Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

# RAILWAY INVESTIGATION REPORT
# R07D0111

## CROSSING COLLISION

## VIA RAIL CANADA INC.
## PASSENGER TRAIN NUMBER 35
## MILE 23.57, CANADIAN NATIONAL KINGSTON SUBDIVISION
## PINCOURT/TERRASSE-VAUDREUIL, QUEBEC
## 17 DECEMBER 2007

Canada

# OCCURRENCE SUMMARY • Crossing Collision: Pincourt/Terrasse-Vaudreuil, Quebec

## EVENT

On 17 December 2007, VIA Rail Canada Inc. passenger train No. 35, travelling westward at 62 mph on the south main track of Canadian National's Kingston Subdivision, struck an empty tractor-trailer that was immobilized on the 3e Avenue level public crossing located at Mile 23.57, near Pincourt/Terrasse-Vaudreuil, Quebec. The tractor-trailer was destroyed; the locomotive was damaged and was unable to continue. Subsequently, 76 passengers were transferred to another VIA Rail Canada Inc. train and rail traffic was delayed for up to 3½ hours. The truck driver sustained minor injuries. There was no derailment and no track damage.

## SAFETY ISSUES

The report highlights two safety issues:

- Risk of Truck/Train Collisions at Level Crossings on the Québec–Windsor Rail Corridor.
- Adequacy of Emergency Contact Information Signage Posted at Railway Crossings.

## TSB RECOMMENDATIONS

Following its investigation, the Transportation Safety Board of Canada made the following two recommendations:

❶ That Transport Canada conduct safety assessments of level crossings on the high-speed passenger rail Québec-Windsor corridor and ensure that defences are adequate to mitigate the risk of truck/train collisions.

and

❷ That Transport Canada implement standards to improve the visibility of emergency contact signage at railway crossings in Canada.

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# Railway Investigation Report

# Crossing Collision

# VIA Rail Canada Inc.
# Passenger Train Number 35
# Mile 23.57, Canadian National Kingston Subdivision
# Pincourt/Terrasse-Vaudreuil, Quebec
# 17 December 2007

# Report Number R07D0111

## *Synopsis*

On 17 December 2007, at approximately 1549 eastern standard time, VIA Rail Canada Inc. passenger train No. 35, travelling westward at 62 mph on the south main track of Canadian National's Kingston Subdivision, struck an empty tractor-trailer that was immobilized on the 3e Avenue level public crossing located at Mile 23.57, near Pincourt/Terrasse-Vaudreuil, Quebec. The tractor-trailer was destroyed; the locomotive was damaged and was unable to continue. Subsequently, 76 passengers were transferred to another VIA Rail Canada Inc. train and rail traffic was delayed for up to 3 ½ hours. The truck driver sustained minor injuries. There was no derailment and no track damage.

*Ce rapport est également disponible en français.*

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## Photos



## Figures

# 1.0 Factual Information

On 17 December 2007, at approximately 1505 eastern standard time, [1] westward VIA Rail Canada Inc. (VIA) passenger train No. 35 (VIA 35) departed Montréal, Quebec, destined for Ottawa, Ontario. The train was composed of one locomotive and four coaches. The VIA 35 crew consisted of three on-board service personnel and two locomotive engineers; one was in charge of the train (VIA conductor) and the other operated the locomotive (VIA locomotive engineer). Both locomotive engineers met fitness and rest standards, were qualified for their respective positions, and were familiar with the territory.

## 1.1 The Accident

At 1548:47, VIA 35 was traversing a right-hand curve at 74 mph on the south track, approaching the automated level public crossing located at Mile 23.57 of the Canadian National (CN) Kingston Subdivision (the crossing), near Pincourt/Terrasse-Vaudreuil, Quebec (see Figure 1).

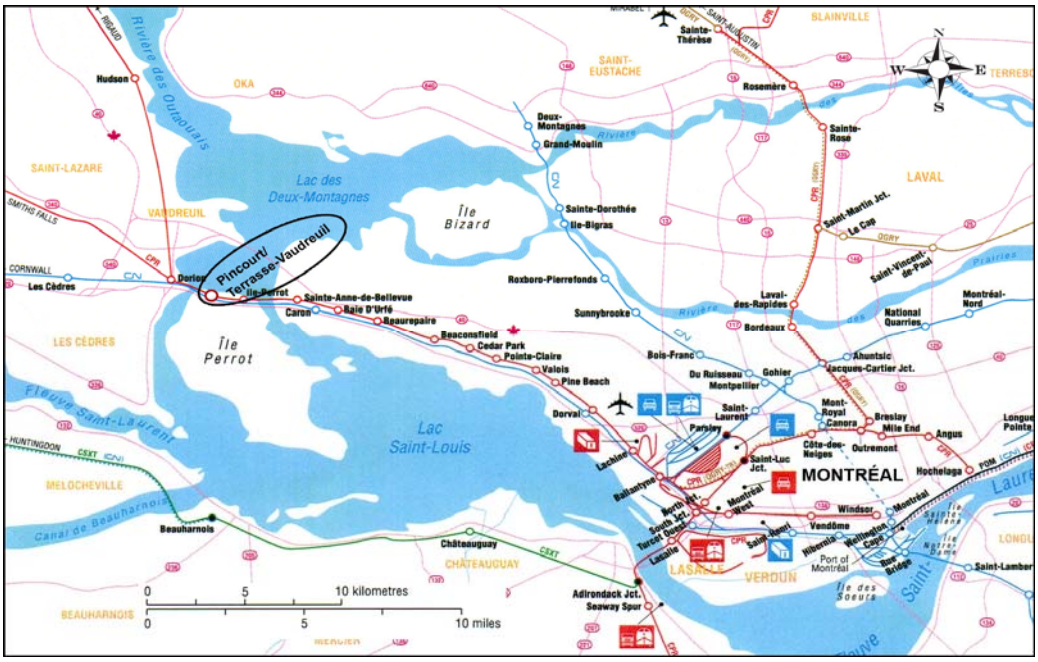


**Figure 1.** Map of the derailment location (Source: Railway Association of Canada, *Canadian Railway Atlas*)

As VIA 35 rounded the curve, the crossing came into view approximately 1800 feet to the west. The VIA locomotive engineer observed a northbound tractor-trailer (the truck) stopped on the crossing, while eastward CN train M31031-16 (CN 310) appeared to be stationary on the north track, west of the crossing (see Figure 2).

[1] All times are eastern standard time.

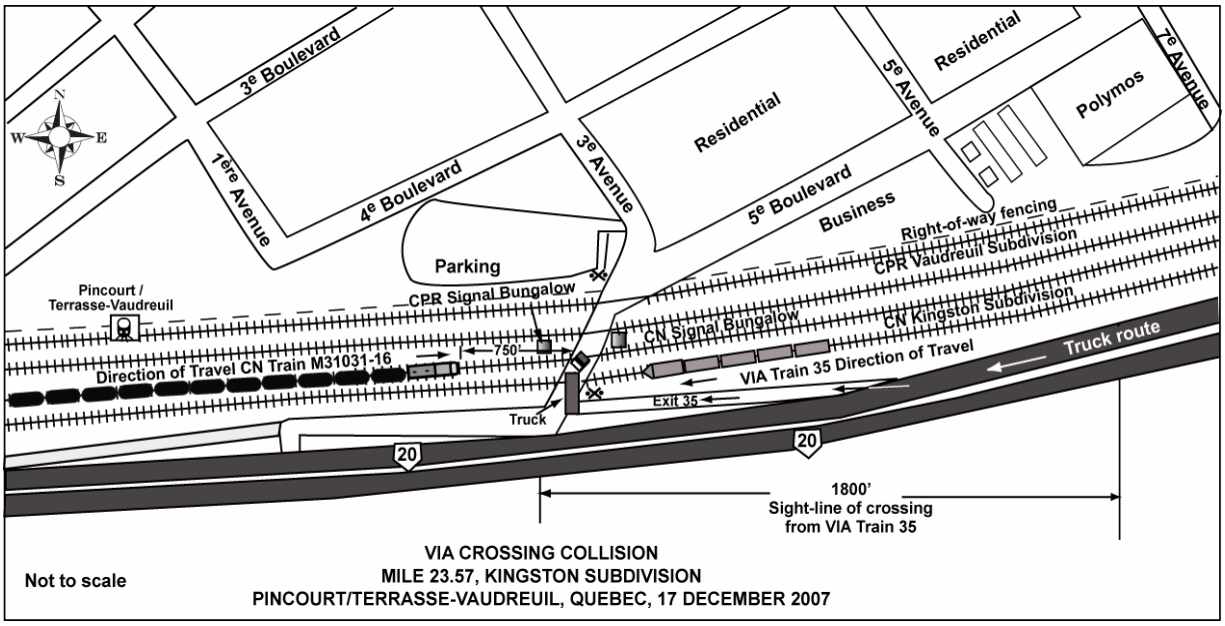


**Figure 2.** Diagram of accident site

The VIA conductor was repeating a General Bulletin Order on a cellular telephone to the rail traffic control centre for the Alexandria Subdivision when the VIA locomotive engineer, who was monitoring the standby radio channel (channel 1), informed him of the impending collision. The VIA 35 locomotive engineer then immediately initiated an emergency radio broadcast on channel 1 and made an emergency brake application at 1548:57. At 1549:07, while travelling at 62 mph, VIA 35 struck the truck at the crossing. From the time VIA 35 was placed into emergency, the train travelled 2746 feet before stopping on the south track, alongside CN 310, at 1549:46.

The sky was clear, the temperature was -11°C and the wind was from the northeast at 30 km/h. The previous day, a severe winter storm passed through the area and deposited 32 cm of snow. There was snow build-up alongside most roads and road surfaces were snow covered and icy.

## *1.2 The Truck*

The truck consisted of a tractor and a covered trailer and was owned by Multi-Marques Inc. The tractor was a 1999 Volvo VNL64; its standard equipment included an event data recorder (EDR). The trailer was manufactured in 1995 by Manac; it was 53 feet long and had a tare weight of 15 800 pounds. The tractor and trailer had been regularly maintained, were in good mechanical condition and had both passed the required Quebec vehicle safety inspections in the fall of 2007. The tractor was equipped with winter tires, which had minimal tread wear.

The truck driver was en route with an empty trailer to pick up a load at Polymos, a plastic fabricating company located in Terrasse-Vaudreuil. The driver travelled westward on Highway 20, exited the highway at Exit 35 and stopped at the stop sign for 3e Avenue at approximately 1545:00. The driver pulled wide into the intersection and began to turn right onto 3e Avenue to cross the railway tracks. As the tractor crossed the CN north track in the left

lane, the rear undercarriage of the trailer got stuck on a large snow bank on the southeast corner of 3e Avenue and the Exit 35 roadway, while the rear tires of the tractor began to spin on the icy crossing surface.

After several unsuccessful attempts to free the trailer, the driver was joined by a passing motorist, who had stopped to provide assistance, when they noticed CN 310 approaching from the west on the north track. The driver exited the cab and stood on the north track near the rear of the tractor and waved to alert the train. CN 310 came to a stop just west of the crossing. The driver went to the rear of the tractor to get some material to assist with the traction, returned to the truck cab for gloves and saw VIA 35 approaching from the east on the south track. The driver quickly exited the cab and pushed the passing motorist northward past the tractor just as VIA 35 struck the front portion of the trailer. According to the truck EDR, the truck had been immobilized on the crossing for 3 minutes 40 seconds before the collision.

## *1.3 Train CN 310*

At approximately 0800, CN 310 departed Belleville, Ontario, destined for Montréal. The train was composed of 1 locomotive and 83 cars (45 loads, 38 empties); it was 4998 feet long and weighed 6798 tons. The crew consisted of a locomotive engineer and a conductor. They met fitness and rest standards, were qualified for their respective positions, and were familiar with the territory.

At 1547:00, CN 310 was proceeding at 32 mph on the north track of the Kingston Subdivision approaching the crossing. Approximately one-half mile west of the crossing, a truck was observed on the track, but it could not be determined if the truck was moving. As a precaution, the locomotive engineer initiated an air brake reduction at 1547:40, to slow down the train. Shortly thereafter, the crew then realized that the truck was immobilized on the crossing and the train was placed into emergency at 1548:00.

The crew focused their attention on the truck driver and passing motorist at the crossing. While the train was still moving, the conductor exited the cab and stood on the locomotive front platform to warn them to clear the track. Upon realizing that they were too far away to hear him, the conductor returned to the cab. The train came to a stop at 1548:44, approximately 750 feet west of the crossing, and the crew observed the driver return to the truck just as VIA 35 appeared east of the crossing. After stopping, the CN 310 crew made an emergency radio broadcast on channel 1 and then sounded the locomotive horn at 1548:51 in an attempt to warn the truck driver and the passing motorist of VIA 35's approach.

## *1.4 Emergency Radio Broadcasts*

The following times were normalized by cross-referencing hot box detector information, rail traffic control recorded information and locomotive event recorder downloads:

- At 1548:50, the VIA 35 locomotive engineer initiated an emergency radio broadcast on channel 1.

- At 1549:05, the VIA 35 locomotive engineer initiated an emergency call to the CN rail traffic controller (RTC) on the rail traffic control channel (channel 2). Two seconds later, VIA 35 struck the immobilized truck at the crossing.

- At 1549:15, CN 310's crew initiated an emergency call to the CN RTC on channel 2.

- At 1549:17, the CN RTC answered VIA 35's emergency call on channel 2 and the VIA 35 locomotive engineer described the accident.

- At 1549:42, CN 310's locomotive engineer broke in on VIA 35's emergency call and explained that they had also stopped in emergency, west of the crossing and had observed the accident.

Neither train crew heard the emergency radio broadcast by the other train on channel 1.

## *1.5 Emergency Response*

After both trains had come to a stop, both crews followed emergency procedures and requested that emergency response and medical personnel attend the site. The CN RTC made the emergency calls, including contacting the Canadian Pacific Railway (CPR) RTC and arranging protection for the double main track of the CPR Vaudreuil Subdivision, which runs adjacent and parallel to the Kingston Subdivision at that location. CN Police and company officers, VIA company officers and emergency staff, Sûreté du Québec, paramedics and local fire department arrived quickly on site.

## *1.6 Site Examination*

Locomotive VIA 909 sustained moderate damage and was removed from service for repair. The tractor had separated from the trailer and was pushed northward, clear of the track, between the CN and CPR lines. The trailer had spun around and came to rest just south of the tracks, blocking 3e Avenue. The tractor and trailer were destroyed.

During snow-clearing operations, most of the snow was pushed to the side of the road and formed snow banks that were up to four feet high. The 3e Avenue roadway width was reduced due to the presence of snow banks. The crossing surface was snow covered and icy. Tire marks were observed on the side of a snow bank located on the southeast corner of Exit 35 and 3e Avenue near the CN crossing mast and gate (see Photo 1).

**Photo 1.** Snow banks on the southeast corner of the crossing

## *1.7 Snow-Clearing Operations*

Under an agreement with Transports Québec (TQ), a contractor is responsible for snow clearing on Highway 20 and all service roads, including the 3e Avenue crossing. After heavy snowfalls, the focus is on keeping roads open. While there is no fixed time for clearing snow banks from alongside roads, secondary clearing and snow removal is done as soon as possible. TQ contractors are required to clean and de-ice road surfaces within three hours after precipitation ends. Each year, CN sends a letter to all road authorities, including TQ, to reinforce the importance of snow removal at level crossings. The letter instructs road authorities not to use de-icing and abrasive materials on the tracks as they can affect the operation of crossing automatic warning devices (AWDs).

## *1.8 Driver Information*

The driver's shift began at noon that day. The driver was employed by Service MRV, which provides professional drivers to operate transport trucks owned by Multi-Marques Inc. The driver had a clear driving record and a valid Class I driver's licence with an air brake endorsement, which was obtained about four years before the accident. The driver made deliveries or pick-ups at different locations between Montréal and Québec, Quebec, and did not have an assigned route. The driver was not familiar with the Pincourt/Terrasse-Vaudreuil area and had never used the crossing. The driver carried a personal cellular telephone but did not attempt to contact anyone when the truck became immobilized. The driver did not see the railway emergency contact information and was not aware that such information was available at railway crossings.

## 1.9 Track Information

CN's Kingston Subdivision consists of double main track that extends from Dorval, Quebec (Mile 10.30), to Toronto, Ontario (Mile 333.80). Train movements in the area of the crossing are governed by the Centralized Traffic Control System as authorized by the *Canadian Rail Operating Rules* (CROR) and supervised by an RTC located in Montréal. The track is Class 5 according to Transport Canada (TC)–approved *Railway Track Safety Rules*. The authorized timetable speed in the area of the crossing was 65 mph for freight trains and 95 mph for passenger trains.

The crossing is located near the west end of a two-mile-long, 0 degree 37 minute, right-hand curve with 1 ¾ inches of superelevation. For a train approaching from the east, the crossing first becomes visible at a distance of approximately 1800 feet. Westward from the crossing, the track is relatively tangent and has a flat grade up to and across the bridge located at Mile 24.00. The crossing and track were inspected in accordance with regulatory and company requirements; no defects were reported in the vicinity of the crossing. The crossing and track were generally in good condition.

## 1.10 Emergency Stop Protection

CROR Rule 102 sets forth procedures for emergency stop protection while operating on double track. It states, in part, that the crew of a train stopping as a result of an emergency brake application, or other abnormal condition, which may cause an adjacent main track to be obstructed, must immediately transmit an emergency radio broadcast on the standby channel. As soon as possible following the emergency broadcast, the crew must advise the RTC of train or engine number, emergency stop location and indicate whether adjacent tracks may be obstructed.

## 1.11 Crossing Information

The crossing is the primary access to the commuter train station and the town of Terrasse-Vaudreuil. Both CN and CPR tracks are located between the residential area of Terrasse-Vaudreuil and Highway 20. The crossing is identified as Mile 23.57 of the CN Kingston Subdivision and Mile 18.07 of the CPR Vaudreuil Subdivision. Westward traffic accessing Terrasse-Vaudreuil via 3e Avenue from Highway 20 must take Exit 35, continue to a stop sign then turn right. The 3e Avenue runs north/south and intersects the Exit 35 ramp and the tracks at a 70-degree angle. To make this turn, even in ideal conditions, a tractor-trailer must pull wide into the opposing lane of 3e Avenue (see Photo 2).

**Photo 2.** Right turn onto 3e Avenue from Exit 35

The asphalt roadway surface has a saw-tooth profile. Northward from Exit 35, the roadway has an ascending gradient on the approaches and a descending gradient over the tracks to accommodate the superelevation of the right-hand curve. The crossing is equipped with AWDs, which include flashing lights, bells, gates and constant warning time track circuits. The AWD system was functioning as intended. The crossing has two gates; one on the southeast corner maintained by CN, and the other on the northwest corner maintained by CPR.

About 43 freight trains, 24 passenger trains, and 22 commuter trains per day operate over the crossing. Highway traffic consists of approximately 4700 vehicles a day, about 70 of which are either heavy trucks or tractor-trailers. Heavy truck and car traffic is expected to increase in the future due to industrial and residential expansion. The total cross product [2] for the crossing is approximately 420 000 (55 per cent for the Kingston Subdivision and 45 per cent for the Vaudreuil Subdivision).

Cross product was one criterion that was used to assist in prioritizing the funding of grade separation projects by TC. A cross product of 200 000 was the accepted benchmark in order for a new grade separation project to be considered. However, no funding has been provided by TC pursuant to Section 13 of the *Railway Safety Act* since 1989, as per a government policy to not appropriate funds in this regard. The railway companies and road authorities can apply for funding under Infrastructure Canada programs. Road authorities are generally responsible for the planning of such installations as part of their road transportation network while the railways are involved in the detailed design of the structure to ensure safe railway operations.

[2] Cross product is obtained by multiplying the number of roadway vehicles by the number of trains that use a crossing during an average day.

A TQ project has been planned for the past 20 years. The project includes the relocation of Highway 20 and the construction of a grade separation that would eliminate the 3e Avenue crossing as well as the other crossing that provides access to Terrasse-Vaudreuil (Boulevard Perrot Nord). At various times, meetings have been held with railways' representatives, TQ and municipal authorities regarding the project, but little progress has been made to date due to funding restraints.

## *1.12 Accident History*

TSB records indicate that, since 1997, there have been eight tractor-trailers struck at public crossings protected by AWDs along the Kingston Subdivision. Five of these accidents involved immobilized tractor-trailers. Three of these five accidents occurred at the 3e Avenue crossing and involved a VIA train and a northbound tractor-trailer. VIA and CN records for "near-miss" incidents reported by train crews revealed that there have been four near-miss incidents at this crossing since 2004.

On 15 July 2008, eastward VIA 60 struck a tractor hauling a low-boy trailer at an automated public crossing located at Mile 138.21 of the Kingston Subdivision near Mallorytown, Ontario. As a result of the collision, the trailer was pushed into the ditch while the lead locomotive and first car (baggage car) derailed; the operating crew and one passenger sustained minor injuries. It was determined that the truck had been stuck on the crossing for at least five minutes. The truck driver did not notice the railway emergency contact information at the crossing and was unaware that such information existed.

## *1.13 Railway Emergency Contact Information*

In 1994, the TSB investigated a crossing accident in which a tractor hauling a low-boy trailer over a crossing dislodged a rail from its fastenings (TSB report R94E0062). The truck driver noted the damage but did not have a phone number available to contact the railway. A freight train subsequently derailed at the crossing. Following the issuance of TSB Rail Safety Advisory 07/95, the railways posted 1-800 emergency contact information at all public railway crossings in Canada.

Emergency contact information at crossings is standardized in the United States through the Department of Transportation *Manual of Uniform Traffic Control Devices* (MUTCD). Chapter 8, Section 8B.12, sets forth guidance for the posting of emergency notification signs. It states, in part, that an emergency notification sign (either 30 inches by 30 inches or 30 inches by 18 inches) should be installed at all roadway-rail grade crossings to provide for emergency notification. The sign should convey a clear and simple message that is visible to anyone stalled or disabled on the railway tracks as well as anyone with other emergencies. There is no similar standard for signage or location under either current TC regulations or the proposed RTD 10 (*Road/Railway Grade Crossings: Technical Standards and Inspections, Testing and Maintenance Requirements*) standard.

CN places an emergency contact phone number (1-800-465-9239), the mileage and subdivision of the crossing location on a sign (4 inches by 24 inches) located on the back of crossbucks at passive public crossings and on the gates and signal bungalows at automated public crossings. CPR places an emergency contact phone number (1-800-716-9132) and the five-digit TC crossing number on a similar sign located on the back of crossbucks at all public crossings (see Photo 3).

**Photo 3.** Location of emergency contact information at the crossing, looking northward

The emergency telephone calls are directed to the CN and CPR police respectively. They in turn notify the appropriate rail traffic control centre, which then broadcasts a radio alert to the train. Under favourable conditions (that is, assuming the emergency lines are not already busy), the whole sequence would take approximately two minutes.

The Railway Association of Canada and TC, through Operation Lifesaver and Direction 2006, have cooperated on several initiatives to increase public awareness of railway grade crossings. In 2002, Operation Lifesaver and Direction 2006 jointly developed training material targeted at improving driver understanding of the risks associated with public railway crossings. The material contains references to railway emergency contact information at public crossings and provides guidance on what to do if a vehicle becomes immobilized on a crossing. This material was provided to professional driver training companies and to provincial authorities to assist with updating training manuals, but has not been incorporated into all provincial driver training manuals. In 2003, the province of Quebec issued an Information Bulletin to the trucking industry in Quebec that outlined steps to take in the event that a truck became immobilized on a crossing. However, the current driver training manuals issued by the province do not contain any reference to railway emergency contact information.

## *1.14 Vehicle Presence Detection*

The presence of motor vehicles immobilized at a railway crossing can be detected by video camera or by sensors embedded into the pavement (loop detectors). In March 2007, the Federal Railroad Administration (FRA) completed the evaluation of a vehicle detection system [3] at a crossing located in Groton, Connecticut, United States, on Amtrak's Northeast High-Speed Rail Corridor. The system detects motor vehicles that are on the crossing and determines if they are a hazard to oncoming trains. It alerts approaching trains to stationary vehicles and prevents exit gates from deploying so that vehicles do not get trapped between the gates and can escape. The system must be interconnected with locomotive in-cab signalling. The Amtrak in-cab signalling train control system can enforce speed reduction automatically if the locomotive engineer fails to take the appropriate action. Banverket, the Swedish Rail Administration, uses a similar system on its 200 km/h passenger rail lines. However, there are no requirements for a four-quadrant gate installation in either TC regulations or the proposed TC RTD 10 standard, nor are there any design parameters.

[3] A.D. Hellman, A.A. Carroll, and D.M. Chappell, *Evaluation of the School Street Four-Quadrant Gate/In-Cab Signaling Grade Crossing System, Safety of Highway Railroad Grade Crossings*, DOT/FRA/ORD-07/09, John A. Volpe National Transportation Systems Center, sponsored by the U.S. Department of Transportation, Federal Railroad Administration, Office of Research and Development, Washington, D.C., March 2007.

# 2.0 Analysis

VIA 35 was operated in accordance with regulatory and company procedures. There were no mechanical or track defects present that might have contributed to the accident. The analysis will focus on snow-clearing operations, roadway configuration, emergency broadcast radio procedures, crossing emergency contact information, crossing protection, and vehicle driver training.

## 2.1 The Accident

Following the severe winter storm the day before the accident, the snow had been pushed to the side of the roads and a large snow bank was left on the southeast corner of Exit 35 and 3e Avenue. Furthermore, the driver had never used this crossing and was unaware of the angle of the crossing. Consequently, while making the turn onto 3e Avenue, the rear undercarriage of the trailer became hung up on the snow bank. The tractor required additional traction to continue to move. However, in the absence of de-icing and abrasive materials, the tractor's rear tires began to spin on the icy crossing surface, and the truck was immobilized and was struck by the VIA train 3 minutes 40 seconds later. The presence of an activated event data recorder in the truck permitted a precise determination of its time of immobilization and an accurate reconstruction of the accident timeline.

In accordance with CN instructions, road authorities did not apply de-icing or abrasive materials on the tracks after the storm because these can cause the crossing AWDs to malfunction. This is an accepted industry practice, and is problematic in severe winter conditions. The snow clearing was performed in accordance with TQ guidelines. However, the icy condition of the crossing surface and the snow banks along the roadways presented additional obstacles to large trucks. Due to the angle of the crossing, even in ideal conditions, a tractor-trailer must pull wide into the opposing lane of 3e Avenue to make the turn and pull over the crossing. This manoeuvre was even more difficult to execute due to the reduction of the 3e Avenue width by the snow banks, the large snow bank left on the corner of 3e Avenue and Exit 35, and the icy crossing surface. The CN instructions and TQ snow-clearing guidelines might be acceptable for most roads and crossings; however, they were not adequate for this crossing due to its particular configuration and snow accumulations.

## 2.2 Emergency Radio Procedures

Both crews made virtually simultaneous emergency radio broadcasts on channel 1. CN 310 came to a stop at 1548:44 and, shortly after, the CN 310 crew made an emergency radio broadcast and sounded the locomotive horn at 1548:51. The VIA 35 locomotive engineer initiated the emergency radio broadcast at 1548:50. Since both train crews were on the radio, neither was able to hear the other's emergency call.

Once CN 310's crew determined that the immobilized truck was blocking both tracks at the crossing, they placed the train into emergency at 1548:00. CN 310's crew members were sufficiently concerned for the safety of the people at the crossing that the conductor exited the cab while the train was moving and attempted to warn them to clear the track. Consequently, they did not immediately initiate an emergency radio broadcast after the emergency brake

application as prescribed by CROR Rule 102. In contrast, as VIA 35 rounded the curve and the truck came into view, the VIA locomotive engineer reacted immediately and initiated an emergency radio broadcast while placing the train into emergency. Administrative defences that require a human interpretation and reaction, such as CROR Rule 102, are not always effective, whereas an automated emergency radio broadcast, similar to the automated response from a wayside inspection system, would be applied consistently and would likely decrease the risk of mishaps.

VIA 35 was travelling at 74 mph at the time the emergency brake application was initiated and it took around 2750 feet for the train to stop. At 74 mph, VIA 35 would travel the distance of 2750 feet in approximately 26 seconds. Once the crew receives an emergency call, it takes two additional seconds for the crew to react and place the train into emergency [4] and another two seconds for the brakes to fully activate on the train. Therefore, the time required for the crew to receive an advance warning of the presence of the truck and avoid the collision was 30 seconds (that is, when VIA 35 was 3200 feet away from the crossing). VIA 35 collided with the trailer at 1549:07, 1 minute and 7 seconds after CN 310 was placed into emergency. Therefore, there was sufficient time to alert VIA 35's crew and stop the train. Since VIA 35's crew members did not receive an emergency radio broadcast on channel 1 before they were at least 30 seconds away from the crossing, the collision could not be averted.

## *2.3 Emergency Contact Information Signage*

The driver had never used the crossing and was unaware of the volume of train traffic; thus, the urgency of the situation was not recognized. The driver first focused on freeing the truck, then became preoccupied with the approach of CN 310, unaware of the approach of VIA 35. Although emergency contact information was posted, the signage was small, not clearly visible and located in different places on either side of the crossing. Consequently, the driver did not see it and did not look for it, being unaware that such information was available at railway crossings.

In the United States, emergency contact information at crossings is standardized on a large sign that conveys a clear and simple message that is visible to anyone stalled or disabled on the railway tracks. There is no similar standard for signage or location under either current TC regulations or the proposed RTD 10 standard. The lack of standardization and conspicuity of railway emergency contact information signage at crossings does not allow uninformed drivers to immediately identify emergency contact information and alert railways.

With prompt usage of the emergency contact information provided at a crossing, an RTC would be advised within approximately two minutes of a crossing incident. Therefore, the entire sequence of events, from the moment the truck became immobilized until the train came to a stop, could reasonably have been accomplished in less than three minutes. Since the truck was stuck for 3 minutes 40 seconds before the accident occurred, there was sufficient time to make an emergency telephone call and alert VIA 35 to the presence of the immobilized tractor-trailer and prevent the accident.

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[4] T. Triggs and W. Harris, *Reaction Time of Drivers to Road Stimuli*, Human Factors Report No. HFR-12, Victoria, Australia: Monash University, Department of Psychology, 1982.

Even though the industry initiative to post emergency contact information at crossings has been a positive step in advancing crossing safety, it has shortcomings due to lack of driver awareness. Operation Lifesaver and Direction 2006 have recognized that increased driver awareness of railway crossing safety is a crucial aspect in the reduction of the number of grade crossing accidents. Consequently, they have developed training material that was disseminated throughout the country. However, the material has not been incorporated into all provincial driver training manuals. As demonstrated by this occurrence and other accidents where vehicles became immobilized on a crossing, the training material has not reached all segments of the public and some drivers remain unaware of the presence of railway emergency contact information.

## *2.4 Crossing Protection*

With a cross product of 420 000, this level crossing is one of the busiest in Canada. Under TC's pre-1989 guidelines (200 000 cross product), it would have been considered for grade separation. Due to its configuration, the crossing presents particular difficulties for large trucks to negotiate the turn from Exit 35 onto 3e Avenue, even in ideal weather conditions. Since 1997, there were three accidents at this crossing in which a VIA train collided with a northbound tractor-trailer that was either stalled, stuck or trapped between the gates; in addition, there were four near-miss incidents since 2004. Considering the level of risk to the public with the actual train and roadway traffic density and the high number of high-speed passenger and commuter trains, the anticipated increase in truck traffic due to planned industrial expansion will increase the already high risk of collision at this crossing.

The AWD protection installed at this crossing is the highest level of protection currently available in Canada. It meets existing highway traffic requirements and remains an effective barrier that protects motorists in most cases. However, in areas with a high number of trains, which includes high-speed passenger trains, this type of protection is not always effective. As demonstrated by this occurrence and accident history on the Kingston Subdivision where trucks became immobilized on a crossing, such as Mallorytown, current safety defence barriers, such as AWD protection, posted emergency contact information and emergency radio broadcasts, are not sufficient to mitigate the risks present at high-speed, high-traffic density level crossings.

In North America, railway level grade crossing risk mitigation research has historically focused on the safety benefits of AWD protection such as flashing lights, bells, and dual crossing gates. There is a clear understanding amongst the industry, regulators, and the research community that grade separation provides the highest level of risk mitigation. However, as the costs of grade separation can be prohibitive, recent research has been concentrated on more economical risk mitigation options such as vehicle presence detection technologies. The FRA evaluation of a vehicle detection system at a crossing on Amtrak's Northeast High-Speed Rail Corridor demonstrates that there are emerging technologies that can be applied to high-speed railway lines to enhance the level of safety at existing crossings equipped with AWD protection. This technology could be considered an alternative for high-speed, high-traffic density level crossings on the Kingston Subdivision where the current safety defence barriers are not deemed sufficient to mitigate the existing risks and grade separation is not economically feasible.

# 3.0 Conclusions

## 3.1 Findings as to Causes and Contributing Factors

1. VIA 35 struck the tractor-trailer that had become stuck on the crossing when the rear undercarriage of its trailer hung up on a snow bank. The configuration, the reduced width, and the icy surface condition of the roadway contributed to the immobilization of the tractor-trailer.

2. The Transports Québec (TQ) and Canadian National (CN) snow-clearing guidelines for roads and crossings might be acceptable for most locations; however, they were not adequate at this crossing due to its configuration and snow accumulations.

3. Since VIA 35's crew did not receive an emergency radio broadcast on channel 1 before they were at least 30 seconds away from the crossing, the collision could not be averted.

4. Since the truck was stuck for 3 minutes 40 seconds before the accident occurred, there was sufficient time to make an emergency telephone call and alert VIA 35 to the presence of the immobilized tractor-trailer and prevent the accident.

## 3.2 Findings as to Risk

1. Administrative defences, such as *Canadian Rail Operating Rules* (CROR) Rule 102, which require a reaction from the train crew, are not always effective, whereas an automated emergency radio broadcast, similar to the automated response from a wayside inspection system, would be applied consistently and would decrease the risk of accidents.

2. The lack of standardization and conspicuity of railway emergency contact information signage at crossings does not allow uninformed drivers to immediately identify emergency contact information and alert railways.

3. The driver training material developed by Operation Lifesaver and Direction 2006 has not reached all segments of the public; consequently, some drivers remain unaware of the presence of railway emergency contact information.

4. Current safety defence barriers, such as automatic warning device (AWD) protection, posted emergency contact information, and emergency radio broadcasts, are not sufficient to completely mitigate the risks present at high-speed, high-traffic density level crossings.

## *3.3 Other Findings*

1. Since both emergency radio broadcasts on channel 1 were made virtually simultaneously, neither train crew was able to hear the other's call.

2. The presence of an event data recorder in the truck permitted a precise determination of its time of immobilization and an accurate reconstruction of the accident timeline.

# 4.0 Safety Action

## 4.1 Action Taken

Three pedestrian crossing gates were installed along the west side of the crossing.

Transports Québec (TQ), Transport Canada (TC) and Canadian National (CN) will be installing traffic lights on both sides of the crossing, interconnected with the railway crossing system circuit, so as to provide an additional 15 seconds of advance warning before the activation of the automatic warning devices (AWDs) by an approaching train.

TQ is planning to reconfigure Highway 20 between Montréal and Dorion, Quebec. The work will include an underpass tunnel for 3e Avenue to pass under the railway tracks and is scheduled to commence in 2012.

In 2009, TQ will commence a study on level crossing safety for new drivers, in cooperation with Operation Lifesaver and Direction 2006. The expected result is to incorporate crossing safety material, including railway emergency contact information, into new driver training manuals. The new material will also be included in examinations for new drivers.

## 4.2 Action Required

### *4.2.1 Assessment of Level Crossings on the Québec–Windsor Rail Corridor*

The Board notes that, between 1997 and 2008, there were eight tractor-trailers struck at public crossings protected by AWDs along the Kingston Subdivision; six of these crossing collisions involved a high-speed VIA Rail Canada Inc. (VIA) passenger train. This accident history indicates that risks for crossing collisions continue, particularly for high-speed passenger trains, along the rail corridor between Québec, Quebec, and Windsor, Ontario. Even though many of the crossings are equipped with the highest level of AWD protection currently available in Canada and emergency contact information is posted at the crossings, these measures are not always adequate to protect against existing risks.

Before authorizing VIA to increase train speed up to 100 mph on the Québec–Windsor rail corridor in the early 1990s, TC conducted crossing safety assessments to identify crossings that required upgrading. These crossing assessments are now nearly 20 years old and do not accurately reflect the present risks nor consider emerging risks. Over the same period of time, rail traffic has increased and communities along the corridor have experienced substantial industrial and residential expansion, as in Terrasse-Vaudreuil. All of these factors increase the

likelihood for a crossing collision involving a passenger train. In order to ensure that the increased risk to rail passengers and vehicle drivers is adequately addressed, the Board recommends that:

> Transport Canada conduct safety assessments of level crossings on the high-speed passenger rail Québec–Windsor corridor and ensure that defences are adequate to mitigate the risk of truck/train collisions.
>
> R09-01

### *4.2.2 Conspicuity of Emergency Contact Information*

In this and several other crossing accidents on the Kingston Subdivision, trucks were immobilized on a crossing for a period of time before the arrival of the train, yet the drivers did not notice the posted railway emergency contact information and made no attempt to place an emergency call. This demonstrates that, even though the industry initiative to post emergency contact information at crossings has been a positive step in advancing crossing safety, it has shortcomings due to driver awareness and signage conspicuity, both of which are critical to reducing the number of grade crossing accidents. To raise driver awareness, Operation Lifesaver and Direction 2006 have developed vehicle driver training material for crossing safety and disseminated it throughout the country. The material includes guidance on the presence and location of emergency contact information at railway crossings, but it has not yet been incorporated into all provincial driver training manuals. Consequently, many drivers remain uninformed.

While it is incumbent upon vehicle drivers to be aware of the available information, railways also have a responsibility to ensure that the information is clearly visible, compelling, and posted in a location that will be easily seen by an uninformed driver whose vehicle becomes immobilized on the track. In the United States, the *Manual of Uniform Traffic Control Devices* (MUTCD) provides guidance for standardizing emergency contact information signage and its location at railway crossings. The MUTCD guidance requires signage to be large, conspicuous and use direct wording that clearly defines the risk. However, in Canada, there is no specified standard for signage size, wording or location under either current TC crossing regulations or the proposed RTD 10 crossing standard. Consequently, signage in Canada is smaller and has varied wording. As a result, there is an increased risk that uninformed drivers may not see the information and alert railways. Therefore, the Board recommends that:

> Transport Canada implement standards to improve the visibility of emergency contact signage at railway crossings in Canada.
>
> R09-02

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 26 February 2009.*

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