TP13536
November 1999
Novembre 1999

Proceedings of the Workshop on

Rail-Highway GRADE CROSSING RESEARCH

Compte rendu de l'Atelier sur

LA RECHERCHE SUR LES passages à niveau

Transport Canada
Transports Canada
Canada

TP 13536

Proceedings of the Workshop on Rail-Highway Grade Crossing Research

Ottawa, Ontario

18 November 1999

Compte rendu de l'Atelier sur la recherche sur les passages à niveau

Ottawa, Ontario

18 novembre 1999

The contents of these proceedings reflect the views of the speakers and not necessarily those of the workshop sponsors.

The presentations appear in the language in which they were delivered. Summaries are provided in both official languages.

The *Direction 2006* Research Committee thanks all those who helped to make the workshop a success.

Les opinions et les vues exprimées dans ce compte rendu sont celles des conférenciers et ne reflètent pas nécessairement celles des organisateurs de l'atelier.

Les exposés sont publiés dans la langue qu'ils ont été présentés. Ils sont accompagnés de sommaires rédigés dans les deux langues officielles.

Le Comité sur la recherche de *Direction 2006* tient à remercier toutes les personnes qui ont contribué à faire de l'atelier un succès.

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16. Abstract

This report contains the presentations given at the Workshop on Rail-Highway Grade Crossing Research held in Ottawa, Ontario, 18 November 1999. The workshop was organized by members of the *Direction 2006* Research Committee. The presentations focus on research and development designed to improve rail-highway grade crossing safety. Summaries are provided in both official languages.

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16. Résumé

Ce rapport rend compte des présentations faites à l'Atelier sur la recherche sur les passages à niveau qui a eu lieu à Ottawa, en Ontario, le 18 novembre 1999. Cet atelier avait été organisé par les membres du Comité sur la recherche de *Direction 2006*. Les exposés portent sur la recherche et développement en cours pour améliorer la sécurité aux passages à niveau. Chacun fait l'objet d'un sommaire en anglais et en français.

17. Mots clés	18. Diffusion
Sécurité ferroviaire, sécurité routière, recherche sur les passages à niveau	Le Centre de développement des transports dispose d'un nombre limité d'exemplaires. Courriel : *tdccdt@tc.gc.ca*

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Introduction

Chairman and moderator, Bob Nash of Canadian Pacific Railway Inc., opened the day by welcoming all participants and outlining the key research areas the workshop hoped to address.

Mr. Nash is a member of the Research Committee of *Direction 2006*, a cooperative federal initiative to reduce rail-highway grade crossing and trespassing accidents by 50 percent by 2006. He was one of the workshop organizers, along with Sesto Vespa of Transport Canada's Transportation Development Centre and Daniel Lafontaine of Transport Canada, Rail Safety, who are also on the Research Committee. The committee has endorsed and is fostering cooperative rail-highway grade crossing research.

The objectives of the workshop were to:

- kick off the Rail-Highway Grade Crossing Research Program
- set the stage for stakeholder participation and project implementation
- review proposed research projects
- solicit feedback on issues, projects, priorities, and plans
- discuss the potential for joint initiatives with stakeholders, as well as with the U.S.

À titre de président et de modérateur de l'atelier, M. Bob Nash, de CP Rail, accueille les participants et fait un survol des grands secteurs de recherche qu'il espère voir abordés au cours de la journée.

M. Nash fait partie du Comité sur la recherche de *Direction 2006*, une initiative multipartite lancée par le gouvernement fédéral, qui a pour objectif de réduire de moitié le nombre des accidents aux passages à niveau d'ici 2006. Il est l'un des organisateurs de l'atelier, avec Sesto Vespa du Centre de développement des transports de Transports Canada et Daniel Lafontaine de la Direction générale de la sécurité ferroviaire de Transports Canada, eux aussi membres du Comité sur la recherche. Le comité préconise la coopération en matière de recherche sur les passages à niveau.

L'atelier vise les objectifs suivants :

- lancer le Programme de recherche sur les passages à niveau
- établir les modalités de participation des intéressés et de mise en oeuvre des projets
- revoir les projets de recherche proposés
- prendre le pouls des intéressés sur divers points (enjeux, projets, priorités, plans)
- discuter la possibilité de mettre sur pied des initiatives conjointes avec divers partenaires, y compris les États-Unis

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Statistics: do they tell the whole story?

Mike Coghlan
Transport Canada, Rail Safety
Ottawa, Ontario

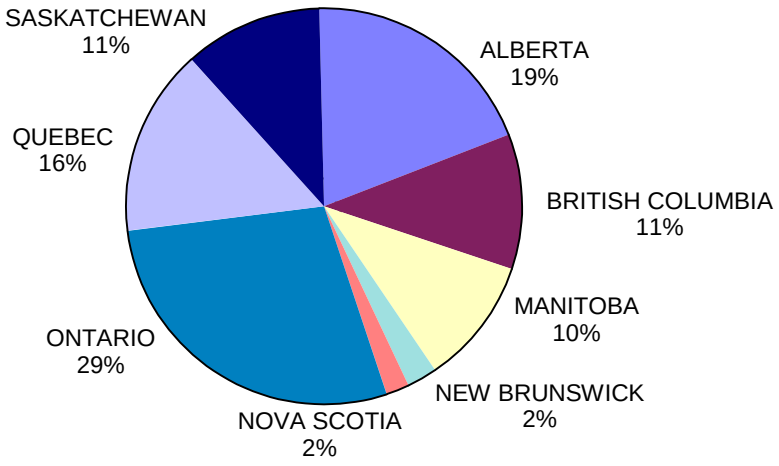
SUMMARY

Statistics have shown a general decline in accidents and fatalities at grade crossings for the entire country, particularly from 1993 on. However, pedestrian accidents and fatalities have gone up over the same period. Data collected by type of protection indicates that the majority of fatalities occur at SRCS (Standard Reflectorized Crossing Signs) and FLB (Flashing Lights and Bells) crossing types. Breaking down the data even further, it can be seen that 59 percent of pedestrian fatalities occur at FLB&G (Flashing Lights, Bells, and Gates) crossings. This demonstrates the need to break down statistics to get a more accurate understanding of rail-highway grade crossing accidents and collisions.

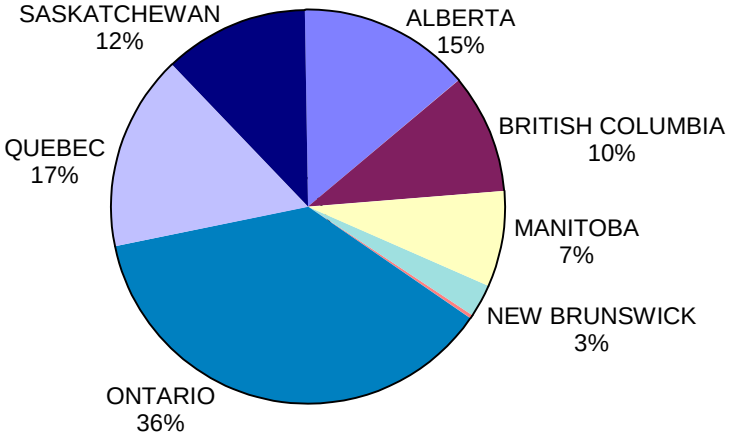
SOMMAIRE

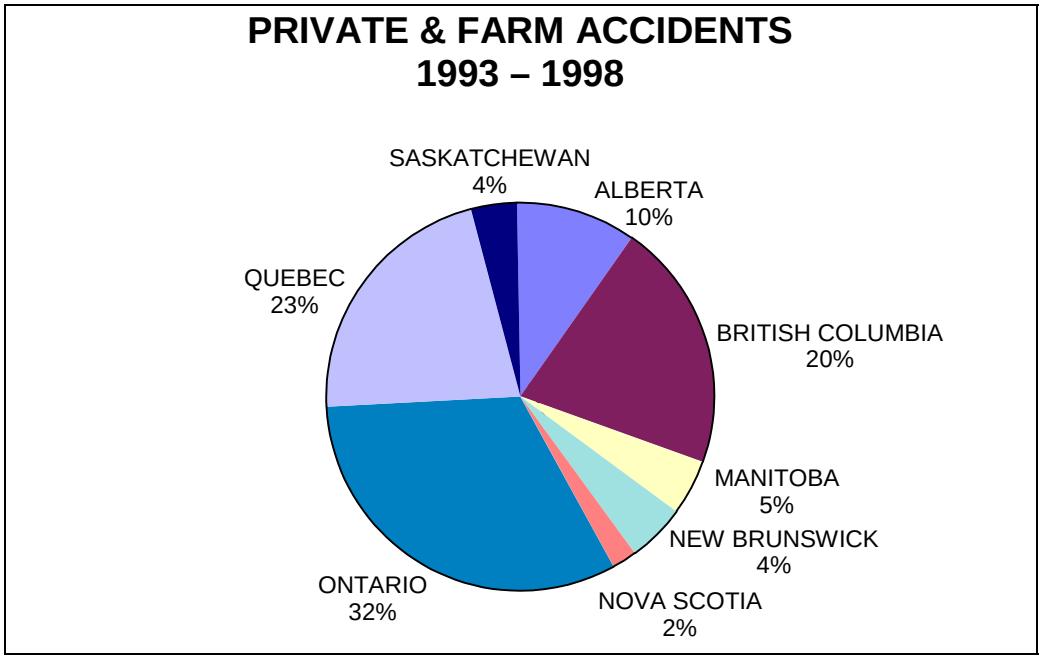
Les statistiques indiquent une diminution générale, depuis 1993, du nombre d'accidents et de tués aux passages à niveau, partout au pays. Mais le nombre de piétons tués dans des accidents ferroviaires a augmenté au cours de la même période. Les données colligées selon le type de signalisation révèlent que la majorité des accidents avec tués ont lieu aux passages équipés de croix d'avertissement réfléchissantes ordinaires et aux passages équipés de feux clignotants et d'une sonnerie. Si on examine de plus près encore les données, on se rend compte que 59 p. cent des accidents entraînant le décès de piétons surviennent à des passages équipés de feux clignotants, d'une sonnerie et d'une barrière. Cela montre la nécessité de scruter attentivement les statistiques pour obtenir un tableau plus clair des accidents aux passages à niveau.

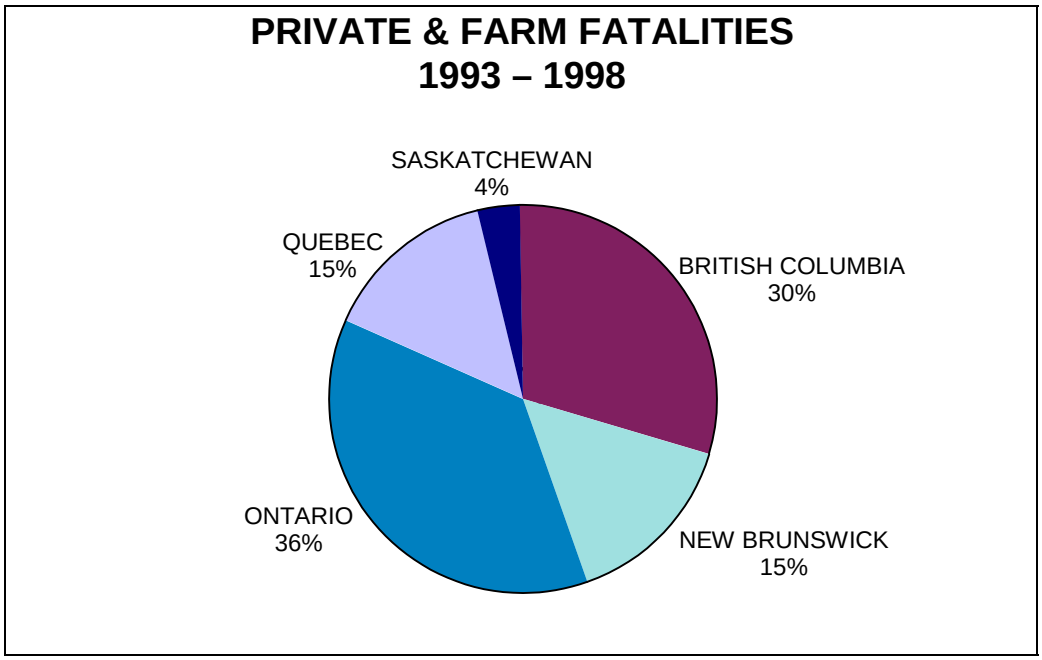
ACCIDENTS
1993 – 1998



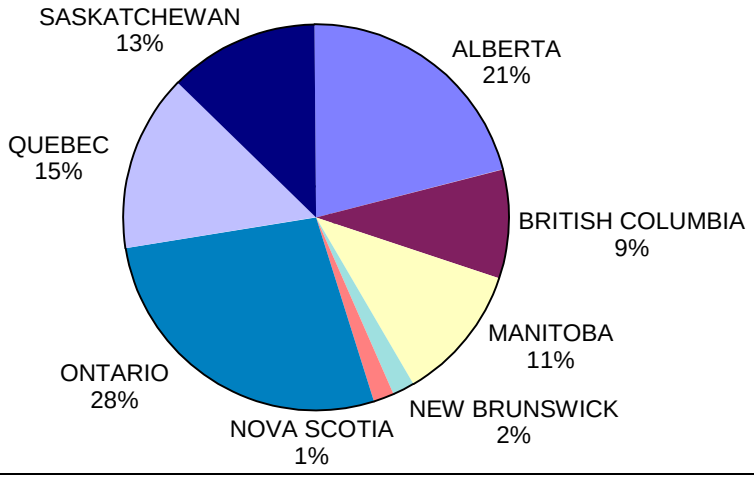
FATALITIES
1993 – 1998



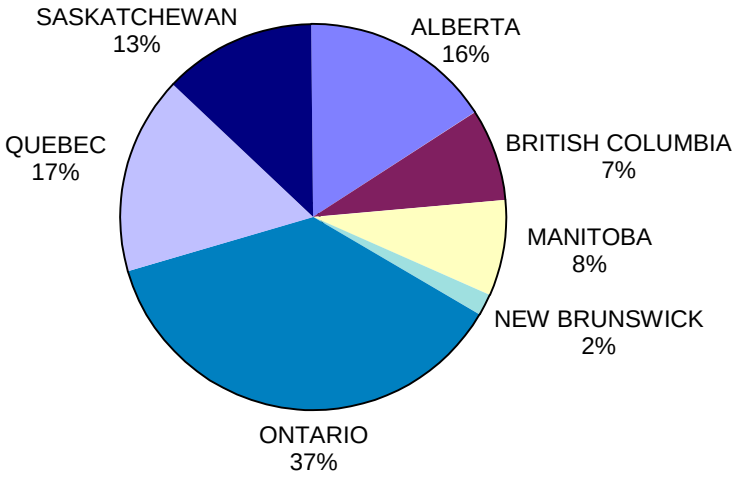

PRIVATE & FARM ACCIDENTS
1993 – 1998
SASKATCHEWAN
4%
ALBERTA
10%
QUEBEC
23%
BRITISH COLUMBIA
20%
MANITOBA
5%
NEW BRUNSWICK
4%
ONTARIO
32%
NOVA SCOTIA
2%

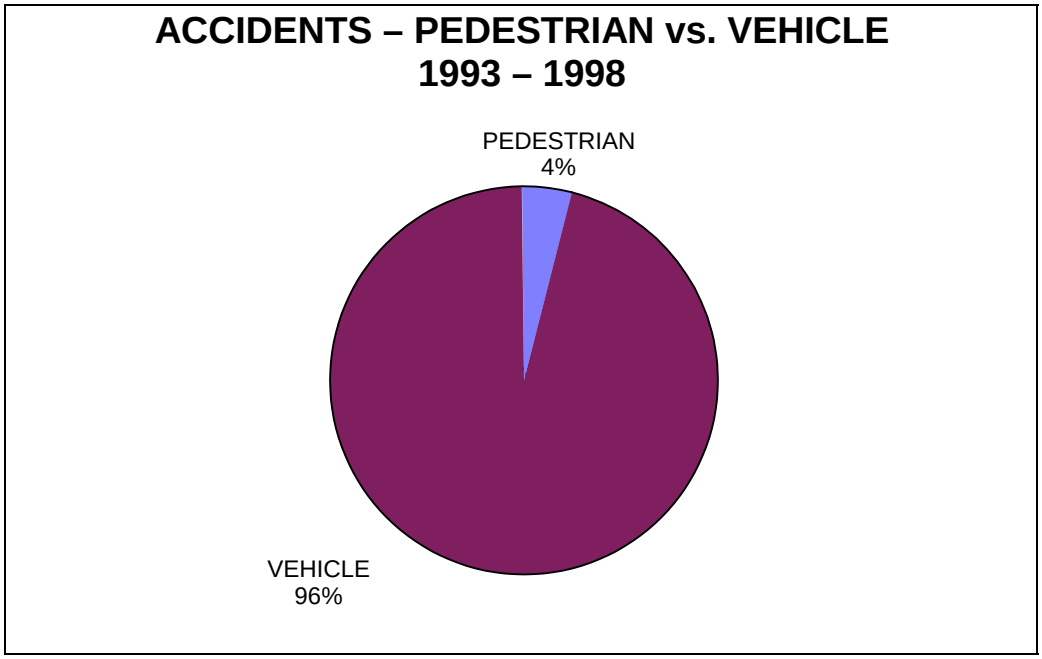

PRIVATE & FARM FATALITIES
1993 – 1998
SASKATCHEWAN
4%
QUEBEC
15%
BRITISH COLUMBIA
30%
ONTARIO
36%
NEW BRUNSWICK
15%

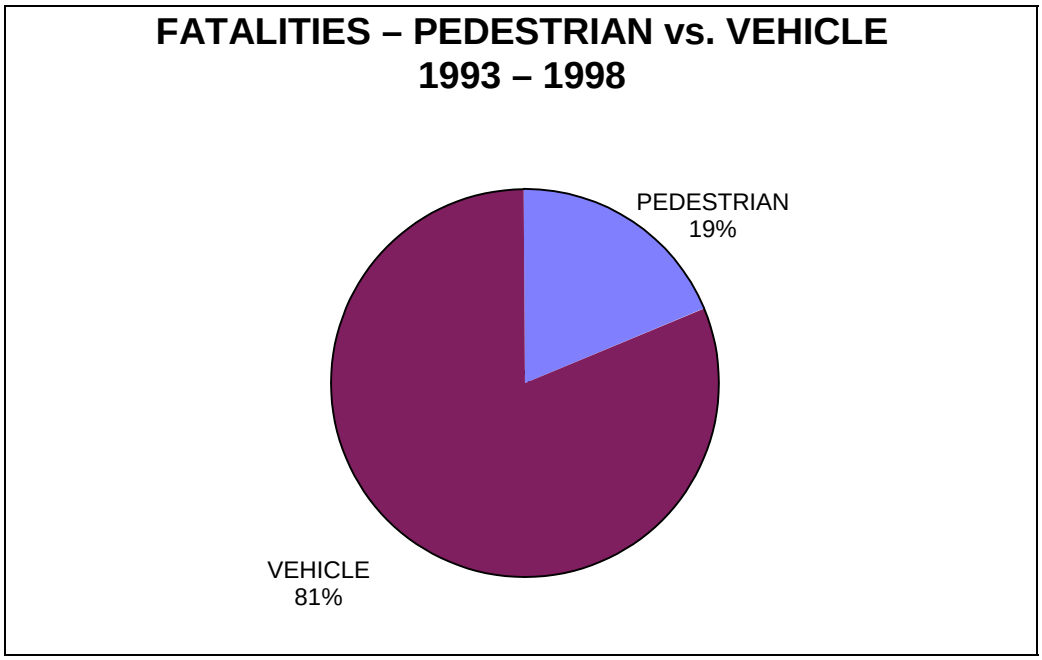
PUBLIC CROSSING ACCIDENTS by PROVINCE 1993 – 1998



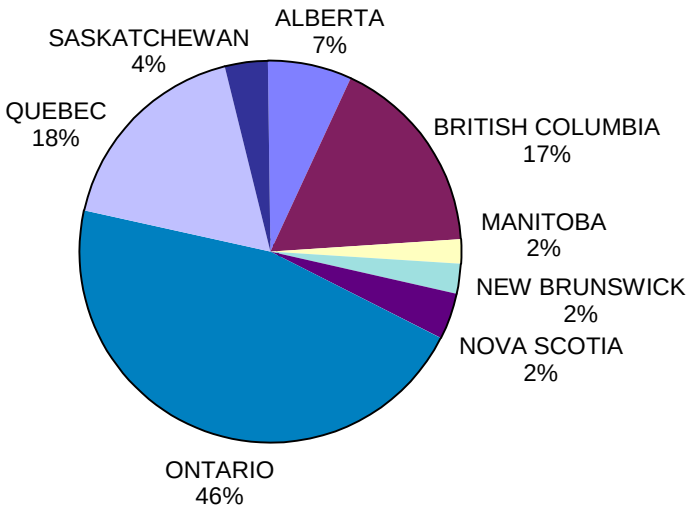
PUBLIC CROSSING FATALITIES by PROVINCE 1993 – 1998



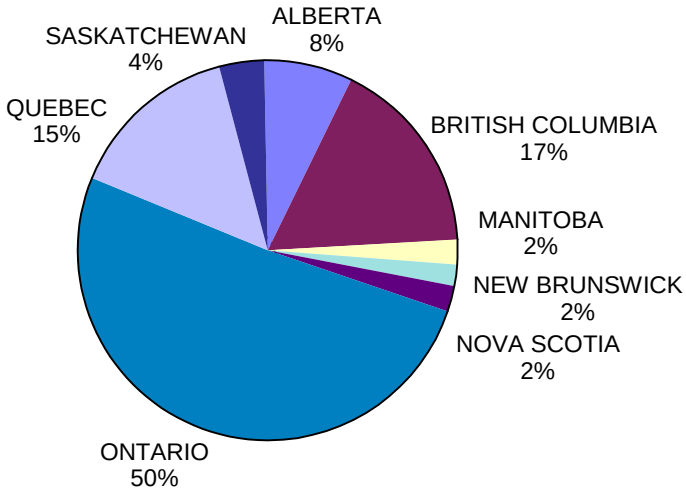

ACCIDENTS – PEDESTRIAN vs. VEHICLE
1993 – 1998
PEDESTRIAN
4%
VEHICLE
96%

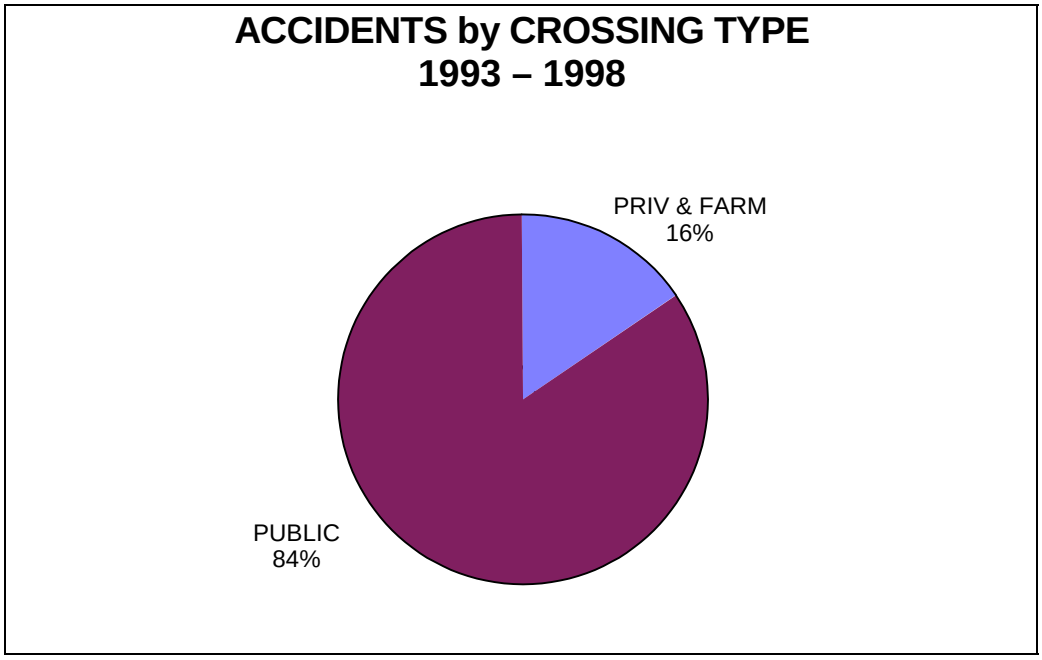

FATALITIES – PEDESTRIAN vs. VEHICLE
1993 – 1998
PEDESTRIAN
19%
VEHICLE
81%

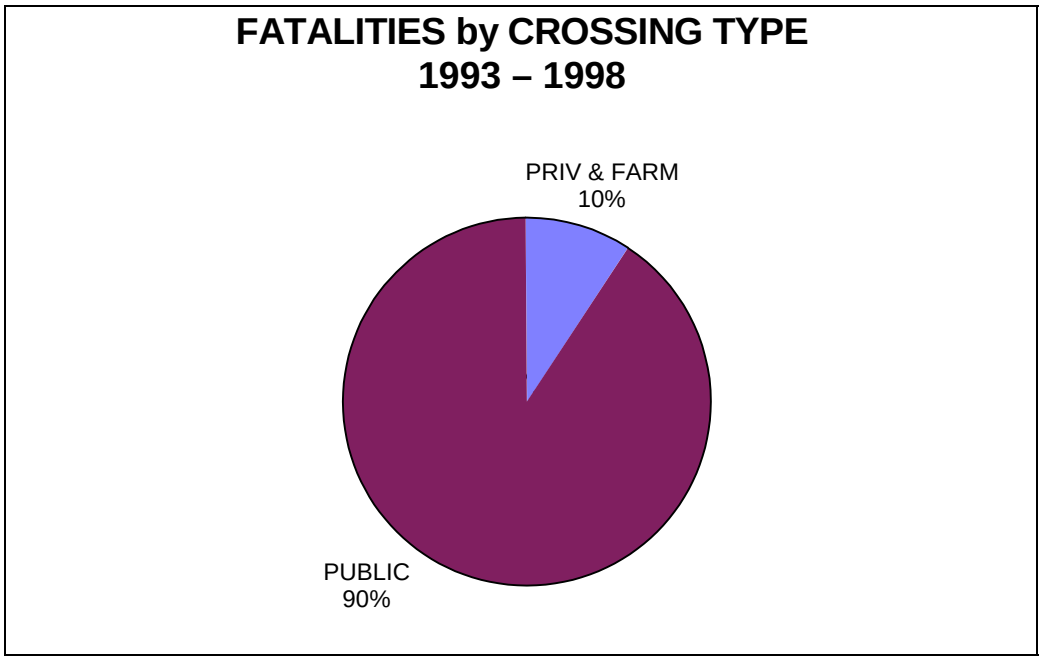
PEDESTRIAN ACCIDENTS by PROVINCE 1993 – 1998



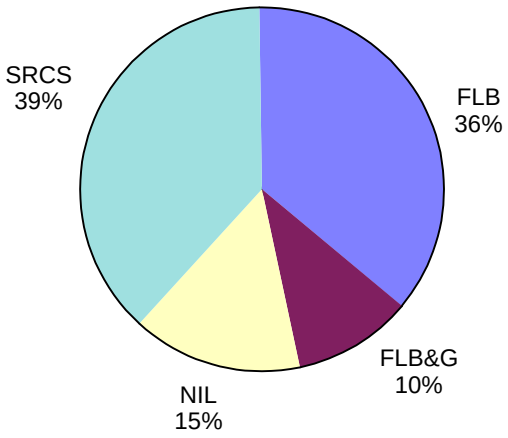
PEDESTRIAN FATALITIES by PROVINCE 1993 – 1999



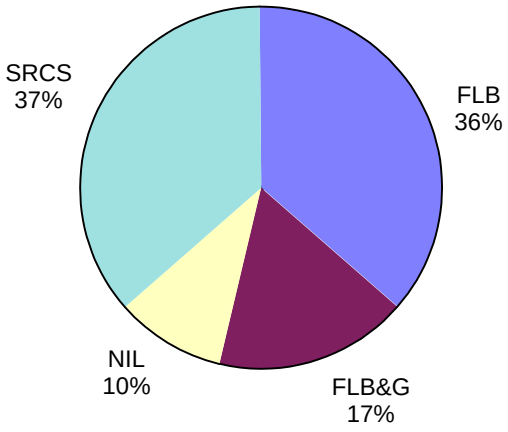

ACCIDENTS by CROSSING TYPE
1993 – 1998
PRIV & FARM
16%
PUBLIC
84%

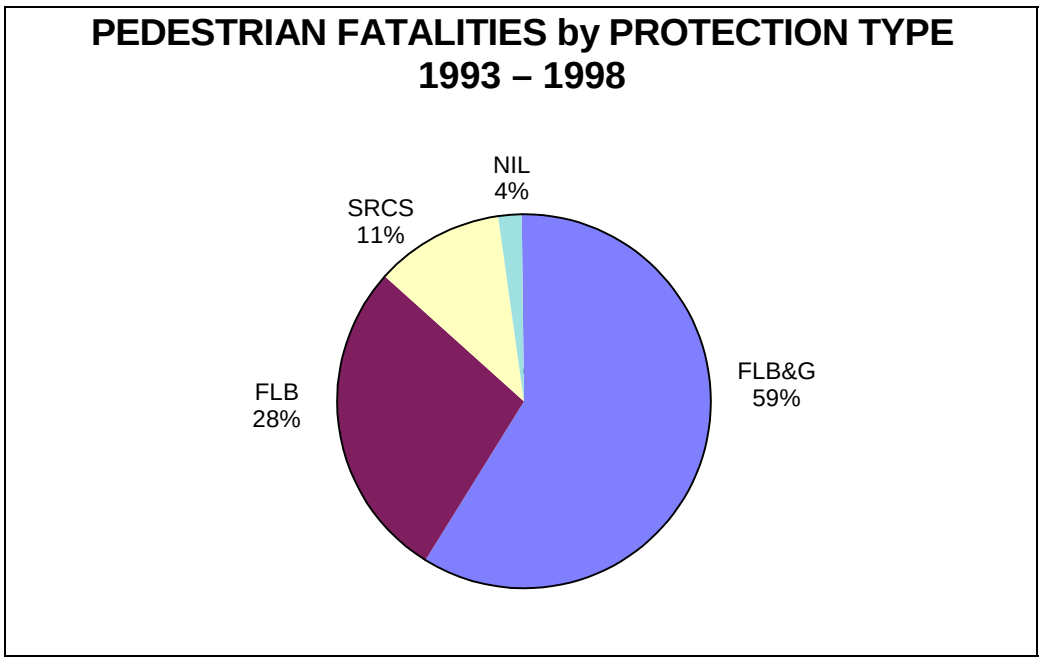

FATALITIES by CROSSING TYPE
1993 – 1998
PRIV & FARM
10%
PUBLIC
90%

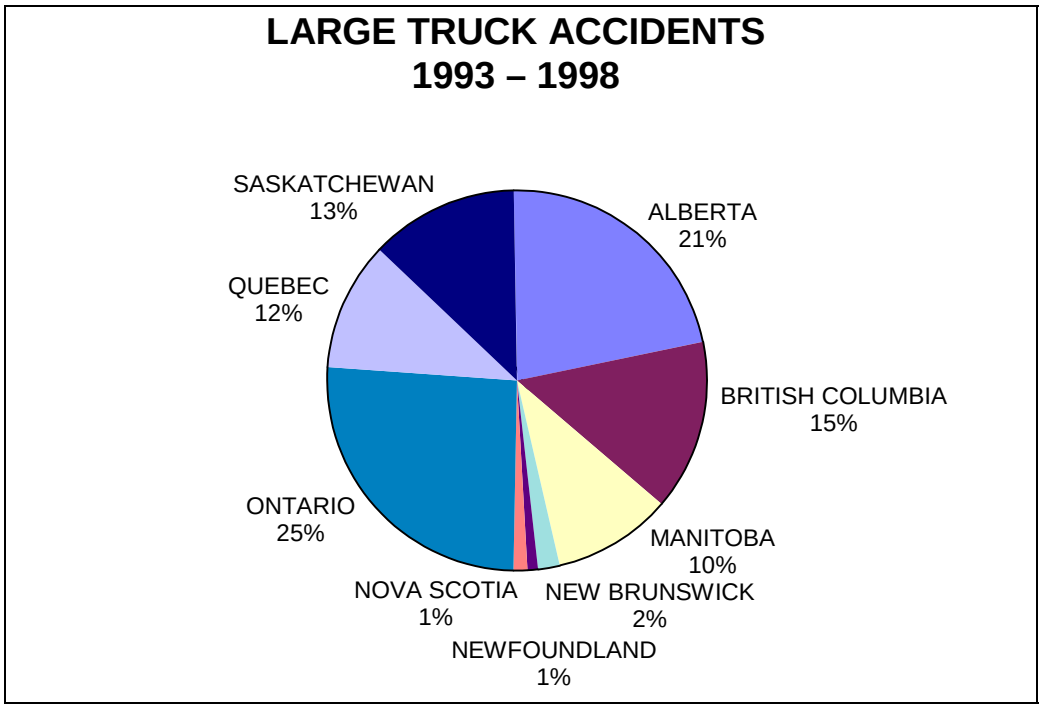
ACCIDENTS by PROTECTION TYPE
1993 – 1998

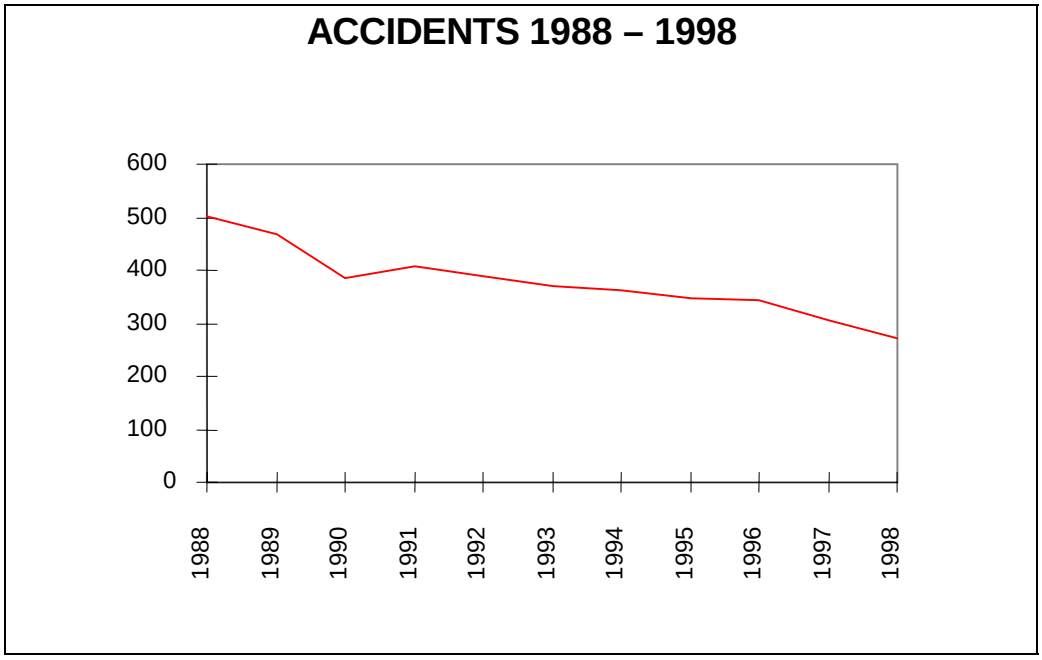


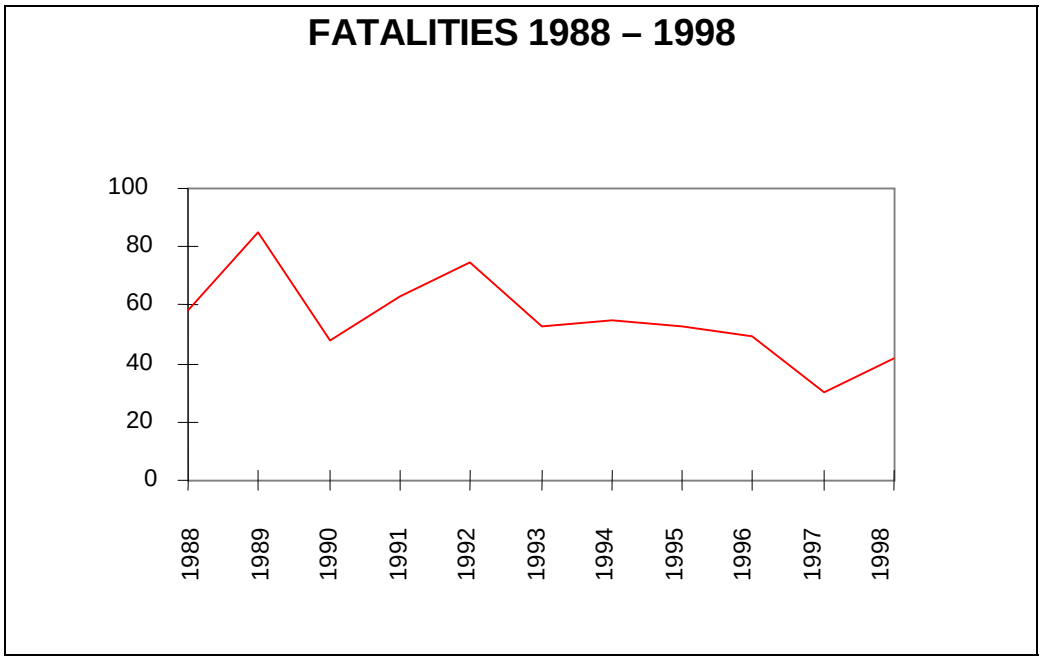
FATALITIES by PROTECTION TYPE
1993 – 1998

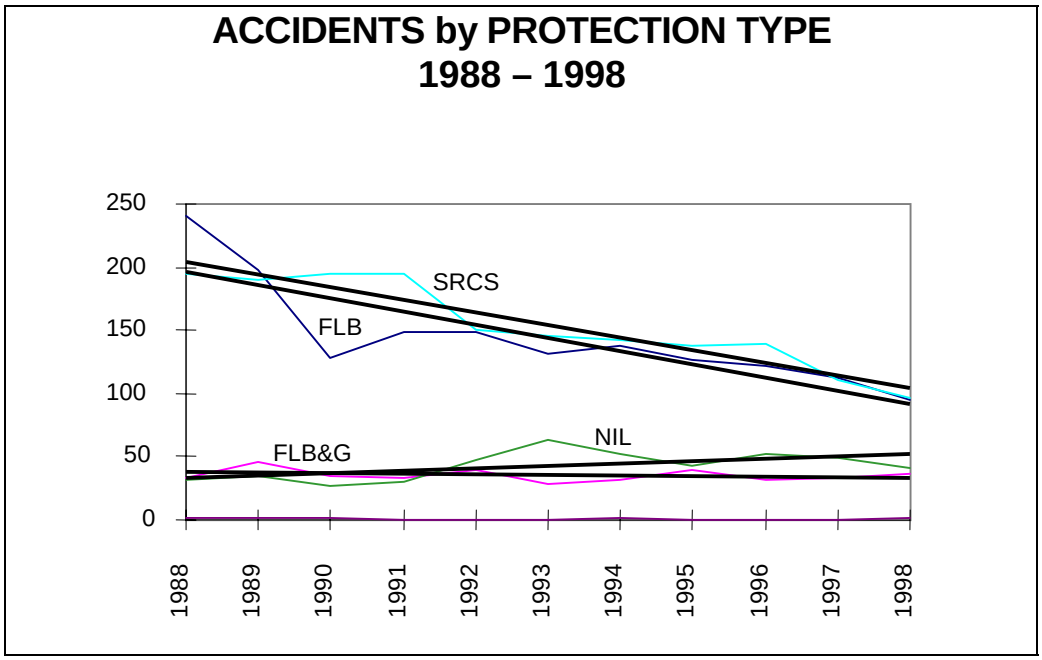


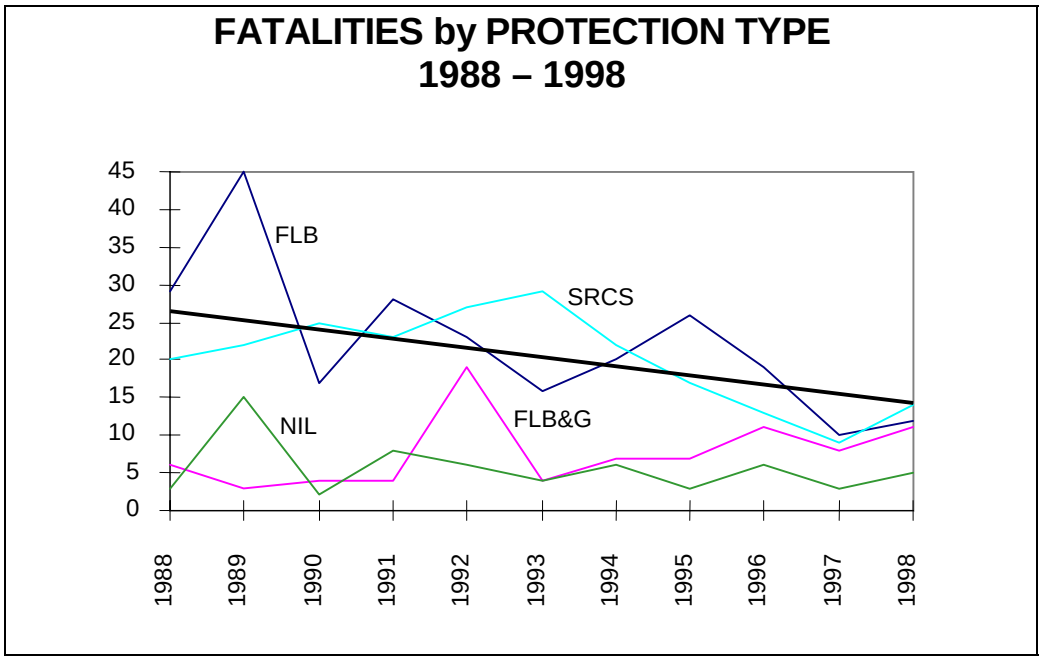

PEDESTRIAN FATALITIES by PROTECTION TYPE
1993 – 1998
NIL
4%
SRCS
11%
FLB
28%
FLB&G
59%

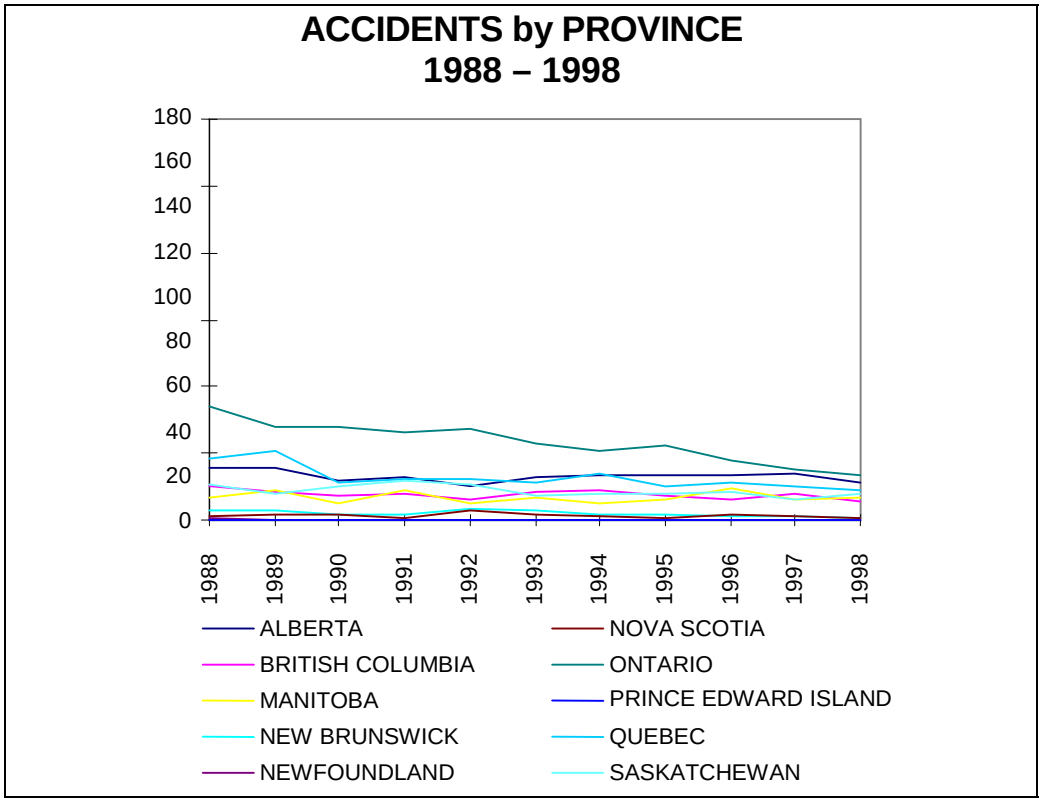

LARGE TRUCK ACCIDENTS
1993 – 1998
SASKATCHEWAN
13%
ALBERTA
21%
QUEBEC
12%
BRITISH COLUMBIA
15%
ONTARIO
25%
MANITOBA
10%
NOVA SCOTIA
1%
NEW BRUNSWICK
2%
NEWFOUNDLAND
1%

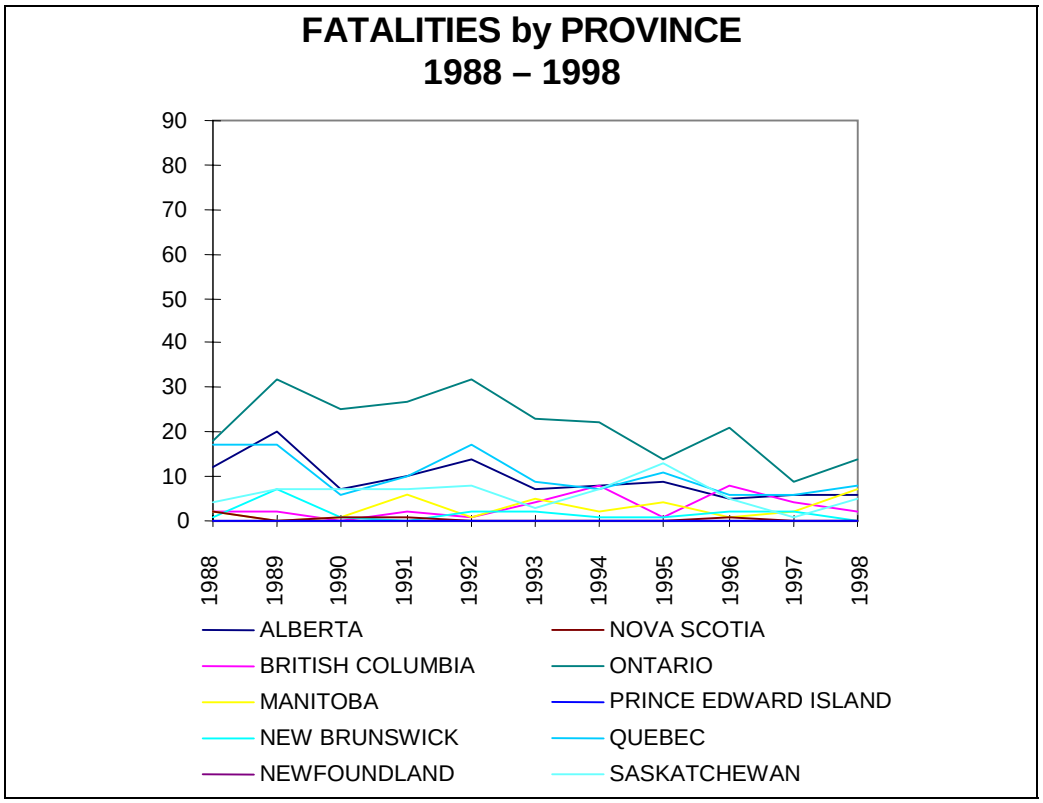

ACCIDENTS 1988 – 1998
600
500
400
300
200
100
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

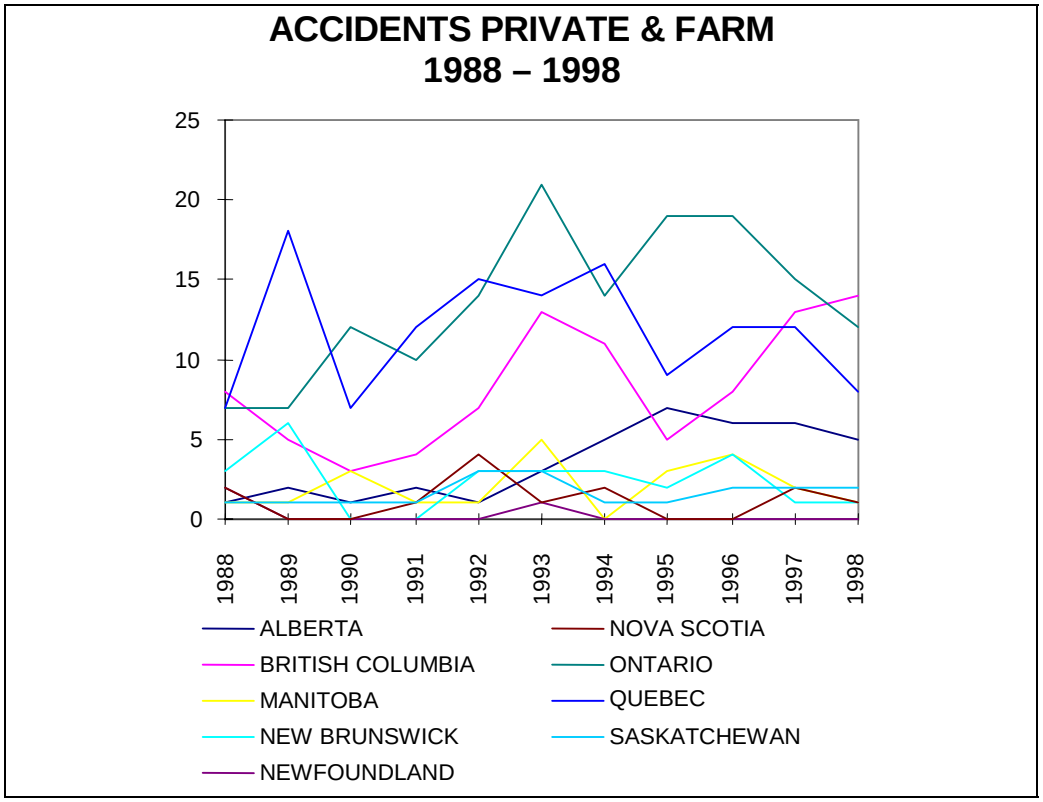

FATALITIES 1988 – 1998
100
80
60
40
20
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

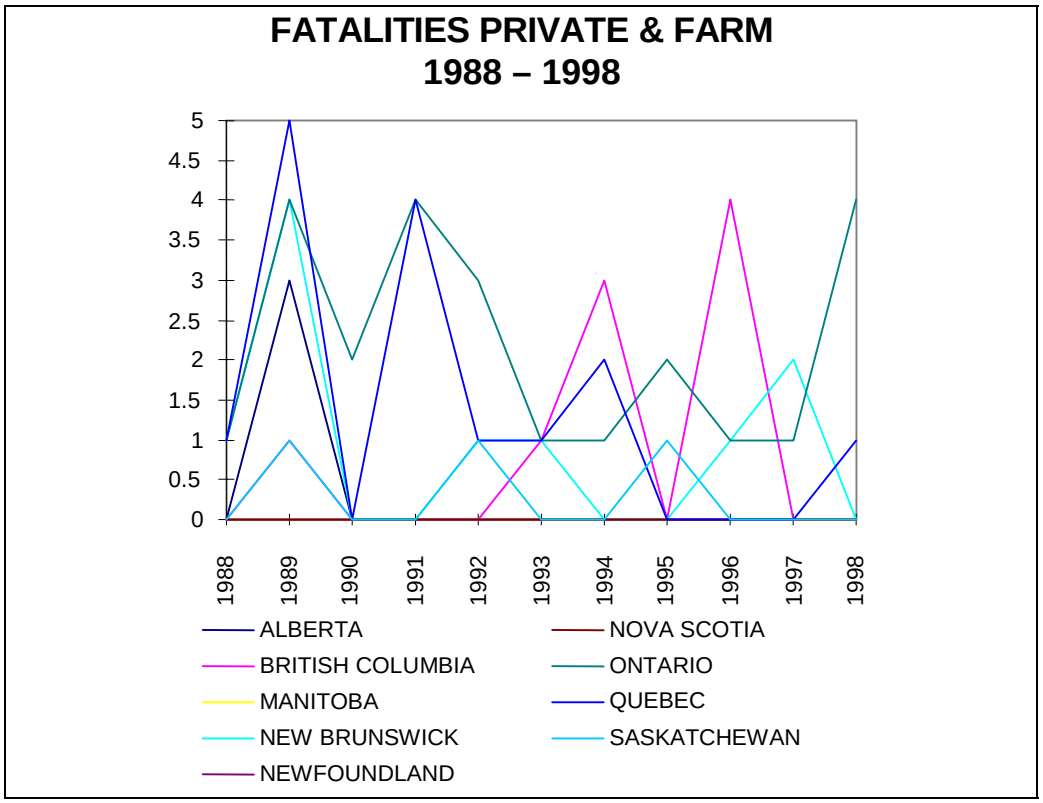

ACCIDENTS by PROTECTION TYPE
1988 – 1998
250
200
150
100
50
0
SRCS
FLB
NIL
FLB&G
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

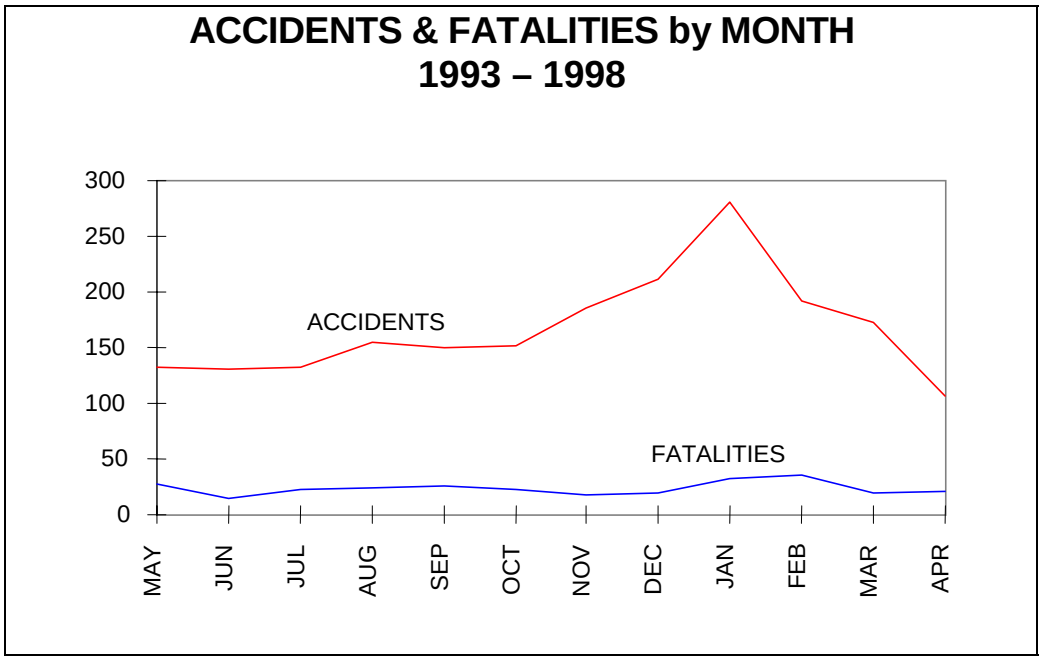

FATALITIES by PROTECTION TYPE
1988 – 1998
45
40
35
30
25
20
15
10
5
0
FLB
SRCS
NIL
FLB&G
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998

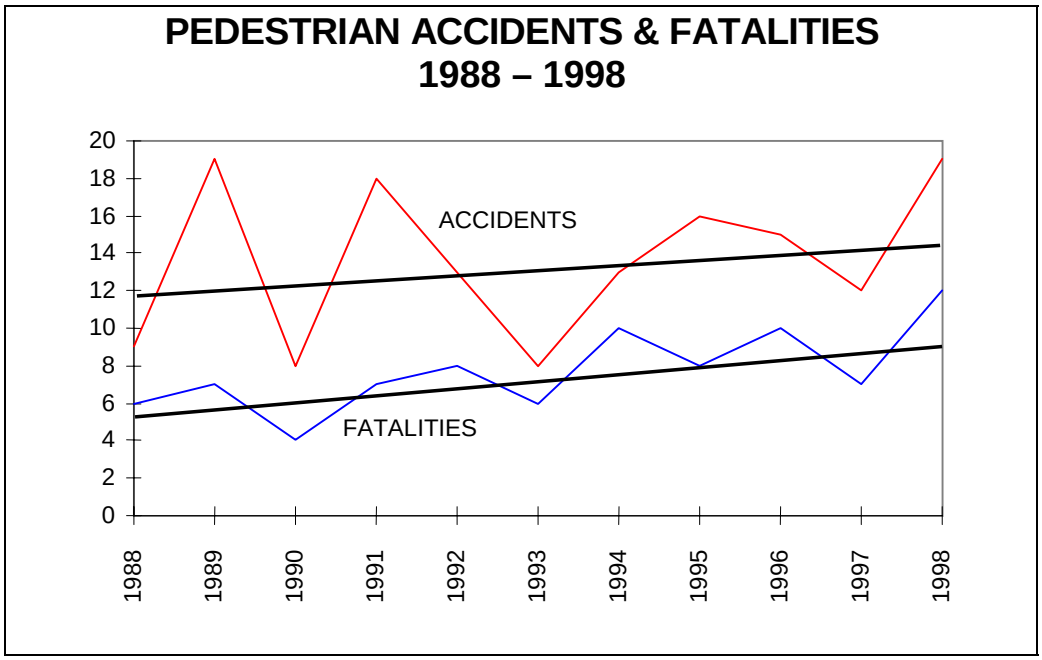

ACCIDENTS by PROVINCE
1988 – 1998
180
160
140
120
100
80
60
40
20
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
ALBERTA
NOVA SCOTIA
BRITISH COLUMBIA
ONTARIO
MANITOBA
PRINCE EDWARD ISLAND
NEW BRUNSWICK
QUEBEC
NEWFOUNDLAND
SASKATCHEWAN

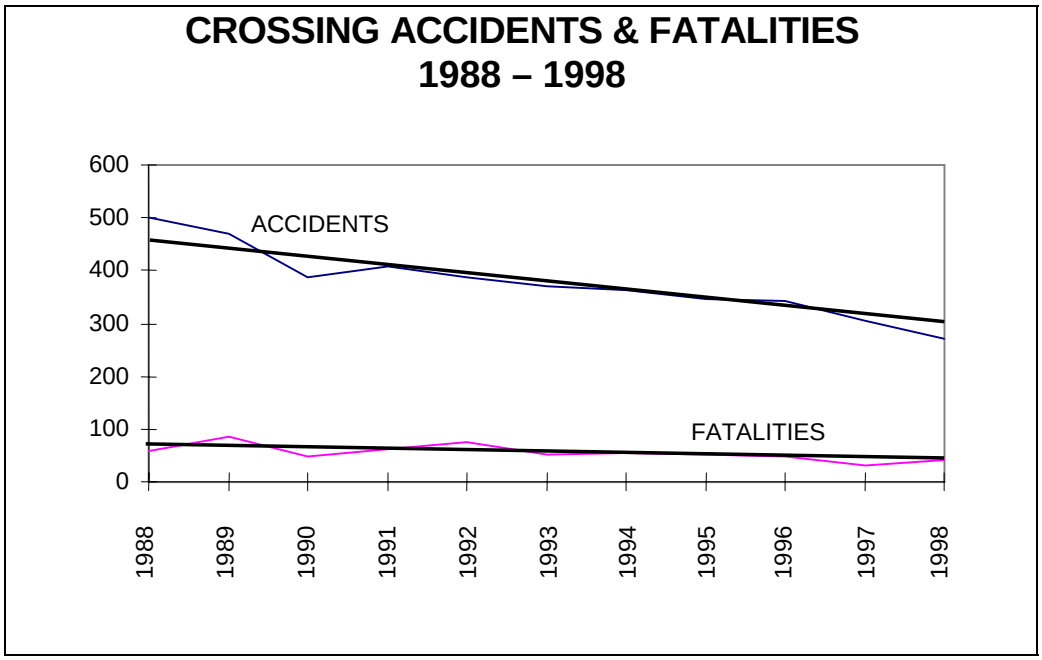

FATALITIES by PROVINCE
1988 – 1998
90
80
70
60
50
40
30
20
10
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
ALBERTA
NOVA SCOTIA
BRITISH COLUMBIA
ONTARIO
MANITOBA
PRINCE EDWARD ISLAND
NEW BRUNSWICK
QUEBEC
NEWFOUNDLAND
SASKATCHEWAN

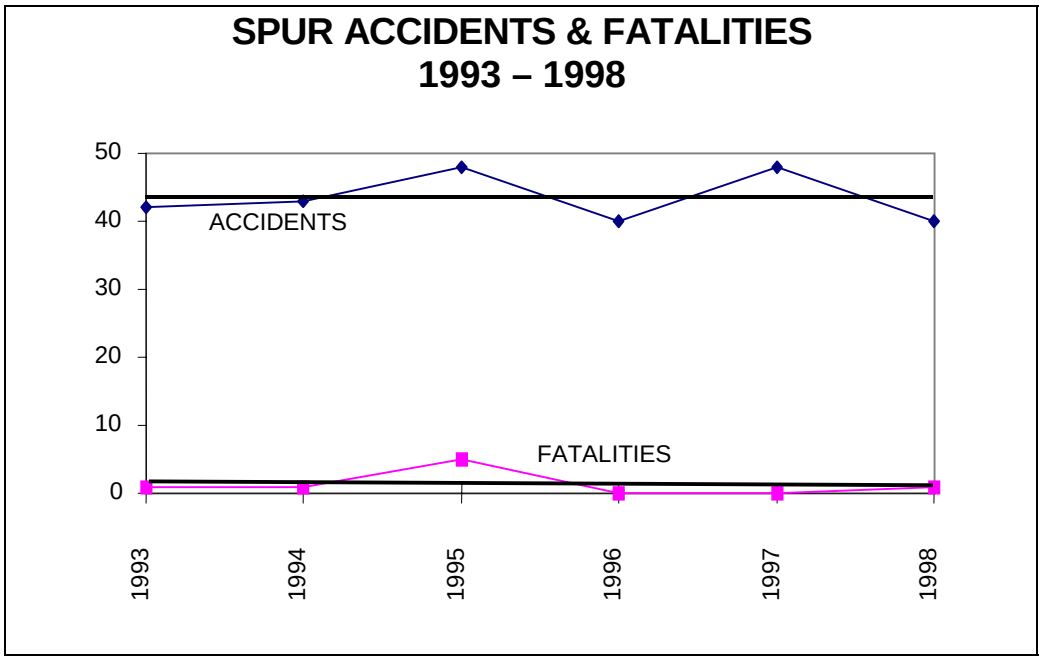

ACCIDENTS PRIVATE & FARM
1988 – 1998
25
20
15
10
5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
ALBERTA
NOVA SCOTIA
BRITISH COLUMBIA
ONTARIO
MANITOBA
QUEBEC
NEW BRUNSWICK
SASKATCHEWAN
NEWFOUNDLAND

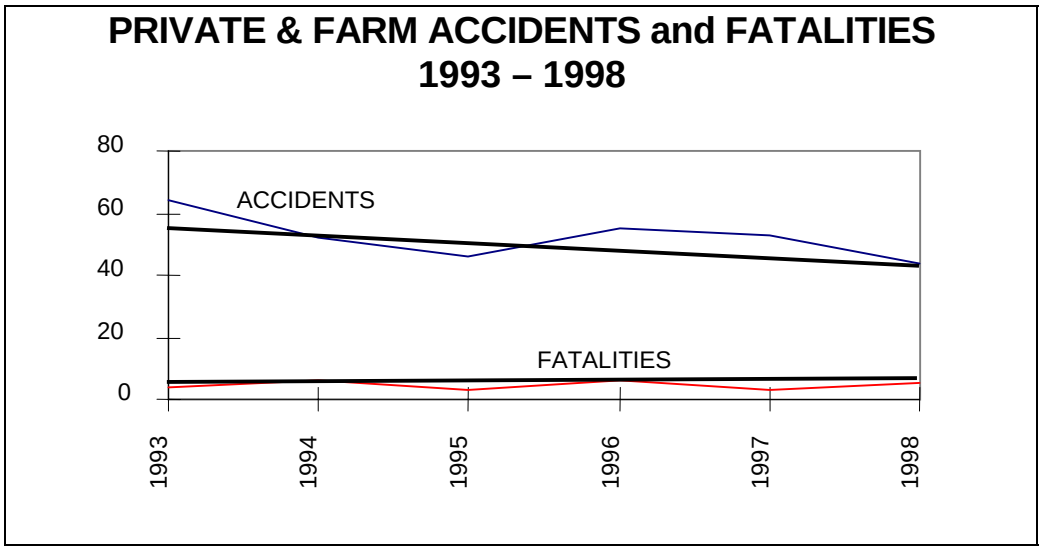

FATALITIES PRIVATE & FARM
1988 – 1998
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
ALBERTA
NOVA SCOTIA
BRITISH COLUMBIA
ONTARIO
MANITOBA
QUEBEC
NEW BRUNSWICK
SASKATCHEWAN
NEWFOUNDLAND


ACCIDENTS & FATALITIES by MONTH
1993 – 1998
300
250
200
150
100
50
0
ACCIDENTS
FATALITIES
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR


PEDESTRIAN ACCIDENTS & FATALITIES
1988 – 1998
20
18
16
14
12
10
8
6
4
2
0
ACCIDENTS
FATALITIES
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998


CROSSING ACCIDENTS & FATALITIES
1988 – 1998
600
500
400
300
200
100
0
ACCIDENTS
FATALITIES
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998


SPUR ACCIDENTS & FATALITIES
1993 – 1998
50
40
30
20
10
0
ACCIDENTS
FATALITIES
1993
1994
1995
1996
1997
1998



TYPE OF ROAD USER

On Road	ACCIDENTS	FATALITIES
EARTH MOVER	1	0
RAILWAY EQUIP	1	1
FORKLIFT	1	0
BUS	3	0
GRADER	4	1
MOTORCYCLE	4	1
VE+TRAILER	5	0
BICYCLE	6	2
MTCE EQUIP	6	0
DG TANK TRUCK	7	1
UNKNOWN	7	1
TRUCK	10	1
SNOWMOBILE	12	4
ALL TERRAIN	15	2
FARM EQUIP	29	1
OTHER	36	0
PEDESTRIAN	77	51
VAN	85	17
VEHICLE	89	8
TRACTOR TRAILER	111	5
HEAVY TRUCK	133	11
LIGHT TRUCK	422	56
AUTO	937	119
Grand Total	2001	282

Trespassers: who they are and what they do

Mark Zadarnowski
Transport Canada, Rail Safety
Ottawa, Ontario

SUMMARY

Statistics for 1986-1998 indicate that the frequency of trespassing has not demonstrated a steady or permanent decline. Further analysis shows that the critical age groups for trespassers are 16-20 and 21-25, and that approximately 87 percent are male. Trespassing incidents have led to serious injuries and fatalities: 52 percent of reported trespassing incidents were fatal. Suicide rates for females and males were 26 percent and 74 percent respectively.

SOMMAIRE

Les statistiques de la période 1986 à 1998 ne dénotent pas de déclin persistant du nombre des intrusions sur les emprises ferroviaires. Une analyse plus poussée révèle que les intrusions sont surtout le fait des 16 à 20 ans et des 21 à 25 ans, qui sont de sexe masculin dans 87 p. cent des cas. Ces intrusions sont la cause de blessures graves et de décès : 52 p. cent des intrusions signalées se sont soldées par le décès de l'intrus. Il s'agissait d'un suicide pour 26 p. cent des personnes de sexe féminin, et pour 74 p. cent des personnes de sexe masculin.

TRANSPORT CANADA

TRESPASSING INCIDENTS

	86			87			88			89			90			91			92			93		
	F	I	A	F	I	A	F	I	A	F	I	A	F	I	A	F	I	A	F	I	A	F	I	A
AL	4	4	8	6	8	14	7	4	11	6	8	13	10	7	17	3	6	9	4	10	13	3	3	6
BC	3	9	12	6	12	16	3	17	19	8	15	20	11	8	16	8	8	16	6	9	14	8	8	16
MA	1	3	4	2	1	3	0	4	4	3	1	4	2	2	5	0	0	0	1	2	3	2	1	3
NB	2	1	3	0	0	0	0	1	1	2	2	4	0	1	1	0	0	0	0	0	0	3	2	5
NF	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NS	0	1	1	1	0	1	0	0	0	1	1	2	0	3	3	1	0	1	0	1	1	1	2	3
ON	21	16	37	20	20	40	23	28	50	20	12	30	22	13	33	34	21	53	32	14	44	27	22	47
QU	7	9	15	6	4	10	12	8	19	5	3	8	4	3	7	10	2	12	11	11	20	10	6	16
SA	0	2	2	2	1	3	2	2	4	2	5	7	1	3	4	0	4	4	3	1	4	1	7	8
TOT	38	45	82	44	46	88	47	64	10	47	47	88	50	40	86	56	41	95	57	48	99	55	51	10

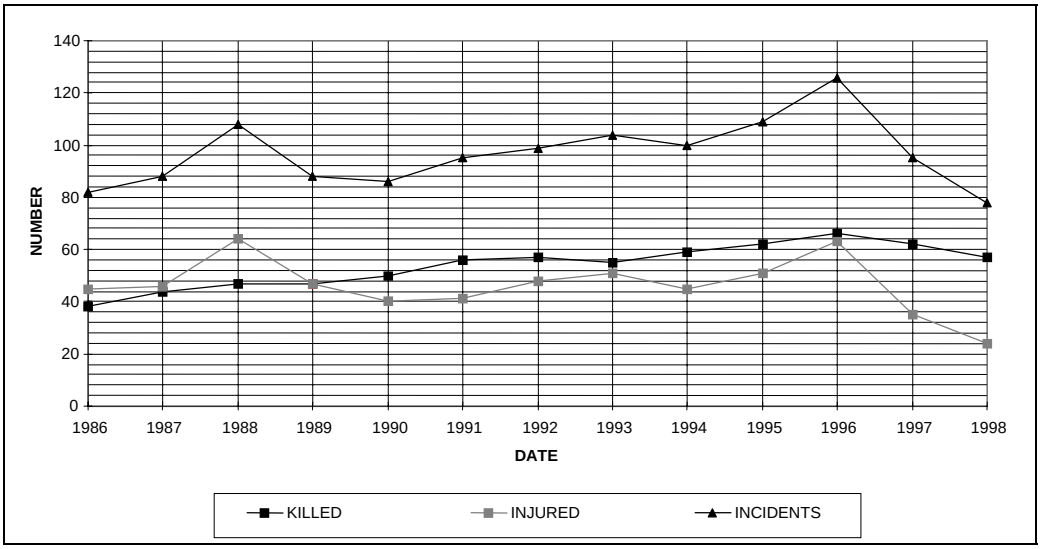
	94			95			96			97			98			99		
	F	I	A	F	I	A	F	I	A	F	I	A	F	I	A	F	I	A
AL	4	8	12	6	7	12	3	5	8	3	4	7	7	4	11			
BC	4	5	9	2	8	9	11	10	20	14	6	19	7	5	12			
MA	2	5	7	4	8	12	0	1	1	4	0	4	3	2	5			
NB	0	0	0	6	0	6	3	1	4	0	0	0	0	0	0			
NF	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0			
NS	1	0	1	0	0	0	1	2	3	0	0	0	0	0	0			
ON	33	14	43	26	16	41	32	24	55	29	17	46	29	8	34			
QU	12	13	25	16	11	26	14	17	31	10	5	15	10	4	14			
SA	3	0	3	2	1	3	1	2	3	2	3	4	1	0	1			
TOT	59	45	10	62	51	10	66	63	12	62	35	95	57	24	78			

TRANSPORT CANADA

TRESPASSING INCIDENTS 1986 – 1998

X	KILLED	INJURED	INCIDENTS
1986	38	45	82
1987	44	46	88
1988	47	64	108
1989	47	47	88
1990	50	40	86
1991	56	41	95
1992	57	48	99
1993	55	51	104
1994	59	45	100
1995	62	51	109
1996	66	63	126
1997	62	35	95
1998	57	24	78
1999	**54**	**29**	**82**

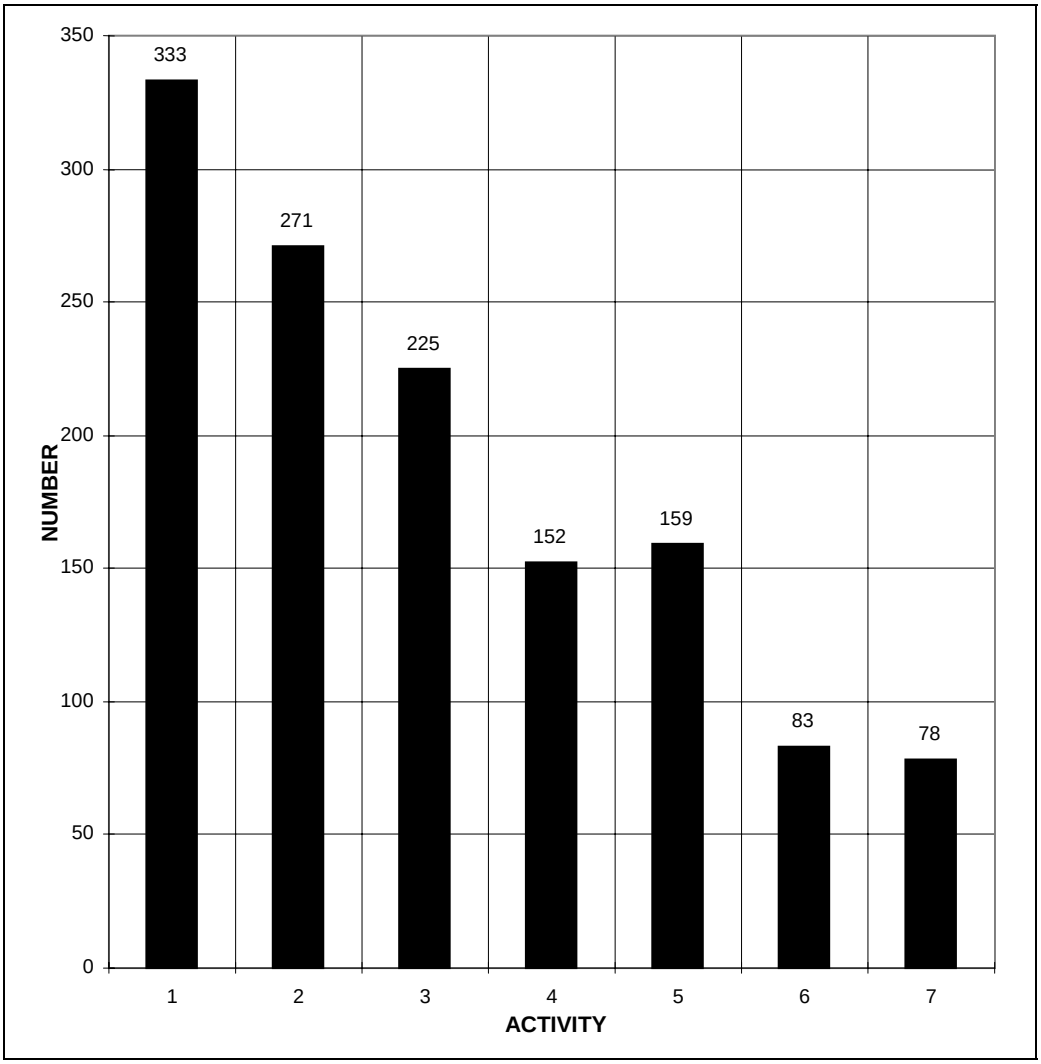
< till October 27, 1999



TRANSPORT CANADA

TRESPASSING INCIDENTS 1986 – 1998 by ACTIVITY

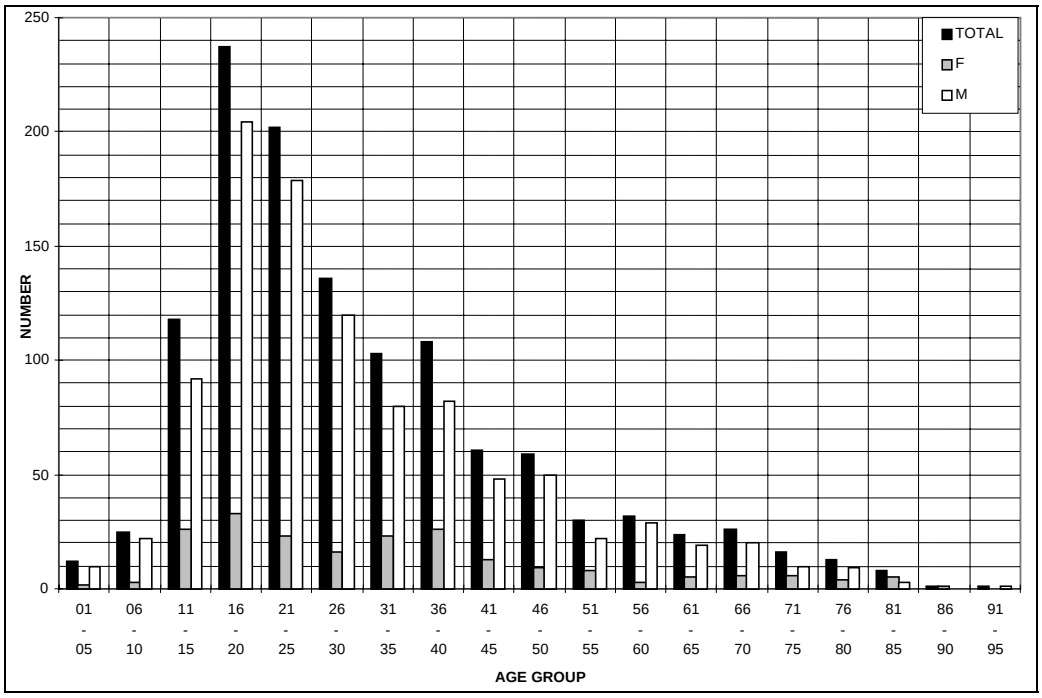
ACTIVITY	No.	%	Description
1	333	26	sitting, lying, standing, sleeping
2	271	21	walking, crossing, playing
3	225	17	found on R/W, struck by train
4	152	12	climbing, crossing through, crawling, falling off
5	159	12	running against, throwing self
6	83	6	snowmobiles, vehicles, ATVs, motorcycles, bicycles
7	78	6	bridges, overpasses, tunnels
	1301	**100**	



TRANSPORT CANADA

TRESPASSING INCIDENTS 1986 – 1998 by AGE

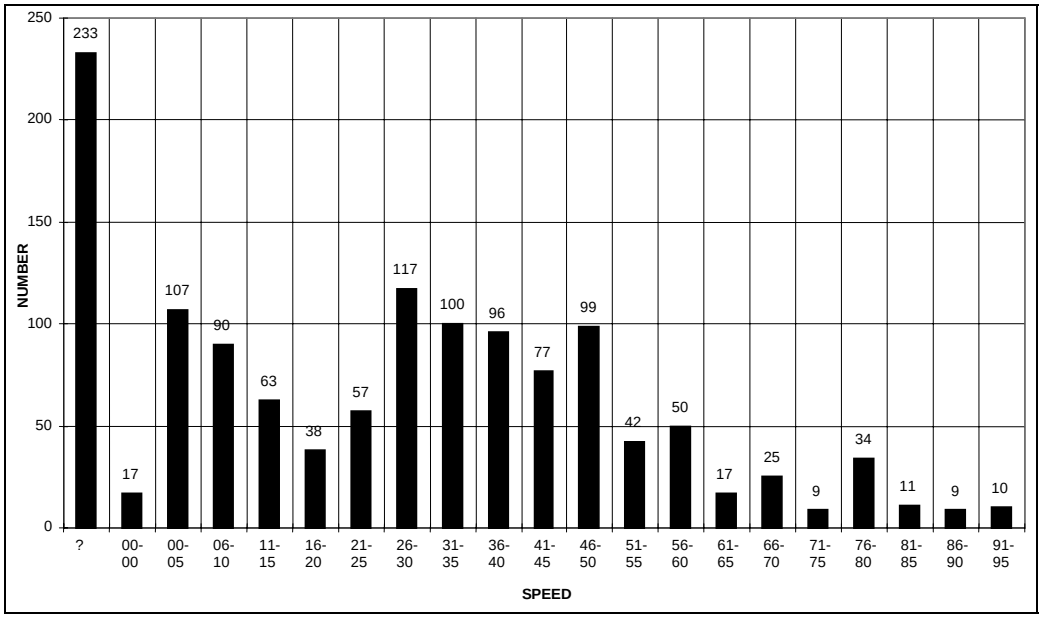
AGE	TOTAL	F	M
01 - 05	12	2	10
06 - 10	25	3	22
11 - 15	118	26	92
16 - 20	237	33	204
21 - 25	202	23	179
26 - 30	136	16	120
31 - 35	103	23	80
36 - 40	108	26	82
41 - 45	61	13	48
46 - 50	59	9	50
51 - 55	30	8	22
56 - 60	32	3	29
61 - 65	24	5	19
66 - 70	26	6	20
71 - 75	16	6	10
76 - 80	13	4	9
81 - 85	8	5	3
86 - 90	1	1	0
91 - 95	1	0	1
	1212	**212**	**1000**



TRANSPORT CANADA

TRESPASSING INCIDENTS 1986 – 1998 by SPEED

SPEED	No.	%
?	233	17.9
00-00	17	1.3
00-05	107	8.2
06-10	90	6.9
11-15	63	4.8
16-20	38	2.9
21-25	57	4.4
26-30	117	9.0
31-35	100	7.7
36-40	96	7.5
41-45	77	5.9
46-50	99	7.7
51-55	42	3.2
56-60	50	3.8
61-65	17	1.3
66-70	25	1.9
71-75	9	0.7
76-80	34	2.6
81-85	11	0.8
86-90	9	0.7
91-95	10	0.8
	1301	**100**

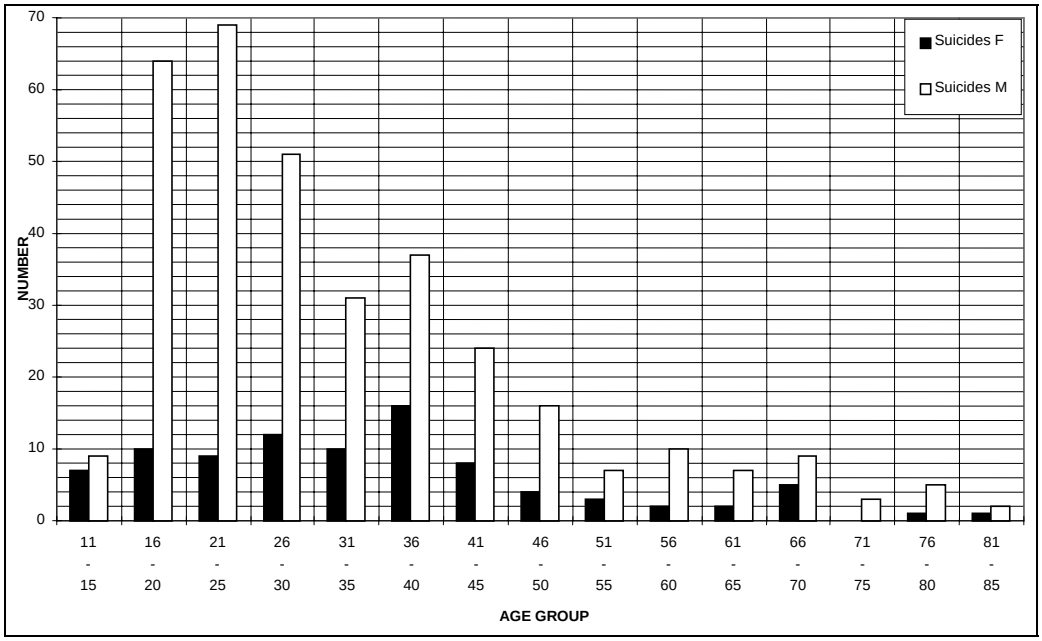


TRANSPORT CANADA

SUSPECTED SUICIDES 1986 – 1998 by AGE M&F

AGE	Suicides F	Suicides M
11 - 15	7	9
16 - 20	10	64
21 - 25	9	69
26 - 30	12	51
31 - 35	10	31
36 - 40	16	37
41 - 45	8	24
46 - 50	4	16
51 - 55	3	7
56 - 60	2	10
61 - 65	2	7
66 - 70	5	9
71 - 75	0	3
76 - 80	1	5
81 - 85	1	2
	90	344 *
	26%	**74%**

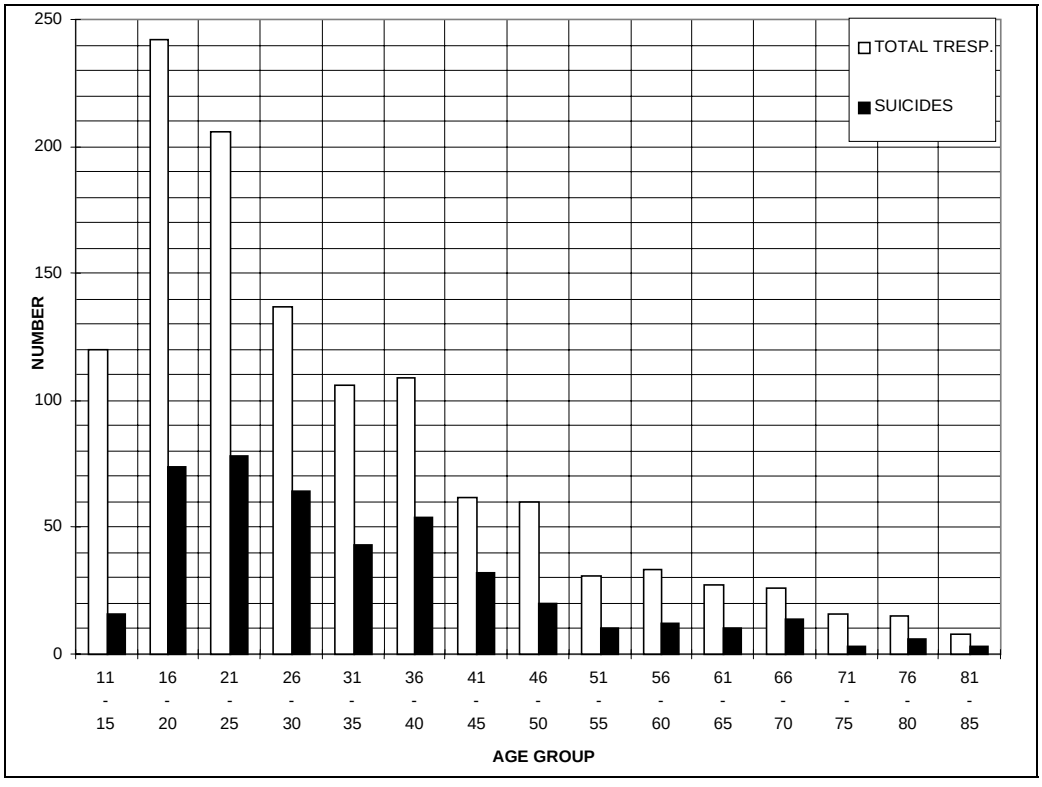
* 5 unknown gender



TRANSPORT CANADA

SUSPECTED SUICIDES 1986 – 1998 between AGES 11 – 85

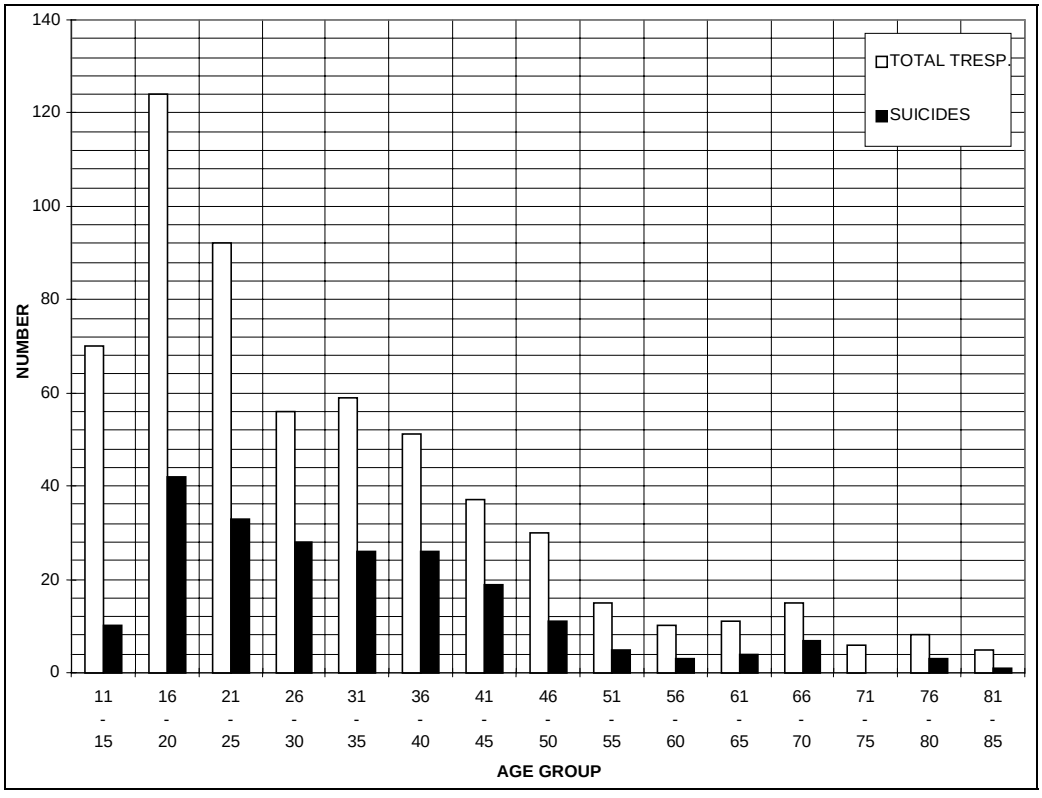
86 – 98			
AGE	**TOTAL TRESP.**	**SUICIDES**	**%**
11 - 15	120	16	13%
16 - 20	242	74	31%
21 - 25	206	78	38%
26 - 30	137	64	47%
31 - 35	106	43	41%
36 - 40	109	54	50%
41 - 45	62	32	52%
46 - 50	60	20	33%
51 - 55	31	10	32%
56 - 60	33	12	36%
61 - 65	27	10	37%
66 - 70	26	14	54%
71 - 75	16	3	19%
76 - 80	15	6	40%
81 - 85	8	3	38%
	1198	**439**	**37%**



TRANSPORT CANADA

SUSPECTED SUICIDES 1993 – 1998 AGES 11 – 85

93 - 98			
AGE	**TOTAL TRESP.**	**SUICIDES**	**%**
11 - 15	70	10	14%
16 - 20	124	42	34%
21 - 25	92	33	36%
26 - 30	56	28	50%
31 - 35	59	26	44%
36 - 40	51	26	51%
41 - 45	37	19	51%
46 - 50	30	11	37%
51 - 55	15	5	33%
56 - 60	10	3	30%
61 - 65	11	4	36%
66 - 70	15	7	47%
71 - 75	6	0	0%
76 - 80	8	3	37%
81 - 85	5	1	20%
	589	**218**	**35%**



TRANSPORT CANADA

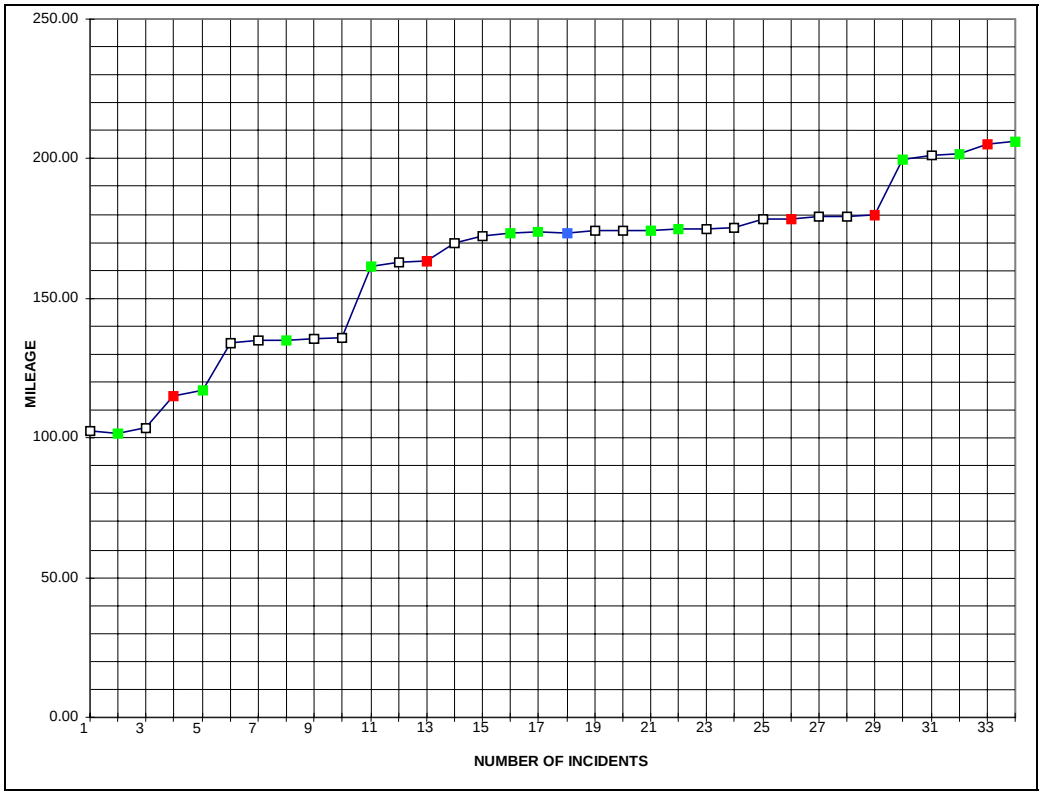
CP BELLEVILLE S/D

No.	Mile	
1	102.60	
2	101.70	
3	103.70	
4	115.14	
5	117.20	
6	134.00	
7	134.98	
8	135.00	
9	135.30	
10	135.75	
11	161.20	
12	162.90	

No.	Mile	
13	163.40	
14	170.00	
15	172.10	
16	173.32	
17	173.80	
18	173.30	
19	174.20	
20	174.20	
21	174.20	
22	174.80	
23	175.00	
24	175.10	

No.	Mile	
25	178.27	
26	178.50	
27	179.10	
28	179.43	
29	180.00	
30	199.48	
31	201.00	
32	201.70	
33	205.00	
34	206.25	

86-93 **94-97** **98** **99**



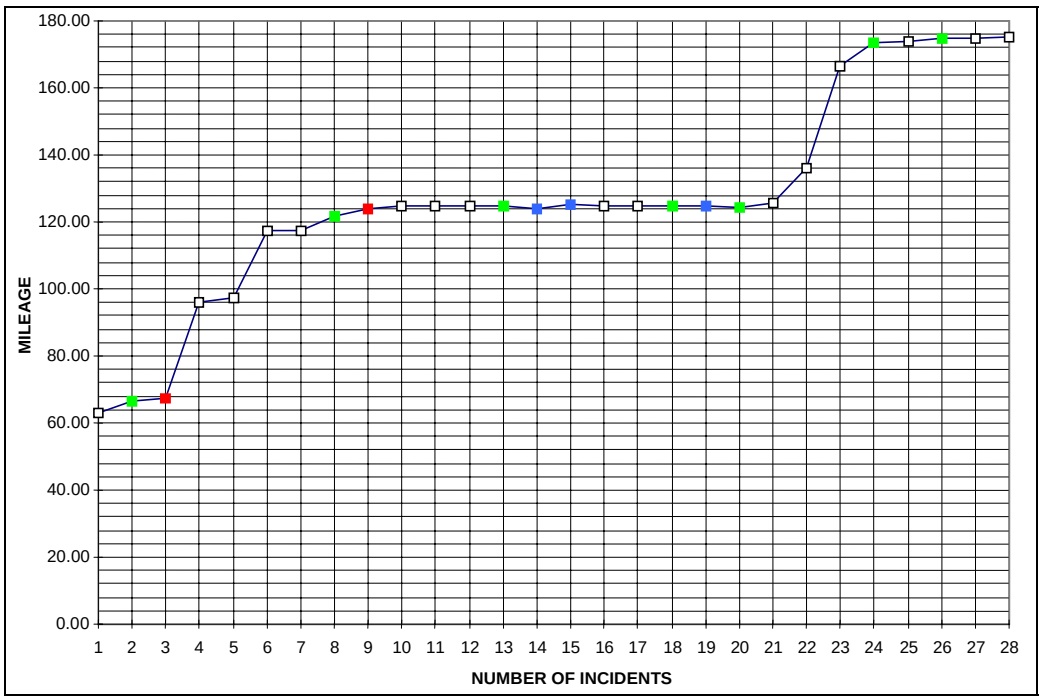
TRANSPORT CANADA

CP BROOKS S/D

No.	Mile	
1	63.20	
2	66.40	
3	67.28	
4	96.00	
5	97.60	
6	117.20	
7	117.20	
8	121.70	
9	124.00	
10	124.70	
11	124.70	
12	124.70	
13	124.70	
14	124.72	

No.	Mile	
15	124.76	
16	124.86	
17	124.90	
18	124.90	
19	125.00	
20	125.10	
21	125.50	
22	136.00	
23	166.40	
24	173.30	
25	174.00	
26	174.80	
27	174.88	
28	175.80	

86-93 **94-97** **98** **99**

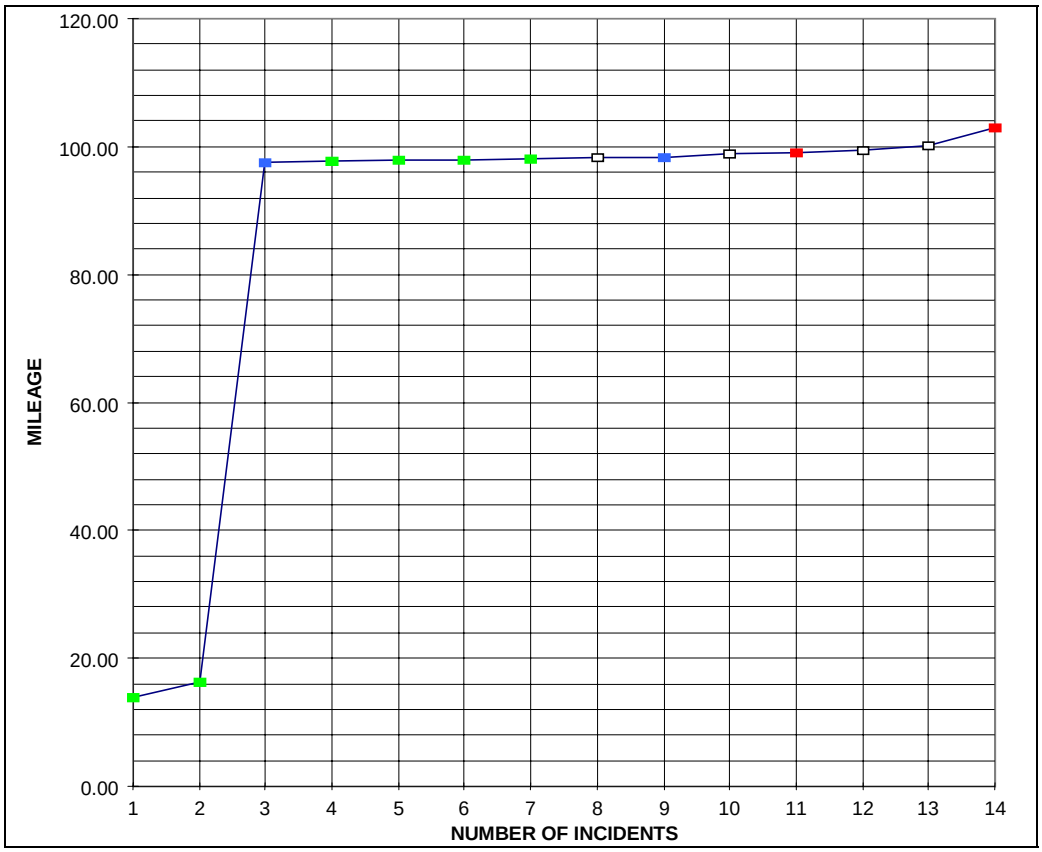


TRANSPORT CANADA

CN DRUMMONDVILLE S/D

No.	Mile	
1	13.80	
2	16.20	
3	97.60	
4	97.80	
5	97.90	
6	98.00	
7	98.13	
8	98.20	
9	98.20	
10	98.77	
11	99.10	
12	99.40	
13	100.10	
14	103.00	

86-93 **94-97** **98** **99**



TRANSPORT CANADA

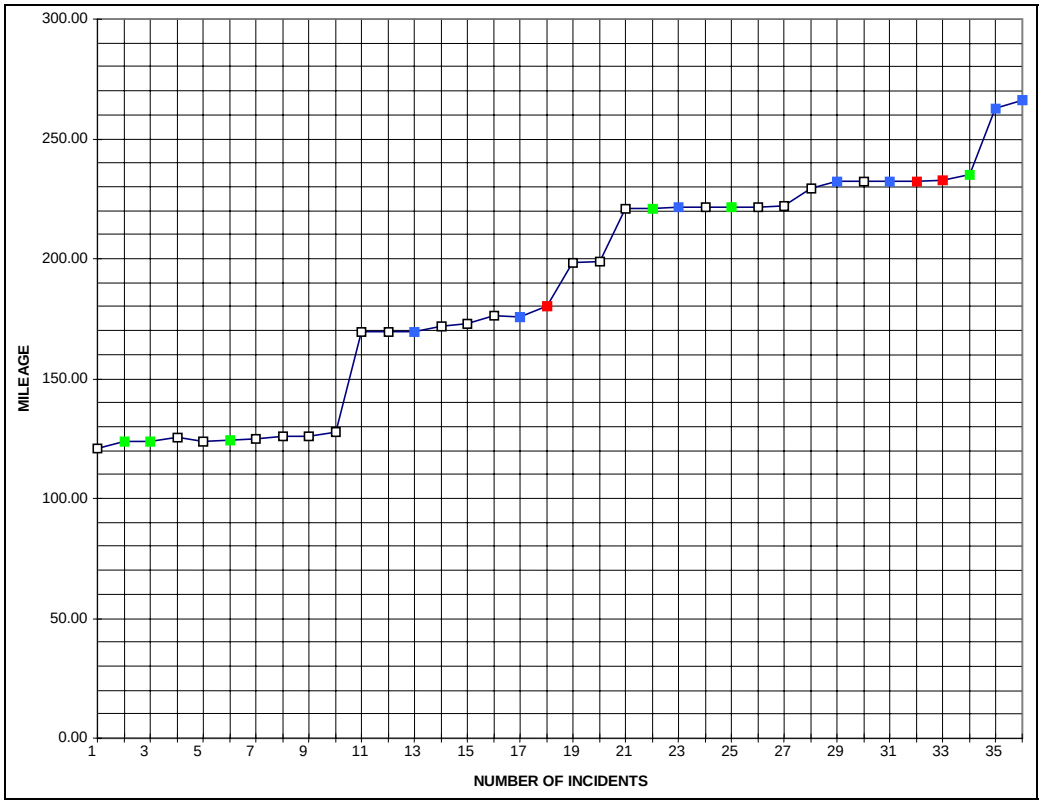
CN KINGSTON S/D (1) ONTARIO

No.	Mile	
1	120.90	
2	123.50	
3	123.80	
4	125.20	
5	123.84	
6	124.50	
7	124.85	
8	125.85	
9	126.00	
10	127.50	
11	169.40	
12	169.44	

No.	Mile	
13	169.50	
14	171.80	
15	172.63	
16	176.29	
17	175.80	
18	180.00	
19	198.30	
20	198.90	
21	220.70	
22	221.00	
23	221.70	
24	221.70	

No.	Mile	
25	221.48	
26	221.50	
27	222.00	
28	229.31	
29	232.00	
30	232.10	
31	232.20	
32	232.17	
33	232.80	
34	235.00	
35	262.90	
36	265.90	

86-93 **94-97** **98** **99**



TRANSPORT CANADA

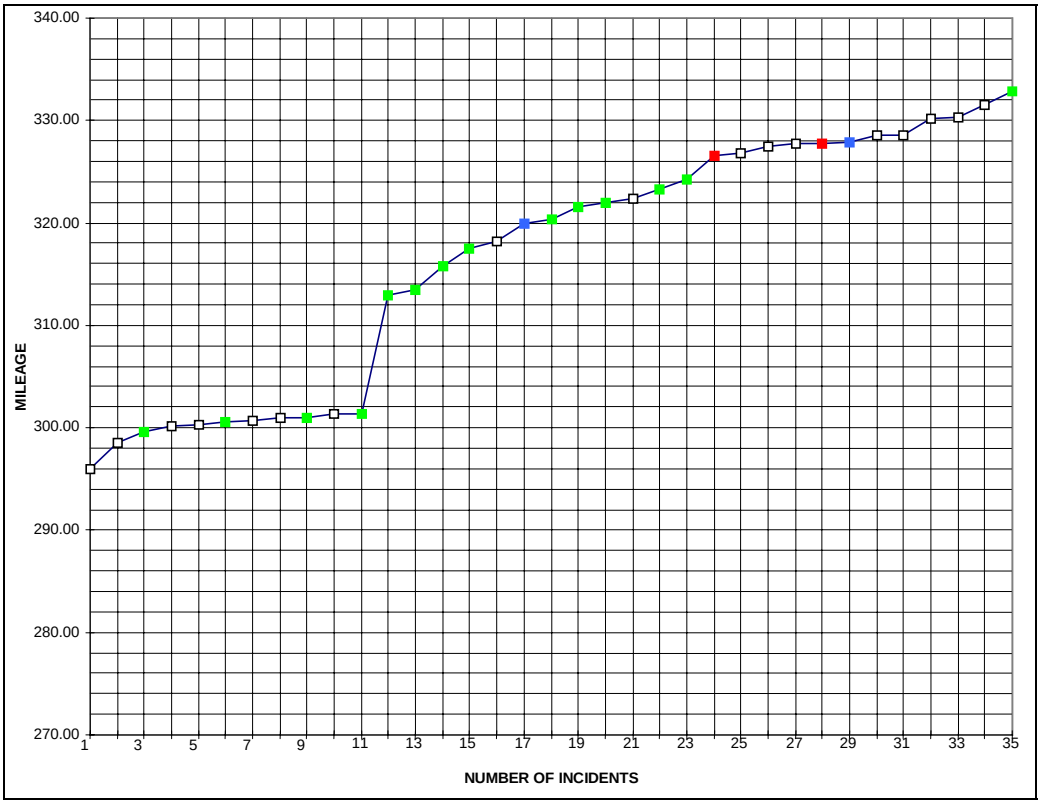
CN KINGSTON S/D (2) ONTARIO

No.	Mile	
1	296.00	
2	298.60	
3	299.60	
4	300.20	
5	300.30	
6	300.61	
7	300.65	
8	300.90	
9	300.90	
10	301.40	
11	301.40	
12	312.90	

No.	Mile	
13	313.50	
14	315.80	
15	317.50	
16	318.20	
17	320.00	
18	320.40	
19	321.60	
20	321.97	
21	322.40	
22	323.25	
23	324.20	
24	326.50	

No.	Mile	
25	326.80	
26	327.50	
27	327.80	
28	327.80	
29	327.93	
30	328.50	
31	328.60	
32	330.20	
33	330.30	
34	331.50	
35	332.80	

86-93 **94-97** **98** **99**

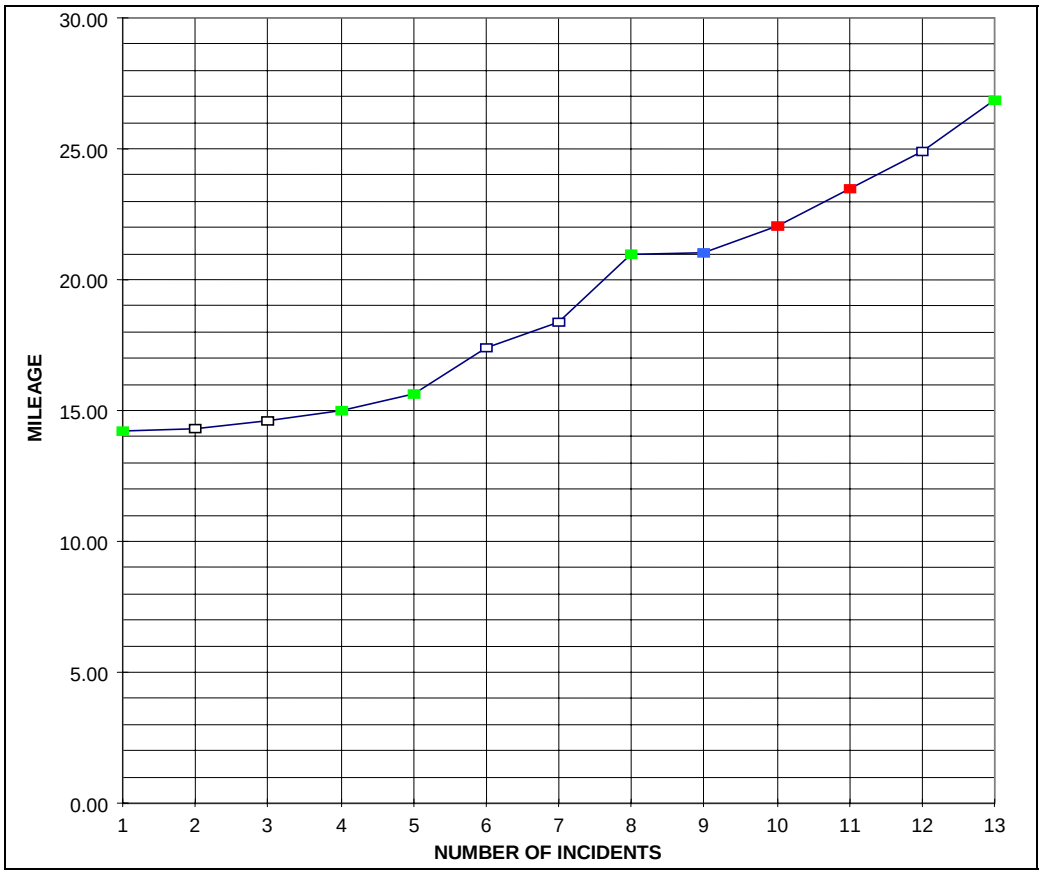


TRANSPORT CANADA

CN KINGSTON S/D QUÉBEC

No.	Mile	
1	14.20	
2	14.30	
3	14.60	
4	15.00	
5	15.64	
6	17.40	
7	18.40	
8	21.00	
9	21.04	
10	22.07	
11	23.50	
12	24.90	
13	26.85	

86-93 **94-97** **98** **99**



TRANSPORT CANADA

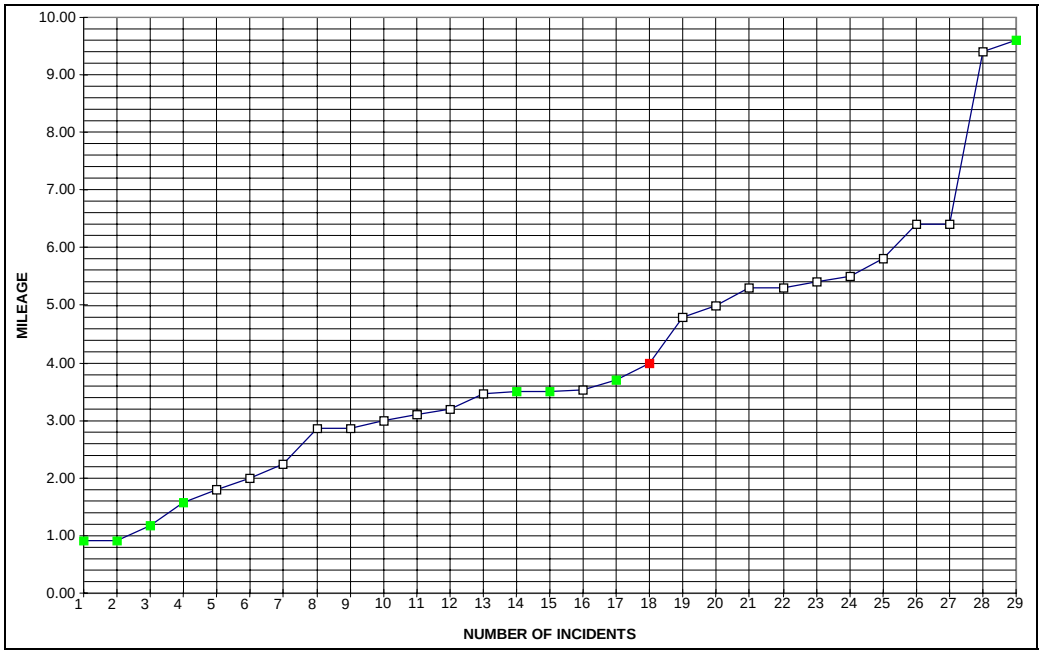
CN OAKVILLE S/D (1)

No.	Mile	
1	0.90	
2	0.90	
3	1.18	
4	1.57	
5	1.80	
6	2.00	
7	2.23	
8	2.85	
9	2.85	
10	3.00	
11	3.10	
12	3.20	

No.	Mile	
13	3.45	
14	3.50	
15	3.50	
16	3.52	
17	3.70	
18	4.00	
19	4.80	
20	5.00	
21	5.30	
22	5.30	
23	5.40	
24	5.50	

No.	Mile	
25	5.80	
26	6.40	
27	6.40	
28	9.41	
29	9.60	

86-93 **94-97** **98** **99**



TRANSPORT CANADA

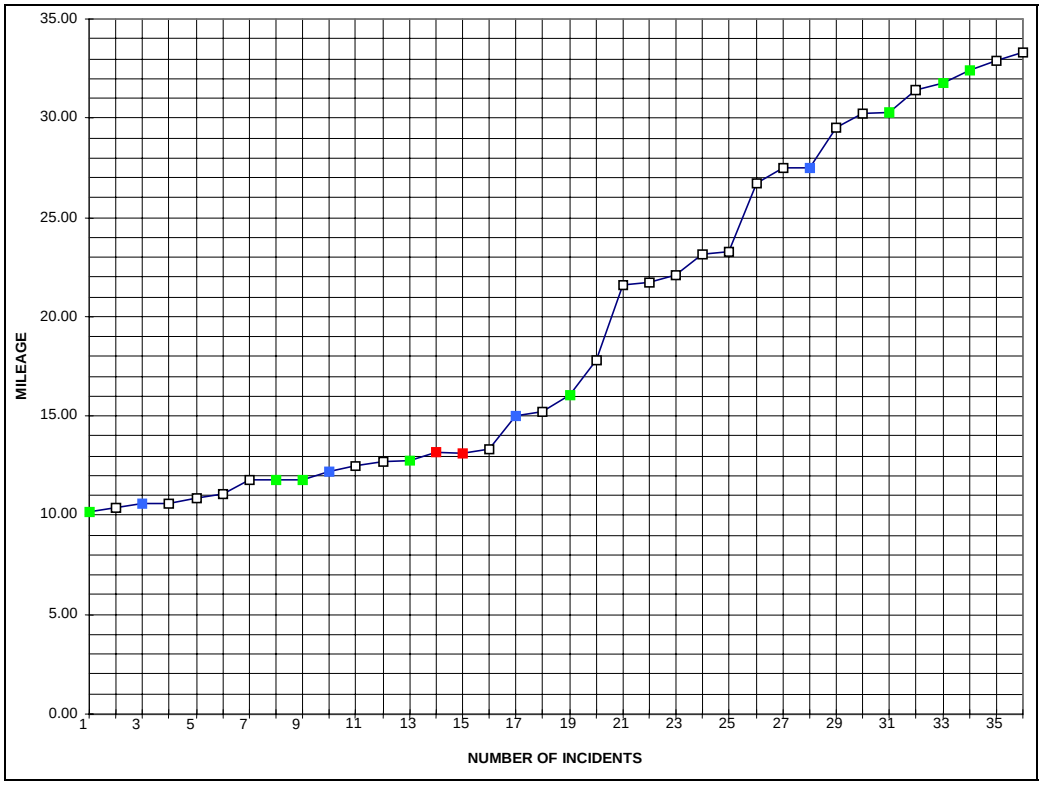
CN OAKVILLE S/D (2)

No.	Mile	
1	10.20	
2	10.38	
3	10.56	
4	10.58	
5	10.86	
6	11.10	
7	11.75	
8	11.80	
9	11.80	
10	12.20	
11	12.45	
12	12.73	

No.	Mile	
13	12.80	
14	13.20	
15	13.11	
16	13.30	
17	15.00	
18	15.20	
19	16.09	
20	17.85	
21	21.60	
22	21.71	
23	22.10	
24	23.13	

No.	Mile	
25	23.30	
26	26.70	
27	27.50	
28	27.50	
29	29.50	
30	30.20	
31	30.30	
32	31.44	
33	31.80	
34	32.40	
35	32.90	
36	33.31	

86-93 **94-97** **98** **99**

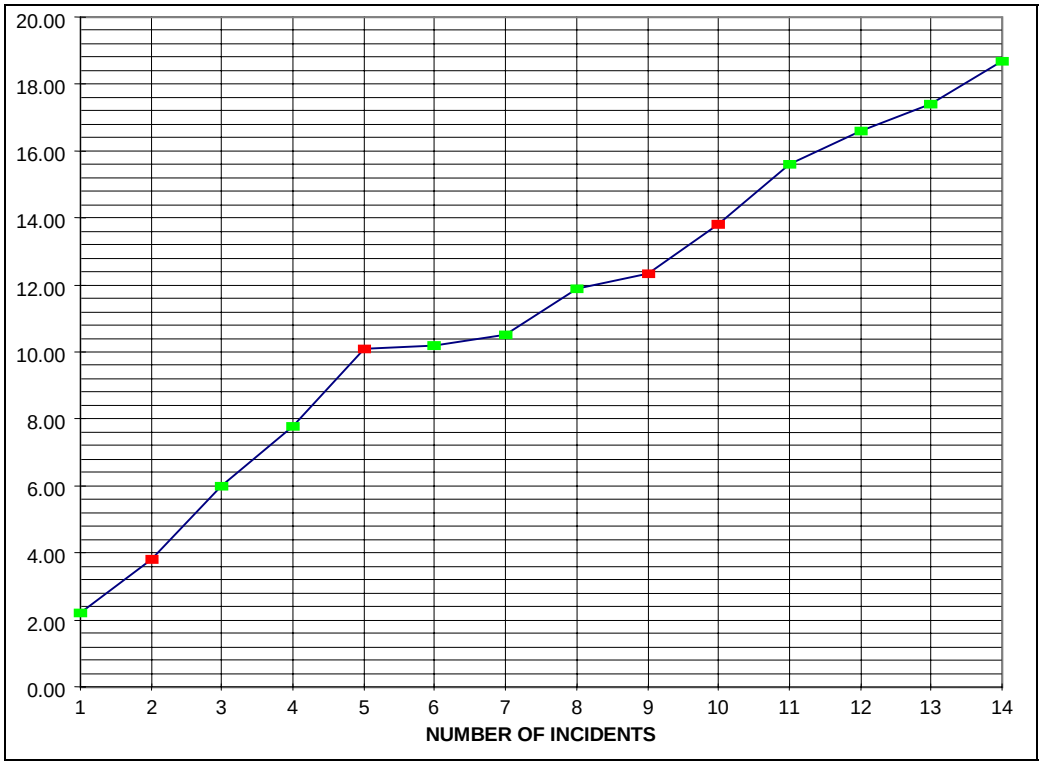


TRANSPORT CANADA

CP VAUDREUIL S/D

No.	Mile	
1	2.20	
2	3.80	
3	6.00	
4	7.80	
5	10.10	
6	10.20	
7	10.50	
8	11.90	
9	12.35	
10	13.80	
11	15.60	
12	16.60	
13	17.40	
14	18.70	

86-93 94-97 98 99



TRANSPORT CANADA

Occurence No.	Date	Rlwy	Prov	Subdivision	Mile	Speed	Fat	Inj	Age	F	M
R99D0113	17/06/99	CP	QU	Adirondack	48.00			1	40		x
	06/07/99	VIA	ON	Alexandria	75.00	8		1	20		x
R99T0197	25/07/99	CP	ON	Belleville	115.14		2			x	x
R99T0219	11/08/99	CP	ON	Belleville	136.10		1				
	19/03/99	CP	ON	Belleville	163.40	50	1		17		x
R99T0020	22/01/99	CP	ON	Belleville	178.50	50		1			
R99T0229	17/08/99	CP	ON	Belleville	180.00			1	16		
R99T0185	13/07/99	CP	ON	Belleville	205.00		1				
R99Q0046	09/09/99	CN	QU	Bridge	14.90		1				
	29/03/99	CP	AL	Brooks	67.28	53	1		26		x
R99C0097	19/09/99	CP	AL	Brooks	124.00		1		19	x	
R99T0201	24/07/99	CN	ON	Caramat	243.80		1				
	31/07/99	CP	BC	Cascade	109.42	5		1	18	x	
R99S0095	27/10/99	VIA	ON	Chatham	34.00		1		16		x
R99D0118	18/06/99	CN	QU	Deux Montagnes	10.17		1		20		x
R99D0172	07/10/99	CN	QU	Deux Montagnes	13.00			1	16	x	
R99Q0044	07/08/99	CN	QU	Diamond	9.70		1				
	19/02/99	CN	QU	Drummondville	99.10	45	1		30		x
	03/01/99	CN	QU	Drummondville	102.98	90	1		16		x
R99T0272	16/10/99	CN	ON	Dundas	22.40		1				
R99E0094	05/09/99	CN	AL	Edson	49.20		1				
	30/03/99	CP	ON	Galt	17.90	47	1		38		x
R99T0273	15/10/99	CP	ON	Galt	60.90			1			
R99T0224	14/08/99	CN	ON	Grimsby	28.30		1		19		x
R99T0152	09/06/99	GE	ON	Guelph	63.00			1			
R99S0070	31/07/99	GER	ON	Guelph	63.02			1			
R99S0064	12/07/99	VIA	ON	Guelph	65.00		1		41	x	
R99W0223	21/10/99	CP	SA	Indian Head	50.13		1				
R99Q0028	22/05/99	CN	QU	Joliette	49.50		1				
R99W0085	21/04/99	CN	ON	Kashabowie	0.13			1			
R99W0142	30/06/99	CP	ON	Keewatin	0.70		1				
R99W0172	09/08/99	CN	ON	Kinghorn	21.15			1			
	17/04/99	VIA	QU	Kingston	22.07	60	1		17		x
	09/03/99	VIA	QU	Kingston	23.60	95	1		46	x	
R99T0236	05/09/99	VIA	ON	Kingston	63.72		1		39		x
R99T0022	23/01/99	VIA	ON	Kingston	91.90	55	1				
R99T0253	20/09/99	CN	ON	Kingston	171.80		1				
R99T0148	06/06/99	CN	ON	Kingston	172.50		1		36		x
	23/05/99	CN	ON	Kingston	180.00	55	1		37	x	
R99T0194	21/07/99	CN	ON	Kingston	232.17		1				
R99T0248	19/09/99	CN	ON	Kingston	232.80			1			
	18/02/99	GO	ON	Kingston	326.50	75	1		50	x	
R99T0249	20/09/99	CN	ON	Kingston	327.80			1			
	26/06/99	CN	BC	Kitimat	0.00	5		1	25		x
	16/01/99	CN	QU	Lac-St-Jean	47.90	30		1	19		x
R99Q0034	20/06/99	VIA	QU	Lac St. Jean	198.50		1		24		x
R99D0125	12/07/99	CP	QU	Lachute	7.00		1				
	15/04/99	CP	QU	Lachute	15.95	45	1		17		x
R99C0046	99/05//04	CP	AL	Laggan	0.10			1	14		x

TRANSPORT CANADA

Occurence No.	Date	Rlwy	Prov	Subdivision	Mile	Speed	Fat	Inj	Age	F	M
R99Q0033	18/06/99	QNS	QU	Menihek	355.20		1		19		x
R99M0021	11/05/99	VIA	QU	Mont Joli	112.70			1	18	x	
R99D0110	11/06/99	VIA	QU	Montreal	1.20				30		
R99D0111	12/06/99	CN	QU	Montreal	8.00		1		50		x
R99D0155	20/08/99	VIA	QU	Montreal	10.45		1				x
R99V0182	10/10/99	CP	BC	Mountain	35.00			1	33		x
	08/02/99	CP	BC	Nelson	136.50	5		1	17		x
	11/06/99	BN	BC	New Westminster	122.00			1	17	x	
R99M0025	05/06/99	VIA	NB	Newcastle	171.80			1	55	x	
R99T0241	10/09/99	CN	ON	Newmarket	145.86			1			
	14/04/99	CP	ON	Nipigon	20.70	33	1		50		x
R99T0244	10/09/99	CN	ON	Oakville	4.00			1			
	13/05/99	GO	ON	Oakville	13.11	28	1		30	x	
R99T0240	09/09/99	CN	ON	Oakville	13.11		1				
R99W0157	19/07/99	CN	SA	Quappelle	45.40			1	43	x	
	25/01/99	CP	AL	Red Deer	52.50	45	1		45		x
R99Q0042	23/07/99	CN	QU	Roberval	12.00			1			
R99E0089	21/08/99	RL	AL	Slave Lake	234.40		1				
	14/02/99	AC	ON	Soo	2.00	10		1	7		x
R99D0109	12/06/99	CN	QU	St-Laurent	137.20		1		23		x
R99D0141	27/07/99	CN	QU	St. Maurice	209.00			1	54		x
R99S0041	07/05/99	CN	ON	Strathroy	0.22	38		1			
R99S0021	21/02/99	CN	ON	Strathroy	0.23			1			x
R99D0126	09/07/99	CP	QU	Vaudreuil	3.80		1				x
R99D0161	03/09/99	CP	QU	Vaudreuil	10.10		1				
	14/04/99	CP	QU	Vaudreuil	12.35	15	1		49		x
R99E0101	01/10/99	CN	AL	Wainwright	140.00		1		26		x
	12/03/99	CP	BC	Westminster	9.20	10	1		35		x
	13/03/99	CP	BC	Windermere	139.00	35	1		24		x
R99S0069	31/07/99	CP	ON	Windsor	0.70		1				
R99V0158	01/09/99	CN	BC	Yale	71.30		1		47		x
	17/05/99	CN	BC	Yale	131.00	10	1		38		x
R99T0130	15/05/99	CN	ON	York	13.34	40		1			

82 incidents till Oct. 27, 1999

48	**60**
59%	**74%**

The human factor in crossing accidents (and Angus-Reid Survey)

Ben Lévesque
Operation Lifesaver
Montreal, Quebec

SUMMARY

The impact of a crossing accident extends far beyond the victim involved. Members of the victim's family, friends, and locomotive employees are all profoundly affected by the tragedy.

A recent Angus-Reid survey and various focus groups indicate that most people have inaccurate perceptions of railway trespassing and safety issues. A majority of the respondents do not perceive rail-highway crossings to be a significant safety problem in their community, and only four in ten expressed some level of concern. Most respondents also believe that motorists and pedestrians should be responsible for their own safety at rail-highway crossings. Railway companies are perceived as having no share in that responsibility. In addition, few people are aware of programs, such as Operation Lifesaver, designed to educate people about rail safety issues.

Operation Lifesaver's activities include a program in which 500 persons across the country make presentations aimed at increasing the public's understanding of crossing dangers. However, this and other efforts have proved inadequate.

We hope that this workshop will lead to approaches that will help to reduce crossing collisions and trespassing accidents.

SOMMAIRE

Un accident à un passage à niveau a une portée qui va bien au delà de la mort d'une personne. La famille, les amis de la victime, et le personnel de la locomotive sortent tous profondément bouleversés d'une telle tragédie.

Un sondage Angus-Reid récent et les données recueillies lors de groupes de discussion révèlent que la plupart des gens ont une perception fausse de l'intrusion sur une voie ferrée et des risques auxquels s'expose l'intrus. En effet, la majorité des répondants associaient un faible risque aux passages à niveau de leur localité, seulement quatre sur dix exprimant une certaine préoccupation. La plupart estimaient en outre que les automobilistes et piétons sont seuls responsables de leur sécurité aux passages à niveau. À leurs yeux, les chemins de fer n'assument aucune part de cette responsabilité. De plus, peu de personnes connaissent l'existence de programmes conçus pour sensibiliser le public aux questions de sécurité ferroviaire, comme l'Opération Gareautrain.

Parmi les activités de l'Opération Gareautrain, on retrouve un programme dans le cadre duquel 500 personnes ont pris la parole à travers le pays afin de faire des présentations visant à accroître la compréhension du public vis-à-vis les dangers associés aux passages à niveau. Toutefois, autant cette démarche que d'autres initiatives n'ont eu les résultats escomptés.

Nous espérons que de nouvelles façons de faire, permettant de diminuer les collisions aux passages à niveau et les accidents imputables aux intrusions, découleront de cet atelier.

Nuts & bolts of crossings and safety systems

Gaétan Fournier and René Turgeon
Transport Canada, Quebec Region
Montreal, Quebec

SUMMARY

The two main causes of grade crossing accidents in Quebec are failure to respect signals and difficulty in detecting or interpreting signals. They account for 35 percent and 31 percent of accidents respectively. In addition, in recent years trespassing on rights of way has become the major cause of railway-related deaths and serious injuries. Transport Canada, Quebec Region, has set out specific measures to respond to these causes:

- programs to raise awareness among the general public, road authorities, and social clubs
- bike-foot paths along and across railway tracks, where required
- improvements to existing warning devices
- signs and fences
- police surveillance
- work with towns to make allowance for the presence of railway installations

These measures are in keeping with Transport Canada's mission and departmental objectives pertaining to grade crossing safety.

Gathering detailed accident-related information continues to be a major challenge, making it very difficult to accurately determine the cause of an accident.

SOMMAIRE

Au Québec, les deux principales causes des accidents aux passages à niveau sont le non-respect de la signalisation et la difficulté à détecter et interpréter celle-ci. Trente-cinq pour cent et 31 p. cent, respectivement, des accidents sont attribués à ces causes. À cela s'ajoute, depuis quelques années, l'intrusion sur l'emprise ferroviaire, qui est devenue la cause principale des décès et blessures graves associés au transport ferroviaire. La région du Québec de Transports Canada a mis en place une série de mesures pour prévenir les accidents ferroviaires :

- programmes destinés à sensibiliser le grand public, les administrations routières et les clubs sociaux
- pistes cyclables-piétonnes longeant et traversant les voies ferrées, au besoin
- modernisation des dispositifs d'avertissement existants
- panneaux de signalisation et clôtures
- surveillance policière
- travail avec les municipalités pour faire en sorte que les installations ferroviaires disposent de tout l'espace nécessaire

Ces mesures s'inscrivent dans la foulée de la mission et des objectifs de Transports Canada en ce qui a trait à la sécurité aux passages à niveau.

La collecte de données accidentologiques détaillées demeure un problème de taille, d'où l'extrême difficulté de déterminer précisément la cause d'un accident.

Transports Canada Région du Québec | Transport Canada Quebec Region

SAFETY AT GRADE CROSSINGS

Canada

May 1999

CONTENTS

SAFETY AT GRADE CROSSINGS

A COLLISION BETWEEN A TRAIN AND...

... A CAR

... 2 FATALITIES !

... A TRACTOR TRAILER

... 1 FATALITY !

... A SNOWMOBILE

... 1 FATALITY !

Page 3

It is impossible to remain indifferent to the number of accidents on our roads. Each year, men, women, friends, brothers, fathers and mothers die or suffer serious injuries. Collisions with trains are all too frequent. In 1998 there were 32 accidents on Quebec's railway network, seven of which resulted in deaths.

Transport Canada is participating in implementing programs to improve railway safety. *Direction 2006* is a committee charged with developing strategies to half the number of accidents at grade crossings in Canada by the year 2006.

Transport Canada Surface, Engineering group has, therefore, set up a program to educate and sensitize those responsible for maintaining grade crossings and approaches.

A reference manual has been published to inform road authorities, towns, municipalities and railway companies about the steps they can take to improve safety at grade crossings and on railway rights of way.

The manual is divided into different sections in an attempt to focus on the problems, solutions and stakeholders. It contains information on legislation and standards and gives examples of situations that could jeopardize safety, as well as suggestions for solving these problems.

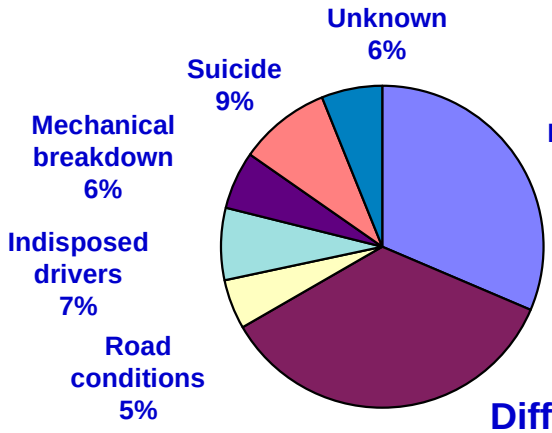
Working together for transportation

Page 4

CAUSES

Page 5

CAUSES:



Difficulty seeing or interpreting signals 35%

Based on Quebec statistics for the past three years

Page 6

SIGNALS: SITUATIONS TO LOOK OUT FOR

ROAD SIGNS	RAILWAY SIGNALS
• No advance sign	• Burned-out lights
• Advance sign obstructed by a post, a building, tree branches, vegetation, a road sign, a parked vehicle, a snow bank, the road layout, etc.	• Device obstructed by a post, a building, tree branches, vegetation, a road sign, a parked vehicle, a snow bank,the road layout, etc.
• Misoriented advance sign	• Misoriented device
• Advance sign too near or too far from the grade crossing	• Damaged lights
	• Inadequate signals
• Glare from the sun or headlights	• Glare from the sun or headlights

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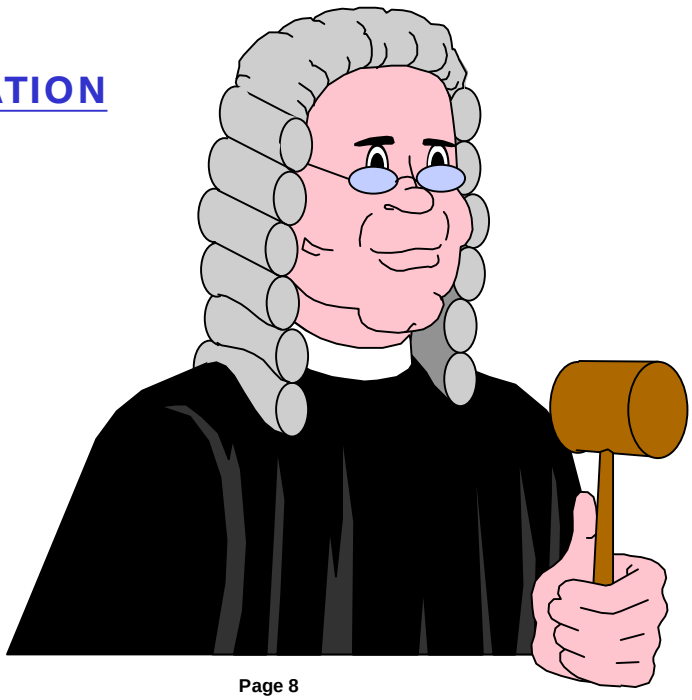
LEGISLATION



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ACTS	ADMINISTERED BY	RESPONSIBILITY
FEDERAL JURISDICTION		
Canada Transportation Act	Canadian Transportation Agency	Settling disputes between railway companies and persons
Railway Safety Act	Transport Canada	Monitoring - operations, equipment - railway lines - grade crossings Examining complaints Helping improve safety at grade crossings
Canadian Transportation Accident Investigation and Safety Board Act	TSB (Transportation Safety Board)	Investigating - derailments - accidents at grade crossings - railway collisions - etc.
PROVINCIAL JURISDICTION		
Safety in Guided Land Transport Act	Quebec Department of Transportation	Monitoring - operations, equipment - railway lines - grade crossings
Highway Safety Code	Quebec Department of Transportation, SAAQ	Installing and maintaining road signals Ensuring visibility Maintaining the road surface and required road markings

Page 9

Federal Jurisdiction *

Transport Canada has jurisdiction over a railway that crosses from one province to another or that crosses Canadian border.
A railway operating inside the province of Quebec can choose to be governed by the Quebec Department of Transportation or Transport Canada.

Provincial Jurisdiction **

A railway operating solely inside the province of Quebec can choose to be governed by the Quebec Department of Transportation or Transport Canada.

*** See Appendix A for the list of railways under federal jurisdiction.**

**** See Appendix B for the list of railways under provincial jurisdiction.**

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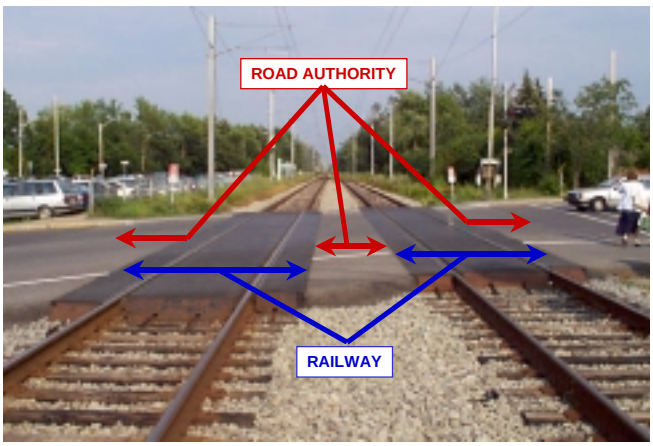
RESPONSIBILITIES



How responsibilities are shared on grade crossing and at the approaches thereto.

Page 12

RESPONSIBILITIES OF THE ROAD AUTHORITY AT A GRADE CROSSING

Page 13

Road authorities are responsible for:

- **APPROACHES**
  Maintaining approaches to grade crossings and any pavements separating the tracks.
- **SIGNS**
  Permanently erecting road signs in accordance with the Highway Safety Code.
- **ROAD MARKINGS**
  Painting and preserving road markings at approaches to grade crossings as stipulated in the Highway Safety Code.
- **VISIBILITY**
  Clearing brush, grass and shrubs from land under its jurisdiction so as not to limit visibility at grade crossings.

- **DE-ICING AND SNOW REMOVAL**
  De-icing and removing snow from approaches to grade crossings and preventing accumulations of snow that could make warning signs and trains difficult to see.

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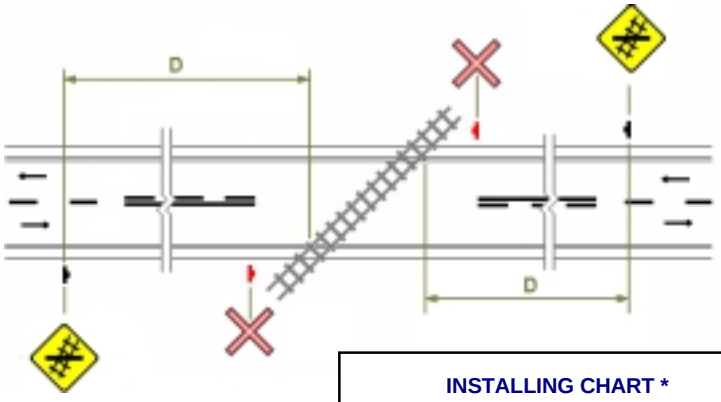
ROAD SIGNS – DANGER

ROAD AUTHORITY



INSTALLING CHART *							
S (km/h)	30	50	60	70	80	90	100
D (m)	25	50	75	100	150	200	250

* Installation distance may vary by ±10%

Ref. Plate D-5 HSC

Signs at approaches to grade crossings

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ROAD SIGNS – DANGER

ROAD AUTHORITY

D-180-1 HSC

D-180-2 HSC

D-180-3 HSC

Grade crossing advance warning sign

Page 16

ROAD SIGNS – DANGER

ROAD AUTHORITY

Grade crossing advance warning sign near an intersection

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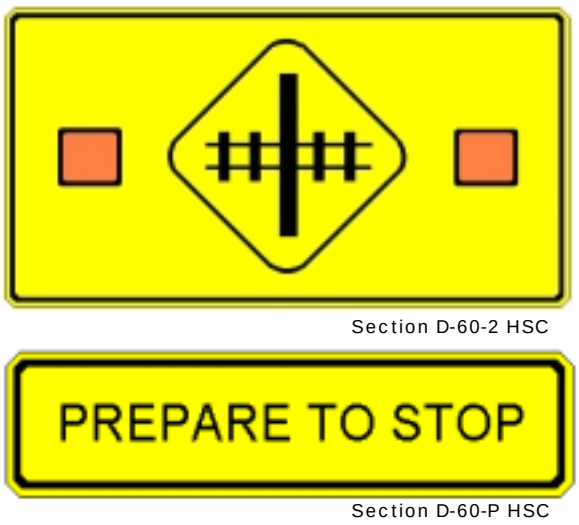
ROAD SIGNS – DANGER

ROAD AUTHORITY



Section D-60-2 HSC

Section D-60-P HSC

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ROAD SIGNS – DANGER

ROAD AUTHORITY

Automatic grade crossing advance warning sign

Cantilevered automatic grade crossing advance warning sign

Page 19

ROAD SIGNS

ROAD AUTHORITY

Downhill approach to a grade crossing requiring an automatic grade crossing advance warning sign

Page 20

ROAD SIGNS – RULES AND INFORMATION

ROAD AUTHORITY

Intersection less than 30 m away from a grade crossing
Obligatory or prohibited manoeuvres to prevent a traffic build-up on a grade crossing

Page 21

ROAD SIGNS – RULES AND INFORMATION

ROAD AUTHORITY

INSTALLING CHART *	
S (km/h)	D (m)
30	25
50	50
60	75
70	100
80	150
90	200
100	250

* Installation distance may vary ±10%

Ref. Plate P-19 HSC

Clearance height

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ROAD SIGNS – DANGER

ROAD AUTHORITY

Section D-190 HSC

Advance clearance height sign

Wrong colour used to indicate clearance height

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ROAD SIGNS – DANGER

ROAD AUTHORITY

Section D-70 HSC

Advance speed limit sign

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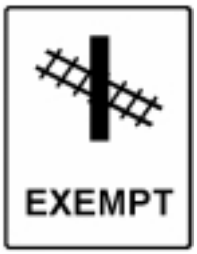
ROAD SIGNS – RULES AND INFORMATION

ROAD AUTHORITY



Section 180 HSC

Stopping not compulsory at a grade crossing

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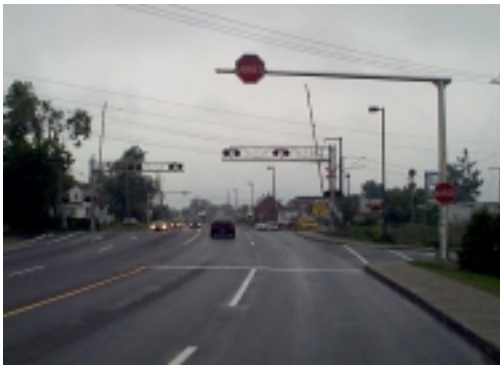
ROAD SIGNS

ROAD AUTHORITY



Section P-10 HSC

Stop signs to prevent queueing on the crossing

Page 26

ROAD SIGNS

ROAD AUTHORITY

As the train approaches, the traffic lights and the automatic warning device are timed to allow any traffic between the intersection and the grade crossing to clear the area.

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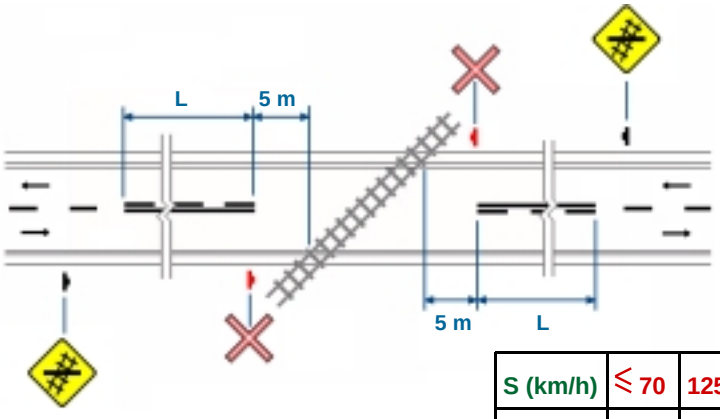
ROAD SIGNS

ROAD AUTHORITY



S (km/h)	⩽ 70	125
L (m)	> 70	200

Ref. Plate D-5 HSC

Road markings at the approaches to a grade crossing

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ROAD SIGNS

ROAD AUTHORITY

Road marking

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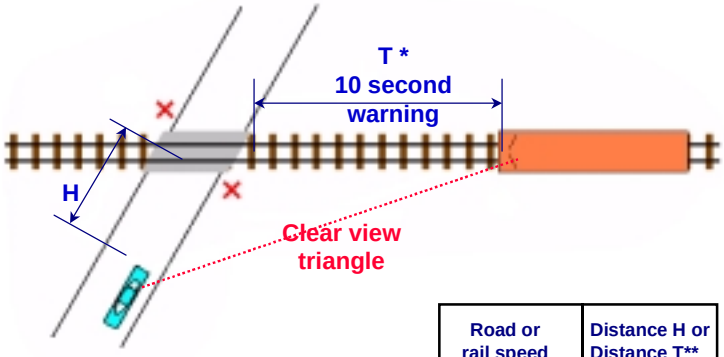
SPEED AND DISTANCE

ROAD AUTHORITY



Road or rail speed	Distance H or Distance T**
See tables of speeds and distances on the following pages	

* T equals 150 feet for each 10 mph of train speed.

** The distances H and T can vary according to the geometry of the grade crossing.

ref. Road/Railway Grade Crossing Manual, TC

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SPEED AND DISTANCE

ROAD AUTHORITY

RAILWAY			ROAD	
maximum train speed	minimum distance T		maximum speed allowed on roads	distance H
mph	m	(feet)	km/h	m
standstill	30	(100)	pedestrians	5
1 - 10	45	(150)	stopped vehicles	8
11 - 20	91	(300)	5 - 20	20
21 - 30	136	(450)	21 - 30	30
31 - 40	182	(600)	31 - 40	45
41 - 50	227	(750)	41 - 50	65
51 - 60	273	(900)	51 - 60	85
61 - 70	318	(1050)	61 - 70	110
71 - 80	364	(1200)	71 - 80	140
81 - 90	409	(1350)	81 - 90	170
91 - 100	455	(1500)	91 - 100	200
			101 - 110	220

Minimum sight distances where there is *NO* automatic warning device

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SPEED AND DISTANCE

ROAD AUTHORITY

RAILWAY			ROAD	
maximum train speed	minimum distance T		maximum speed allowed on roads	distance H
mph	m	(feet)	km/h	m
standstill	30	(100)	0 - 20	20
1 - 10	45	(150)	21 - 30	30
11 - 20	90	(300)	31 - 40	45
21 - 30	135	(450)	41 - 50	65
31 - 40	180	(600)	51 - 60	85
41 - 50	225	(750)	61 - 70	110
51 - 60	270	(900)	71 - 80	140
61 - 70	315	(1050)	81 - 90	170
71 - 80	365	(1200)	91 - 100	200
81 - 90	410	(1350)	101 - 110	220
91 - 100	455	(1500)		

Minimum sight distances where there *IS* automatic warning device

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VISIBILITY

ROAD AUTHORITY

View of the signal obstructed; advance signal too close to the grade crossing; no road marking and car parked too close to the crossing.

Factors that may prevent a driver from seeing warning devices and trains.

MAINTENANCE

Incomplete snow removal making the grade crossing potentially unsafe.

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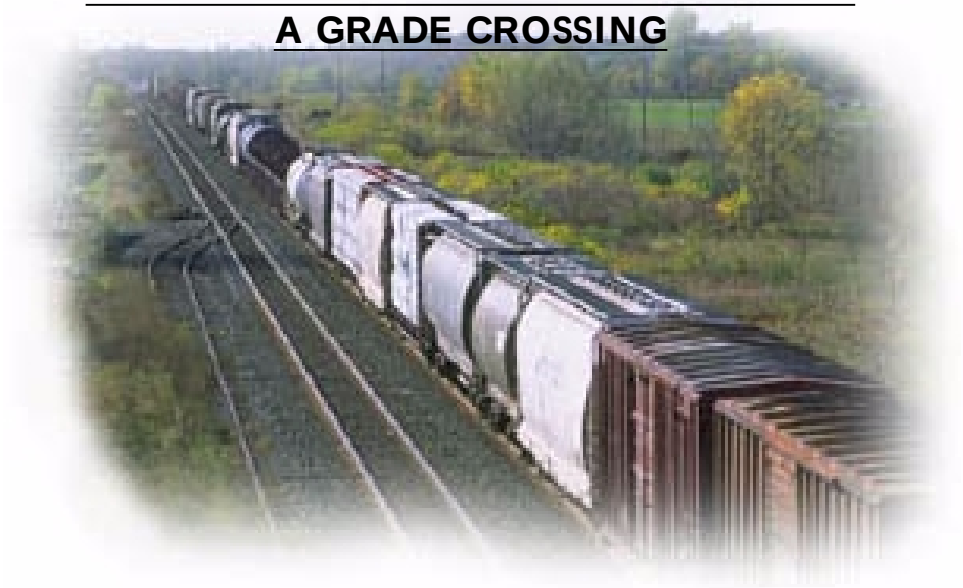
RESPONSIBILITIES OF THE RAILWAY AT A GRADE CROSSING



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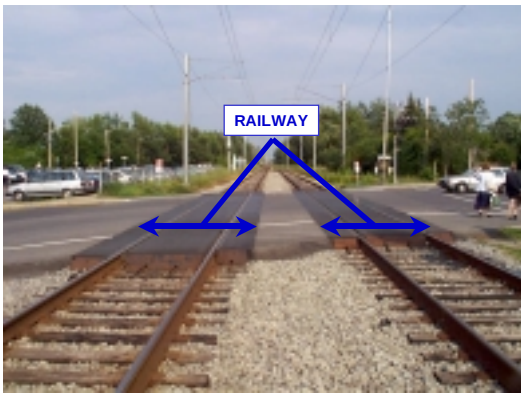
The railway is responsible for:

•THE CROSSING SURFACE
Constructing and maintaining the crossing surface.

•SIGNALS
Erecting permanent reflectorized crossing signs and other warning devices: flashing lights, bells, gates, etc.

•VISIBILITY
Clearing railway rights of way of all obstacles, scrub and trees that make it difficult to see the train.



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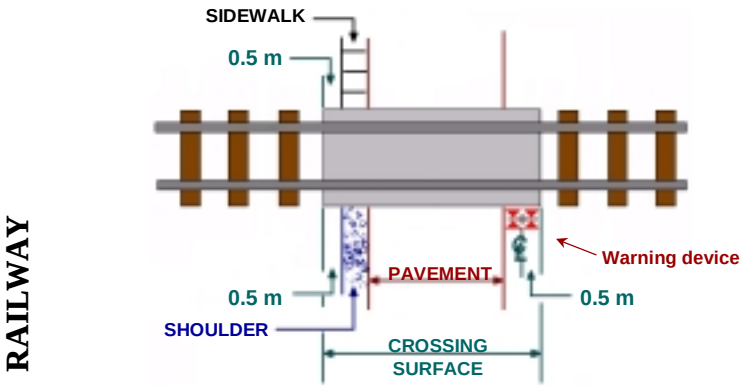
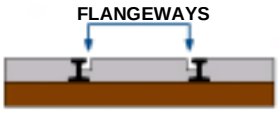
CROSSING SURFACE





CROSS SECTION

Width of flangeways: 65-80 mm
Depth of flangeways: 50-75 mm

ref. Road/Railway Grade Crossing Manual, TC

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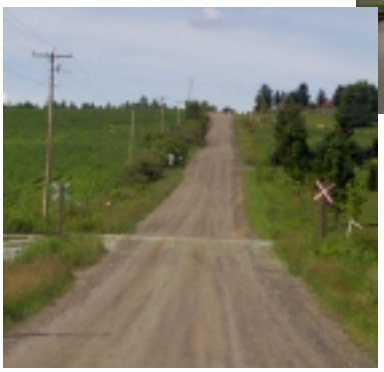
WARNING DEVICES

RAILWAY

Reflectorized crossing signs



Flashing lights and bell

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WARNING DEVICES

RAILWAY

Flashing lights, bell and gates

Additional cantilevered flashing lights

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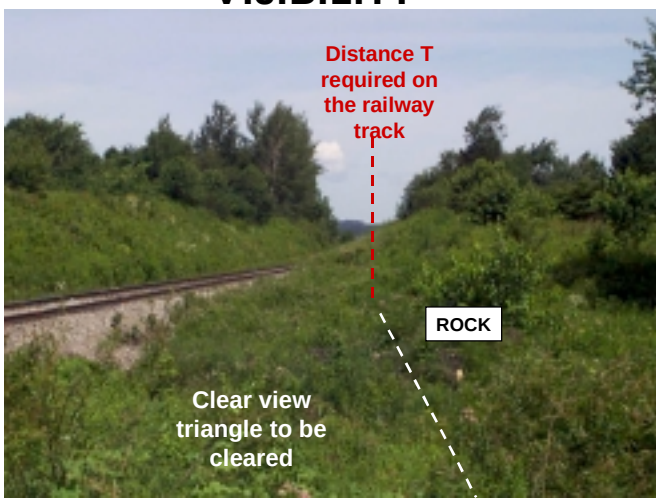
VISIBILITY

RAILWAY



Limited visibility at a grade crossing equipped only with reflectorized crossing signs

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RAILWAY

Flashing lights damaged by a snowplough

Crossing surface in poor condition

Page 40

TRESPASSING ... a problem to be solved !!!

Trespassing on rights of way has become the major cause of deaths and/or serious injuries in recent years.

Pedestrians, snowmobilers, ATV enthusiasts and cyclists blithely use railway rights of way completely illegally and without taking any precautions whatsoever.

However, section 26.1 of the Railway Safety Act is quite clear:

"No person shall, without lawful excuse, enter on land on which a line work is situated."

Causes:

- **Unplanned urban development along railway rights of way.**
- **Excessive distances between grade crossings, and/or under- and overpasses.**
- **Shortcuts to facilities, parks, skating rinks, libraries, schools, etc.**
- **Hiking, cross-country skiing, walking the dog, trips in recreational vehicles, etc.**

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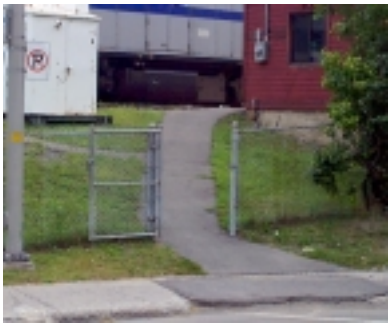
TRESPASSING

Fence needs to be extended

Dead end street without fence. Unlimited access to the railway

Page 43

TRESPASSING



Gate left unlocked

Gap in fence

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TRESPASSING

Track without ballast
Rails could buckle

Opening in hedge gives access to the railway right-of-way

Page 45

Solutions:

- **Program to raise awareness among the general public, in schools and social clubs**
- **Bike-foot paths along and across railway tracks, where required**
- **Railway underpasses and overpasses**
- **Installing necessary signs and fences**
- **Increased police surveillance**
- **Town planning that makes allowances for the presence of railway installations**

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CROSSING FOR CYCLISTS AND PEDESTRIANS

Grade crossing for cyclists and pedestrians – single track

PEDESTRIAN OVERPASS

Pedestrian overhead walkway

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Underpass for cyclists and pedestrians

Bike-foot path alongside a railway bridge

Page 48

BIKE-FOOT PATH

Land purchased from the railway for the construction of a bike-foot path

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TRANSPORT CANADA

Our mission:

To develop and administer policies, regulations and services for the best possible transportation system

Working together for transportation

Our objective:

To reduce grade crossing accidents and accidents involving trespassing by 50%

Page 50

As part of its program to improve grade crossing safety, Transport Canada can contribute up to 80% of improvement costs.

LATEST CONTRIBUTIONS FOR THE YEAR 98-99:

In Valleyfield

Maden Street	$87 100	Gates added
Grande-Ile Street	$87 358	Gates added
Alexandre Street	$105 309	Gates added
St-Philippe Street	$95 454	Gates added
Ellen Street	$122 313	Gates added

In St-Tite

St-Léon Street	$94 905	Gates added
De la Montagne Street	$94 732	Gates added

To the Quebec Department of Transportation network

Deschambeault	$17 676	Installation of automatic advance warning sign
St-Casimir	$18 636	Installation of automatic advance warning sign
Rivière à Pierre	$36 312	Installation of automatic advance warning sign
Rivière Bleue	$14 560	Automatic advance warning sign added
St-Léonard-d'Aston	$152 198	Gates added
Chibougamau	$32 072	Installation of automatic advance warning sign

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Inspections:

It is Transport Canada's duty to ensure that railway companies operate safely. The following elements are some of those covered by Transport Canada inspections:

- **Warning devices**
- **Visibility at grade crossings**
- **Synchronization**
- **Crossing surfaces**
- **Railway lines and bridges**
- **Trespassing**
- **Complaints**

Awareness raising and education:

By participating in public information initiatives and meeting recreational organizations, road authorities and railway companies, Transport Canada raises awareness among and educates the various stakeholders about the concept of railway safety.

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HOW TO REACH US?

TRANSPORT Canada
Quebec Region
Surface Transport

tel. (514) 283-5722
fax. (514) 283-8234

www.tc.gc.ca/quebec

800 René Lévesque Blvd West
6th Floor
Montreal, Quebec
H3B 1X9

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In brief...

We will reach our objective of reducing grade crossing accidents by 50% by 2006, if all stakeholders work to ensure that the highest construction and maintenance standards are implemented and observed at all grade crossings.

Railways and road authorities must make a priority of ensuring that trains and warning devices can be seen. Transport Canada believes that this objective can be reached with the renewed commitment of all stakeholders.

The railways must work with the municipalities and take appropriate action to put an end to trespassing, a dangerous practice that is becoming more and more widespread.

N.B. It is important to inform the railway company as quickly as possible about anything untoward or any accident you see at a grade crossing. You will find an emergency telephone number behind any of the reflectorized crossing signs or on the signal bungalows near the grade crossing.

Working together for transportation safety

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APPENDIX A

Railways under federal jurisdiction

Subdivision	From	To
Canadian National Railway Company (CN)		
Alexandria	Coteau Jct	Sainte Justine de Newton
Beachburg	Pontiac	Portage du Fort
Bécancour	Aston Jct	Bécancour
Bridge	Joffre Yard	Quebec City (Palais Station)
Deux Montagnes	Montreal (Central Station)	Saint Eustache
Diamond	Saint Charles	West Jct
Drummondville	West Jct	Sainte Rosalie
Joliette	Garneau Yard	Montreal (Pointe aux Trembles)
Kingston	Dorval	Coteau West
La Tuque	Cap Rouge	Saint Adelphe
Montmagny	Riviere du Loup	West Jct
Montreal	Montreal (Central Station)	Dorval
Pelletier	Saint Marc du Lac Long	Saint André Jct
Rouses Point	Rouses Point (NY)	Cannon
Sorel	Bruno Jct	Tracy
Saint Hyacinthe	Sainte Rosalie	Pointe Saint Charles (Cape)
Saint-Laurent	Taschereau Yard	Montreal (Pointe aux Trembles)
Valleyfield	Cécile	Coteau Jct
Northern Quebec Local Interest Railway		
Chapais	Barraute	Franquet
Chapais	Chapais	Chibougamau
Cran	Triquet	Faribault
La Tuque	Saint Adelphe	La Tuque (Fitzpatrick)
Lac Saint-Jean	Garneau Yard	Arvida
Matagami	Franquet	Matagami
Roberval	Chambord	Dolbeau
Saint Maurice	La Tuque (Fitzpatrick)	Senneterre
Taschereau	Senneterre	La Sarre
Val d'Or	Senneterre	Rouyn-Noranda

Subdivision	From	To
St. Lawrence and Hudson Railway (SL&H)		
Adirondack	Saint Jean sur Richelieu	Outremont
Farnham Connect	Saint Luc Yard (Wentworth)	North Jct (Sorting)
Lachute	Outremont	Sainte-Thérèse
Lacolle	Rouses Point (NY)	Delson
M & O	Dorion	Rigaud
Saint Luc Branch	Saint Luc Yard	Ballantyne
Sainte Agathe	Sainte Thérèse	Saint Jérôme
Vaudreuil	Montreal West	Dorion
Westmount	Montreal (Windsor Station)	Montreal West (Sorting)
Winchester	Dorion	Saint Télesphore
National Harbour Board		
Port of Montreal	1.8 miles	Montreal East
Matapédia Railway		
Mont Joli	Mont Joli	Matapédia
Matane	Matane	Mont Joli
Canadian American Railroad (CAR)		
Moosehead	Lac Mégantic	Frontenac
Sherbrooke	Lac Mégantic	Lennoxville
Ottawa Valley Railink (CDAC)		
Témiscaming	Mattawa (Ont)	Témiscaming
Nipissing Central (Ontario Northern Railway ONR)		
Kirkland Lake	Swastika Jct (Ont)	Rouyn-Noranda
St-Lawrence & Adirondack (Conrail CR)		
Montreal Branch	Huntingdon	Kahnawake
Quebec North Shore and Labrador Railway (QNSL)		
Menihek	Shefferville	Shefferville
Wacouna	Sept Îles	Quebec-Labrador Border
Arnaud Railway		
Arnaud	Pointe Noire	Arnaud Jct
St.Lawrence & Atlantic (SL&A)		
Sherbrooke	Island Pond (VT)	Sainte Rosalie

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APPENDIX B

Railways under provincial jurisdiction

Subdivision	From	To
Quebec Southern Railway (CFQS)		
Adirondack	Brookport	Saint Jean sur Richelieu
Newport	Brookport	Abercorn (border)
Newport	Glen Sutton	Highwater
Sherbrooke	Lennoxville	Brookport
Stanbridge	Farnham	Stanbridge
Saint Guillaume	Farnham	Sainte Rosalie
Quebec-Gatineau Railway (CFQG)		
Lachute	Saint Augustin	Île Lemieux
Trois Rivières	Quebec	Saint Martin Jct
St Maurice Valley	Trois Rivières	Grand Mère
Chemin de fer Charlevoix (CFC)		
Charlevoix	Quebec City	Clermont
Chemin de fer Baie-des-Chaleurs (CFBC)		
Cascapédia	Matapédia	New Carlisle
Chandler West	New Carlisle	Chandler East
Corporation du chemin de fer de la Gaspésie (CCFG)		
Chandler East	Chandler East	Gaspé

Subdivision	From	To
Chemin de fer Lanaudière (CFL)		
	Joliette	Saint-Félix-de-Valois
Quebec Central Railway (QC)		
Chaudière	Vallée Jonction	Lac Frontière
Lévis	Scott Jonction	Harlaka
Vallée	Sherbrooke	Diamond
Roberval-Saguenay Railway (CFRS)		
	Jonquière	La Baie
	Grande Baie	Laterrière
	Alma	Saguenay Power
Chemin de fer de l'Outaouais (CFO)		
	Hull	Wakefield
Compagnie de gestion de Matane (COGEMA) *railroad ferry*		
	Matane	Baie Comeau Hauterive
Chemin de fer Cartier (CFC)		
	Port Cartier	Mont Wright
Chemin de fer de la Rivière Romaine (CFRR)		
	Havre Saint Pierre	Lac Tio

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Transport Canada and grade crossing research

Daniel Lafontaine
Transport Canada, Rail Safety
Ottawa, Ontario

SUMMARY

The Rail-Highway Grade Crossing Research Program is a collaborative effort by Transport Canada, *Direction 2006*, railway companies, provinces, and other stakeholders. The Grade Crossing Improvement Program is one tool used to achieve broader program goals. With a $7 million a year contribution base, it funds a wide array of grade crossing safety-related projects. Costs have risen over the years so that funding that covered many projects in 1989 covers far fewer in 1999. Therefore, Transport Canada, provincial governments, the railway industry, and all other stakeholders must work together to find effective solutions and more innovative ways to improve grade crossing safety.

SOMMAIRE

Le Programme de recherche sur les passages à niveau est une initiative multipartite qui réunit Transports Canada, *Direction 2006*, des compagnies de chemin de fer, des provinces et d'autres intéressés. Le Programme d'amélioration des passages à niveau est un des outils utilisés pour atteindre les objectifs du programme global. Doté d'une contribution annuelle de 7 millions de dollars, il finance un large éventail de projets visant à rendre les passages à niveau plus sûrs. En raison de l'augmentation des coûts au fil des ans, ce programme, qui finançait de nombreux projets en 1989, avait une portée beaucoup plus modeste en 1999. C'est pourquoi Transports Canada, les gouvernements provinciaux, l'industrie du transport ferroviaire et tous les autres intéressés doivent unir leur forces pour trouver des moyens efficaces et novateurs d'améliorer la sécurité aux passages à niveau.

TC & Grade Crossing Research

Presented by Daniel Lafontaine to
Consultation Workshop
November 18, 1999
Ottawa, Ontario

Why a research program on crossing safety?

- To reduce grade crossing and trespassing accidents by 50% in ten years, ending in 2006. One way to achieve this goal is to improve safety at grade crossings.
- Collaborative effort by Transport Canada Rail Safety Directorate, the Transportation Development Centre, and *Direction 2006*

Grade crossing improvement program

- One tool to improve safety at grade crossings
- Funding of $7.5 million per year
- Wide range of eligible projects, e.g.:
  - installation or modification of automatic warning systems
  - interconnection with nearby highway traffic signals
  - improvement to the highway geometry at a crossing
  - improvement to sight lines
  - closure of crossings (the most efficient safety measure)

Increase the funding contribution

- Same amount of money contributes to fewer projects in 1999 than in 1989
- Ron Mitchell, Pacific Region, developing business case to convince authorities to increase funding

Do more with the money available

- Innovative ways to improve safety at grade crossings must be found (a primary goal of the research program)

Background studies

- To gain a better understanding of the problems
- To assess the effectiveness of current systems

Research

- Effective, low-cost, new technology
- Alternative equipment and systems
- Pedestrian and trespassing problems

1999 program

- Research on integration and accessibility of databases on crossing and trespassing accidents
- Crossing analysis, causal analysis, and remedial measures
- Investigation of second-train warning at grade crossing for pedestrians
- Study of utilization of LED for Canadian railway operations
- Study of locomotive horn

Some systems and ideas

- Four-quadrant gates
- Median barriers
- Photo enforcement
- In-vehicle audible and visual warning devices
- Video imaging for trespassing

Main program objective

To focus our attention on the right solutions

Workshop objective

To share opinions, plan, and aim in the right direction

Research partnership

- Transport Canada
- Railway industry
- Provincial governments

Biggest challenge

To bring aboard more road authorities and municipalities, as grade crossing safety and trespassing problems are also their concerns

Canadian cooperative grade crossing research program

Sesto Vespa
Transport Canada, Transportation Development Centre
Montreal, Quebec

SUMMARY

Since autumn 1998 Transport Canada has been collaborating with *Direction 2006* and other stakeholders to develop a research program aimed at increasing the safety of rail-highway grade crossings by improving the effectiveness of crossing warning systems. The vision was to apply new technologies and other improvements to existing systems, based on an enhanced understanding of the technological, operational, and human factor aspects. The developed cooperative program was submitted to Transport Canada's R&D Management Board for funding approval, which was obtained on 2 June 1999. A four-year research program was approved in principle by the Board on the basis of a substantial financial contribution from other partners, with that from the railways and provinces being among the most significant. To date, in addition to Transport Canada and *Direction 2006*, the participation of the major Canadian railways and several provinces has been secured. The program is now soliciting support from other stakeholders and initiating a number of projects.

The program addresses the following major research areas:

- program planning
- crossings database and risk mitigation
- enforcement technologies
- active crossings
- signal lights and structures
- passive crossings
- train-based warning systems

SOMMAIRE

Depuis l'automne 1998, Transports Canada collabore avec *Direction 2006* et d'autres partenaires à la mise au point d'un programme de recherche pour améliorer la sécurité aux passages à niveau en les dotant de systèmes d'avertissement plus efficaces. Le principe était d'améliorer les systèmes existants, en y intégrant les nouvelles technologies et en misant sur une meilleure compréhension des facteurs techniques, opérationnels et ergonomiques en jeu. Le programme associatif mis au point et la demande de financement connexe ont été soumis au Conseil de gestion de la R&D de Transports Canada. Le 2 juin 1999, le Conseil donnait son approbation de principe à un programme de recherche d'une durée de quatre ans, sous réserve d'une contribution financière substantielle d'autres partenaires, parmi lesquels les compagnies de chemin de fer et les provinces devaient figurer en bonne place. À ce jour, outre Transports Canada et *Direction 2006*, le programme s'est acquis le concours des principaux chemins de fer canadiens et de plusieurs provinces. Toujours à la recherche de nouveaux appuis, il s'apprête à lancer une série de projets.

Voici les grands secteurs de recherche autour desquels s'articule le programme :

- organisation du programme
- base de données sur les passages à niveau et atténuation des risques
- techniques de répression des infractions
- passages à niveau automatisés
- feux de signalisation et structures
- passages à niveau non automatisés
- systèmes d'avertissement à bord des trains

RAIL-HIGHWAY GRADE CROSSING RESEARCH PROGRAM

Cooperative government & industry initiative
under auspices of
Research KRA, *Direction 2006* Committee

Presented by Sesto Vespa to

Consultation Workshop
18 November 1999
Ottawa, Ontario

OBJECTIVES

- Provide options for increasing the safety and lowering the cost of crossing warning systems
  - through application of new technologies and other improvements to existing systems
  - based on an enhanced understanding of technological, operational, and human factors aspects

PARTNERSHIPS

- *Direction 2006* Committee
- Federal, provincial, & municipal governments
- Canadian railways & associations
- Railway industry suppliers
- Trucking industry & associations
- U.S. Federal Railroad Administration

ORGANIZATION

- Rail Safety to have overall TC program responsibility
- TDC to manage research on behalf of Rail Safety under established procedures
- TDC to serve as program office, with Sesto Vespa as program leader
- Program steering committee:
  - includes program sponsors
  - oversees overall direction of work, costs, progress, and results
  - is chaired by TC Rail Safety

ORGANIZATION (cont'd)

- Technical steering committees:
  - include project sponsors plus subject matter experts as needed
  - oversee individual projects; review work to be contracted out or performed in-house by project sponsors, contracting-out documents, and selection of contractors for specific work elements
  - are chaired by TDC program leader

ADMINISTRATION

- TDC to sign cooperative agreements with individual funding sponsors, outlining overall principles of cooperation and funding modalities
- Technical and administrative support, beyond that made available by TDC and funding partners, to be engaged by TDC on a contract basis and charged to the program
- Contracting out by TDC to be done in accordance with normal TDC and government procedures

ADMINISTRATION (cont'd)

- Chair of *D2006* Research KRA to liaise with *D2006* Executive Committee
- Program letterhead to include *D2006* logo
- *D2006* & program sponsors visible in program publications

PROPOSED BUDGET

	FY 1999/00	FY2000/01	FY2001/02	FY2002/03
TC	150,000	350,000	350,000	150,000
Partners	50,000	100,000	100,000	50,000
Annual Totals	200,000	450,000	450,000	200,000
	Program Total: $1,300,000*			

* Does not include in-kind support, staff, and travel costs

* Funds would be subject to annual review and approval

MAJOR DELIVERABLES

- Integrated and accessible database of railway crossings and incidents
- Methodology for risk analysis and evaluation of risk mitigation measures
- Analysis of primary contributing factors to crossing accidents
  - from the perspective of countermeasures development through technology and design of crossings and warning systems

MAJOR DELIVERABLES (cont'd)

- Cost-effective technology/design countermeasures to accident-contributing factors
  - where not feasible or cost-effective, reasons and/or required further research to be identified. Risk mitigation measures would address issues associated with rail, road, and pedestrian users
  - prototype equipment, concept systems, design standards, specifications, methodologies
- Individual final report on each project
- Final report on overall program including expected safety contributions and cost-benefit evaluations

PROGRAM ELEMENTS

- Program planning
- Crossings database and risk mitigation
- Enforcement technologies
- Active crossings
- Signal lights and structures
- Passive crossings
- Train-based warning systems

PROGRAM PLANNING

- Program development and implementation plan
  - annual workshop on R&D

CROSSING DATABASE & RISK MITIGATION

- Integrated and accessible database of railway crossings and incidents
- Crossing accidents – causal analysis and remedial measures
- Risk mitigation approach to grade crossing safety
- Impacts of road heavy trucks and tractor-trailers on crossing safety

ENFORCEMENT TECHNOLOGIES

- Field measurement of luminous intensity for grade crossing signal lights

ACTIVE CROSSINGS

- Second-train warning at grade crossings
- Advance warning of approaching trains at grade crossings
- Low-cost active grade crossing system

SIGNAL LIGHTS & STRUCTURES

- LED technology for improved conspicuity of signal lights at grade crossings
- Cost-effective cantilever structure for grade crossing signals

PASSIVE CROSSINGS

- Advance warning to road users on approach to passive grade crossings
- Enhanced low-cost passive grade crossing system

TRAIN-BASED WARNING SYSTEMS

- Locomotive horn study

FY 1999/00
PROPOSED PROJECTS

- Program development and implementation plan
- Integrated and accessible database of railway crossings and incidents
- Crossing accidents – causal analysis and remedial measures
- Second-train warning at grade crossings
- LED technology for improved conspicuity of signal lights at grade crossings
- Locomotive horn study

Safetran products, research, and future directions

Bill Wilson
Safetran Systems
Mississauga, Ontario

SUMMARY

Over the last few decades Safetran Systems Corporation has been providing state-of-the-art equipment for improving the safety of rail-highway intersections. More specifically, Safetran has been involved in improving crossing warning equipment by providing systems for upgrading passive warning systems to active ones and for making existing active systems more effective. Safetran's main focus is to find more innovative approaches that help make rail-highway crossing warning systems safer, more conspicuous, and less costly.

SOMMAIRE

Depuis quelques décennies, Safetran Systems Corporation met sur le marché des équipements d'avant-garde pour améliorer la sécurité aux passages à niveau. Safetran se spécialise plus précisément dans la modernisation des dispositifs d'avertissement. C'est ainsi qu'elle offre des systèmes qui permettent d'automatiser les passages non automatisés et de rendre les passages automatisés encore plus efficaces. La préoccupation constante de Safetran est de mettre l'innovation au service de passages à niveau plus sûrs, plus visibles et moins coûteux.

Welcome

Direction 2006

In the last few decades we have significantly improved the safety of the highway-railway intersection.

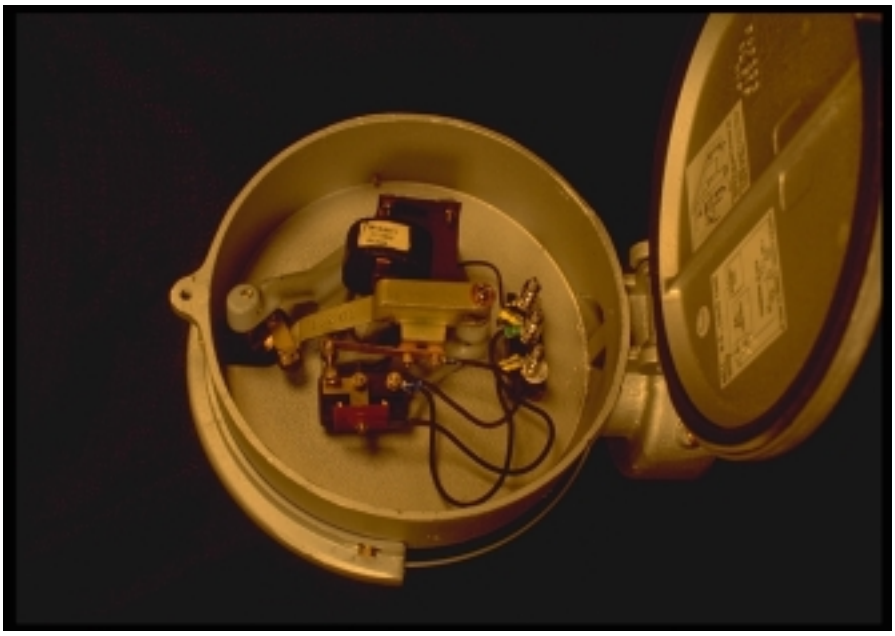
Direction 2006

We have achieved this success by:

- **Improving crossing warning equipment**
- **Upgrading passive crossings to active warning systems**
- **Upgrading existing active systems to be more effective**

Direction 2006

Let's take a look at some of the improvements in warning equipment design

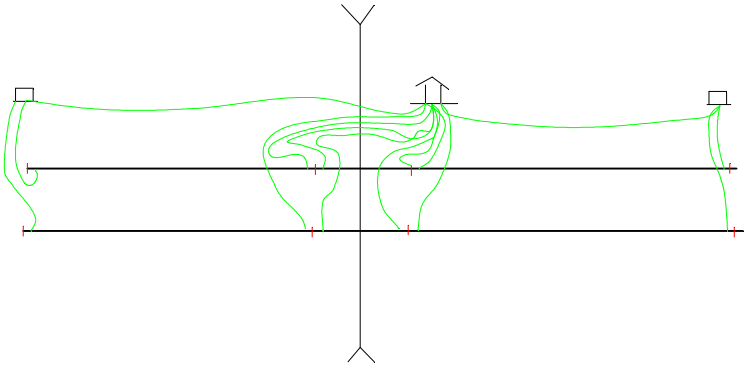


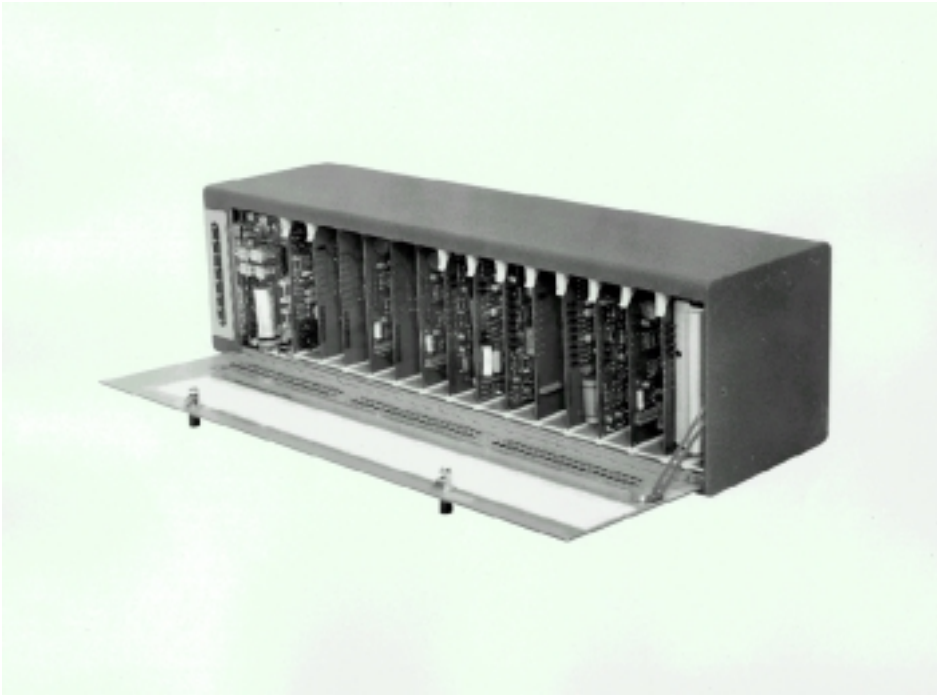
Direction 2006

Evolution of the Modern Grade Crossing Predictor (GCP) and Motion Sensor

Traditional Three DC Track Circuit Crossing Approach Scheme

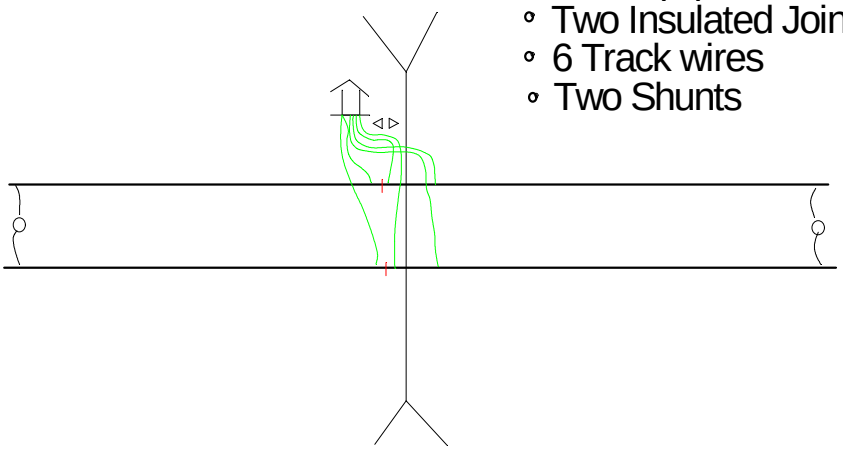
- Three Equipment Locations
- Eight Insulated joints
- 10 Track Wires
- Cables Between Locations





Early GCP Circuits

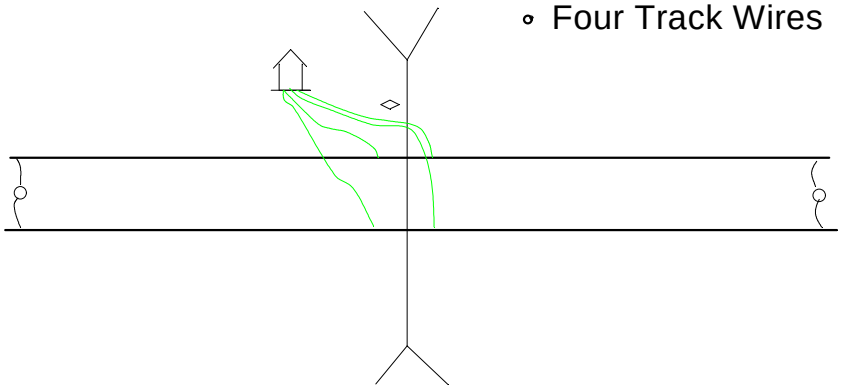
- One equipment location
- Two Insulated Joints
- 6 Track wires
- Two Shunts



Modern GCP

Modern GCP or Motion Sensor Crossing

- One equipment location
- Four Track Wires

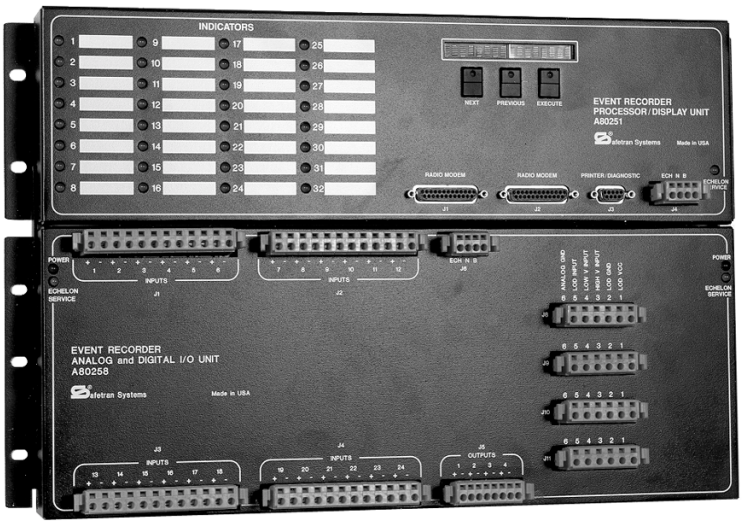


Modern Motion Sensor

Direction 2006

Data Recorders

Direction 2006



Direction 2006

But making improvements in crossing warning equipment is not enough!

Direction 2006

We Must:

- **Support the implementation and enforcement of traffic regulations regarding crossing warning systems**
- **Continue to upgrade passive warning equipment to active warning equipment**
- **Look to more innovative approaches to improving the safety of high risk crossings**


3
TRACK


TRACKS
P&O
APL

Direction 2006

The most effective way to improve the safety at crossings may be to upgrade more crossings from passive warning equipment to active warning equipment

Direction 2006

But with limited resources, we need to cut the cost of the average crossing

Direction 2006

- **Standardize crossing designs to reduce design and system costs**
- **Utilize GCPs or Motion Sensors to reduce installation cost and improve performance**
- **Use warning equipment consistent with the needs of that crossing**

Direction 2006

Improving the safety of crossings is an industry effort

We all must contribute

It will take time and innovation

But we can do it

Thank You

SAFETRAN systems

Crossing signals enforcement and intrusion detection

Catherine Hirou
Lockheed Martin IMS
Montreal, Quebec

SUMMARY

Lockheed Martin IMS is involved in the development of automated rail crossing enforcement products and systems. These systems, such as Traxguard, are designed to deter drivers from engaging in risky behavior. Activation of the Traxguard system occurs only when a vehicle is detected entering the grade crossing after the flashing lights and ringing bells have been activated and the gates have started to descend. The system is dormant at all other times. Upon detection of a violation, pictures are taken. At a Los Angeles County Metropolitan Transportation Authority Blue Line Crossing, where the Traxguard system was installed, the results were very positive. After the installation of this system, the number of violations declined dramatically.

SOMMAIRE

Lockheed Martin IMS travaille au développement de produits et systèmes automatisés de répression des infractions aux passages à niveau. Ces systèmes, tel Traxguard, sont conçus pour détourner les conducteurs de comportements à risque. Traxguard ne s'active que lorsqu'il détecte un véhicule en train de s'engager sur la voie alors que les feux clignotants et la sonnerie sont activés, et que les barrières ont commencé à s'abaisser. Il demeure inactif en toute autre circonstance. Dès qu'une infraction est détectée, une caméra prend des photos. Traxguard a été installé aux passages à niveau de la Blue Line du réseau de la Metropolitan Transportation Authority de Los Angeles, où il a donné d'excellents résultats : peu après l'installation du système, on notait une chute radicale du nombre d'infractions.

LOCKHEED MARTIN

Lockheed Martin IMS

Municipal Services

Crossing Signals Enforcement and Intrusion Detection

Safety Improvement

LOCKHEED MARTIN

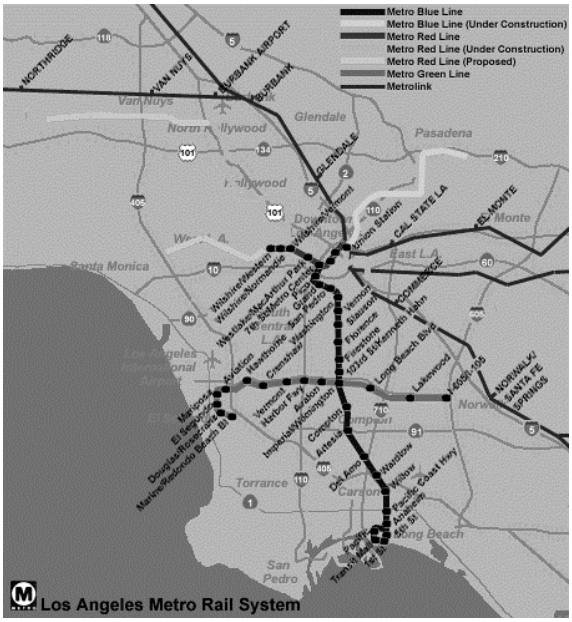
- The Blue Line Experience
- The TRAXGUARD System
- The Program Results
- New Implementations
- Potential for Canada

LOCKHEED MARTIN

LOCKHEED MARTIN

Metro Blue Line

LOCKHEED MARTIN



LOCKHEED MARTIN

The Blue Line

- 22 miles between downtown Los Angeles and downtown Long Beach
- Opened in mid-1990
- Los Angeles County Metropolitan Transportation Authority (LAC MTA)
- 100 at-grade crossings on the line
- Safety improvement program: 17 grade crossings, 23 poles, and 10 cameras

LOCKHEED MARTIN

The biggest problem facing the Blue Line: grade crossing accidents

- Since opening in July 1990 through end of June 1997: 353 collisions, including 33 fatalities
- LRT speeds up to 55 miles/hour (88.5 km/h)
- Driving around closed crossing gates against flashing lights and bell warnings

LOCKHEED MARTIN

Results from 1994 telephone interviews of grade crossing users

- Speed of train after lights flashing is misunderstood (80%)
- Driving around lowered crossing gates (76%)
- Freight trains are long and slow (70%)
- Two or three trains can go through at the same time (70%)
- Not enough barriers to keep pedestrians off the track (68%)

LOCKHEED MARTIN

Key contributing factors for the collisions

- Grade crossing geometry
- Left turns from streets parallel to the tracks
- Presence of two trains at the same time
- Slower speeds of freight trains
- Longer gate down time of freight trains

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The TRAXGUARD System

- The TRAXGUARD system consists of two parts:
  - an enforcement unit, which consists of a computer, high speed camera, flash, digital loop signal processor and
  - an optional memory card system
- Since it is integrated and portable, this unit can be shared among multiple intersections (10/33)

LOCKHEED MARTIN

The TRAXGUARD System

LOCKHEED MARTIN

The TRAXGUARD System (cont'd)

The fixed part of the system is composed of a bullet-resistant cabinet (which houses the portable enforcement unit) mounted on a hinged pole, along with wiring and detection loops which are installed in the roadway.

Ensuring maximum productivity per investment, approximately 80% of the system's cost is in the portable enforcement unit.

LOCKHEED MARTIN

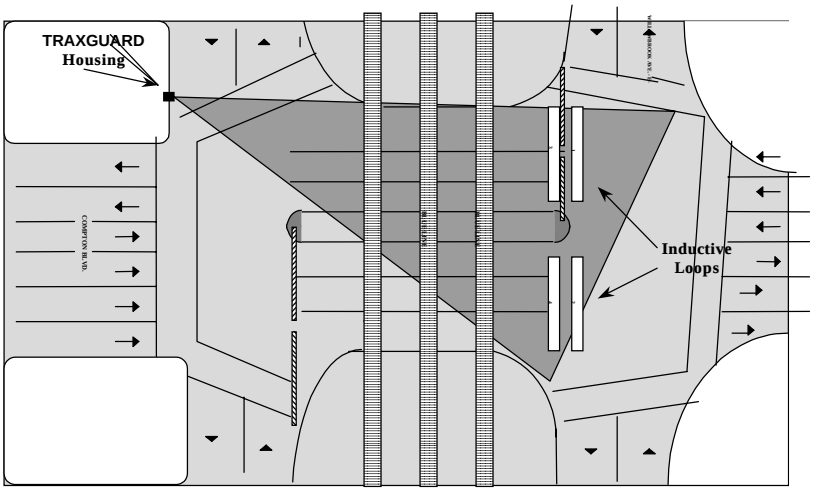
The TRAXGUARD System (cont'd)

In actual enforcement applications, a single enforcement unit can be easily rotated among as many as ten crossings.

Because potential violators are unable to tell the difference between an "active" and a "passive" system they are unwilling to take the chance of being cited – hence all systems retain their deterrent value.

LOCKHEED MARTIN

Equipment Location



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Operation

Activation of the system occurs only when a vehicle is detected entering the grade crossing after the flashing lights and ringing bells have been activated and the crossing gate arms have started to descend.

The system is dormant at all other times.

When the photos are taken, information is also recorded.

LOCKHEED MARTIN

Operation (cont'd)

Upon detection of a grade crossing violation, a series of two photographs are taken.

The initial photograph is taken when the vehicle enters the crossing and a second picture is taken within 1.5 seconds, to show the vehicle's illegal progression through the crossing.

Clearly visible in each photograph is the vehicle committing the violation, the license plate, the driver's face, and other visible environmental conditions.

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The TRAXGUARD System in Action

LOCKHEED MARTIN

The Data Box

Each photograph has a superimposed data box which contains:

- the time
- the date
- the location of the violation
- the speed of the offending vehicle
- the number of seconds after the red light started flashing that the vehicle illegally entered the grade crossing

LOCKHEED MARTIN

Program Results

- August 1995 – 30-day warning period
- September 1995 – Commenced issuing citations
- September 1995-January 1998 – no injuries or fatalities at crossings where photo enforcement equipment was operational
- January 23rd, 1998 – the first accident occurred and was captured on film
- Prior to September 1995 – 17 train/vehicle accidents and 8 fatalities at these locations

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Nov-99 Lockheed Martin Proprietary 19

LOCKHEED MARTIN

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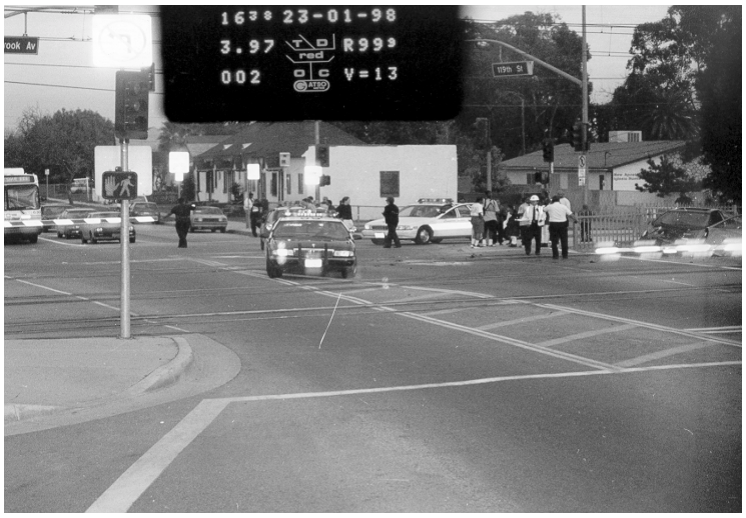
16 37 23-01-98
2Y0 R99
red
002 0982


16 38 23-01-98
3.97 R99
red
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Citations Issued

LA County MTA Blue Line citations between April 1996 to October 1998 – 6,666

Issuance of Citations = Change in Behavior

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New Implementations

- Two-year pilot program in Chicago, Illinois, launched on 3 November 1999
  - 17 crashes in three years
  - two-week grace period
  - two signs in place
- Possible 11 additional grade crossings monitored on the Blue Line equipped with 7 cameras

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Potential Applications for Canada

- Photo enforcement provides more than photographic evidence
- Photo enforcement provides more than ticketing potential, where the law allows it
- Photo enforcement increases the effectiveness of existing installations
- This technology has never been implemented at grade crossings in Canada

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Potential Applications for Canada (cont'd)

- Increases driver awareness of the danger associated with the infraction
- Provides a powerful tool by collection at the monitored location of:
  - the registered owner as well as his/her social profile
  - the weather and road surface conditions
  - the time
  - the date

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Potential Applications for Canada (cont'd)

- the speed of the offending vehicle
- the number of seconds after the flashing lights were activated

- Therefore facilitates the development of appropriate and well-adapted countermeasures and campaigns

LOCKHEED MARTIN

Thank you

For further information, please contact:

LOCKHEED MARTIN

Municipal Services
6111 Royalmount Ave.
Montreal, Quebec
H4P 1K6
Tel.: (514) 340-8375
Fax: (514) 340-8448

Harmon products, research, and future directions

Leo Green and John Johnson
Harmon Industries Inc.
Blue Springs, Missouri; Calgary, Alberta

SUMMARY

Harmon Industries Inc. is active in the supply, improvement, and research of equipment for rail-highway and rail-pedestrian intersections. It is presently carrying out a demonstration of the Incremental Train Control System (ITCS) on the Kalamazo-New Buffalo rail line in Michigan. In this project, an integrated electronic system uses a communication link between a given control point – a train – and a crossing and may activate the crossing warning when train speed dictates a need for additional warning time. Harmon Industries Inc. is also involved in the remote monitoring and gathering of critical crossing information and bringing this information back to a central location for evaluation and action (Medesto, California). New products such as Light Emitting Diodes and existing products such as HXP (a constant warning time system) and PMD (a motion detection system) are continuously improved to take advantage of the latest technology and to provide cost-effective solutions to highway crossing warning systems in an ever-increasing complexity of applications.

SOMMAIRE

Harmon Industries Inc. se spécialise dans le matériel de protection des passages à niveau. Ses activités se répartissent entre trois secteurs : vente, modernisation et recherche. Elle participe présentement à un projet de démonstration du système de commande incrémentale des trains (ITCS pour *Incremental Train Control System*) sur la ligne Kalamazoo-New Buffalo, au Michigan. Il s'agit d'un système électronique intégré qui relie, au moyen d'une liaison radio, un point de référence donné – un train – et un passage à niveau, et active le dispositif d'avertissement du passage à niveau en fonction de la vitesse d'approche du train. Harmon Industries Inc. fabrique également des dispositifs qui surveillent à distance les passages à niveau et colligent les données vitales pour les relayer vers un centre pour évaluation et suite à donner (Medesto, Californie). Tant les nouveaux produits, comme les diodes électroluminescentes, que les produits éprouvés, comme le HXP (un dispositif d'annonce à temps constant) et le PMD (un système de détection du mouvement) sont l'objet d'améliorations constantes, le but étant de mettre à profit les percées technologiques et d'offrir des solutions économiques pour la protection des passages à niveau, parmi une panoplie d'applications chaque jour plus complexe.

Harmon Industries, Inc.

America's Largest Signal Supplier is recognized as an industry leader in:

- Systems Integration
- State of the Art Crossing Systems
- Asset Management Services
- Train Control Systems
- Advanced Technology

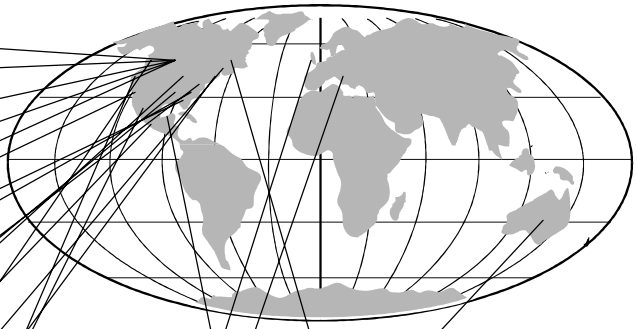
By railroads and transit systems worldwide.

Harmon Locations

Harmon INDUSTRIES

United States

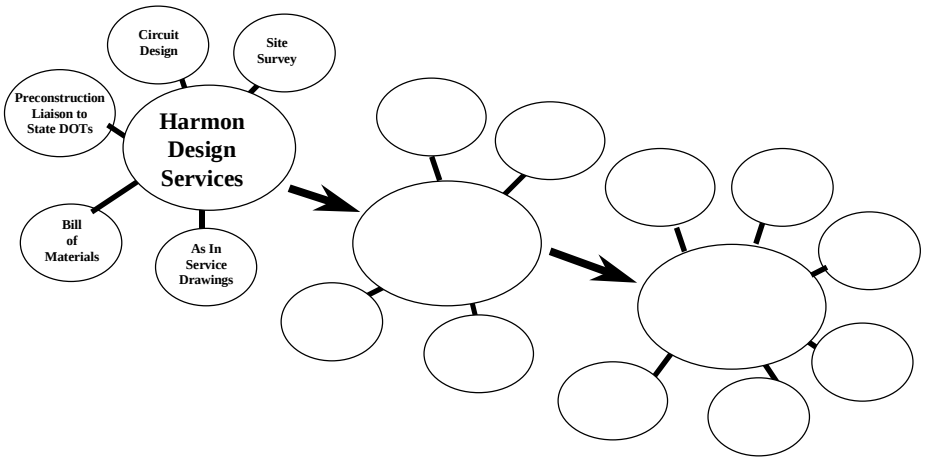
- Omaha, NE
- Grain Valley, MO
- Warrensburg, MO
- Lee's Summit, MO
- Blue Springs, MO
- Riverside, CA
- Jacksonville, FL
- Atlanta, GA
- Hauppauge, NY
- Louisville, KY
- Delphi, IN
- Torrance, CA
- Spokane, WA
- Hingham, MA
- Marina del Rey, CA
- Glenelg, MD
- Napa Valley, CA



International

- Ware, England
- Pointe Claire, Quebec, Canada
- Bayswater, Victoria, Australia
- Monterrey, Mexico
- Florence, Italy

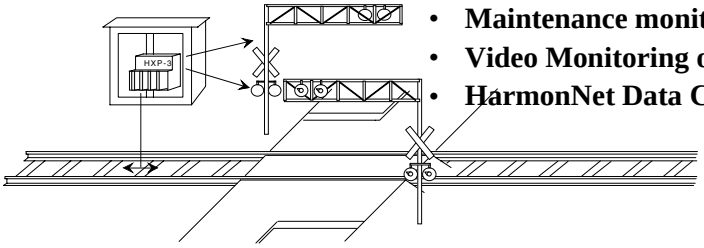
Comprehensive Signal Solution



State of the Art

Crossing Systems

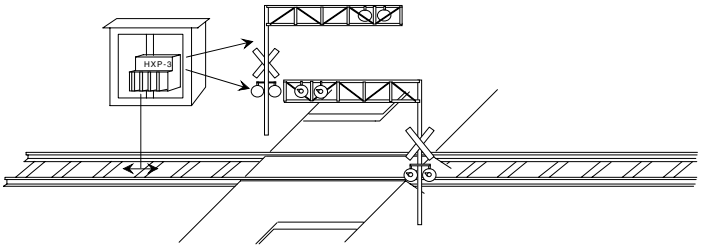
- **Electronic systems for train detection**
- **Electronic crossing control systems**
- **Crossing signals and signal structures**
- **Median Barriers & 4 Quadrant Gates**
- **Dragnet Barrier**
- **Maintenance monitoring and alarms**
- **Video Monitoring of Events**
- **HarmonNet Data Collection System**



Electronic Systems

for Train Detection

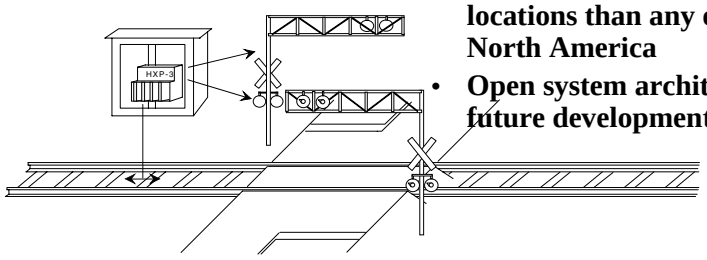
- **HXP-3 Constant Warning Time Systems**
- **PMD-3 Motion Detectors**
- **SCX-1 Solid State Style “C” System**



HXP-3 Constant

Warning Time Systems

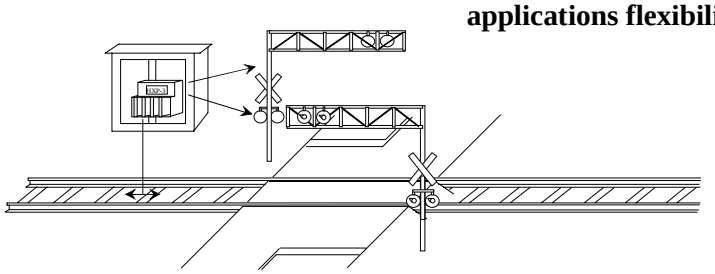
- **State of the Art Constant Warning**
- **Traffic Control System Interface**
- **Unit of choice where train speeds vary most**
- **Applied at more 4 quadrant gate locations than any other system in North America**
- **Open system architecture allows for future development**



PMD-3

Motion Detector Systems

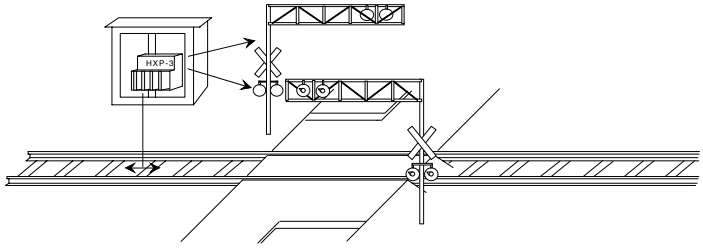
- **Reliable Motion Detector Start**
- **Shares module compatibility with HXP-3 systems**
- **Advanced system features ensure applications flexibility**



SCX-1 Solid State

Style "C" Systems

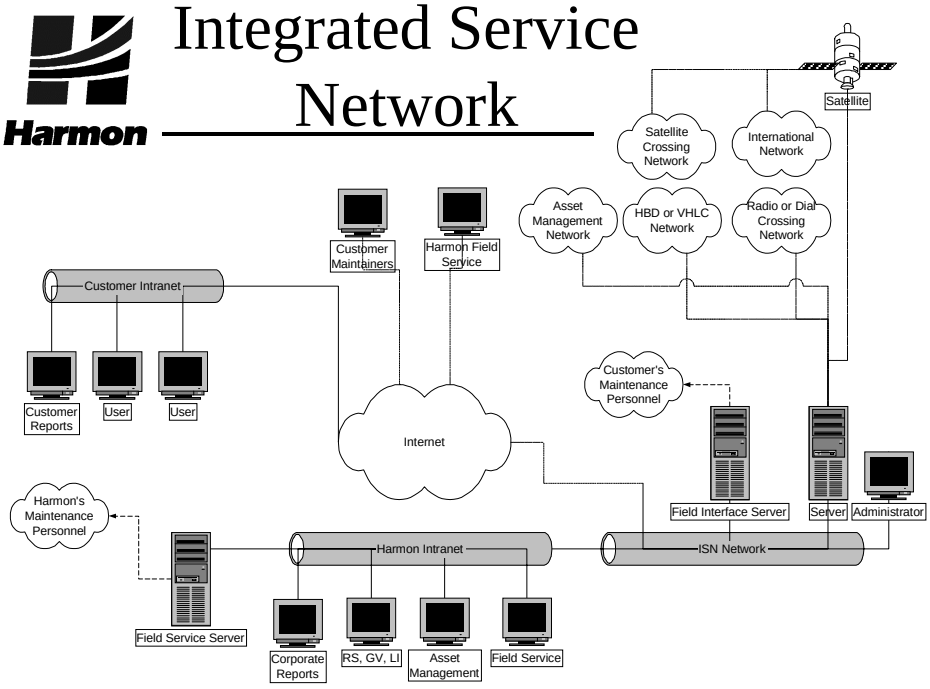
- **State of the art electronic system for train detection on seldom used sidings**
- **Fully programmable vital logic**



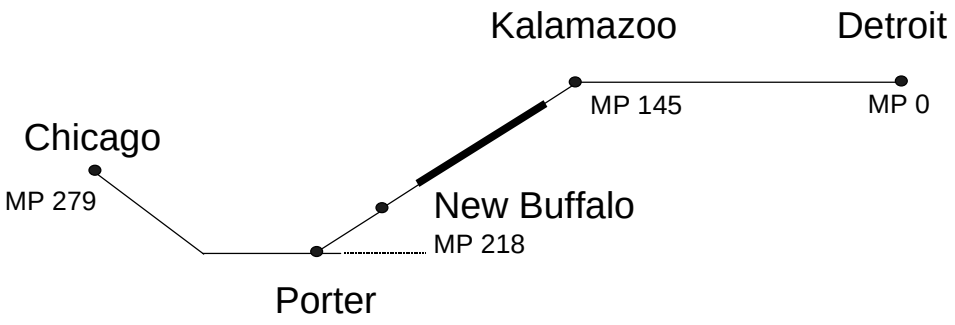
Median Barriers

4 Quadrant Gates

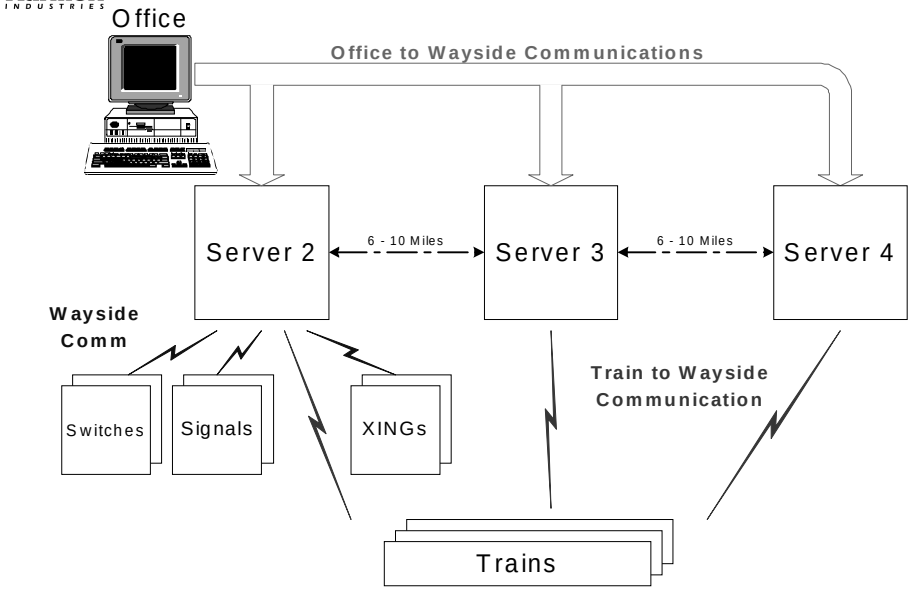
Integrated Service Network



ITCS Demonstration Project Michigan



ITCS Overview



Slide 14

CLD – Clear Signal

- Mode Light
- Speed Limit
- Actual Speed

- No Target
- Targets only show if more restrictive

CLD – Normal Crossing

- No Target

CLD – Crossing with No Ack

- Speed Reduction to Normal Crossing Speed at the Approach Circuit

U.S. directions in research and the expectations

Anya A. Carroll
Volpe National Transportation Systems Center
Cambridge, Massachusetts

SUMMARY

The U.S. Department of Transportation (DOT) Research and Special Programs Administration's John A. Volpe National Transportation Systems Center actively supports the U.S. DOT Federal Railroad Administration and Intelligent Transportation Systems Joint Program Office in a variety of areas touching on highway-rail grade crossing safety. An Interagency Working Group was established in 1994 to implement the recommendations in the Highway-Rail Grade Crossing Action Plan. In response to the Fox River Grove Crash, the group (HRXTEAM) was re-established in 1998 to improve safety and mobility at highway-rail grade crossings. In collaboration with various stakeholders, the HRXTEAM goals are:

- to reduce the number of fatalities, injuries, and collisions at crossings by 50 percent by the year 2008
- to reduce the number of fatalities, injuries, and collisions per 100 million transit passenger miles by one percent per year
- to increase mobility by decreasing traveller delay at highway-rail grade crossings

To achieve these goals, the Volpe Center provides engineering support, direction, and analysis to determine appropriate tools and technologies for highway-rail grade crossings. It also provides evaluation and analysis in the areas of educational techniques and enforcement technologies.

An ITS/HRI evaluation workshop, organized by the Volpe Center 6 - 7 May 1999, focussed on the application of Intelligent Transportation Systems (ITS) to Highway-Rail Intersections (HRI). The workshop identified ITS-HRI projects carried out at seven high-priority demonstration sites. ITS findings and recommendations for HRI were presented.

SOMMAIRE

Le Centre national de recherche sur les systèmes de transport John A. Volpe, de la *Research and Special Programs Administration* (U.S. Department of Transportation - DOT) participe activement au programme de la FRA (*Federal Railroad Administration*) sur les systèmes de transports intelligents, qui comprend divers projets touchant la sécurité aux passages à niveau. C'est ainsi qu'un groupe de travail interagence a été mis sur pied en 1994 pour appliquer les recommandations formulées dans le plan d'action sur les passages à niveau. En 1998, par suite de l'accident de Fox River Grove, le groupe (HRXTEAM) a été constitué de nouveau avec cette fois comme mandat d'améliorer la sécurité et la mobilité aux passages à niveau. De concert avec divers partenaires, le HRXTEAM poursuit les objectifs suivants :

- réduire de moitié, d'ici 2008, le nombre d'accidents, de tués et de blessés aux passages à niveau
- réduire de 1 p. cent par année le taux d'accidents, de tués et de blessés par 100 millions de passagers-milles
- accroître la mobilité en diminuant les temps d'attente aux passages à niveau

L'apport du Volpe Center prend la forme d'un soutien technique, de conseils et d'analyses quant au choix des produits et technologies pour passages à niveau. Le centre réalise également des évaluations et des analyses touchant les techniques de sensibilisation à la sécurité et les technologies de répression des infractions.

L'atelier ITS/HRI (*Intelligent Transportation Systems/Highway-Rail Intersections*) organisé par le Volpe Center les 6 et 7 mai 1999 s'est penché sur l'application de systèmes de transports intelligents (STI) aux passages à niveau. Sept projets de démonstration ITS-HRI menés sur des sites hautement prioritaires ont ainsi été présentés, de même que les résultats et recommandations issus de ces projets.

HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

U.S. Directions in Research and the Expectations

Workshop on Rail-Highway Grade Crossing Research
D2006 National Consultation Meetings
Key Results Area - November 18, 1999
Ottawa, Canada

HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Introduction

Interagency Working Group for Grade Crossing R&D

- Established in 1994 to implement the recommendations from the Highway-Rail Grade Crossing Action Plan
- Re-established in early 1998 in response to the Fox River Grove crash

Mission

Improve Safety and Mobility at Highway-Rail Grade Crossings

HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

HRXTEAM Goals

- Reduce the number of fatalities, injuries, and collisions at highway-rail grade crossings 50% by the year 2008
- Reduce the number of fatalities, injuries, and collisions per 100 million transit passenger miles by one percent per year
- Increase mobility by decreasing traveler delay at highway-rail grade crossings

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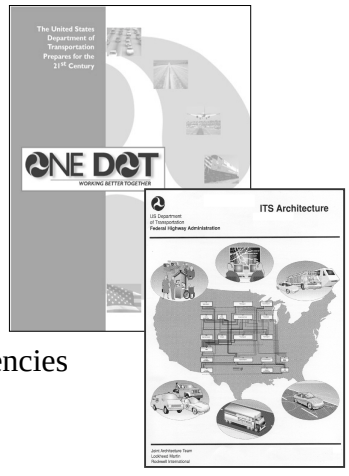
HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

FRA leads the "ONEDOT" focus on Highway-Rail (HRI) Intersection Safety Research



- Collaboration with:

FHWA	Academia
FTA	Industry
NHTSA	State & Local Agencies

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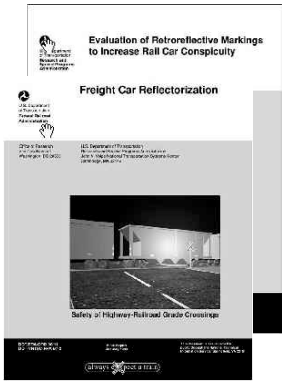
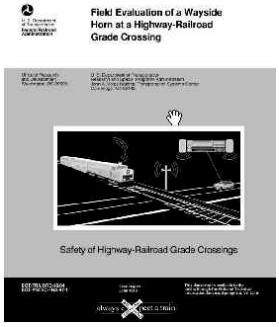
HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

FRA Recent Grade Crossing Research Accomplishments:
WEB Site: http://www.volpe.dot.gov/frarnd/rndpubs.htm





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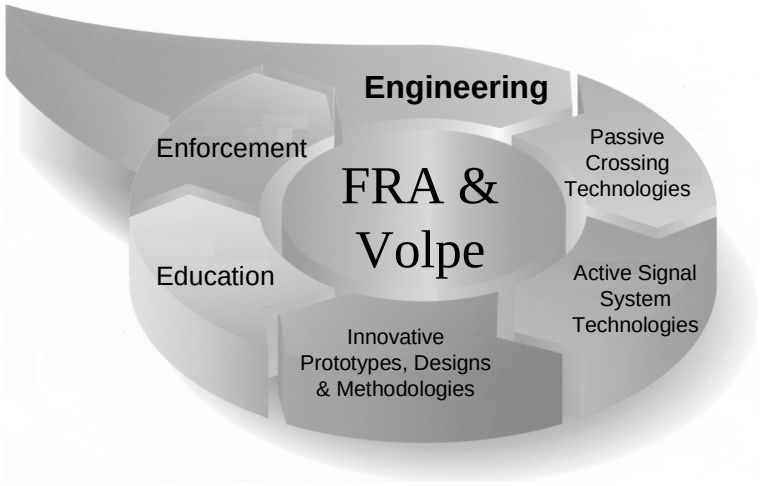
HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH



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HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Education Activities

Objectives of Work
Provide an analysis and assessment of driver and public education techniques; to include dissemination of technical guidelines

Major Outputs
Highway-Rail Grade Crossing Safety: Driver and Public Education Workshop held in San Antonio, Texas, in 3/99

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HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Education Activities (cont'd)

Approach
Work collaboratively with Operation Lifesaver and other agencies involved in motor vehicle operator education and licensing. Develop guidelines for appropriate technical subject matter to aid in deployment

Technical Results
- Guidelines for "Illumination of Crossings"
- Public/Driver Education Workshop Proceedings
- Guidelines for "Closing & Consolidating Crossings"

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HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Enforcement Activities

Objectives of Work

Evaluate, analyze, or demonstrate the ability of state-of-the-art security technology and initiatives being conducted by railroads, states, or local agencies to change public behavior by means of photo enforcement and/or the use of security technology on railroad rights-of-way

HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Enforcement Activities (cont'd)

Technical Approach

Analyze the effectiveness of railroad, state, and local agency initiatives in the use of law enforcement/security techniques and technologies to reduce violations of railroad rights-of-way

Technical Results

- Guidelines for "Photo Enforcement at HRIs"
- Guidelines for "Trespass Prevention on Trestle Bridges"

HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Evaluations

Objectives of Work
Provide engineering support, direction, and analysis to determine appropriate tools and technologies to aid in the reduction of HRI collisions

Major Outputs – See Examples

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HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Evaluations (cont'd)

Approach
- Evaluations include field operational tests, demonstrations, and/or prototypes of new or improved grade crossing safety systems and components
- Standard methodological processes and tools are developed to aid states in allocation of available funding

Technical Results
Technical reports, guidelines, rulemaking support, and deployment

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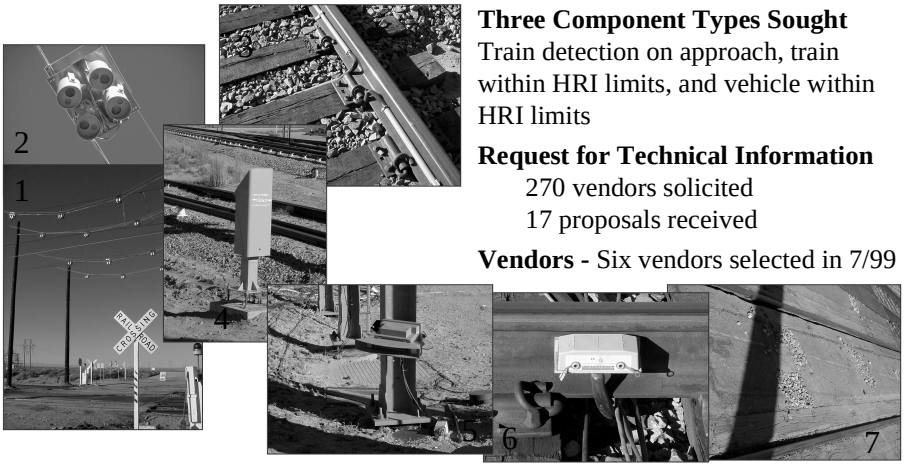
HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Evaluations – Example 1 – Off-Track Train & Vehicle Detection



Three Component Types Sought
Train detection on approach, train within HRI limits, and vehicle within HRI limits

Request for Technical Information
270 vendors solicited
17 proposals received

Vendors - Six vendors selected in 7/99

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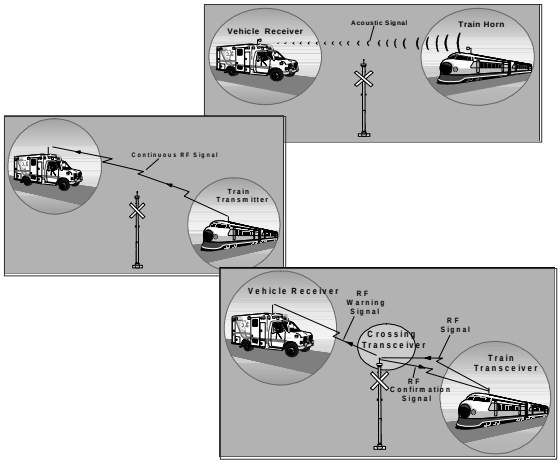
HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Example 2 – FRA/FHWA Joint Technology Research

Purpose
Evaluate the concept of Vehicle Proximity Alerting Systems (VPAS) for warning emergency vehicles of the approach of a train to a grade crossing and determine whether feasible for field operational test

Results
None of the systems as tested were suitable for further testing



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HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Example 3 – Barrier Demonstrations

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HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

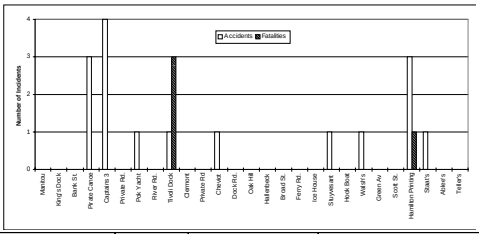
Example 4 – Risk Methodology Case Study

Purpose

- To create a tool for analyzing HSR grade crossing improvements
- To apply this tool to examine the Empire Corridor in terms of risk

Location

- 27 crossings along New York's Empire Corridor
- Nine crossings projected for speeds up to 125 mph



Crossing	Mile Post	Current Allowable Train Speed	Crossing Type
Stuyvesant	**124.81**	**110**	**Gated Public**
Hook Boat	**126.98**	**110**	**Passive Private**
Walsh's	**133.85**	**110**	**Passive Private**
Green Av.	**134.00**	**110**	**Gated Public**
Scott St.	**134.20**	**110**	**Gated Public**
Hamilton Printing	**134.90**	**110**	**Flashing Lights Private**
Staat's	**137.20**	**110**	**Gated Public**
Ablee's	**139.10**	**110**	**Passive Private**
Teller's	**139.98**	**110**	**Gated Private**

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HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Example 4 (cont'd) – Risk Methodology Case Study

Purpose

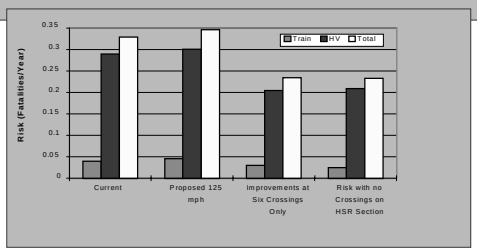
- To create a tool for analyzing HSR grade crossing improvements
- To apply this tool to examine the Empire Corridor in terms of risk

Results

- Comparison of Total Risk: 6 highest risk crossings improved versus elimination of crossings on HSR section

Summary of Results

Strategy	Improvements	Cost	Risk at 125 MPH
Eliminate All High Speed Crossings	3 Grade Separations 6 Closures	$3.0 – 9.0 Million +	0.23 fatal/year
Improve Six Highest Risk Crossings	3 Upgrades to 2 Quad 3 Upgrades to 4 Quad	$0.75-1.5 Million	0.23 fatal/year



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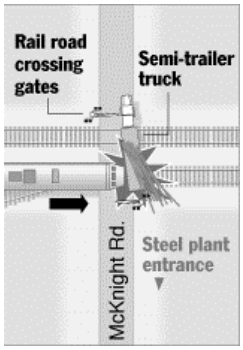
HIGHWAY-RAIL GRADE CROSSING SAFETY RESEARCH

Future Goals

Aid in the reduction of collision, fatality, and injury rates to 50% of the 1994 levels by the year 2004

Durham, North Carolina

Bourbonnais, Illinois



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Decision oriented management of data*

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SUMMARY

In collaboration with the University of Laval, Transport Canada's Road Safety Directorate is developing a modelling framework and processes for carrying out risk assessment/evaluation, known as the RAESM (Risk Analysis and Evaluation System Model). The concepts of risk, relative risk, and relative risk odds-ratio are necessary components in measuring and evaluating the level of risk (i.e., level of safety) on roads and highways.

To date, risk analysis research in the area of roads and highways has been minimal, mainly because the following are lacking:

- accurate/standardized exposure (to risk) data
- a standardized modelling framework for conducting risk analyses
- standardized mathematical and statistical methodology for estimating and interpreting risk indicators

In light of these serious deficiencies, this project was undertaken, with the intent of stimulating work on this aspect of road safety and generating a renewed thrust towards advancing our knowledge of travel risks on Canadian roads and highways.

The basic design of the computerized modelling system for implementing the RAESM is complete. Further enhancements being developed and incorporated include:

- completion and refinement of the procedures and techniques for interpreting the risk performance indicators computed within the RAESM modules (e.g., tabular and graphical representations of the road travel accident/injury/fatality risk performance measure indicators and their accuracy)
- design, development, and implementation of a separate module within the existing RAESM framework that will allow a user to conduct a specific type of risk evaluation study
- integration and testing of all modules within the framework of the full-scale RAESM

* This presentation was based on/Cet exposé était inspiré de : *Methodological Approaches for the Estimation, Evaluation, Interpretation and Accuracy Assessment of Road Travel "Basic Risk", "Relative Risk", and "Relative Risk Odds-Ratio" Performance Measure Indicators: A "Risk Analysis and Evaluation System Model" for Measuring Monitoring, Comparing and Evaluating the Level(s) of Safety on Canada's Roads and Highways*, TP 13238E.

Extensive testing will follow the satisfactory completion of this phase of the work. The final phases of system implementation will involve fine-tuning or additions (as required), production of reference manuals (e.g., system and user manuals), and plans for dissemination to users (e.g., technology transfer, workshops, and training sessions).

SOMMAIRE

La Direction générale de la sécurité routière de Transports Canada est à mettre au point, de concert avec l'Université Laval, un cadre et des processus de modélisation pour une analyse/évaluation du risque, baptisé RAESM (pour *Risk Analysis and Evaluation System Model*). Les notions de risque, risque relatif et risque relatif approché constituent des éléments essentiels pour mesurer et évaluer le niveau de risque (ou, à l'inverse, le degré de sécurité) qui caractérise une route.

Peu de recherche a été effectuée à ce jour sur le risque associé aux routes. Cela est principalement dû à l'absence :

- de données précises/normalisées sur l'exposition (au risque)
- d'un cadre normalisé de modélisation pour la conduite d'analyses du risque
- d'une méthode mathématique et statistique normalisée pour estimer et interpréter les indicateurs de risque

Ce projet a été lancé, compte tenu de ces lacunes majeures, dans le but de stimuler les travaux sur cette facette de la sécurité routière, ainsi que de donner un nouvel élan à l'avancement de nos connaissances en matière de risques associés aux déplacements sur les routes canadiennes.

La version de base du système informatisé de modélisation pour l'analyse de risque est terminée. Des travaux sont en cours pour produire une version perfectionnée du modèle. Voici en quoi consistent ces travaux :

- enrichissement et affinage des procédures et techniques pour interpréter les indicateurs de risque calculés par les modules du RAESM (représentations tabulaires et graphiques des indicateurs de risque d'accident/de blessure/de décès associé au transport routier) et évaluer leur précision
- conception, développement et mise en oeuvre d'un module distinct permettant à l'utilisateur de réaliser un type particulier d'étude de risque
- intégration et essai de tous les modules faisant partie du RAESM

Une série complète d'essais aura lieu au terme de la présente phase des travaux. Il restera ensuite à procéder aux réglages fins du modèle ou, le cas échéant, à des ajouts, à produire les manuels de référence (manuel du système et guide d'utilisateur) et à élaborer des plans de «mise en marché» du système (transferts de technologie, ateliers, séances de formation).

Round-table discussion

The presentations were followed by a round-table discussion. Participants agreed that the workshop provided a welcome opportunity for stakeholders to meet and become acquainted with the various initiatives and activities within the Rail-Highway Grade Crossing Research Program. They also endorsed the collaborative approach to implementing the program and reached consensus on a number of administrative points:

- the *Direction 2006* Research Committee should set up a Web site to keep stakeholders up-to-date on the Rail-Highway Grade Crossing Research Program; a chat line would allow for exchange of ideas and feedback
- the workshop should become an annual event
- research work in the area of rail-highway grade crossing safety should be actively encouraged; one idea discussed, and viewed positively, was to create a university award that would encourage graduate students to choose grade-crossing safety as their field of interest

After pooling ideas on research directions and priorities, participants made the following suggestions and recommendations:

- rail accident-related data should be as complete as possible and incorporate data from short-line railways under provincial jurisdiction (Transport Canada is working with the Transportation Safety Board and the provinces to improve the accident database)
- ITS may allow for cost-effective grade crossing safety improvements where conventional technology cannot (more research in this area is required)
- dealing with problems specific to heavy vehicles at grade crossings should be a priority because of the serious consequences of collisions
- crossing system elements should be investigated from a human factors perspective, to determine which elements are most effective for safety purposes and what improvements would be beneficial – this would provide some new basic data for design enhancements
- enforcement technologies, such as automatic photo-based ticketing systems for driver violations, should be investigated and piloted for grade crossings
- risk assessment (RAESM) work for road safety could be utilized successfully for grade crossings
- evaluation of technology developments and lower-cost approaches should take into account that the cost of crossing systems is directly related to their reliability, durability, and fail-safe nature (equipment manufacturers stressed that this is the only way to draw fair comparative cost conclusions)
- Canada-U.S. cooperation in grade crossing research should be encouraged and pursued to ensure effective and efficient use of limited resources and to avoid fruitless duplication

Table ronde

Après les exposés a eu lieu une discussion à bâtons rompus, au cours de laquelle les participants ont salué l'occasion que leur avait donnée l'atelier de se rencontrer et de faire le point sur les diverses activités du Programme de recherche sur les passages à niveau. Ils ont en outre acquiescé à la démarche associative préconisée par le programme et se sont mis d'accord sur un certain nombre de points :

- le Comité sur la recherche de *Direction 2006* devrait créer un site Web pour tenir les intéressés informés sur le Programme de recherche sur les passages à niveau; un groupe de discussion devrait aussi être créé, pour permettre l'échange d'idées
- l'atelier devrait devenir un événement annuel
- la recherche dans le secteur de la sécurité aux passages à niveau doit être encouragée par des mesures concrètes; une proposition a été chaudement accueillie : offrir des bourses d'études universitaires aux étudiants de 2e et 3e cycles choisissant de consacrer leurs travaux de recherche à la sécurité aux passages à niveau

Après avoir partagé leurs points de vue sur les orientations prioritaires à donner à la recherche, les participants ont formulé les recommandations suivantes :

- constituer une base de données la plus complète possible sur les accidents ferroviaires et y incorporer les données des compagnies de chemin de fer sur courtes distances, qui relèvent des provinces (Transports Canada travaille avec le Bureau de la sécurité des transports et les provinces à améliorer la base de données accidentologiques)
- envisager le recours aux STI pour améliorer de façon économique la sécurité aux passages à niveau, là où la technologie classique se révèle impuissante à le faire (nécessité d'approfondir la recherche dans ce secteur)
- étudier en priorité les problèmes associés aux poids lourds se présentant aux passages à niveau, en raison de la gravité des conséquences d'accidents mettant en cause ces véhicules
- étudier les dispositifs d'avertissement sous l'angle des facteurs humains afin de déterminer lesquels sont les plus efficaces sur le plan de la sécurité et quelles améliorations pourraient leur être apportées – ce qui donnerait accès à des données nouvelles, utiles pour l'amélioration des dispositifs
- étudier des technologies pouvant aider à faire respecter la signalisation, comme les systèmes de «photo-radar» pour la délivrance de constats d'infraction, et en faire l'essai aux passages à niveau
- transposer aux passages à niveau le modèle RAESM d'évaluation du risque conçu pour les routes
- ne pas oublier, lors de l'évaluation des nouvelles technologies et des systèmes économiques, que le coût des équipements est directement fonction de leur fiabilité, de leur durabilité, et du fait qu'ils sont ou non à sécurité intégrée (il s'agit, selon les fabricants d'équipements, de la seule façon de comparer équitablement les coûts)
- encourager la coopération canado-américaine en matière de recherche sur les passages à niveau, afin de tirer le meilleur parti possible des ressources et de prévenir les cas de double emploi

Conclusion

Bob Nash of Canadian Pacific Railway Inc. closed the workshop. He outlined the main points discussed during the day, and recapped the results of the round-table discussions. After thanking the participants for making the workshop a success, he assured them that their suggestions and recommendations would help to enhance the Program's initiatives and activities.

Bob Nash, de CP Rail, clôt l'atelier. Il fait un retour sur les principaux thèmes abordés au cours de la journée, et résume la teneur des discussions en groupe. Il remercie finalement les participants de leur précieuse contribution au succès de l'atelier et les assure que leurs suggestions et recommandations seront fort utiles pour améliorer le Programme.

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