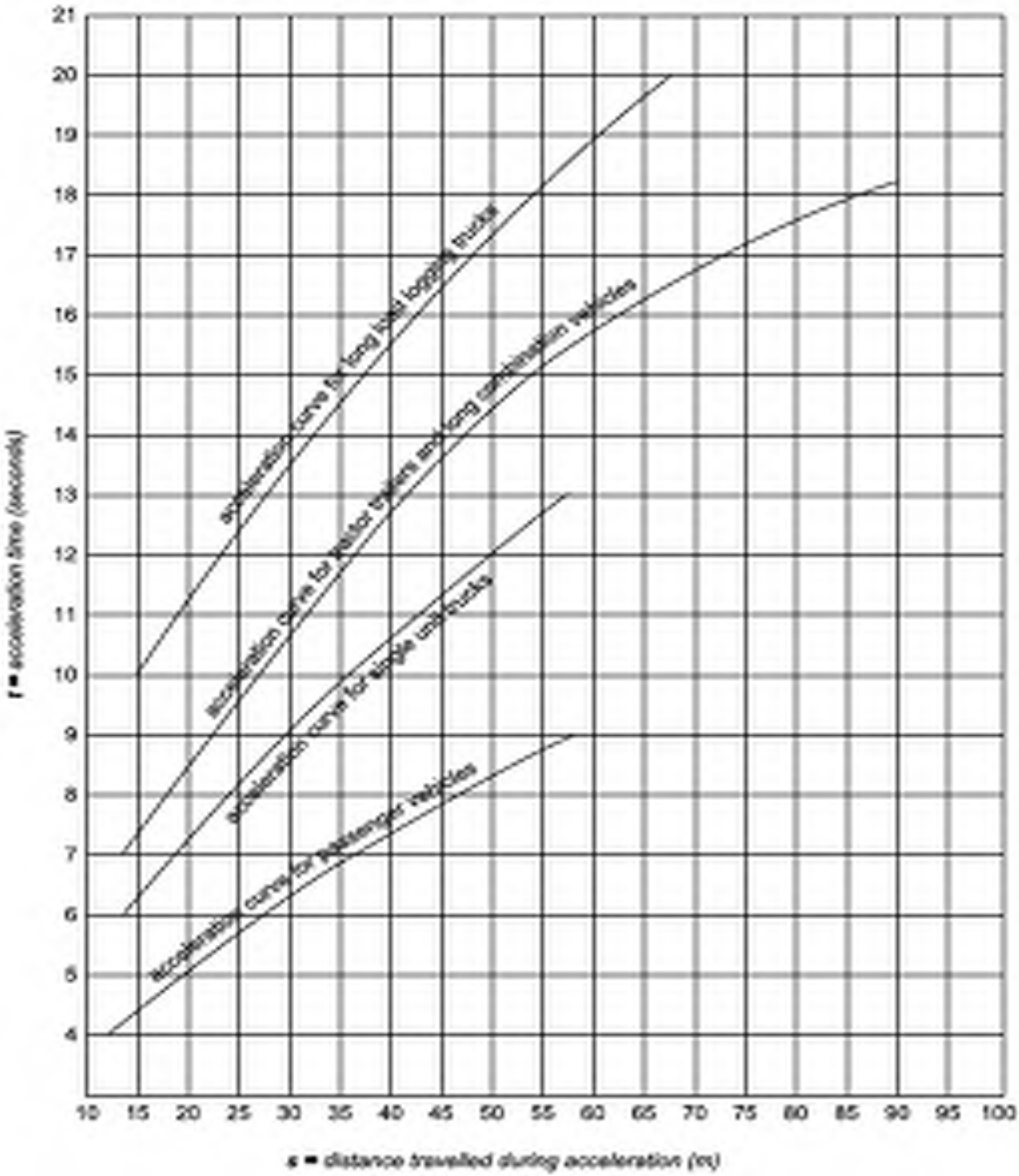
Grade Crossings Standards, July 2014

Table 10-1 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 & Buses	0.8	0.9	1.0	1.1	1.3
Tractor-Semitrailer	0.8	0.9	1.0	1.2	1.7

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 10-2 Assumed Acceleration Curves



MileX.XX (357 Dock Road),SRY Rail
Surrey, British Columbia

Sheet 4 **DESIGN CONSIDERATIONS**

Source	Item						SB Approach		NB Approach		Reference
	Design Vehicle										
Road	Type:	6	WB-20 Tractor-Semitrailers (WB-20)								Table 1* SOR 57
look-up	Length, **L:**		22.7	m							Table 1*
look-up	**Stopping Sight Distance, SSD**		45	m (round to 1.0% of grade)		=	10	m	45	m	Table 3*
measure	**Clearance Distance, cd**					=	11.2	m	10.9	m	GCS 16.1.1
calculate	**Vehicle Travel Distance, S**	**S= L+cd**	33.9	max <---		=	33.9	m	33.6	m	
look-up	**Vehicle Departure Time, t**					=	11.6	sec	11.6	sec	GCS Figure 10-2
Road V	Road Grade Effect:	maximum approach grade within 'S':				=	1.00	%	0.50	%	Sheet 7
look-up	grade adjustment factor (anto calc assumes Truck)(manual input from Table 10-1 if other)					=	1.06		1.02		GCS Table 10-1
calculate	**T**= t x adjustment factor					=	12.3	sec	11.9	sec	
	Design Vehicle Departure Time, T_D = J + T (where J = 2 sec (min.) perception & reaction)						2.0	sec	2.0	sec	
calculate	$T_{G\ stop} = T_D$=	14.3	sec			<-	14.3	sec	13.9	sec	GCS 10.3.2
observe	Do field acceleration times exceed T_D?	**Acceleration measurement beyond the scope of this assessment.**									
measure	**Pedestrian , cyclist & Assistive Devices Departure Time**			pedestrian **cd** distance		=	0.0	m	0.0	m	GCS 10.3.3
calculate	walking speed 1.22m/s max.	T_P =	0.0	sec	(1.0m/s used)	<-	0.0	sec	0.0	sec	
calculate	T_{SSD}	= (SSD+cd+L)/(0.277837 x $V_{road\ design}$) =	9.5	sec							

Comments Following Site Visit:
- **Railway Operations have ceased.**
- **No sidewalk located at crossing**

Table 1 – Design vehicle Lengths/Class

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

Source: *Geometric Design Guide for Canadian Roads*, TAC; September 1999.

Table 6 – Minimum Sightlines along the Rail Line ($D_{stopped}$) (as illustrated in Figure 3)

Railway Design Speed V_r (mph)	$T_{stopped}$ = Departure Time (greater of T_d or T_p) (seconds)											If greater of T_d or T_p > 20 sec., add for each additional second (m)
	≤ 10	11	12	13	14	15	16	17	18	19	20	
WARNING: Railway design speed in mph!	Minimum Sightlines along Rail Line ($D_{stopped}$) (m)											
STOP	30	30	30	30	30	30	30	30	30	30	30	+0
1-10	45	50	55	60	65	70	72	76	80	85	90	+5
11-20	90	100	110	120	125	135	145	155	165	170	180	+10
21-30	135	150	165	175	190	205	215	230	245	255	270	+15
31-40	180	200	220	235	250	270	285	305	325	340	360	+20
41-50	225	250	270	290	315	335	360	380	405	425	450	+25
51-60	270	300	325	350	380	405	430	460	485	510	540	+30
61-70	315	350	380	415	445	470	505	535	565	595	630	+35
71-80	360	395	435	465	505	540	580	610	650	680	720	+40
81-90	405	445	490	535	570	605	650	685	730	765	810	+45
91-100	450	500	540	580	630	670	715	760	805	850	895	+50

Table 3 – Determine SSD for Truck Class

Road Crossing Design Speed V (km/hr)	Truck Class Stopping Sight Distance (SSD) (m)																				
	Road Approach Gradient																				
	-10%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
20	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	24	24	24	24	24
30	48	48	47	47	47	46	46	46	45	45	45	45	45	44	44	44	44	44	44	43	43
40	76	75	74	74	73	73	72	71	71	70	70	70	69	69	68	68	68	67	67	67	67
50	121	120	118	117	116	115	114	113	112	111	110	109	108	108	107	106	106	105	105	104	104
60	149	146	144	142	140	138	136	134	133	131	130	129	128	126	125	124	123	122	122	121	120
70	210	205	202	198	195	192	189	187	184	182	180	178	176	175	173	171	170	169	167	166	165
80	252	246	241	236	231	227	223	219	216	213	210	207	205	202	200	198	196	194	192	191	189
90	318	311	304	297	292	286	281	277	273	269	265	262	258	255	252	250	247	245	243	240	238
100	401	391	382	373	365	358	352	346	340	335	330	325	321	317	314	310	307	304	301	298	295
110	455	441	428	417	406	397	388	380	373	366	360	354	349	344	339	334	330	326	322	319	315

* Source: Transport Canada's "Determining Minimum Sightlines at Grade Crossings: A Guide for Road Authorities and Railway Companies"

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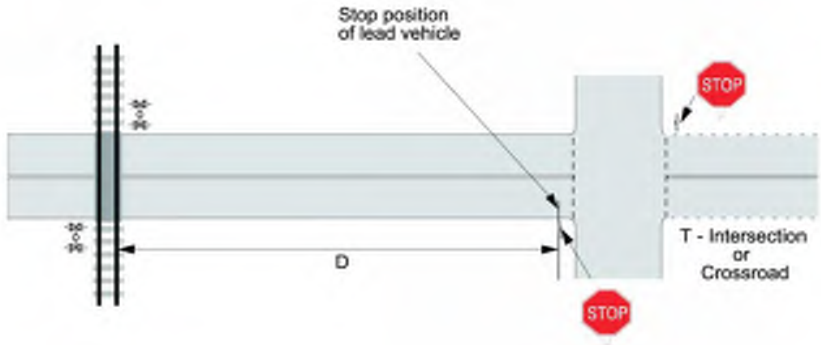
Sheet 5

LOCATION of GRADE CROSSING

Source	Item		Reference
observe	"D" should not be less than 30m for either approach if the train speed exceeds 15 mph. **D =18.6m**		GCS Section 9.1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	**No**	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks?	**No**	
	Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing?	**No**	

Comments Following Site Visit:
- The minimum "D" dimension to the edge of the entrance to facility in Northern approach. The Southern approach "D" is 40.5m
- RAILWAY CROSSING AHEAD sign installed from previous inspection (2015)
- Railwayspeed = 10mph

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

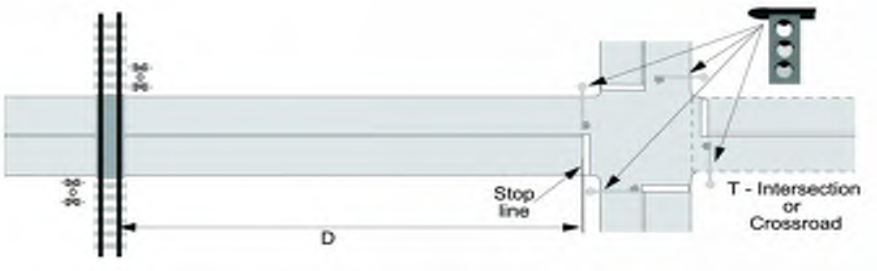
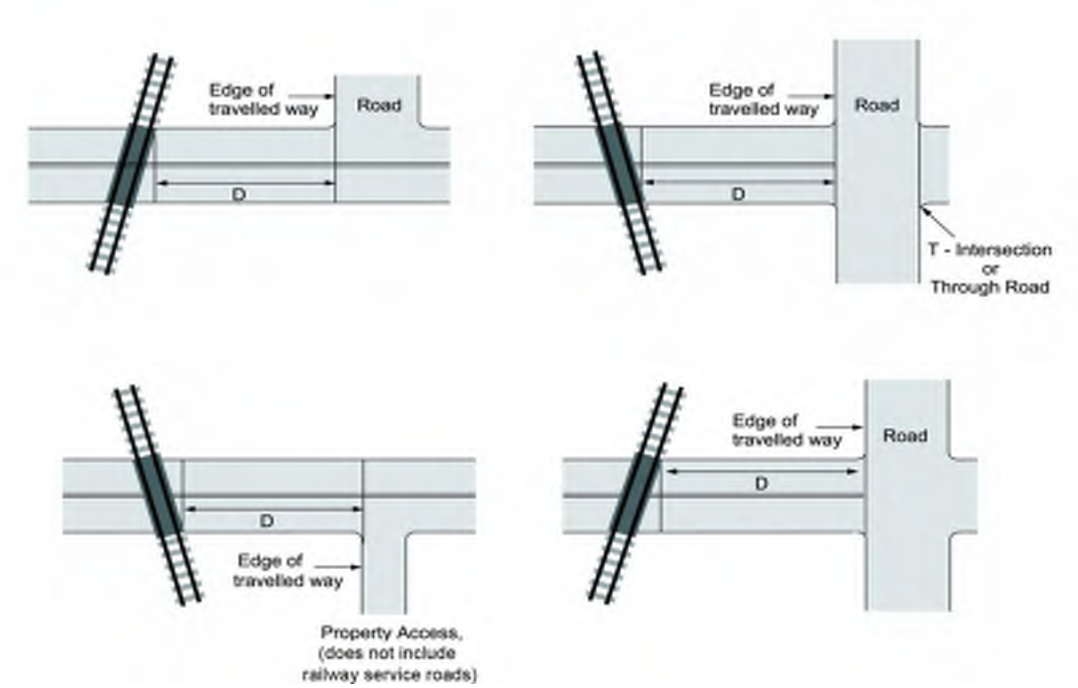


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings



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Sheet 6 **GRADE CROSSING SURFACE**

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? **Yes**							SOR 60; GCS 5
observe	Grade Crossing Surface Material: **Concrete Panels** Grade Crossing Surface Condition: **Fair**							SOR 60; GCS 5
observe	Approach Road Surface Type: **Ashpalt** Approach Road Surface Condition: **Fair** Roadway Illumination?: **Yes**							SOR 60; GCS 5
		SB Approach		**NB Approach**				
measure	Road Surface crossing width (perp. C.L. min. = 8.0m)		**22.2** m					GCS 5.1
measure	Road Surface extension beyond travel lanes (min. = 0.5m)	**0.5** m		**2.5** m				GCS 5.1
measure	Sidewalk/Path/Trail crossing width (min. = 1.5m)		**NA** m	**N/A** m		No sidewalk		GCS 5.1
measure	Sidewalk/Path/Trail extension beyond sidewalk (min. = 0.5m)	**NA** m		**N/A** m				GCS 5.1
measure	Distance Between Travel Lane and C.L. of Trail		**N/A** m					
	Cross-Section:		**South (Right) Rail:**		**North (Left) Rail:**			GCS Table 5-1
measure	Flangeway width (min. = 65mm; max.= 120mm or 75mm[1])		**61** mm		**61** mm			GCS Table 5-1
measure	Flangeway depth (min. = 50mm; max.= no limit or 75mm[1])		**10** mm		**10** mm			GCS Table 5-1
	Rural Field Side Gap:							GCS Table 5-1
measure	Side Gap width (max.= 120mm or 0[1])		**22** mm		**22** mm			GCS Table 5-1
measure	Side Gap depth (max.= no limit or 0[1])		**0** mm		**0** mm			GCS Table 5-1
	Wear Limits:							GCS Table 5-1
measure	Elevation of Top Rail above road surface (max. = 13mm[1], 25mm, or 50mm)		**5** mm		**5** mm			GCS Table 5-1
measure	Elevation of Top Rail below road surface (min. = -7mm[1],-25mm, or -50mm)		**0** mm		**0** mm			GCS Table 5-1

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Flangeway and field side gap constructed out of rubber. Flangeways needs to be cleared

- Vegetation within flange on eastern side.

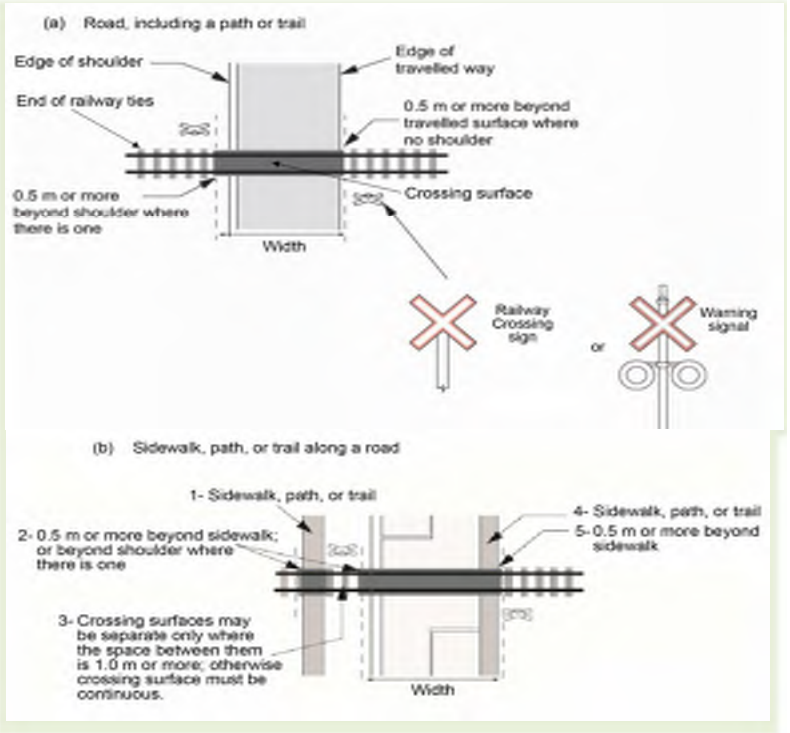
-rough crossing surface, loose timbers, etc. - difference between road grade and rail superelevation -surface distress of roadway approaches -photos

Grade Crossings Standards, July 2014

Table 5-1 – Grade Crossing Surface – Cross Section

a) Flangeway:		
Width	**Minimum**	65 mm
	Maximum for:	
	Public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	120 mm
Depth	**Minimum**	50 mm
	Maximum for:	
	Public sidewalks, paths and trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	No limit
(b) Field side gap A space is permitted on the outer side of the rail at rural locations, except for public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices		
	Maximum width	120 mm
	Maximum depth	No limit
(c) Elevation of the top of the rail with respect to the crossing surface The top of the crossing surface must be installed as close as possible to the top of the rail within the wear limits below:		
Wear limits:		
Public sidewalk, path or trail designated by the road authority for use by persons using assistive devices		
	Maximum distance of the top of the rail above crossing surface	13 mm
	Maximum distance of the top of the rail below crossing surface	7 mm
All other public grade crossings; the maximum distance of the top of the rail above or below the crossing surface		25 mm
Private grade crossings; the maximum distance of the top of the rail above or below the crossing surface		50 mm

Figure 5-1 - Grade Crossing Surface Dimensions



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Sheet 7 — **ROAD GEOMETRY**

Source	Item									Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Are the road lanes at least the same width on the crossing as on the road approaches? WB Approach: **Yes** EB Approach: **Yes**									
	Grades		**SB Approach**		**NB Approach**		Difference: rail e & rd grade (GCS 6.1)			GCS Sect. 6
measure	Slope within 8m of nearest rail (max. = 2%)		**1.00**	%	**1.50**	%	**0.50%**	%	**0.75%**	Diff in Grade Max
measure	Slope between 8m & 18m of nearest rail (max. = 5%)		**1.00**	%	**0.50**	%				3%
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices (max. = 1[1] or 2%): slope within 5m of nearest rail =		**N/A**	%	**N/A**	%				
Road √	General approach grade (max. = +/- 5%)		**1.00**	%	**1.00**	%				
	measured over the SSD distance of:		**10**	m	**45**	m				Sheet 4
Rail √	Are rail tracks super-elevated?	**No**	Rate of s/e:	**0.00**	m/m Sdg	**0.00**	m/m ML			GCS Sect. 6.1 & 6.2
Road √	If train speeds exceed 15mph (70° minimum w/o warning system; 30° minimum with warning system): What is the angle between the crossing and the roadway?		=	**60.0**	degrees					
observe	**Condition of Road Approaches:** **Fair.** (e.g., anything that might affect stopping or acceleration)									SOR 60
observe	NA									

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Minor crack in ashpalt observed on the approaches
- Crossing angle less than 70d. A warning system is warrented.

Grade Crossings Standards, July 2014

Table 6-1 – Difference in Gradient

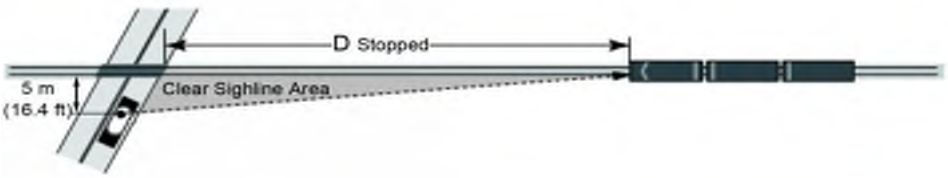
Classification	Difference in Gradient (%)
RLU	2
RCU	1
RCD	1
RAU	0
RAD	0
RFD	-
ULU	3
UCU	2
UCD	2
UAU	0

*Legend
Urban (U) Rural (R) Local (L) Collector (C) Arterial(A) Expressway (E) Freeway(F)
Divided (D) Undivided (U)

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 7-1 - Minimum Sightlines - Grade Crossings

(a) Sightlines for Users Stopped at a Grade Crossing (applicable to all quadrants)



(b) Sightlines for Users Approaching Grade Crossing (applicable to all quadrants)

MileX.XX (357 Dock Road),SRY Rail
Surrey, British Columbia

Sheet 8 **SIGHTLINES**

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			SB Approach		NB Approach		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 **No**							
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location **No**							
look-up	**SSD** minimum =			10	m	45	m	Sheet 4
measure	**SSD Actual** (not including turning movements)**:**			175.0	m	40.6	m	
calculate	D_{SSD}	=	$0.277837 \times V_{train\ km/h} \times T_{SSD}$	42	m	42	m	1.609 convert mph to km/h
calculate	$D_{STOPPED}$ minimum (m)	=	$0.277837 \times V_{train\ km/h} \times T_D$ =	64	m	62	m	T_D from Sheet 4
measure	$D_{STOPPED}$ **Actual**:		Driver looking LEFT	30	m (ne)	65	m (sw)	
			Driver looking RIGHT	125	m (nw)	60	m (se)	
calculate	**Ped./Cyclist** $D_{STOPPED}$ **(m)**			0	m	0	m	T_P from Sheet 4
measure	**Ped./Cyclist** $D_{STOPPED}$ **Actual:**		Person looking LEFT	N/A	m	N/A	m	
	note: measured from a point 2m in advance of sign/signals		Person looking RIGHT	N/A	m	N/A	m	
observe	Are there any obstacles within the sight triangles other than traffic signs/utility poles that might affect visibility? **Fencing and equipment within facility. Heavy vegetation thoughout the ROW.**							

Comments Following Site Visit:

- Fencing and equipment blocks sights to the east . Heavy vegetation along the ROW. If removed sightlines improve.

- SSD limited by road intersection in south

-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 8-3 - Location of Railway Crossing Signs and Number of Tracks Signs (public grade crossings without warning systems)

a) **b)**

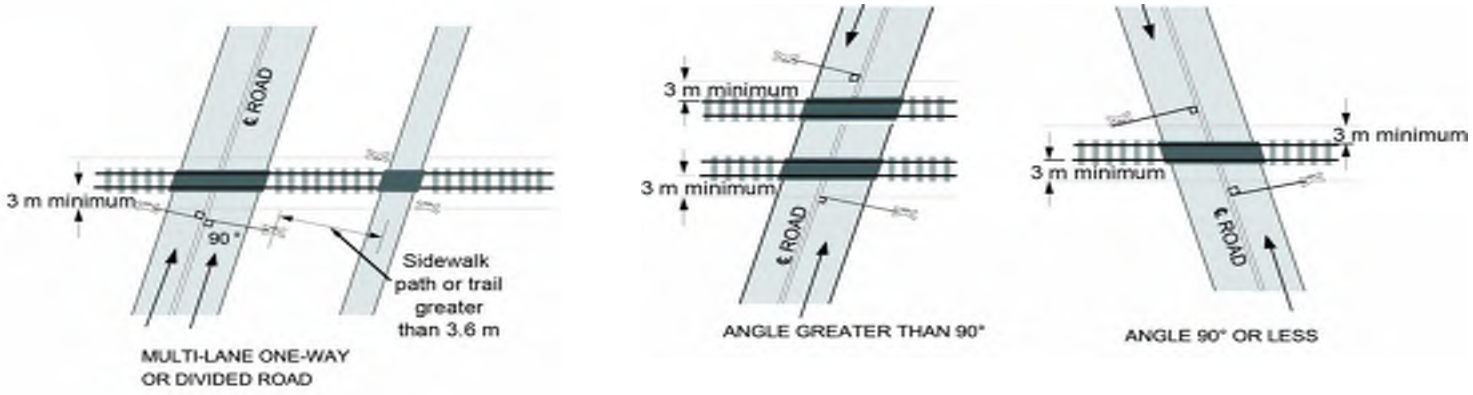
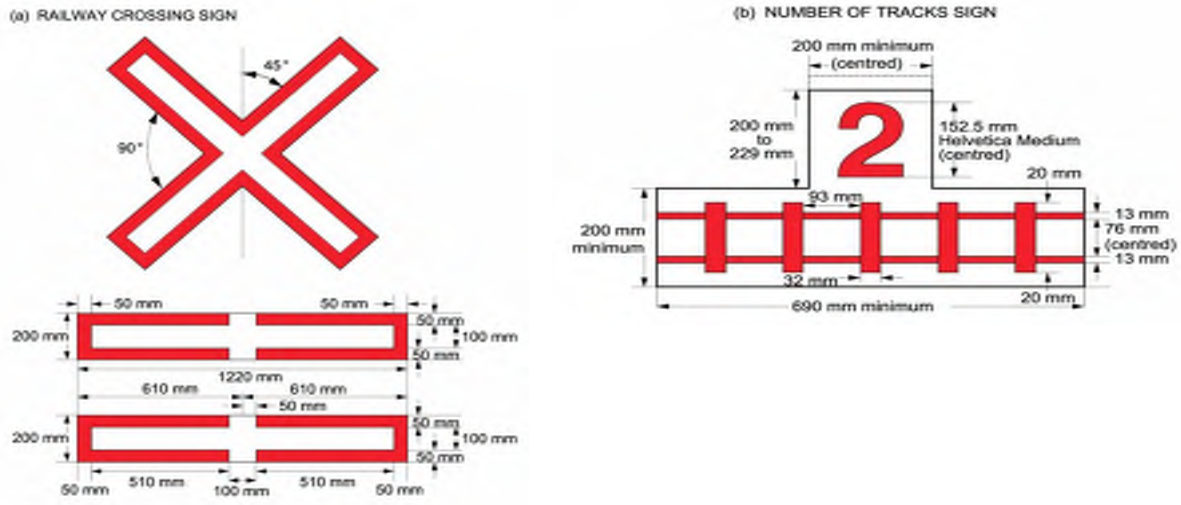


Figure 8-1 - Railway Crossing Sign and Number of Tracks Sign



MileX.XX (357 Dock Road),SRY Rail
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Sheet 9a — **SIGNS AND PAVEMENT MARKINGS**

Source	Item						Reference
	Railway Crossing Sign  **These signs will be required**						MUTCD
		SB Approach		**NB Approach**			
measure	distance from nearest rail:	**N/A**	m	**3.0**	m		
measure	distance from edge of road:	**N/A**	m	**2.1**	m		
measure	height of centre of crossbucks:	**N/A**	m	**N/A**	m		
measure	retroreflectivity readings:	**N/A**	cd/lux/m^2	**N/A**	cd/lux/m^2		
observe	Number of Tracks sign? **No**						
observe	A Stop Sign must be installed at grade crossing without a warning system if the road design speed is less than 15mph				Yes/ No/ NA	**N/A**	SOR 64
observe	A Stop Ahead sign must be installed if the Stop Sign is not clearly visable within the Stopping Distance				Yes/ No/ NA	**N/A**	SOR 65

Comments Following Site Visit:
- No sign or pole is installed on the south approach.
- A pole with reflective tape is located on the North approach. No signs are on the pole.

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

Source	Item		Reference
	DO NOT STOP ON TRACKS 		MUTCD
Road √	Does queued traffic routinely encroach closer than 5m from the crossing surface?	**No**	
observe	Are these signs present on either approach?	**No**	

Comments Following Site Visit:
- DO NOT STOP ON TRACKS Sign not required.

-general condition -posts -photos

Source	Item					Reference
	Railway Crossing Ahead Sign (WA 18-20) 					MUTCD & SOR 66
look-up	Is AADT > 100? **Yes**		**SB Approach**	**NB Approach**		Sheet 3
observe	Is area urban such that WA 18-20 is not required?		**Yes**	**Yes**		
measure	Distance from nearest rail to sign	=	**33** m	**40** m		MUTCD
observe	height:		**2.5**	**2.5**		
observe	appropriate orientation of symbol		**Yes**	**Yes**		

Comments Following Site Visit:
- RAILWAY CROSSING AHEAD Sign has been installed since the previous inspection.
- RAILWAY CROSSING AHEAD Sign installed Min. Approx 33m from crossing

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

Source	Item			Reference
	ADVISORY SPEED SIGN 			MUTCD & SOR 66 (2)
observe	Are they present on both approaches?	**No**		
	Posted speed limit?	**N/A**	km/h	
look-up	Are they required on either approach?	**No**		check SSD (Sheet 8)

Comments Following Site Visit:

- ADVISORY SPEED Sign not installed

-general condition -posts -photos

MileX.XX (357 Dock Road),SRY Rail
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Sheet 9b **SIGNS AND PAVEMENT MARKINGS**

Source	Item		Reference
	EMERGENCY NOTIFICATION		GCS Sect. 8.5
observe	Are these signs present on both approaches?	**No**	
observe	Is the information complete and legible?	**N/A**	

Comments Following Site Visit:

- EMERGENCY NOTIFICATION Sign not present

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

Source	Item		Reference
	PAVEMENT MARKINGS		
observe	Are pavement markings consistent with those from the MUTCD Manual?	**No**	Fig C1-6 MUTCD
observe	Are there lines to delineate sidewalks/paths?	**N/A**	

Comments Following Site Visit:

- Road markings and DOUBLE STOP BARS have been installed since the 2015 inspection.

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

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

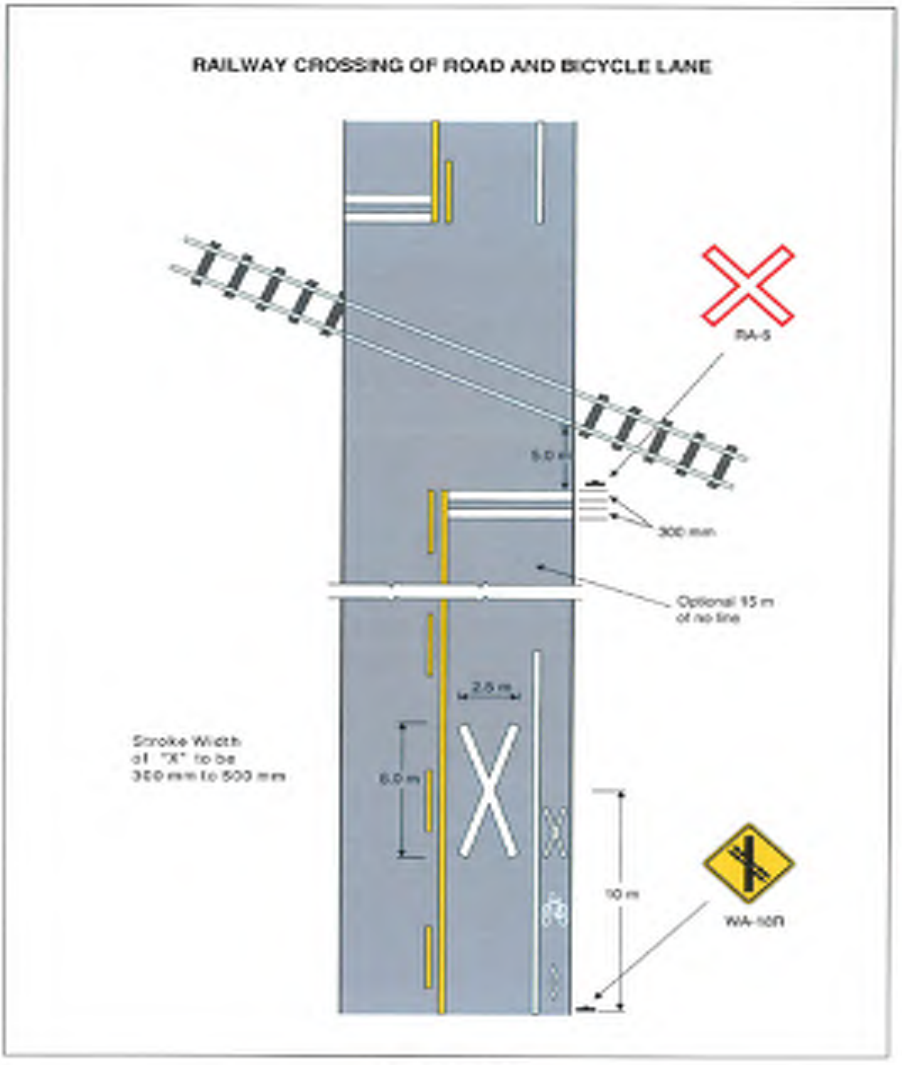
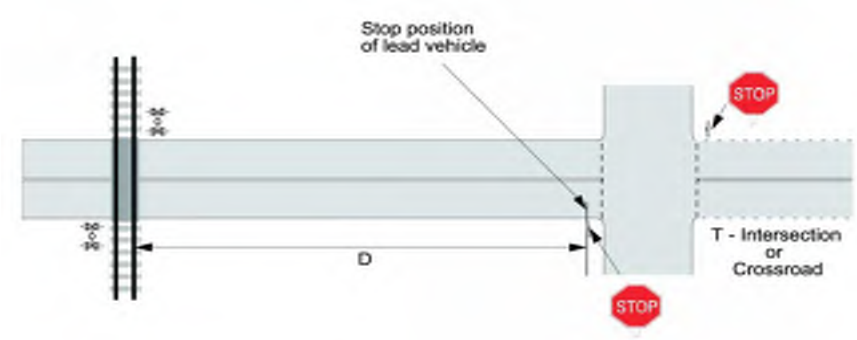


FIGURE C1-6

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings

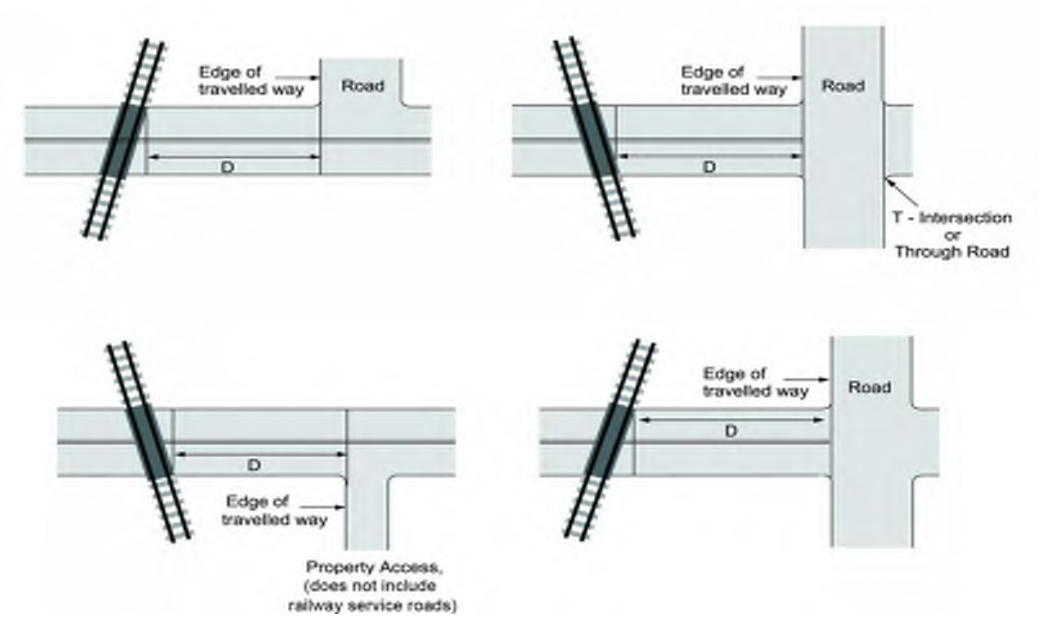
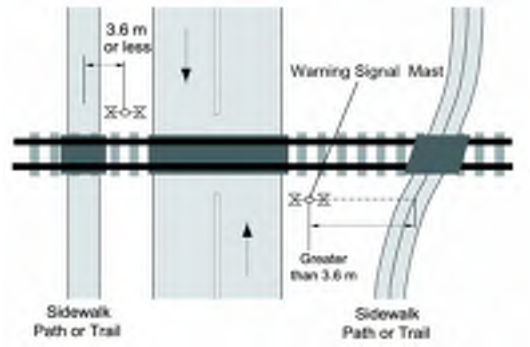
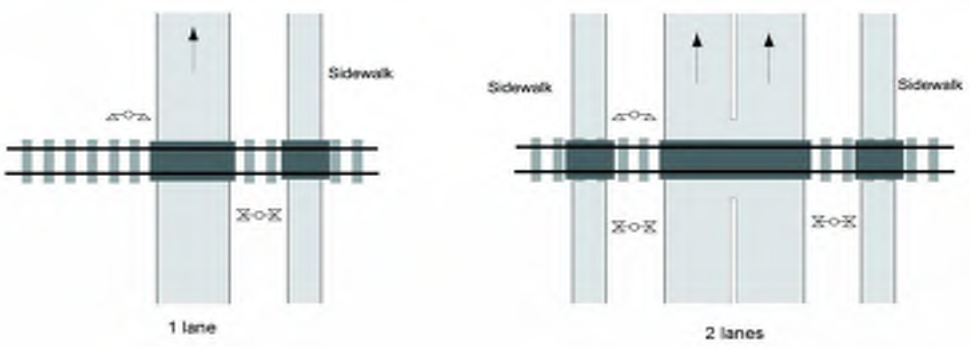


Figure 13-2 - Sidewalks, Paths and Trails
(a) Two Way



(b) One-Way



Sheet 10 eliminated in the new GCS

MileX.XX (357 Dock Road),SRY Rail
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Sheet 11 — **GRADE CROSSING WARNING SYSTEMS** — **GCS Section 9**

Source	Item is not required.									Reference
	Warning System Warrants if any of A through E below are met, then a warning system is warranted									
	Question							**Warrant for Warning System**		
look-up	Existing AADT =	210	Forecast AADT =	240						Sheet 3
look-up	Daily Train Volume =	0			trains					Sheet 3
calculate	**A. Cross-Product =**	0						> 2,000 FLB req'd	**> 50,000 requires gates**	
look-up	**B. Maximum Rail Operating Speed =**		10		mph			(max = 80mph or 50 mph with crosswalk)		Sheet 3
Rail	**C. Number of Tracks =**		1							
	if ≥ 2, can trains pass one another?		N/A					if ≥ 2 and trains can pass one another -> FLB req'd		
look-up	**D. Are Sightlines obscured?**		No					if "Yes" -> FLB req'd: If Fig 7.1 applies --> add G		Sheet 8 & Fig 7.1
observe	**E. Are any proximity conditions met?**		No					if "Yes" -> FLB required.		GCS Sect 9 & 11
look-up	Is a Warning System warranted?		No					If any of A through E above meet the Warrant		
	Field Visit	**Present? (Y/N)**	**Condition / Alignment:**							GCS 13
observe	Light Units,	N								GCS 13
observe	Bells,	N								GCS 13
observe	Gates,	N								GCS 13
observe	Cantilever Lights,	N								GCS 13
observe	Check that warning signal assemblies and cantilevers are in accordance with GCS Figures.									GCS Sect. 12
observe	Is warning system housing at least 9m from traveled way of the road and 8m from the nearest rail?									
observe	If there is a sidewalk, is a bell on the adjacent assembly?									
Rail √	Have all light units been aligned?	NA	Date?	NA						
Rail	Design Approach Warning Time (greatest of):			20sec OR [20+((cd-11)/3)] if cd>11m	Td	Tp	Gate Clearance Time + Descent Time + 5 seconds	Traffic Signal Clearance Time (=0 if no traffic signal)	(SSD + cd + L)/(0.277837xVv)	
	SB Approach	31.3	sec	20.1	14.3	0.0	31.3	0.0	5.3	
	NB Approach	31.3	sec	20.0	13.9	0.0	31.3	0.0	9.4	
observe	Is warning time less than 35 sec (without gates) or 55 sec (with gates)			N/A						

Comments Following Site Visit:
- Railway operations have ceased along spur.
- If Railway oerations increase, an active warning system may be required due to crossing angle.
- Train Speed: 10mph

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted?

Figure 12-1 - Warning Signal Assemblies

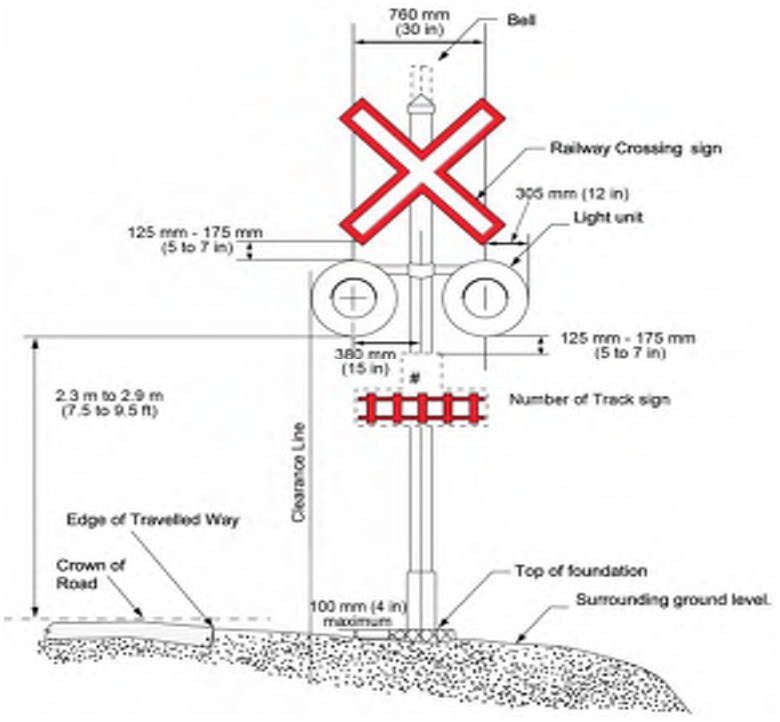
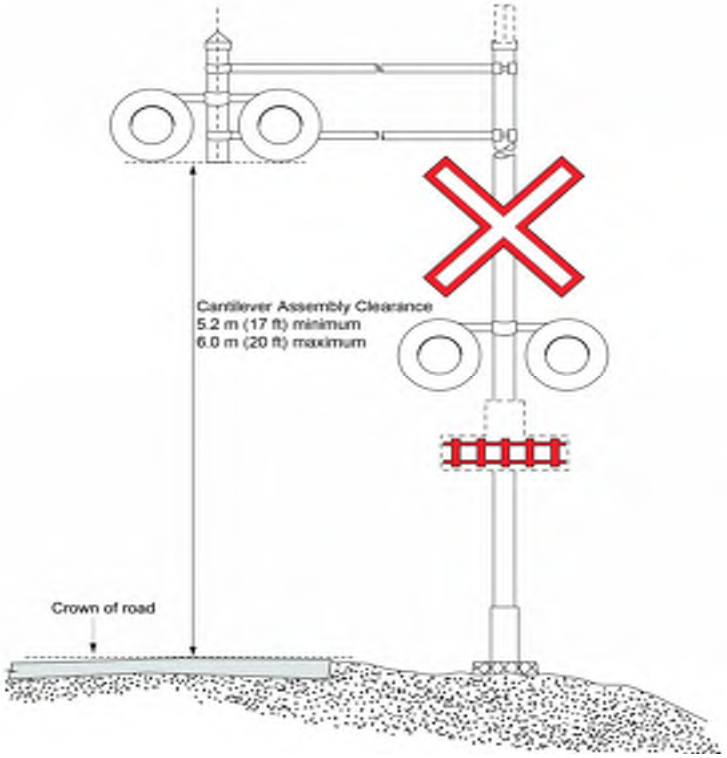


Figure 12-3 - Cantilevers



MileX.XX (357 Dock Road),SRY Rail
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Sheet 12  **GATES FOR GRADE CROSSING WARNING SYSTEMS** **GCS Section 9**

Source	Item							Reference
	Warning System Warrants -if any of A through E below are met then a warning system with gates is warranted. **Not required as warning system is not necessary**							
calculate	**A. Cross-Product =**	**0**	(50,000 min)					
look-up	**B. Maximum Rail Operating Speed =**	**10**	mph (max = 50mph)					Sheet 3
Rail √	**C. Number of Tracks =**	**1**						
	.....if ≥ 2 , can trains pass one another?	**N/A**						
look-up	**D. Is $D_{STOPPED}$ Insufficient?**	**No**	**Minor vegetation work required on Northwest and Southwest quadrants.**					Sheet 8
observe	**E. Are any proximity conditions met?**	**N/A**						
calculate	Gate clearance distance: eq 10.4b	**24.7**	m cd $_{G\ stop}$	**34.7**	m cd SSD SB	**69.7**	m cd SSD NB	GCS Sect. 10.4
look-up	travel time =	**14.3**	sec $_{G\ stop}$					
calculate	Gate arm clearance times:	**14.3**	sec SB from stop	$T_{G\ ssd}$ = **4.2**	sec SB from SSD			
		13.9	sec NB from stop	$T_{G\ ssd}$ = **8.4**	sec NB from SSD			
look-up	Gate arm delay time: **14.3**	sec (greatest value from above)						
calculate	effect of grade =	**0.9**	sec (SB from Stop)	**-4.2**	sec SB from SSD			
		0.3	sec (NB from Stop)	**0.0**	sec NB from SSD			
measure	Measure gate arm delay and compare with above:		**N/A**					
observe	Do gates conform to standards depicted in GCS Figures?		**N/A**					
observe	Check gate descent (10 to 15 sec) and ascent (6 to 12 sec)		**N/A**					
observe	Is gate striping vertical as depicted in GCS Figures?		**N/A**					
observe	Where railway equipment regularly stops, or railway equipment is left standing, within the activating limits of a warning system, the warning system must be equipped with a control feature to minimize the operation of the warning system.					Yes/No/NA	**NA**	GCS 16.3.1

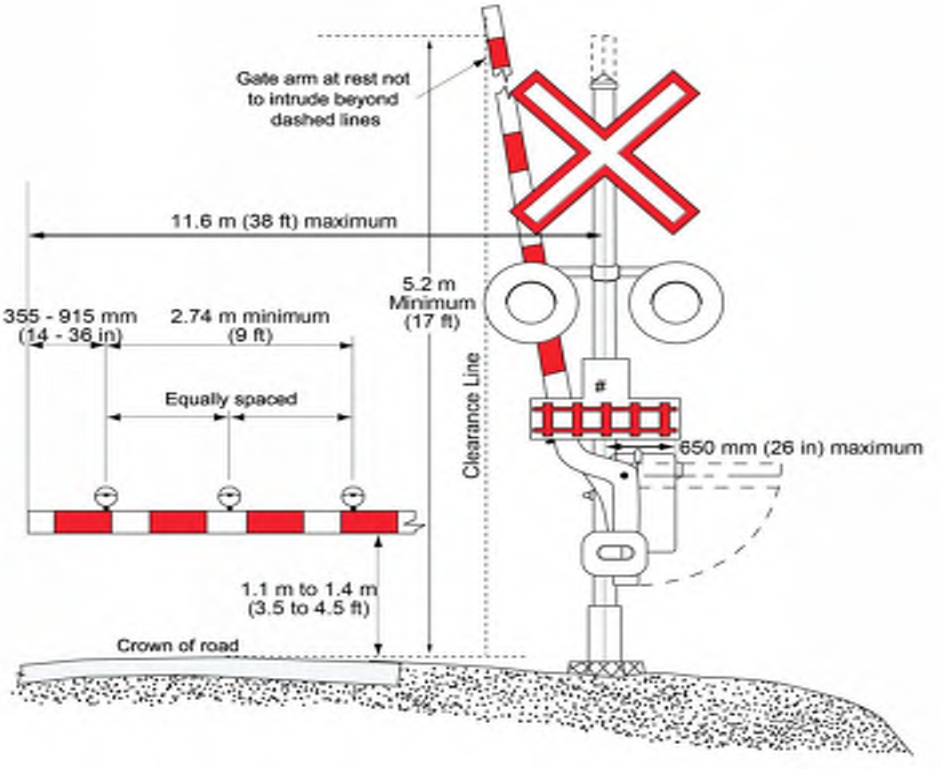
Comments Following Site Visit:

- Warning System with Gates is not required.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted? **No**

Figure 12-2 - Gates



MileX.XX (357 Dock Road),SRY Rail
Surrey, British Columbia

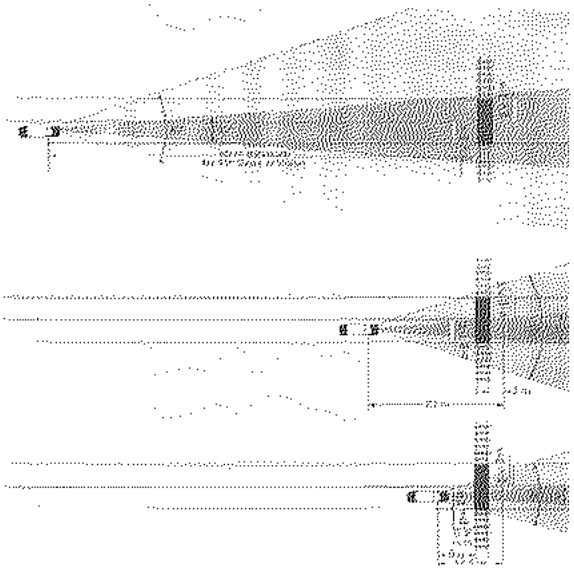
Sheet 13 **FLASHING LIGHT UNITS**

Note: Driver's cone of vision is ± 5° horizontally; limited by top of windshield vertically. GCS Sections 12-14

Source	Item is not required as warning system is not required.				u
	Number and Location				
look-up	Minimum Distance for Primary Light Units (SSD) =	**45.0**	m		
look-up	Recommended Distance for Primary Light Units =	**69.7**	m		
observe	Are flashing light units located within 5° horizontally of the centerline of the road (throughout the approach distance above)?			**Yes (covered by front and back units)**	
	Does horizontal/vertical curvature necessitate supplemental units?			**N/A**	
observe	Can back lights be seen by all stopped drivers?			**N/A**	
observe	Are lights obscured by vehicles stopped on adjacent intersections?			**N/A**	
observe	Are additional light units required for drivers as they begin to turn onto an approach road from an intersecting road/lane/pkg lot?			**N/A**	
	Cantilevered Light Units				
measure	Does D_R exceed 7.7m?	**N/A**			
measure	Does D_L exceed 8.7m?	**N/A**	(Assumes signal poles on both sides of road alignment, approach side of rail)		
	Multiple Lanes				
observe	Can front light units be seen by drivers in all lanes (….would T/T obscure?)?	**N/A**			
observe	Can back light units be seen by all stopped drivers in all lanes?	**N/A**			
	Sidewalks, paths, trails, etc.				
measure	Distance from path centerline to signal mast =	**N/A**	m (max.=3.6m)		
observe	Are separate light units required?	**N/A**			

Comments Following Site Visit:
- Crossing currently regulated by a passive warning system.

Horizontal Cone of Vision



Typical Light Unit Arrangement for an Adjacent Intersection

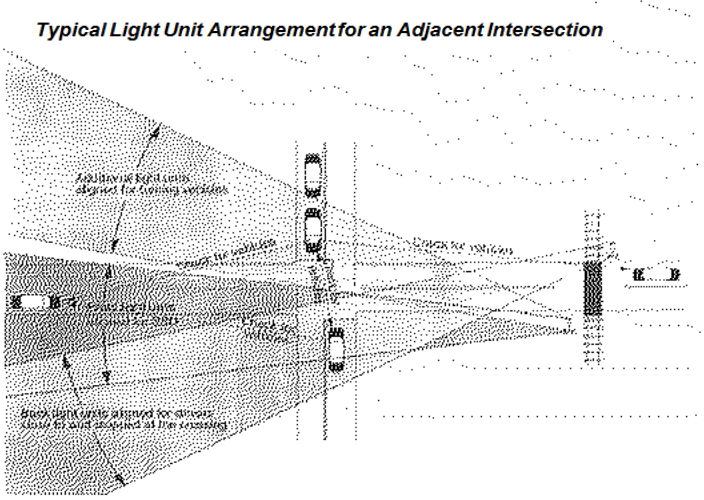
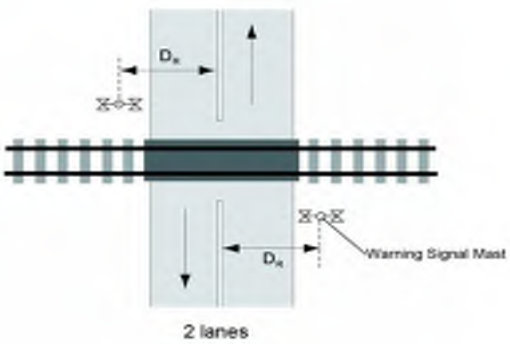
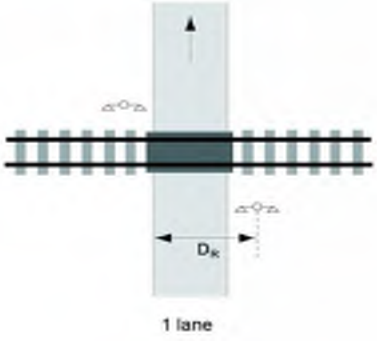


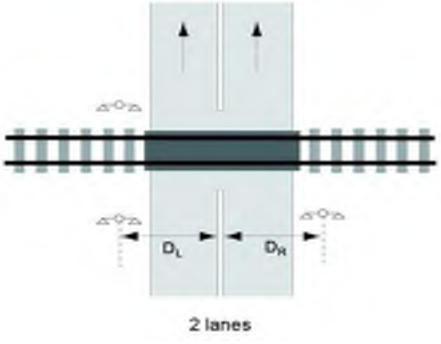
Figure 13-1 – Warning Signal Offsets Requiring Cantilevered Light Units

(a) Two-Way Road



(b) One-Way or Divided Road





MileX.XX (357 Dock Road),SRY Rail
Surrey, British Columbia

Sheet 14

PREPARE TO STOP AT RAILWAY CROSSING SIGN

GCS Sections 13 and 14

Source	Item NA				Reference
observe	Are signs present?	**No**	EB approach		SOR 67 (1), (2) GCS 18.21 & 18.2
		No	WB approach		
look-up	Minimum Distance for Primary Light Units (SSD)	**N/A**	m		Sheet 13
look-up	Recommended distance for Primary Light Units	**N/A**	m		Sheet 13
	Warrants				
observe	Are all front light units obscured within minimum distance above?	**N/A**			
look-up	Is the facility designated a "freeway" or "expressway"?	**N/A**			Sheet 3
observe	Do environmental conditions frequently obscure signal visibility?	**N/A**			
	Considering maximum prevailing speeds, geometry, and traffic composition, checkthe following:				
observe	Does sign flash during operation of grade crossing warning system?	**N/A**			
measure	Distance from the sign to 2.4m beyond the furthest rail =	**N/A**			
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?	**N/A**			
measure	Distance from the sign to the closest gate =	**N/A**	m		
observe	Does the flashing sign precede actuation of the descent of the gate arms by the time required to travel from the sign to clear closest gate?	**N/A**			
measure	Time required for all queued vehicles to resume to maximum road operating speed =	**N/A**	sec		

Comments Following Site Visit:

- **PREPARE TO STOP RAILWAY CROSSING Signs not required.**

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

Sheet 15

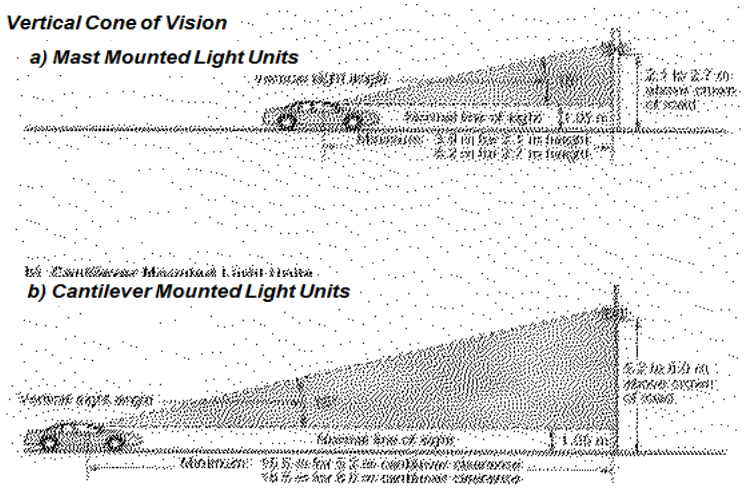
PREEMPTION OF TRAFFIC SIGNALS

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

Comments Following Site Visit:

- **No Traffic Signals located at crossing**

-functions as intended



Grade Crossings Standards, July 2014

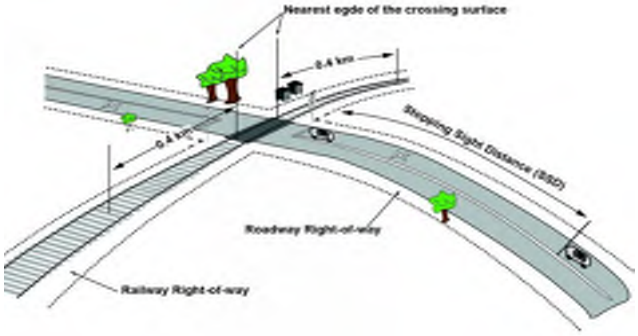
APPENDIX D – WHISTLING CESSATION

Table D-1 – Requirements for Warning Systems at Public Grade Crossings within an Area without Whistling

	Column A		Column B	
Railway Design Speed	Grade Crossings for Vehicle Use		Grade Crossings For Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Column 1	***Column 2***	***Column 3***	***Column 4***	***Column 5***
1 – 25 km/h (15 mph)	FLB	FLB	No warning system requirement	No warning system requirements
25 – 81 km/h (16 – 50 mph)	FLB	FLB & G	FLB	FLB & G
Over 81 km/h (50 mph)	FLB & G	FLB & G	FLB & G	FLB & G

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

Figure D-1 - prescribed area for whistling cessation as per article 23.1 of the RSA



RSA = Railway Safety Act of Canada

Source	Item					Reference
Rail	Is train whistling prohibited at this crossing?	**No**	24 hours?	**No**		
observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?			**No**		
observe	Are the requirements of Table D-1 met?	**No**				

Comments Following Site Visit:
- Whistle Cessation not required

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:

END OF FIELD DATA FORMS

VFPA
REPORT NUMBER: 20-0173

VFPA FSPL TRANSPORTATION IMPROVEMENTS PROJECT

07 - MILE X.XX, 10610 TIMBERLANDS ROAD, CROSSING ASSESSMENT REPORT

FEBRUARY 09, 2021

REVISION HISTORY

FINAL ISSUE

2020/09/03	FIRST DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	R. Sewell, Senior Project Engineer			
2020/10/21	SECOND DRAFT			
Prepared by	Reviewed by			
P. McCabe, Track Designer	G. Smith, Senior Project Engineer			
2021/02/09	FINAL			
Prepared by	Reviewed by	Approved By		
P. McCabe, Track Designer	G. Smith, Senior Project Engineer	R. Sewell, Senior Project Engineer		

SIGNATURES

PREPARED BY

Patrick McCabe, CPEng (Aus), APEC Eng
Track Designer

09/02/2021
Date

Robert Sewell, P.Eng
Senior Project Engineer

09/02/2021
Date

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TABLE OF CONTENTS

1 CROSSING OVERVIEW

WSP Canada Group Limited (WSP) has been contracted as part of the Fraser Surrey Port Lands – Transportation Improvements Preliminary Design Services project, to complete a Railway Crossing Safety Assessment on the 10610 Timberland Road grade crossing. The SRY owned crossing is located within the Vancouver Fraser Port Authority (VFPA), Fraser Surrey Docklands near to the Canadian National (CN) Brownsville Spur which comes off Mile 117 of the Yale Subdivision.

A Railway Crossing Field Safety Assessment was undertaken on the 22nd of July 2020 and updates the previous Railway Crossing Assessment undertaken WSP (formally MMM Group) on the 5th of May 2015. The Railway Crossing Assessment as conducted follows the guidelines of applicable requirements identified in the most recent edition of Transport Canada's Grade Crossing Regulations (GCR) and Grade Crossing Standards (GCS).

The crossing is a passive protected crossing (SRCS), equipped with two RAILWAY CROSSING and STOP signs, located within an industrial area. A Tractor Trailer (WB-20) is the design vehicle used to represent daily traffic on port property. The Railway traffic volumes were provided by the SRY while the Average Annual Daily Traffic (AADT) was calculated based on the realigned infrastructure.

This report aims to identify the modifications to the grade crossing since the previous inspection completed by MMM Group in 2015, as well as highlight any new or previously identified non-compliances still relevant to this crossing.

1.1 LOCATION

The Timberland Road grade crossing is located within Fraser Surrey Docks jurisdiction at 10610 Timberland Road and crosses the SRY spur track. The crossing is located at the latitude and longitude of 49°11'39" and 112°53'59" respectfully. Figure 1, below shows the location of the crossing.

Figure 1: Crossing Location (source: Google Earth, 2020)

2 SAFETY ASSESSMENT

2.1 PREVIOUS ASSESSMENT (2015)

A previous crossing assessment was undertaken in 2015 by WSP for the 10610 Timberland Road crossing. The objective of the assessment was to:

- Reduce crash risk within the grade crossing environment.
- Minimize the frequency and severity of preventable crashes.
- Consider the safety of all grade crossing users.
- Verify compliance of the technical standards referred to in the Railway Safety Act / Grade Crossing Regulations and contained in the Grade Crossing Standards.
- Ensure that all the crash mitigation measures/factors aimed to eliminate or reduce the identified safety problems were fully considered, evaluated and documented for review/action by the appropriate authorities.

The outcome of the 2015 assessment offered recommendations for consideration by the VFPA. Table 1: Previous Non-Compliances, illustrates the non-compliances and recommendations offered within the 2015 report. The recommendations were categorised within the three priority levels;

- Low - implement the measures as soon as practicable
- Medium - implement the measures by Transport Canada GCS & GCR November 2021 deadline.
- High - implement the measures forthwith

Table 1: Previous Non-Compliances

Observations	Suggested Actions	Priority	Addressed?
GCS Section 3 – Crossing Surface (Basic Requirement)			
a. Railway crossing surface does not extend a minimum of 0.5m beyond the travel lanes on the south approach.	Extend railway crossing surface to at least 0.5m beyond the travel lanes on the south approach	High	Yes – Railway crossing surface extends 0.5m beyond travel way.
b. Flangeway depth does not meet the requirement due to debris.	Clean debris from the flangeway. Once debris is removed from the flangeway, the railway company is to ensure the minimum depth is met	High	No
GCS Section 4 – Railway Crossing and Number of Tracks Sign (Basic Requirement)			
a. RAILWAY CROSSING sign on the south approach is located too close to the nearest railway, too far from the curb and does not face the correct direction.	Relocate RAILWAY CROSSING sign on the south approach as per GCS Section 4.1.	High	Yes – New RAILWAY CROSSING Signs installed in compliant location.
GCS Section 8 – Signs			
a. Retroreflective strips are not provided for the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Install retroreflective strips on the back of the RAILWAY CROSSING sign and both sides of the sign supporting post.	Medium	Yes – New RAILWAY CROSSING Signs installed with reflective strips on front and back of sign.
b. RAILWAY CROSSING AHEAD signs are not present on either approach of the crossing	Install RAILWAY CROSSING AHEAD signs 45m +/- 10m in advance of the stopping location	Medium	Yes – Signs installed in compliant location.
c. STOP signs are not present on either approach of the crossing.	STOP signs should be installed on the same post as the RAILWAY CROSSING signs on both approaches	Medium	Yes – STOP Signs installed below RAILWAY CROSSING Signs

d. EMERGENCY NOTIFICATION signs are not present on either approach of the crossing.	Install EMERGENCY NOTIFICATION sign on both approaches as per GCS Section 8.5	Medium	Yes – EMERGENCY NOTIFICATION Sign installed below RAILWAY CROSSING Sign.
e. Double stop bars are not present on either approach to the crossing for vehicles.	Paint double stop bars on both road approaches as per MUTCD Fig.C1-6 (Jan. 2014).	High	Yes – Double stop bars painted on both approaches
f. RAILWAY CROSSING symbol pavement markings are not present on either approach to the crossing	Paint RAILWAY CROSSING symbol pavement markings on both road approaches as per MUTCD Fig.C1-6 (Jan. 2014).	Medium	Yes – RAILWAY CROSSING SYMBOL painted on both approaches
g. Stopping or parking restriction is not observed on the driveway at the railway right-of-way.	Install NO STOPPING signs within the railway right-of-way.	Low	Yes – PARKING RESTRICTION Signs installed along Timberland Road.
GCS Sections 9, 12 to 17 – Warning System Design			
a. An active warning system without gates is warranted based on cross-product.	Install active warning system without gates. However, Transport Canada indicated that the crossing could stay passive indefinitely unless the sightline requirements could not be met	Low	No

2.2 CROSSING MODIFICATIONS

As shown in Appendix A: Site Photographs, a number of changes have occurred at the crossing between inspections. Most changes were based on recommendations outlined in the 2015 inspection. Table 1, shows what changes have been made based on the 2015 recommendations. Below is a summarised list of all the changes observed from the site inspection:

- Rail operations have ceased along the spur track
- New grade crossing signage, including;
    - RAILWAY CROSSING Signs
    - STOP Signs
    - RAILWAY CROSSING AHEAD signs
    - EMERGENCY INFORMATION Signs
    - PARKING RESTRICTION Signs
- New MUTCD compliant pavement markings.

2.3 ASSESSMENT AND RECOMMENDATIONS

An updated Grade Crossing Safety Assessment was undertaken for the proposed realignment of the port road access and to determine any required crossing upgrades to ensure compliance with the GCR & GCS. **Appendix B: Site Inspection Report** provides details of the observations made during the site inspection. The inspection report also outlines outstanding safety issues, along with recommended remediations. As the railway operations have ceased along the spur, no upgrades are recommended. However, if railway operations are bought back, an updated Grade Crossing Safety Assessment is advised.

APPENDIX

A SITE PHOTOGRAPHS

APPENDIX

A - North Approach Drivers View Left

B - North Approach

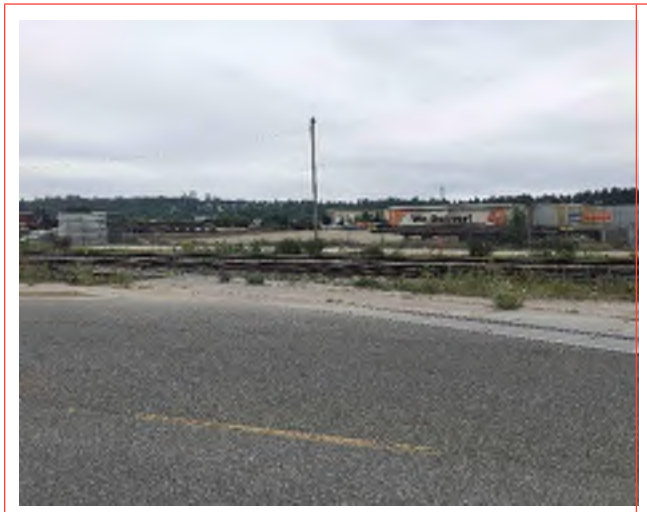
C - North Approach Drivers View Right

D - South Approach Drivers View Left

E - South Approach

F - South Approach Drivers View Right

APPENDIX

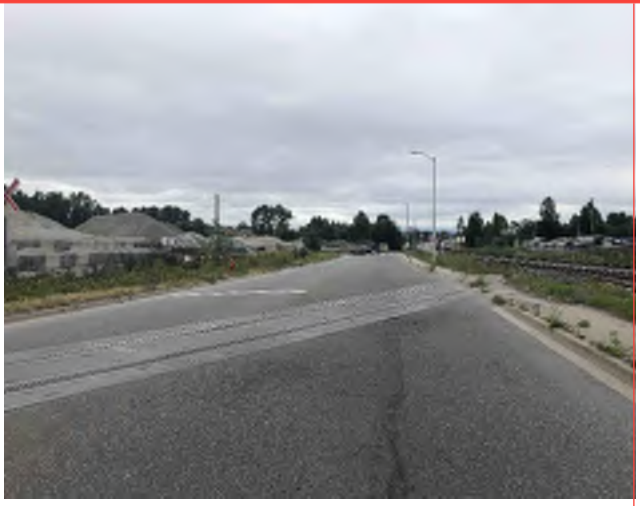


G – North Approach Driver View Left
(At Stopped Position)

H - North Approach (At Stopped Position)

I – North Approach Drivers View Right
(At Stopped Position)

J- South Approach Drivers View Left
(At Stopped Position)



K - South Approach (At Stopped Position)

L - South Approach Drivers View Right
(At Stopped Position)

APPENDIX

M – East Facing Crossing Surface

N – General Crossing Photo

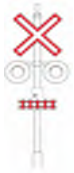
O – West Facing Crossing Surface

APPENDIX

B SITE INSPECTION REPORT

CANADIAN ROAD / RAILWAY GRADE CROSSING DETAILED SAFETY ASSESSMENT FIELD GUIDE (2005)*

Appendix C2: Field Data Forms



Passive & Active Crossings

MileX.XX (10610 Timberland Road),SRY Rail
Surrey, British Columbia
For Vancouver Fraser Port Authority

Legend:

calculate	**Formula**	Spreadsheet cell has formula
look up		User to look up value in table or chart.
		User to input value here for conditional formatting or formulas in other cells to function
		Warning! Value beyond acceptable limits.
		Warning! Value beyond acceptable limits for certain conditions (i.e. for people using assistive devices).
	Rail	Information to be provided by Railway Company
	Road	Information to be provided by Roadway Authority
measure	observe	Information to be obtained during Site Investigation
	√	Information provided by others to be verified in the field

* Updated to reflect Transport Canada's Grade Crossing Standards (GCS) July 2014 and Grade Crossing Regulations (GCR)(SOR-2014-275 Feb 2016)

MileX.XX (10610 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 1 | **Grade Crossing Safety Assessment** | **Passive Crossings**

Date of Assessment: **22-Jul-20** Site Investigation

Assessment Team Members & Affiliations: **Patrick McCabe**
Rob Sewell

Reason for Assessment: **New Proposed Pedestrian Crossing**

____	periodic assessment	**X**	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: **Vancouver Fraser Port Authority**

Crossing Location: **10610 Timberland Road**

Location Number: **N/A**

Municipality: **City of Surrey, BC**

Railway: **SRY** Mile: **N/A**

Sub-division: **N/A** Spur: **N/A**

Type of Grade Crossing [private/public; warning devices]: **SRSC**

Track Type: [mainline, etc.] **Yard**

Road Authority: **City of Surrey**

Road Name/Number: **10610 Timberland Road**

Province: **British Columbia**

Location Reference (control section, etc.): **Fraser Surrey Docks**

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

Roadway East/West (yes/ no) No
Roadway North/ South (yes/ no) Yes

*Urban Local Undivided

Collision History (5-year period): **No record of accitents at the subject railway crossing within the past five years**

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

Provide Details of the collisions if available:
Sources:

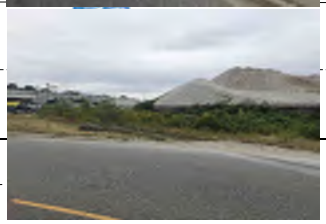
- identify main contributing factors

- attach collision diagrams if available

MileX.XX (10610 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 2a **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 2b)



For the full set of photos taken, see the Appendix to the Safety Assessment Report.

MileX.XX (10610 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 2b **SCENE SKETCH**

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

Notes: Images from Google Earth

Include: - directions to nearby municipalities for both road & rail approaches (use arrows)
- adjacent intersections
- relevant road signs/signals
- signal warning systems hardware
- landmarks
- crosswalks/paths
- geographical features
- bus stops, etc.

MileX.XX (10610 Timberland Road),SRY Rail
Surrey, British Columbia

Sheet 3 **GENERAL INFORMATION**

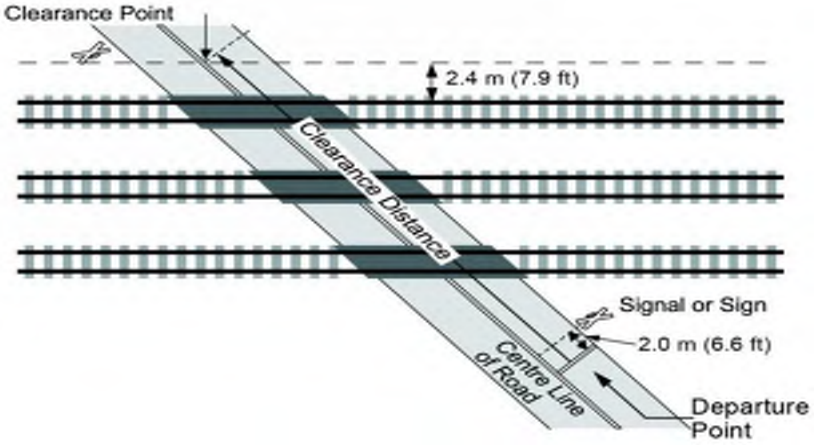
Source	Item								Reference
Rail	Maximum Railway Operating Speed, V_T	=	10	(mph)					
Rail	Daily Train Volume:	=	0	(freight trains/day)					
		=	0	(passenger trains/day)					
Rail	Switching during daytime? Y/N	Yes			nighttime? Y/N	Yes			
Road	Avg. Annual Daily Traffic, AADT:	=	3,000	(vpd)	Year of count:	2020			
Road	High seasonal fluctuation in volumes?		No						
Road	Pedestrian Volumes	=	0	(ped./day)					
Road V	Is crossing on a School Bus route?		No						
Road V	Do Dangerous Goods trucks use this roadway?		Yes						
Road	Cyclist Volumes	=	0	(cyclists/day)	Cyclist not anticipated				
Road V	Regular use of crossing by persons with Assistive Devices?				None				
Road V	Other special road users?	type	Unknown	daily volume	None				
Road	Forecasted AADT[2]	=	1,170	(vpd)	Forecasted Year:	2022			
Road V	Design Speed:		30	km/h	Posted Speed:	30	km/h		
	Maximum Operating Speed:		30	km/h					
	note: provide details if all approaches are not the same								
Road V	Road Surface Type (asphalt, concrete, gravel, etc.):		Asphalt						
observe	Surrounding Land Use (urban/rural)?:		Industrial						
observe	Any schools, retirement homes, etc. nearby?		No						

Notes:
1. Road Authority should provided plans if available.
2. AADT is based upon modelled future traffic counts for the Realigned infrastrucutre.

From GCS Section 7.1.2:

Column 1	*Column 2*	*Column 3*
Class of Track	***The maximum allowable operating speed for freight trains is -***	***The maximum allowable operating speed for passenger trains is -***
Class 1 track	17 km/h (10 mph)	25 km/h (15 mph)
Class 2 track	41 km/h (25 mph)	49 km/h (30 mph)
Class 3 track	65 km/h (40 mph)	97 km/h (60 mph)
Class 4 track	97 km/h (60 mph)	129 km/h (80 mph)
Class 5 track	129 km/h (80 mph)	153 km/h (95 mph)

Figure 10-1 - Clearance Distance (cd) for Grade Crossings
(a) For Grade Crossings with a Warning System or Railway Crossing Sign



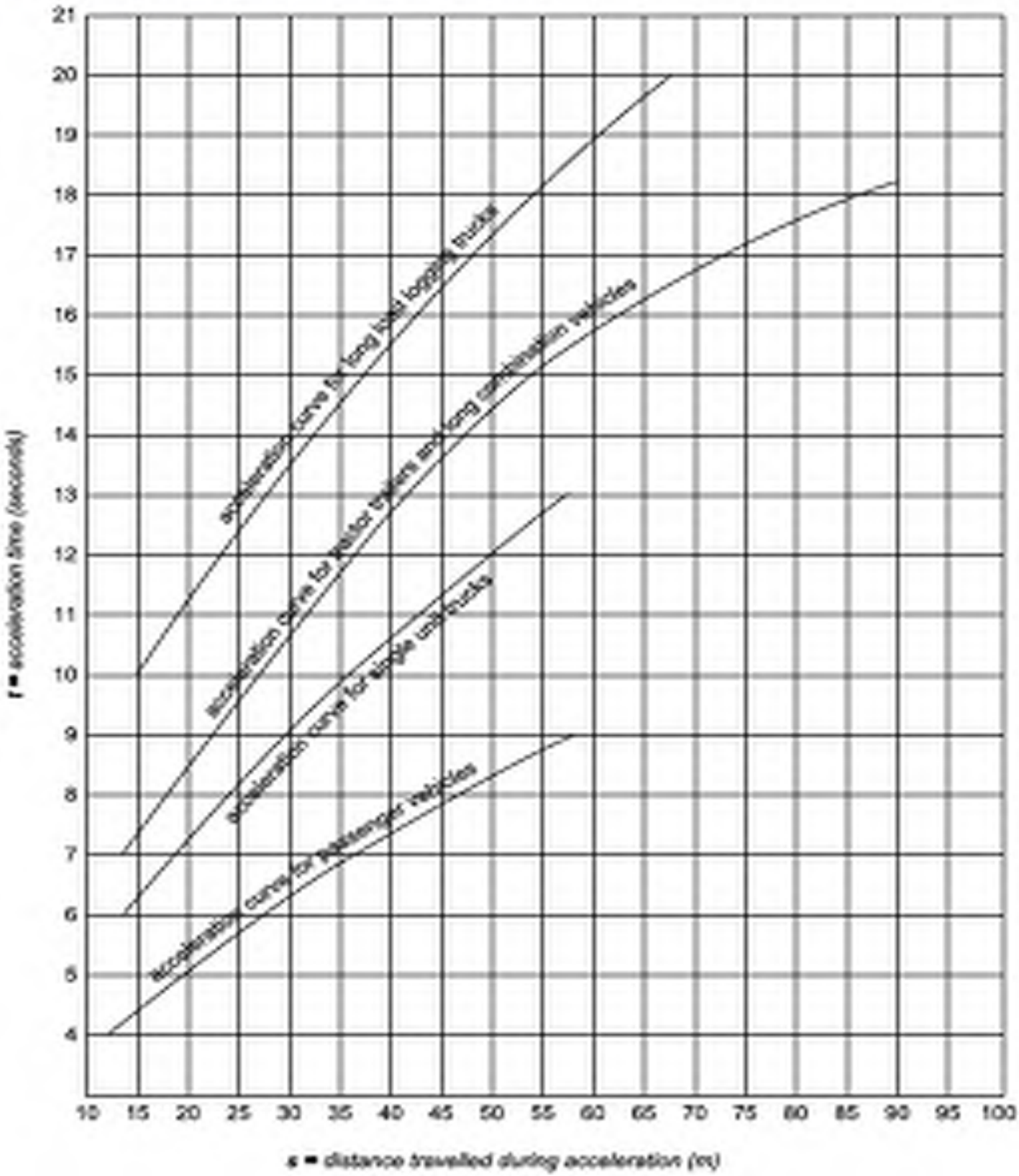
Grade Crossings Standards, July 2014

Table 10-1 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 & Buses	0.8	0.9	1.0	1.1	1.3
Tractor-Semitrailer	0.8	0.9	1.0	1.2	1.7

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 10-2 Assumed Acceleration Curves



MileX.XX (10610 Timberland Road),SRY Rail
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Sheet 4 **DESIGN CONSIDERATIONS**

Source	Item						SB Approach		NB Approach		Reference
	Design Vehicle										
Road	Type:	6	WB-20 Tractor-Semitrailers (WB-20)								Table 1* SOR 57
look-up	Length, **L:**		22.7	m							Table 1*
look-up	**Stopping Sight Distance, SSD**		45	m (round to 1.0% of grade)		=	10	m	45	m	Table 3*
measure	**Clearance Distance, cd**					=	29.1	m	16.4	m	GCS 16.1.1
calculate	**Vehicle Travel Distance, S**	**S= L+cd**	51.8	max <---		=	51.8	m	39.1	m	
look-up	**Vehicle Departure Time, t**					=	14.8	sec	14.8	sec	GCS Figure 10-2
Road V	Road Grade Effect:	maximum approach grade within 'S':				=	0.60	%	0.50	%	Sheet 7
look-up	grade adjustment factor (anto calc assumes Truck)(manual input from Table 10-1 if other)					=	1.03		1.02		GCS Table 10-1
calculate	**T**= t x adjustment factor					=	15.2	sec	15.1	sec	
	Design Vehicle Departure Time, T_D = J + T (where J = 2 sec (min.) perception & reaction)						2.0	sec	2.0	sec	
calculate	$T_{G\ stop} = T_D$=	17.2	sec			<-	17.2	sec	17.1	sec	GCS 10.3.2
observe	Do field acceleration times exceed T_D?	**Acceleration measurement beyond the scope of this assessment.**									
measure	**Pedestrian , cyclist & Assistive Devices Departure Time**			pedestrian **cd** distance		=	0.0	m	0.0	m	GCS 10.3.3
calculate	walking speed 1.22m/s max.	T_P =	0.0	sec	(1.0m/s used)	<-	0.0	sec	0.0	sec	
calculate	T_{SSD}	= (SSD+cd+L)/(0.277837 x $V_{road\ design}$) =	11.6	sec							

Comments Following Site Visit:

Table 1 – Design vehicle Lengths/Class

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

Source: *Geometric Design Guide for Canadian Roads*, TAC; September 1999.

Table 6 – Minimum Sightlines along the Rail Line ($D_{stopped}$) (as illustrated in Figure 3)

Railway Design Speed V_r (mph)	$T_{stopped}$ = Departure Time (greater of T_d or T_p) (seconds)											If greater of T_d or T_p > 20 sec., add for each additional second (m)
	≤ 10	11	12	13	14	15	16	17	18	19	20	
WARNING: Railway design speed in mph!	Minimum Sightlines along Rail Line ($D_{stopped}$) (m)											
STOP	30	30	30	30	30	30	30	30	30	30	30	+0
1-10	45	50	55	60	65	70	72	76	80	85	90	+5
11-20	90	100	110	120	125	135	145	155	165	170	180	+10
21-30	135	150	165	175	190	205	215	230	245	255	270	+15
31-40	180	200	220	235	250	270	285	305	325	340	360	+20
41-50	225	250	270	290	315	335	360	380	405	425	450	+25
51-60	270	300	325	350	380	405	430	460	485	510	540	+30
61-70	315	350	380	415	445	470	505	535	565	595	630	+35
71-80	360	395	435	465	505	540	580	610	650	680	720	+40
81-90	405	445	490	535	570	605	650	685	730	765	810	+45
91-100	450	500	540	580	630	670	715	760	805	850	895	+50

Table 3 – Determine SSD for Truck Class

Road Crossing Design Speed V (km/hr)	Truck Class Stopping Sight Distance (SSD) (m)																				
	Road Approach Gradient																				
	-10%	-9%	-8%	-7%	-6%	-5%	-4%	-3%	-2%	-1%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
20	26	26	26	26	26	26	25	25	25	25	25	25	25	25	25	25	24	24	24	24	24
30	48	48	47	47	47	46	46	46	45	45	45	45	45	44	44	44	44	44	44	43	43
40	76	75	74	74	73	73	72	71	71	70	70	70	69	69	68	68	68	67	67	67	67
50	121	120	118	117	116	115	114	113	112	111	110	109	108	108	107	106	106	105	105	104	104
60	149	146	144	142	140	138	136	134	133	131	130	129	128	126	125	124	123	122	122	121	120
70	210	205	202	198	195	192	189	187	184	182	180	178	176	175	173	171	170	169	167	166	165
80	252	246	241	236	231	227	223	219	216	213	210	207	205	202	200	198	196	194	192	191	189
90	318	311	304	297	292	286	281	277	273	269	265	262	258	255	252	250	247	245	243	240	238
100	401	391	382	373	365	358	352	346	340	335	330	325	321	317	314	310	307	304	301	298	295
110	455	441	428	417	406	397	388	380	373	366	360	354	349	344	339	334	330	326	322	319	315

* Source: Transport Canada's "Determining Minimum Sightlines at Grade Crossings: A Guide for Road Authorities and Railway Companies"

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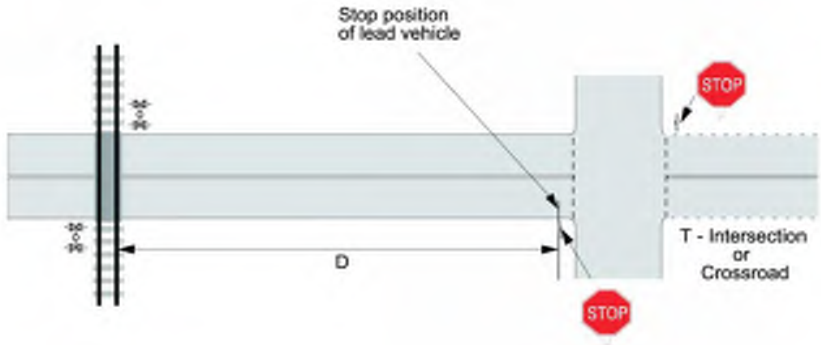
Sheet 5

LOCATION of GRADE CROSSING

Source	Item		Reference
observe	"D" should not be less than 30m for either approach if the train speed exceeds 15 mph. **D =46m**		GCS Section 9.1
observe	Are there pedestrian crossings on either road approach that could cause vehicles to queue back to the tracks?	**No**	
observe	Is "D" insufficient such that road vehicles might queue onto the rail tracks?	**No**	
	Is "D" insufficient such that road vehicles turning from a side street might not see warning devices for the crossing?	**No**	

Comments Following Site Visit:
- The minimum "D" diminsion is measured on the South approach. The North "D" is 66m
- RAILWAY CROSSING AHEAD sign installed from previous inspection (2015)
- Railwayspeed = 10mp

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

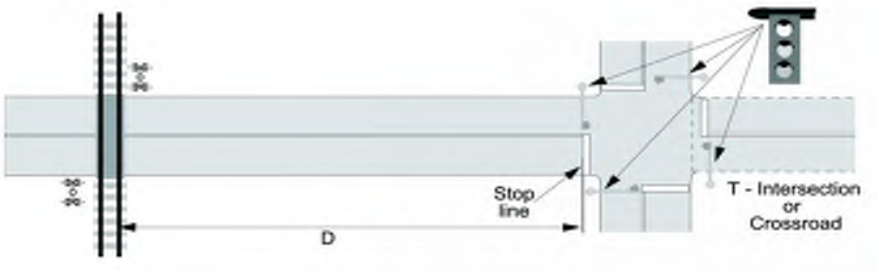
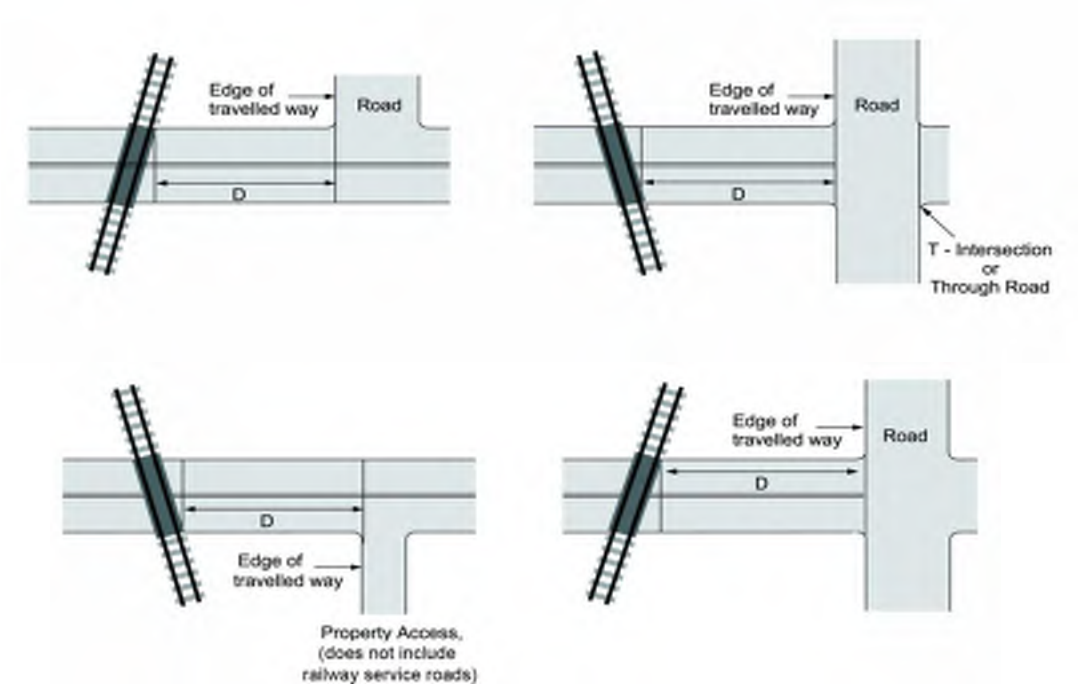


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings



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Sheet 6 **GRADE CROSSING SURFACE**

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? **Yes**							SOR 60; GCS 5
observe	Grade Crossing Surface Material: **Concrete Panels** Grade Crossing Surface Condition: **Fair**							SOR 60; GCS 5
observe	Approach Road Surface Type: **Ashpalt** Approach Road Surface Condition: **Fair** Roadway Illumination?: **Yes**							SOR 60; GCS 5
		SB Approach		**NB Approach**				
measure	Road Surface crossing width (perp. C.L. min. = 8.0m)		**19.7** m					GCS 5.1
measure	Road Surface extension beyond travel lanes (min. = 0.5m)	**2.0** m		**1.0** m				GCS 5.1
measure	Sidewalk/Path/Trail crossing width (min. = 1.5m)		**NA** m	**1.5** m		Crosswalk on WB only		GCS 5.1
measure	Sidewalk/Path/Trail extension beyond sidewalk (min. = 0.5m)	**NA** m		**1.0** m		Crosswalk on WB only		GCS 5.1
measure	Distance Between Travel Lane and C.L. of Trail		**0.8** m					
	Cross-Section:		**South (Right) Rail:**		**North (Left) Rail:**			GCS Table 5-1
measure	Flangeway width (min. = 65mm; max.= 120mm or 75mm[1])		**61** mm		**65** mm			GCS Table 5-1
measure	Flangeway depth (min. = 50mm; max.= no limit or 75mm[1])		**25** mm		**25** mm			GCS Table 5-1
	Rural Field Side Gap:							GCS Table 5-1
measure	Side Gap width (max.= 120mm or 0[1])		**6** mm		**6** mm			GCS Table 5-1
measure	Side Gap depth (max.= no limit or 0[1])		**10** mm		**10** mm			GCS Table 5-1
	Wear Limits:							GCS Table 5-1
measure	Elevation of Top Rail above road surface (max. = 13mm[1], 25mm, or 50mm)		**11** mm		**10** mm			GCS Table 5-1
measure	Elevation of Top Rail below road surface (min. = -7mm[1],-25mm, or -50mm)		**0** mm		**0** mm			GCS Table 5-1

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Flangeway and field side gap constructed out of rubber. Flangeways need cleared.

- Minor cracking in the asphalt either side of concrete panels.

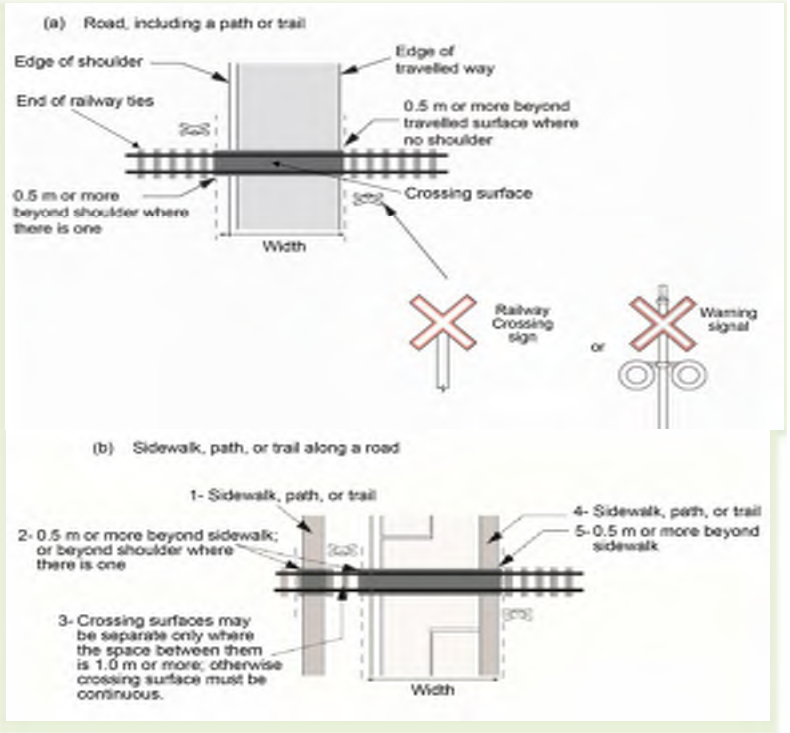
-rough crossing surface, loose timbers, etc. - difference between road grade and rail superelevation -surface distress of roadway approaches -photos

Grade Crossings Standards, July 2014

Table 5-1 – Grade Crossing Surface – Cross Section

a) Flangeway:		
Width	**Minimum**	65 mm
	Maximum for:	
	Public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	120 mm
Depth	**Minimum**	50 mm
	Maximum for:	
	Public sidewalks, paths and trails designated by the road authority for use by persons using assistive devices	75 mm
	All other grade crossings	No limit
(b) Field side gap A space is permitted on the outer side of the rail at rural locations, except for public sidewalks, paths or trails designated by the road authority for use by persons using assistive devices		
	Maximum width	120 mm
	Maximum depth	No limit
(c) Elevation of the top of the rail with respect to the crossing surface The top of the crossing surface must be installed as close as possible to the top of the rail within the wear limits below:		
Wear limits:		
Public sidewalk, path or trail designated by the road authority for use by persons using assistive devices		
	Maximum distance of the top of the rail above crossing surface	13 mm
	Maximum distance of the top of the rail below crossing surface	7 mm
All other public grade crossings; the maximum distance of the top of the rail above or below the crossing surface		25 mm
Private grade crossings; the maximum distance of the top of the rail above or below the crossing surface		50 mm

Figure 5-1 - Grade Crossing Surface Dimensions



MileX.XX (10610 Timberland Road),SRY Rail
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Sheet 7 **ROAD GEOMETRY**

Source	Item									Reference
observe	Are horizontal and vertical alignments smooth and continuous throughout SSD? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Is horizontal alignment straight beyond rails for a distance ≥ design vehicle length, L? WB Approach: **Yes** EB Approach: **Yes**									Sheet 4
observe	Are the road lanes at least the same width on the crossing as on the road approaches? WB Approach: **Yes** EB Approach: **Yes**									
	Grades		**SB Approach**		**NB Approach**		Difference: rail e & rd grade (GCS 6.1)			GCS Sect. 6
measure	Slope within 8m of nearest rail (max. = 2%)		**0.80**	%	**0.80**	%	**0.40%**	%	**0.40%**	Diff in Grade Max
measure	Slope between 8m & 18m of nearest rail (max. = 5%)		**0.60**	%	**0.50**	%				3%
measure	If crossing is only for pedestrians, cyclists, or persons using assistive devices (max. = 1[1] or 2%): slope within 5m of nearest rail =		**N/A**	%	**N/A**	%				
Road √	General approach grade (max. = +/- 5%)		**1.00**	%	**1.00**	%				
	measured over the SSD distance of:		**10**	m	**45**	m				Sheet 4
Rail √	Are rail tracks super-elevated?	**No**	Rate of s/e:	**0.00**	m/m Sdg	**0.00**	m/m ML			GCS Sect. 6.1 & 6.2
Road √	If train speeds exceed 15mph (70° minimum w/o warning system; 30° minimum with warning system): What is the angle between the crossing and the roadway?		=	**71.0**	degrees					
observe	**Condition of Road Approaches:** **Fair.** (e.g., anything that might affect stopping or acceleration)									SOR 60
observe	NA									

1. If frequent use by persons using assistive devices

Comments Following Site Visit:

- Minor cracks within both approachs. But still in Fair Condition.

- Crossing Angle measured via aerial imagery.

Grade Crossings Standards, July 2014

Table 6-1 – Difference in Gradient

Classification	Difference in Gradient (%)
RLU	2
RCU	1
RCD	1
RAU	0
RAD	0
RFD	-
ULU	3
UCU	2
UCD	2
UAU	0

*Legend

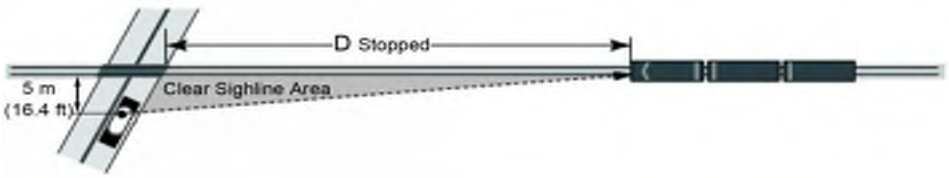
Urban (U) Rural (R) Local (L) Collector (C) Arterial(A) Expressway (E) Freeway(F)

Divided (D) Undivided (U)

Source: *Geometric Design Guide for Canadian Roads*, published by the Transportation Association of Canada and dated September 1999

Figure 7-1 - Minimum Sightlines - Grade Crossings

(a) Sightlines for Users Stopped at a Grade Crossing (applicable to all quadrants)



(b) Sightlines for Users Approaching Grade Crossing (applicable to all quadrants)

MileX.XX (10610 Timberland Road),SRY Rail
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Sheet 8 **SIGHTLINES**

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 **No**							
observe	Are sightlines on the road R.O.W. within 15m of the rail crossing clear of bushes/vegetation? -if no, detail the location **No**							
				SB Approach		**NB Approach**		
look-up	**SSD** minimum =			10	m	45	m	Sheet 4
measure	**SSD Actual** (not including turning movements)**:**			250.0	m	200.0	m	
calculate	D_{SSD}	=	$0.277837 \times V_{train\ km/h} \times T_{SSD}$	52	m	52	m	1.609 convert mph to km/h
calculate	$D_{STOPPED}$ minimum (m)	=	$0.277837 \times V_{train\ km/h} \times T_D$ =	77	m	76	m	T_D from Sheet 4
measure	$D_{STOPPED}$ **Actual**:		Driver looking LEFT	80	m (ne)	200	m (sw)	
			Driver looking RIGHT	200	m (nw)	80	m (se)	
calculate	**Ped./Cyclist $D_{STOPPED}$ (m)**			0	m	0	m	T_P from Sheet 4
measure	**Ped./Cyclist $D_{STOPPED}$ Actual:**		Person looking LEFT	N/A	m	N/A	m	
	note: measured from a point 2m in advance of sign/signals		Person looking RIGHT	N/A	m	N/A	m	
observe	Are there any obstacles within the sight triangles other than traffic signs/utility poles that might affect visibility? **Vegetation, parked vehicles & retaining wall**							

Comments Following Site Visit:
- Railway currently not in use. Vegetation, Parked Vehicles and retaining walls obstruct sightlines in West.
- No vegetation or obstructions in the East.

Figure 8-3 - Location of Railway Crossing Signs and Number of Tracks Signs (public grade crossings without warning systems)

a) **b)**

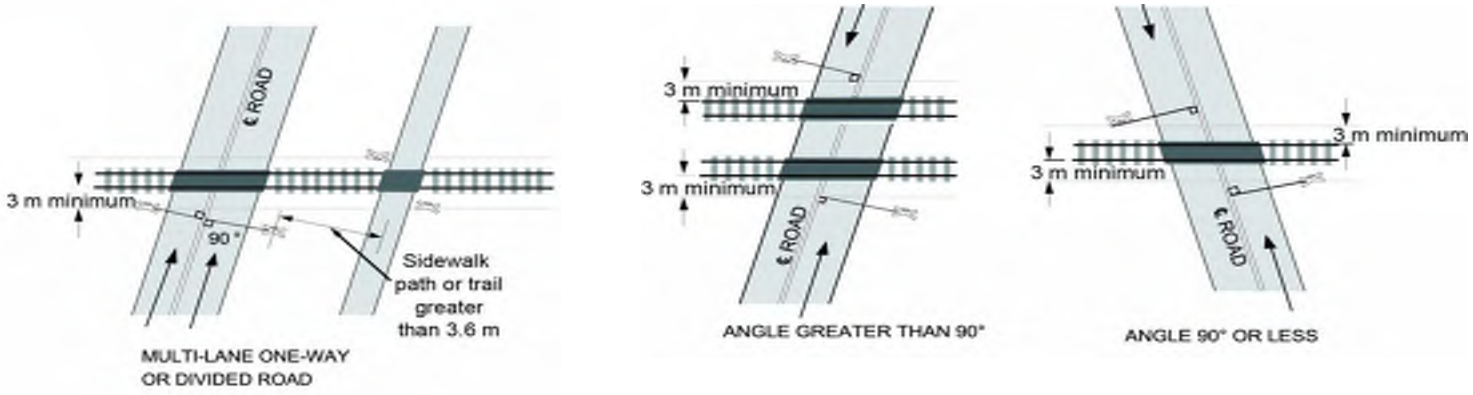
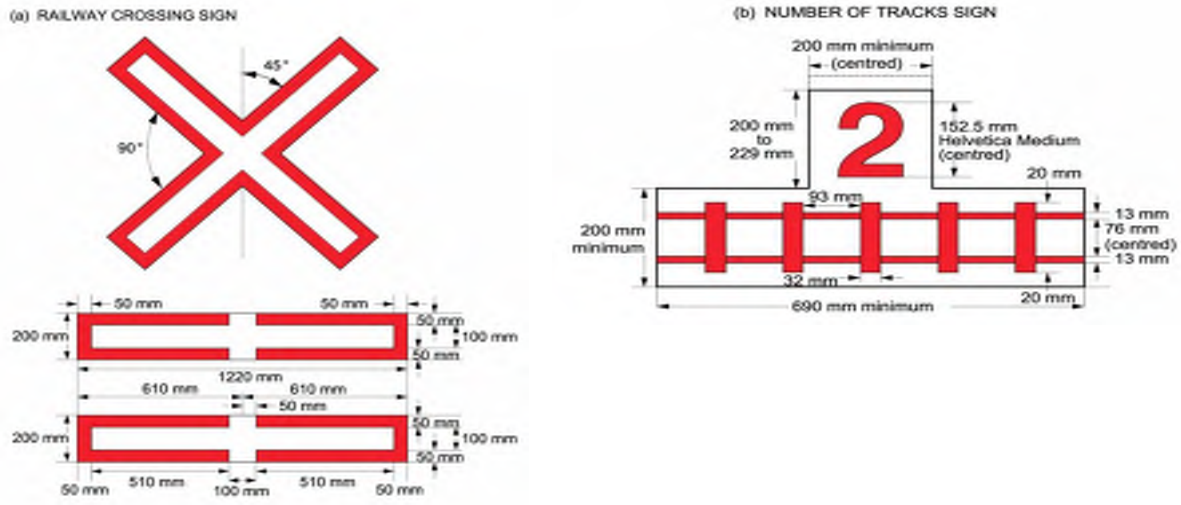


Figure 8-1 - Railway Crossing Sign and Number of Tracks Sign



MileX.XX (10610 Timberland Road),SRY Rail
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Sheet 9a — **SIGNS AND PAVEMENT MARKINGS**

Source	Item							Reference
	Railway Crossing Sign  **These signs will be required**							MUTCD
		SB Approach		**NB Approach**				
measure	distance from nearest rail:	**9.8**	m	**10.7**	m			
measure	distance from edge of road:	**2.1**	m	**1.9**	m			
measure	height of centre of crossbucks:	**3.5**	m	**2.5**	m			
measure	retroreflectivity readings:	**N/A**	cd/lux/m^2	**N/A**	cd/lux/m^2			
observe	Number of Tracks sign? **No**							
observe	A Stop Sign must be installed at grade crossing without a warning system if the road design speed is less than 15mph					Yes/ No/ NA	**Yes**	SOR 64
observe	A Stop Ahead sign must be installed if the Stop Sign is not clearly visable within the Stopping Distance					Yes/ No/ NA	**N/A**	SOR 65

Comments Following Site Visit:
- New RAILWAY CROSSING signs installed in 2017.
- The back of poles and signs only have partial reflective strips (reflectivity not measured).
- NUMBER OF TRACKS Sign not required as only 1 track.

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

Source	Item		Reference
	DO NOT STOP ON TRACKS 		MUTCD
Road √	Does queued traffic routinely encroach closer than 5m from the crossing surface?	**No**	
observe	Are these signs present on either approach?	**No**	

Comments Following Site Visit:
- DO NOT STOP ON TRACKS Sign not required.

-general condition -posts -photos

Source	Item					Reference
	Railway Crossing Ahead Sign (WA 18-20) 					MUTCD & SOR 66
look-up	Is AADT > 100? **Yes**		**SB Approach**	**NB Approach**		Sheet 3
observe	Is area urban such that WA 18-20 is not required?		**Yes**	**Yes**		
measure	Distance from nearest rail to sign	=	**57** m	**65.0** m		MUTCD
observe	height:		**2.5**	**2.5**		
observe	appropriate orientation of symbol		**Yes**	**Yes**		

Comments Following Site Visit:
- RAILWAY CROSSING AHEAD Sign has been installed since the previous inspection.
- RAILWAY CROSSING AHEAD Sign installed Min. Approx 34m from crossing

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

Source	Item			Reference
	ADVISORY SPEED SIGN 			MUTCD & SOR 66 (2)
observe	Are they present on both approaches?	**No**		
	Posted speed limit?	**N/A**	km/h	
look-up	Are they required on either approach?	**No**		check SSD (Sheet 8)

Comments Following Site Visit:

- No ADVISORY SPEED Sign observed on site.

-general condition -posts -photos

MileX.XX (10610 Timberland Road),SRY Rail
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Sheet 9b **SIGNS AND PAVEMENT MARKINGS**

Source	Item		Reference
	EMERGENCY NOTIFICATION		GCS Sect. 8.5
observe	Are these signs present on both approaches?	**Yes**	
observe	Is the information complete and legible?	**Yes**	

Comments Following Site Visit:
- EMERGENCY NOTIFICATION Sign installed below RAILWAY CROSSING Sign.

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

Source	Item		Reference
	PAVEMENT MARKINGS		
observe	Are pavement markings consistent with those from the MUTCD Manual?	**Yes**	Fig C1-6 MUTCD
observe	Are there lines to delineate sidewalks/paths?	**N/A**	

Comments Following Site Visit:
- Road markings and DOUBLE STOP BARS and X have been installed since the 2015 inspection.
- Roadway "X" marking requires to be repainted.

-special sign required? -missing signs -visual clutter -obscured view/sightlines -retroreflect levels at night
-general condition of markings -are centrelines or stop lines present? -width of markings? -provincial practice not to use *X* ?

GENERAL ASPECTS C1

MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR CANADA

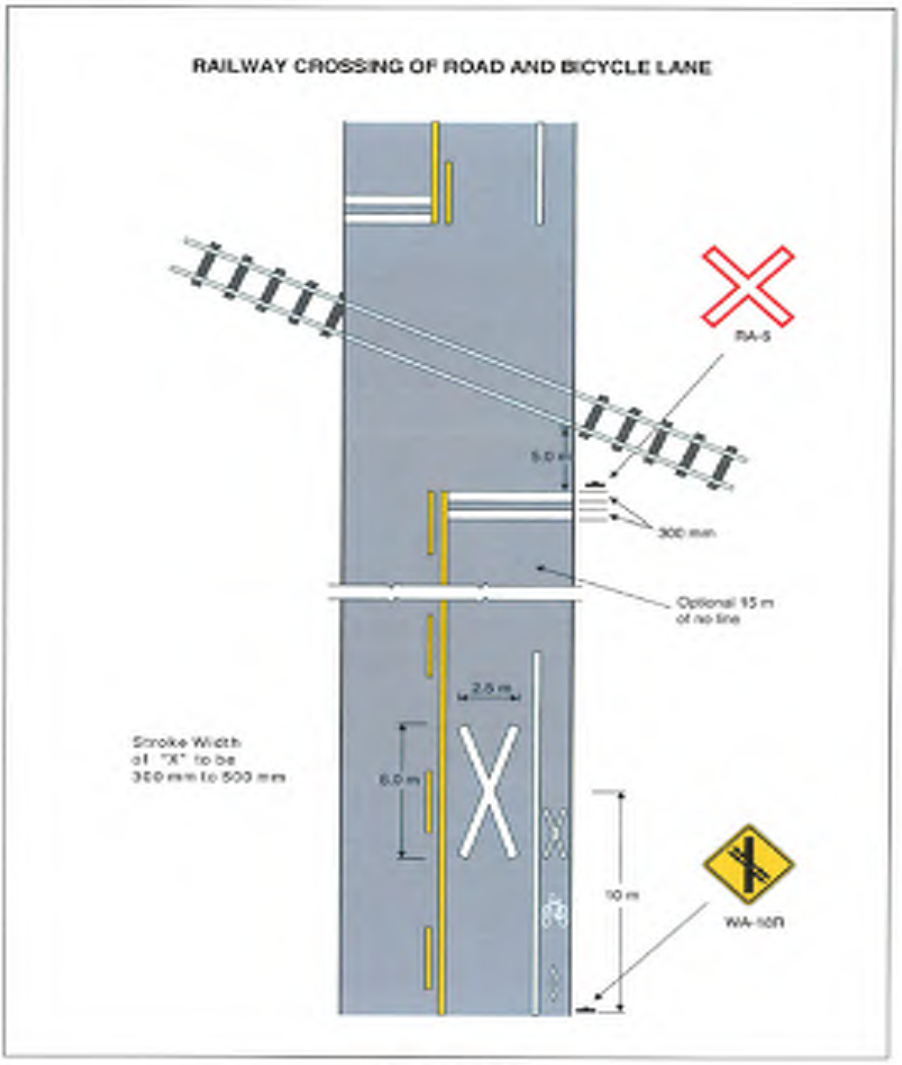
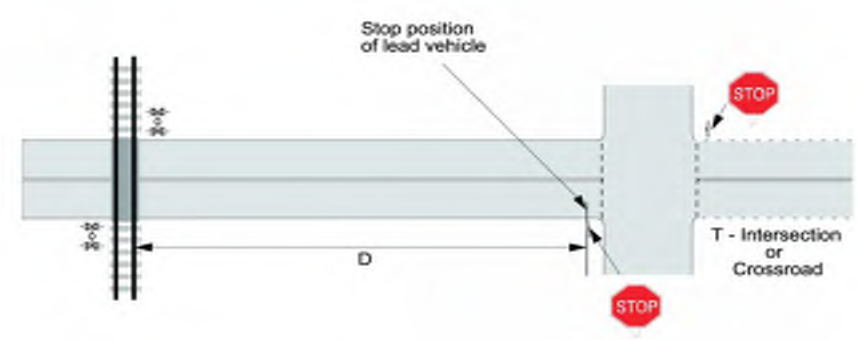


FIGURE C1-6

JANUARY 2014

Figure 9-1 - Proximity of Warning Systems to Stop Signs and Traffic Signals
(a) Intersection with Stop Sign



(b) Intersection with Traffic Signal

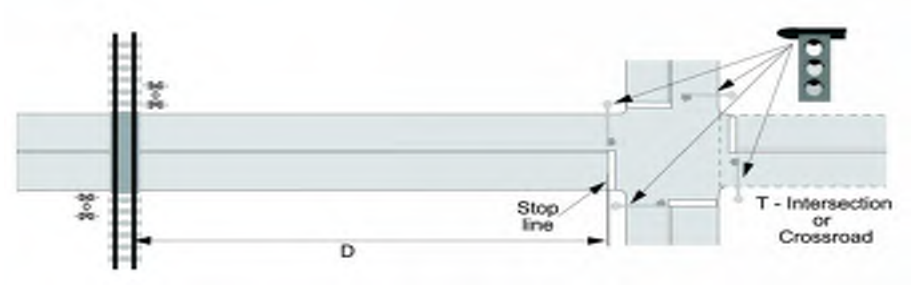


Figure 11-1 - Restrictions on the Proximity of Intersections and Entranceways to Public Grade Crossings

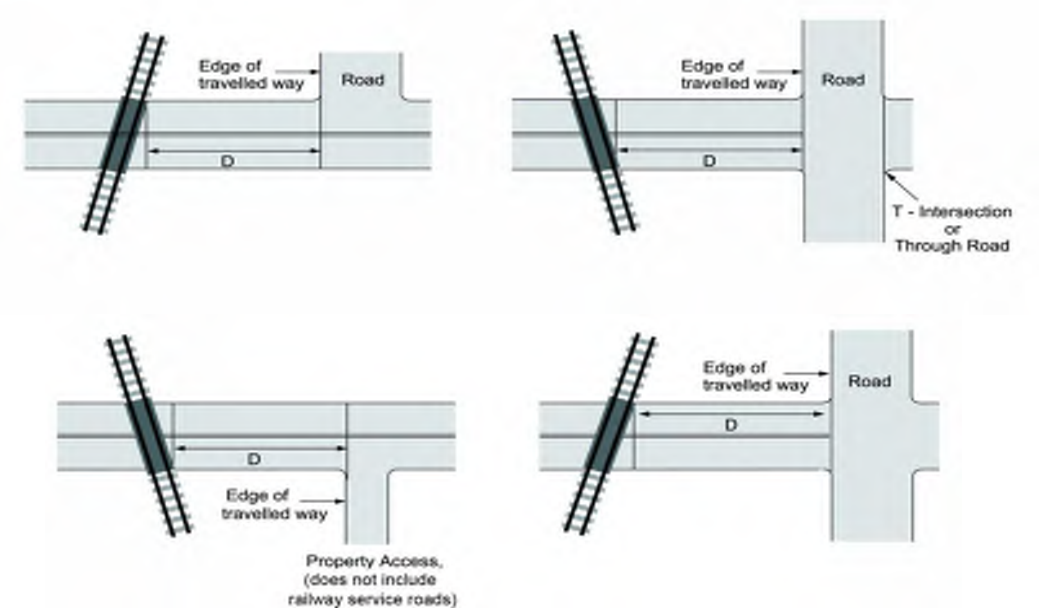
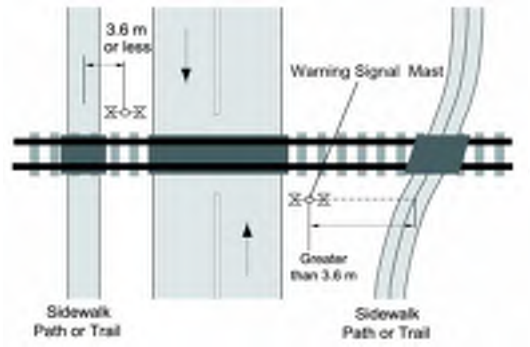
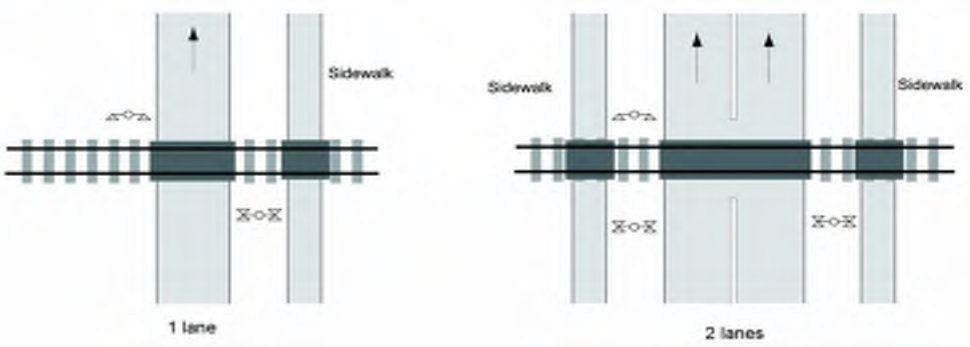


Figure 13-2 - Sidewalks, Paths and Trails
(a) Two Way



(b) One-Way



Sheet 10 eliminated in the new GCS

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Sheet 11 — **GRADE CROSSING WARNING SYSTEMS** — **GCS Section 9**

Source	Item is not required.									Reference
	Warning System Warrants if any of A through E below are met, then a warning system is warranted									
	Question							**Warrant for Warning System**		
look-up	Existing AADT =	3,000	Forecast AADT =	1,170						Sheet 3
look-up	Daily Train Volume =	0.000			trains					Sheet 3
calculate	**A. Cross-Product =**	0						> 2,000 FLB req'd	**> 50,000 requires gates**	
look-up	**B. Maximum Rail Operating Speed =**		10		mph			(max = 80mph or 50 mph with crosswalk)		Sheet 3
Rail	**C. Number of Tracks =**		1							
	if ≥ 2, can trains pass one another?		N/A					if ≥ 2 and trains can pass one another -> FLB req'd		
look-up	**D. Are Sightlines obscured?**		No					if "Yes" -> FLB req'd: If Fig 7.1 applies --> add G		Sheet 8 & Fig 7.1
observe	**E. Are any proximity conditions met?**		No					if "Yes" -> FLB required.		GCS Sect 9 & 11
look-up	Is a Warning System warranted?		No					If any of A through E above meet the Warrant		
	Field Visit	**Present? (Y/N)**	**Condition / Alignment:**							GCS 13
observe	Light Units,	N								GCS 13
observe	Bells,	N								GCS 13
observe	Gates,	N								GCS 13
observe	Cantilever Lights,	N								GCS 13
observe	Check that warning signal assemblies and cantilevers are in accordance with GCS Figures.									GCS Sect. 12
observe	Is warning system housing at least 9m from traveled way of the road and 8m from the nearest rail?									
observe	If there is a sidewalk, is a bell on the adjacent assembly?									
Rail √	Have all light units been aligned?	NA	Date?	NA						

Rail	Design Approach Warning Time (greatest of):			20sec OR [20+((cd-11)/3)] if cd>11m	Td	Tp	Gate Clearance Time + Descent Time + 5 seconds	Traffic Signal Clearance Time (=0 if no traffic signal)	(SSD + cd + L)/(0.277837xVv)	
	SB Approach	34.2	sec	26.0	17.2	0.0	34.2	0.0	7.4	
	NB Approach	34.2	sec	21.8	17.1	0.0	34.2	0.0	10.1	

observe	Is warning time less than 35 sec (without gates) or 55 sec (with gates)	N/A	

Comments Following Site Visit:

- Active warning system not required as Railway operations have ceased.

- If Railway operations are increased, a new Grade Crossing Field Safety Assessment is required.

-extraordinary conditions why warning system should be installed

-is warning system present but not warranted?

Figure 12-1 - Warning Signal Assemblies

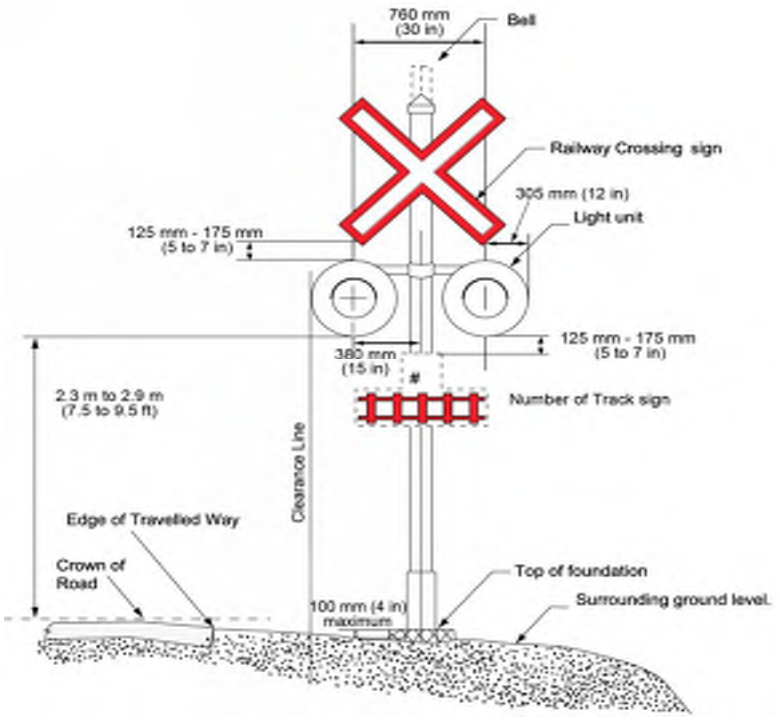
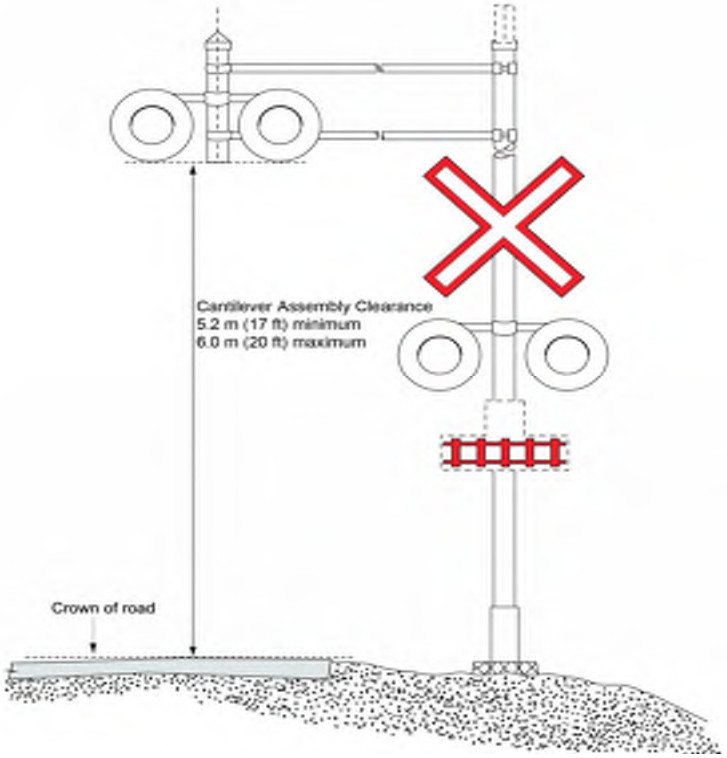


Figure 12-3 - Cantilevers



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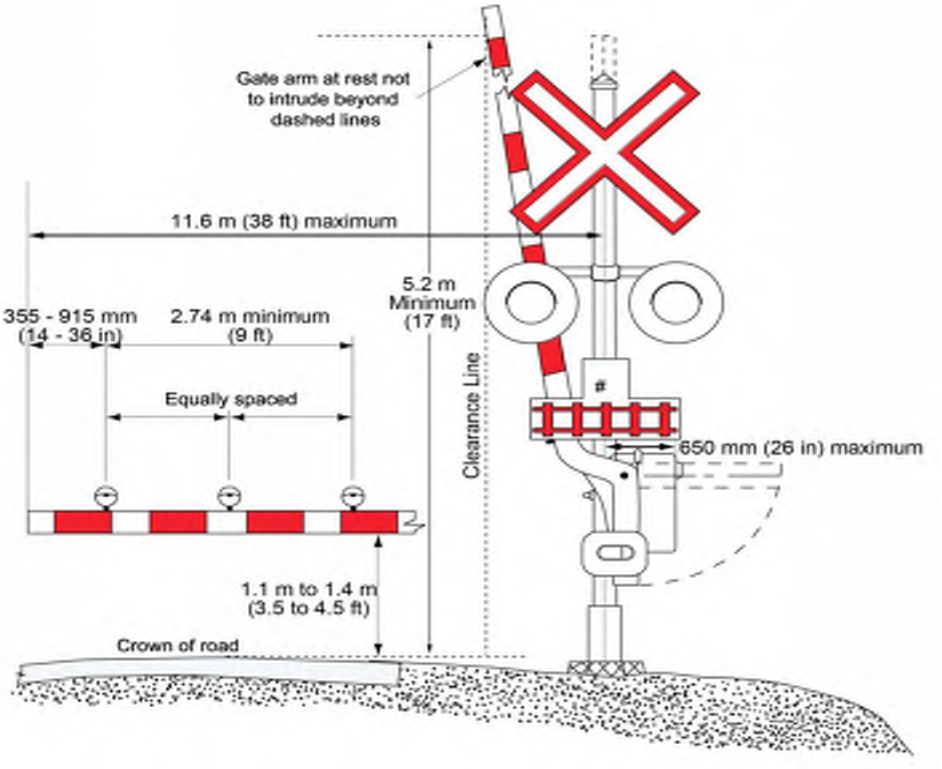
Sheet 12  **GATES FOR GRADE CROSSING WARNING SYSTEMS** **GCS Section 9**

Source	Item							Reference
	Warning System Warrants -if any of A through E below are met then a warning system with gates is warranted. **Not required as warning system is not necessary**							
calculate	**A. Cross-Product =**	**0**	(50,000 min)					
look-up	**B. Maximum Rail Operating Speed =**	**10**	mph (max = 50mph)					Sheet 3
Rail √	**C. Number of Tracks =**	**1**						
	.....if ≥ 2 , can trains pass one another?	**N/A**						
look-up	**D. Is $D_{STOPPED}$ Insufficient?**	**No**	**Minor vegetation work required on Northwest and Southwest quadrants.**					Sheet 8
observe	**E. Are any proximity conditions met?**	**N/A**						
calculate	Gate clearance distance: eq 10.4b	**24.7**	m cd $_{G\ stop}$	**34.7**	m cd SSD SB	**69.7**	m cd SSD NB	GCS Sect. 10.4
look-up	travel time =	**17.2**	sec $_{G\ stop}$					
calculate	Gate arm clearance times:	**17.2**	sec SB from stop	$T_{G\ ssd}$ = **4.2**	sec SB from SSD			
		17.1	sec NB from stop	$T_{G\ ssd}$ = **8.4**	sec NB from SSD			
look-up	Gate arm delay time: **17.2**	sec (greatest value from above)						
calculate	effect of grade =	**0.5**	sec (SB from Stop)	**-4.2**	sec SB from SSD			
		0.4	sec (NB from Stop)	**0.0**	sec NB from SSD			
measure	Measure gate arm delay and compare with above:	**N/A**						
observe	Do gates conform to standards depicted in GCS Figures?	**N/A**						
observe	Check gate descent (10 to 15 sec) and ascent (6 to 12 sec)	**N/A**						
observe	Is gate striping vertical as depicted in GCS Figures?	**N/A**						
observe	Where railway equipment regularly stops, or railway equipment is left standing, within the activating limits of a warning system, the warning system must be equipped with a control feature to minimize the operation of the warning system.				Yes/No/NA	**NA**		GCS 16.3.1
Comments Following Site Visit:								
- Warning System with gates not required.								
-extraordinary conditions why warning system should be installed				-is warning system present but not warranted?	**No**			

Figure 12-2 - Gates



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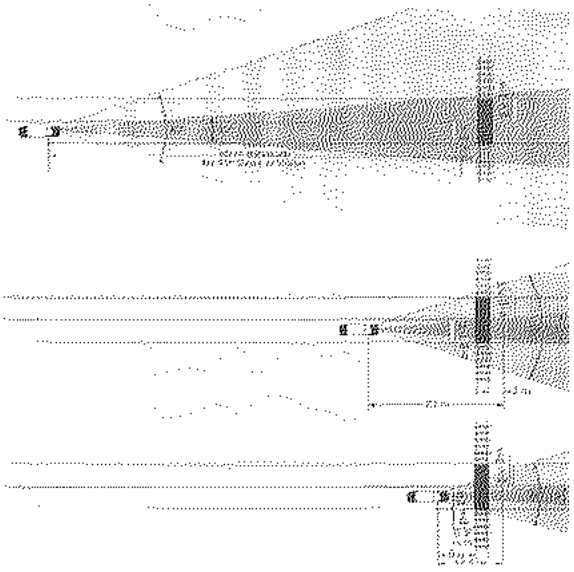
Sheet 13 **FLASHING LIGHT UNITS**

Note: Driver's cone of vision is ± 5° horizontally; limited by top of windshield vertically. GCS Sections 12-14

Source	Item is not required as warning system is not required.				u
	Number and Location				
look-up	Minimum Distance for Primary Light Units (SSD) =	45.0	m		
look-up	Recommended Distance for Primary Light Units =	69.7	m		
observe	Are flashing light units located within 5° horizontally of the centerline of the road (throughout the approach distance above)?			Yes (covered by front and back units)	
	Does horizontal/vertical curvature necessitate supplemental units?			N/A	
observe	Can back lights be seen by all stopped drivers?			N/A	
observe	Are lights obscured by vehicles stopped on adjacent intersections?			N/A	
observe	Are additional light units required for drivers as they begin to turn onto an approach road from an intersecting road/lane/pkg lot?			N/A	
	Cantilevered Light Units				
measure	Does D_R exceed 7.7m?	N/A			
measure	Does D_L exceed 8.7m?	N/A	(Assumes signal poles on both sides of road alignment, approach side of rail)		
	Multiple Lanes				
observe	Can front light units be seen by drivers in all lanes (….would T/T obscure?)?	N/A			
observe	Can back light units be seen by all stopped drivers in all lanes?	N/A			
	Sidewalks, paths, trails, etc.				
measure	Distance from path centerline to signal mast =	N/A	m (max.=3.6m)		
observe	Are separate light units required?	N/A			

Comments Following Site Visit:
- Crossing currently regulated by a passive warning system.

Horizontal Cone of Vision



Typical Light Unit Arrangement for an Adjacent Intersection

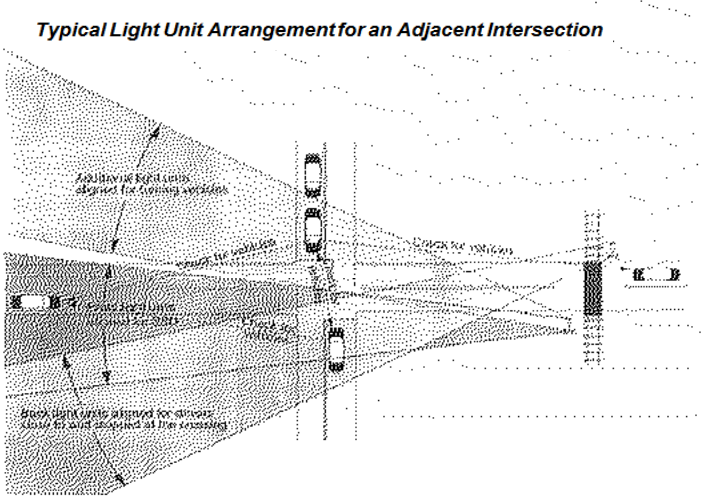
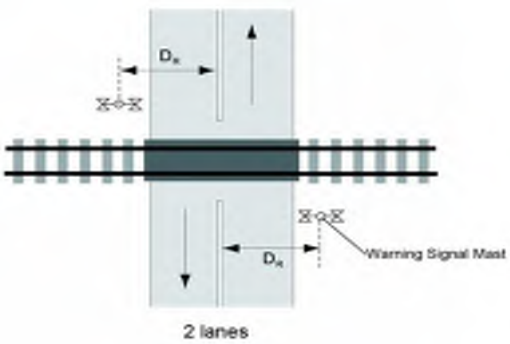
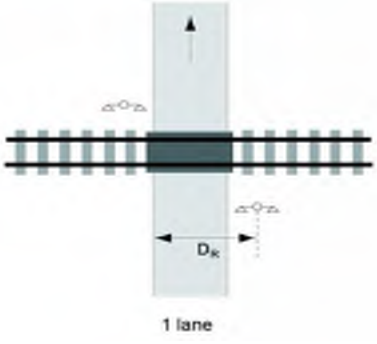


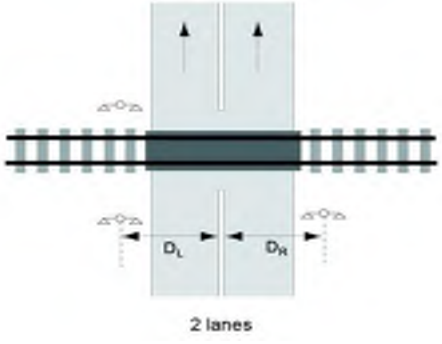
Figure 13-1 – Warning Signal Offsets Requiring Cantilevered Light Units

(a) Two-Way Road



(b) One-Way or Divided Road





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Sheet 14

PREPARE TO STOP AT RAILWAY CROSSING SIGN

GCS Sections 13 and 14

Source	Item NA				Reference
observe	Are signs present?	**No**	EB approach		SOR 67 (1), (2) GCS 18.21 & 18.2
		No	WB approach		
look-up	Minimum Distance for Primary Light Units (SSD)	**N/A**	m		Sheet 13
look-up	Recommended distance for Primary Light Units	**N/A**	m		Sheet 13
	Warrants				
observe	Are all front light units obscured within minimum distance above?	**N/A**			
look-up	Is the facility designated a "freeway" or "expressway"?	**N/A**			Sheet 3
observe	Do environmental conditions frequently obscure signal visibility?	**N/A**			
	Considering maximum prevailing speeds, geometry, and traffic composition, checkthe following:				
observe	Does sign flash during operation of grade crossing warning system?	**N/A**			
measure	Distance from the sign to 2.4m beyond the furthest rail =	**N/A**			
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?	**N/A**			
measure	Distance from the sign to the closest gate =	**N/A**	m		
observe	Does the flashing sign precede actuation of the descent of the gate arms by the time required to travel from the sign to clear closest gate?	**N/A**			
measure	Time required for all queued vehicles to resume to maximum road operating speed =	**N/A**	sec		

Comments Following Site Visit:

- No PREPARE TO STOP AT RAILWAY CROSSING Signs required.

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

Sheet 15

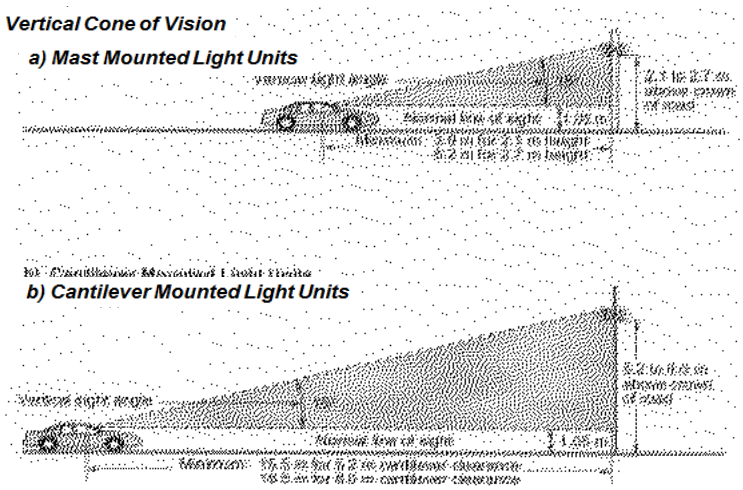
PREEMPTION OF TRAFFIC SIGNALS

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

Comments Following Site Visit:

- No TRAFIC SIGNALS located at crossing.

-functions as intended



Grade Crossings Standards, July 2014

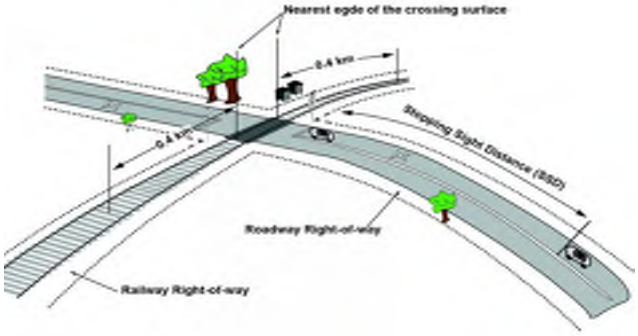
APPENDIX D – WHISTLING CESSATION

Table D-1 – Requirements for Warning Systems at Public Grade Crossings within an Area without Whistling

	Column A		Column B	
Railway Design Speed	Grade Crossings for Vehicle Use		Grade Crossings For Sidewalks, Paths, or Trails with the centreline no closer than 3.6 m (12 ft) to a warning signal for vehicles	
	No. of Tracks		No. of Tracks	
	1	2 or more	1	2 or more
Column 1	*Column 2*	*Column 3*	*Column 4*	*Column 5*
1 – 25 km/h (15 mph)	FLB	FLB	No warning system requirement	No warning system requirements
25 – 81 km/h (16 – 50 mph)	FLB	FLB & G	FLB	FLB & G
Over 81 km/h (50 mph)	FLB & G	FLB & G	FLB & G	FLB & G

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

Figure D-1 - prescribed area for whistling cessation as per article 23.1 of the RSA



RSA = Railway Safety Act of Canada

Source	Item					Reference
Rail	Is train whistling prohibited at this crossing?	**No**	24 hours?	**No**		
observe	Is there evidence of routine unauthorized access (trespassing) on the rail line in the area of the crossing?			**No**		
observe	Are the requirements of Table D-1 met?	**No**				

Comments Following Site Visit:
- Whistle Cessation not required

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:

END OF FIELD DATA FORMS