



**RAILWAY INVESTIGATION REPORT
R13Q0012**



COLLISION AT A LEVEL CROSSING

**PASSENGER TRAIN NO. 24
OPERATED BY VIA RAIL CANADA INC.
MILE 15.62, BRIDGE SUBDIVISION
NEAR THE GARE DU PALAIS
QUÉBEC, QUEBEC
02 MAY 2013**

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Summary

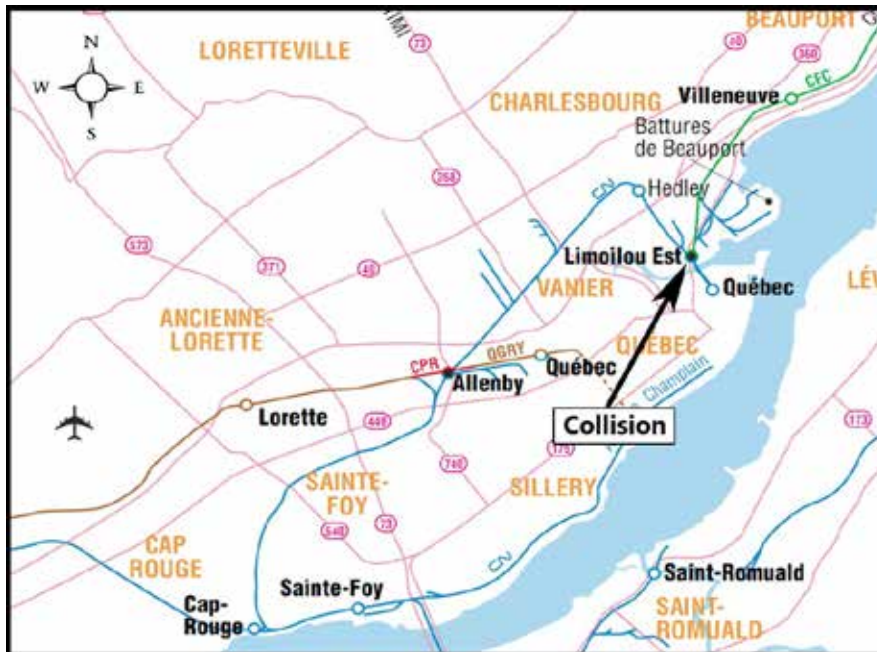
On 02 May 2013, at about 1948 Eastern Daylight Time, VIA Rail Canada Inc. passenger train No. 24, while carrying out a reverse movement between the Gare du Palais and the Limoilou Yard, collided with a tractor-trailer at the private level crossing leading to the White Birch Paper mill. The last passenger car was damaged, and the tractor-trailer was destroyed. No one was injured as a result of the accident. Nearly 300 litres of diesel fuel from the tractor-trailer's fuel tank spilled on the ground.

Le présent rapport est également disponible en français.

Factual information

On 02 May 2013, at about 1610,¹ eastbound passenger train No. 24 operated by VIA Rail Canada Inc. (VIA) left Montréal, Quebec, for the Gare du Palais in Québec, Quebec (Figure 1), arriving at 1932. The train consisted of 1 locomotive and 7 passenger cars. It was approximately 670 feet long and weighed about 560 tons. The operating crew was composed of 2 engineers: 1 operating locomotive engineer (LE), and 1 in-charge locomotive engineer (ICLE) who ensured the protection of the reverse movement. Both locomotive engineers met work/rest and fitness requirements, were qualified for their respective positions, and were familiar with the territory.

Figure 1. Location of the collision (source: Railway Association of Canada, *Canadian Railway Atlas*)



After the passengers detrained, the crew refuelled the locomotive and initiated a reverse movement in Limoilou Yard in preparation for the next day's trip to Montréal. To protect the reverse movement, the ICLE, who was positioned in the last passenger car of the train, used the radio to give instructions to the LE. At about 1940, the train started the reverse movement and placed the locomotive next to the refuelling platform, located at the exit of the station. During the refuelling operation, the ICLE got off the train to line the switch for crossover XX03, to allow the train to enter the yard.

At about 1947, after the refuelling was completed and having received authorization from the ICLE, who was on the ground, the train resumed its reverse movement. After travelling approximately 480 feet and reaching a speed of 13 mph, the train collided with a tractor-trailer, which had entered the private level crossing from Boulevard des Capucins. The last passenger car (VIA 7202) was damaged. The tractor-trailer was completely destroyed. No one was injured as a result of the accident.

¹ All times are Eastern Daylight Time (Universal Coordinated Time minus 4 hours).

As per the emergency plan for the White Birch Paper mill, the guard located in the gatehouse contacted emergency services, who intervened quickly. The emergency responders noted that 300 litres of diesel fuel had spilled from the fuel tank of the damaged tractor-trailer. Boulevard des Capucins was closed to traffic in both directions for a few hours, until the site was cleared up by the city's and the plant's firefighters.

At the time of the collision, the temperature was 8 °C, the sky was clear, and visibility was good.

Track information

The Bridge Subdivision is a single main track that extends from Joffre, near Charny, Quebec, at Mile 0.0, to the Gare du Palais, at Mile 15.9. Train movements are governed by centralized traffic control (CTC) authorized by the *Canadian Rail Operating Rules* (CROR), and are supervised by a rail traffic controller (RTC) located in Montréal. The subdivision is classified as Class 4 track, according to the *Track Safety Rules* (TSR) approved by Transport Canada (TC). The maximum allowable speed is 75 mph for passenger trains and 45 mph for freight trains. However, in the occurrence area, a permanent speed restriction of 15 mph is in effect. Rail traffic consists of 8 passenger trains a day, and freight trains can cross the level crossings up to 35 times a day during switching operations.

Track FL09 and track AL01 are used exclusively by freight trains that are carrying out switching operations or are on their way to the Port of Québec or to the paper mill. All movements that operate on these 2 tracks are governed by CROR 105. Rule 105 states, in part, that unless otherwise provided by special instructions, movements operating on non-main tracks must operate at a speed that will allow them to stop within ½ the range of vision of the equipment. The allowable speed on these 2 tracks cannot exceed 10 mph.

Particulars of the track

The track consisted of 115-pound jointed rail laid on double-shouldered tie plates with 3 spikes per tie plate, and every third tie was box-anchored. There were approximately 3200 hardwood ties per mile of track. The ballast consisted of crushed rock and gravel. The track was in good condition.

Site inspection

The rear of passenger car VIA 7202 came to a stop approximately 20 feet west of the level crossing. The tractor-trailer was pushed along the track and came to rest against the fence between Boulevard des Capucins and the railway right-of-way. Shortly before the collision, a truck coming out of the plant had stopped just short of the level crossing.

The main entrance to the White Birch Paper mill is located on Boulevard des Capucins. On the access road, there is a private level crossing that crosses 3 tracks: the main track used by VIA trains; track FL09, which gives access to the Port of Québec from the Limoilou Yard; and track AL01, which leads to the White Birch Paper mill (Figure 2).

Figure 2. Collision area



The average daily vehicular traffic at the level crossing is approximately 240 heavy trucks and about 400 automobiles. The road vehicles coming from the east must carry out a right-angle turn to enter the plant from Boulevard des Capucins. The turn is controlled by traffic lights with directional arrows.

The gatehouse is equipped with an audible and visual warning system connected to the main track block circuit, between Mile 14.49 and Mile 15.87 (Gare du Palais). When a train approaches on the main track, the warning system activates a bell outside and a strobe light inside the gatehouse, where the guard who controls the traffic in and out of the plant is situated. The gates that protect the level crossing are manually operated by the guard when a train approaches. The audible warning system and the gate-activating system interact with the traffic lights to prevent conflicting movements. Switches on the control panel inside the gatehouse allow the guard to deliberately bypass the connection between the bell and the traffic lights, even when the block is occupied by a train. The connection between the movement of the gates and the traffic lights can also be cut. Due to the delay from the equipment, it is possible for the gates to be going down while the traffic light display (green arrow) still indicates that vehicular traffic can proceed to the plant.

A pedestrian level crossing along a bike path is located approximately 230 feet west of the road crossing and is equipped with an automatic warning system. This warning system protects the bike path users from any rail traffic on the main track and on track FL09. It has a complete warning system, including flashing lights, bell, and gates, and a detection system that allows the gates to go up and the bell to turn off if a train movement stops. The gates are lowered again as soon as the train resumes movement. According to pedestrian counts conducted by the City of Québec, approximately 800 persons per hour use this level crossing at peak times, and approximately 200 persons per hour use it between 1800 and 1900.

On track FL09, there are no block circuits to warn the guard of an approaching train. The White Birch Paper mill has installed a camera on the roof of the gatehouse that detects the movement of the gates at the pedestrian level crossing. The camera triggers an audible alarm inside the gatehouse to let the guard know when a train movement approaches. This detection system is not reliable, as the audible alarm can be triggered by a vehicle on the overpass of Dufferin Highway, or by birds flying by.

The AL01 private track that leads to the paper mill connects with track FL09. It does not cross the pedestrian level crossing. The guard has no advance warning when the track is occupied by a train and must observe the approaching equipment to protect the level crossing.

The tractor-trailer

The driver of the tractor-trailer complied with work/rest and fitness requirements, was qualified for the position, and was familiar with the territory. The driver carried out 3 return trips per week of approximately 5 hours each, and always used the same route.

On the day of the occurrence, the driver left St-Pamphile, Quebec, at about 1700 with a load of wood chips. After crossing the bridge over the Saint-Charles River, the driver approached the main entrance to the paper mill from the east, as normally. The traffic light controlling access to the paper mill displayed a horizontal green arrow, which indicated that the tractor-trailer could turn right. The gate at the level crossing was up. After the tractor-trailer driver initiated a wide turn at low speed, the gates at the level crossing started to lower without the driver being aware of it. The tractor-trailer proceeded toward the level crossing and was struck by the last car of the train that was carrying out a reverse movement on the main track.

Recorded information

The video from the security camera installed on the roof of the gatehouse, and the data downloaded from the locomotive event recorder, showed the following sequence of events:

- At 1940:00, the gates were lowered.
- At 1942:00, the train stopped for refuelling.
- At 1942:00, the gates were lifted to permit a delivery truck to pass through.
- At 1944:00, the ICLE walked past the level crossing on the way to the switch for crossover XX03.²
- At 1945:00, a second truck entered the plant.
- At 1947:00, refuelling was completed, and authorization was given to resume the reverse movement.
- At 1947:25, the train resumed the reverse movement.
- At 1948:19, the tractor-trailer turned and entered the level crossing.
- At 1948:21, the train's emergency brakes were applied.

² The ICLE walked across the level crossing, which is approximately 50 feet wide, in 13 seconds, thus at a speed of 2.67 mph.

- At 1948:22, the train collided with the tractor-trailer.
- At 1952:00, the emergency responders arrived on site.

In particular, the video showed that the level crossing gates started to come down as the tractor-trailer was initiating its turn and was entering the level crossing. When the gate reached level position, the front end of the tractor-trailer had already passed on to the main track.

The gatehouse

The gatehouse of the White Birch Paper mill is located on the northeast side of the entrance to the plant from Boulevard des Capucins. The guard is responsible for controlling the road vehicles going into and out of the plant and for ensuring their safety at the level crossing. The inside of the gatehouse is set up to allow the guard to monitor and control road traffic and pedestrian traffic. Large glass windows provide a view of the vehicles going into and out of the paper mill. The workstation has several pieces of communications equipment, along with various screens and knobs to control the gates, the bell, and other devices. The layout of the guard's desk and the guard's field of view are conducive to monitoring road traffic to the right. However, the field of view toward Gare du Palais is restricted by the building's pillars and several bookcases (Photo 1).

Photo 1. The obstructed view toward the Gare du Palais from inside the gatehouse.



When a train leaves Gare du Palais, the warning system is activated and warns the guard, who then lowers the gates to protect the movement. However, when the train stops to refuel, the guard can turn off the bell and raise the gates to allow vehicles to drive across the level crossing. When the train resumes its movement after refuelling, the guard does not receive a second advance notice until the detection system of the pedestrian level crossing reacts by lowering the gates and activating the audible alarm of the movement detection device.

Before the accident, the guard was unable to observe the initial movement of the train, and did not lower the gates immediately to protect the level crossing.

Refuelling

The train refuelling operation took approximately 5 minutes. Normally, refuelling a VIA locomotive takes about 15 minutes. However, the length of time required to refuel can vary from one day to the next, depending on the quantity of fuel required.

Canadian Rail Operating Rules

A reverse movement is governed by CROR 115, entitled “Shoving Equipment”, which states that:

- (a) When equipment is shoved by an engine or is headed by an unmanned remotely controlled engine, a crew member must be on the leading piece of equipment or on the ground, in a position to observe the track to be used and to give signals or instructions necessary to control the move.

EXCEPTION: A crew member need not be so positioned when the portion of the track to be used is known to be clear. However, equipment not headed by an engine must not approach to within 100 feet of any public, private or farm crossing unless such crossings are protected as described in Rule 103 paragraph (b) or (g).³

Rule 103 (b) states that:

When required by special instruction or when cars not headed by an engine, snow plow or other equipment equipped with a whistle and headlight, are moving over a public crossing at grade, a crew member must provide manual protection of the crossing until the crossing is fully occupied.⁴

Rule 103 (g) states that:

When providing manual protection of a crossing, a crew member or other qualified employee must be on the ground ahead of the movement, in a position to stop vehicular and pedestrian traffic before entering the crossing. A hand signal by day and a light or a lighted fusee by night will be used to give a signal to stop vehicular and pedestrian traffic over such crossing. The movement must not enter the crossing until a signal to enter the crossing has been received from the employee providing the manual protection.

When the crossing is known to be clear of traffic, and will remain clear until occupied, manual protection need not be provided.⁵

³ Transport Canada, TC O-0-093, *Canadian Rail Operating Rules* (CROR), 115. Shoving Equipment, (a).

⁴ *Ibid.*, 103. Public Crossings at Grade, (b).

⁵ *Ibid.*, (g).

Reverse movement

During the reverse movement toward Limoilou Yard, the ICLE must first line up the switch for crossover XX03, which is approximately 1000 feet from the train. The ICLE would then walk back toward the train to protect the movement. The position of the ICLE on the ground can vary from one day to the next, depending on how much time is required to refuel the locomotive. The ICLE can either return to the train or wait near the crossover before climbing back on board.

After the refuelling is completed, the LE would notify the ICLE that the LE is ready to complete the manoeuvre. The ICLE would then ensure that the White Birch level crossing is free of traffic before authorizing the train to move in reverse. The ICLE then turns attention to the movement of the gates and notes their position before advising the LE that the level crossing is protected or in the process of being protected.

Analysis

Given that the VIA train collided with the tractor-trailer that was driving across the level crossing, the analysis will focus on the protection of level crossings and the applicable *Canadian Rail Operating Rules* (CROR).

The accident

After the train was refuelled, it was authorized to resume its reverse movement by the in-charge locomotive engineer (ICLE), who was on the ground beyond the pedestrian crossing. The train approached the private level crossing as the tractor-trailer was initiating a turn to enter the paper mill. The guard had raised the level crossing gates while the train was refuelling. The traffic light display at Boulevard des Capucins, which controls access to the plant, indicated that traffic could proceed. As such, the protection of the level crossing was not in place to prevent conflicting movements between the train and road vehicles. The guard, at the last minute, did notice that the train was moving and lowered the gates. The driver of the tractor-trailer noticed that the gate on the other side was coming down, but it was too late to stop. The train's emergency brakes were applied, but the train could not be stopped, and it struck the tractor-trailer.

Canadian Rail Operating Rules 103 and 115

CROR 103 and 115 state that a crew member must provide manual protection of a level crossing that is not equipped with automatic warning devices, unless the crossing can be seen to be clear of traffic and will remain clear until fully occupied. In the vicinity of Gare du Palais, an ICLE must authorize the train to reverse before the crossings are protected, in order to activate the detection system of the pedestrian level crossing. However, the ICLE should not consider that the movement is protected until the gates are down or are being lowered. The ICLE must therefore pay close attention to the position and movement of the gates.

Visual perception of the in-charge locomotive engineer

Visual perception is a function of the field of vision, which encompasses central vision and peripheral vision. Central vision is located at the centre of the field of vision. It allows the eye to perceive details and is quite narrow. Peripheral vision, which is much broader than central vision, is characterized mostly by the ability to detect movements.

The gate should have triggered a nearly automatic response from the ICLE; that is, the ICLE should have realized that the gate was not down and was not protecting the level crossing. However, this static stimulus, which was along the edge of the ICLE's field of vision, was not sufficient to trigger a response, because the ICLE's selectivity of visual stimuli was focused on the movement of the train rather than on the gate. The visual and mental attention of the ICLE were most likely focused on the train given that the ICLE did notice the reverse movement of the train and that, from the ICLE's location on the ground, the ICLE did not see any road traffic on the level crossing.

While looking toward the gatehouse, the ICLE's attention and central vision would have been directed to the truck stopped on the paper mill side of the level crossing. This was the more

obvious visual stimulus, and, as such, distracted the ICLE from the position of the gate, which was the more critical visual cue. The gate in the up position was in the field of vision of the ICLE for several seconds, but it did not catch the ICLE's attention.

In addition, as the refuelling operation had been completed more quickly than usual, the ICLE was located quite far from the private level crossing when notified by the lead engineer (LE) that the LE was ready to complete the manoeuvre. The ICLE checked to confirm that the level crossing was not occupied and noticed the presence of the truck stopped on the paper mill side. The ICLE then authorized the LE to start the reverse movement. Incorrectly concluding that the gate of the private level crossing must be down, the ICLE informed the LE that the level crossings were protected when, in fact, they were not.

During refuelling operations, after a train stops next to the refuelling platform, an ICLE usually gets off the train and walks toward the connecting track to line up the switch for crossover XX03. Depending on how much time is required for the refuelling operation, the ICLE can either return to the train or wait in the vicinity of the connecting track before climbing back on board. Therefore, the position of the ICLE on the ground can vary from one day to the next. As such, the ICLE might be too far away from the level crossing that needs to be protected, which increases the risk of misperception and the risk of collision.

Alertness of the guard

When a train leaves Gare du Palais, the warning system is activated and warns the guard situated in the gatehouse, who then lowers the gates to protect the movement. If the movement then stops at the refuelling platform, the guard can raise the gates to allow vehicles to drive across the crossing. When the train resumes its movement after refuelling, the guard receives no immediate warning. Therefore, the guard must constantly visually monitor the movement of the train to again lower the gates in a timely manner to protect the level crossing. If there is no other warning when a train resumes its movement, the defences in place (that is, the gates) may not be activated, thereby increasing the risk of collision.

As the refuelling operation normally takes about 15 minutes, the guard raised the gates to allow vehicles to drive through. The guard's attention then shifted to tasks associated with the control of the vehicular traffic. In addition, the guard's attention was diverted by the arrival of a truck that approached the level crossing from the paper mill side and stopped. Furthermore, the train was stopped to the left of the gatehouse, where the guard's field of vision was partially obstructed by pillars and several bookcases. The refuelling operation was completed much quicker than usual (in 5 minutes rather than 15 minutes), and the attention of the guard was focused on the truck that was stopped on the paper mill side. With the view of the train partially obstructed, the guard was unable to detect the initial movement of the train, and did not immediately recognize the need to lower the gates and protect the level crossing.

Findings

Findings as to causes and contributing factors

1. Having resumed its reverse movement, the train struck the tractor-trailer as the tractor-trailer was initiating a turn to enter the paper mill.
2. When the tractor-trailer initiated the turn, the level crossing gates were up, and the traffic light display that controls access to the plant indicated that traffic could proceed.
3. The in-charge locomotive engineer noticed the presence of the truck stopped on the paper mill side, concluded that the gate of the private level crossing must be down, and informed the lead engineer that the level crossings were protected when, in fact, they were not.
4. The refuelling operation was completed much quicker than usual, and the attention of the guard was focused on the truck that was stopped on the paper mill side.
5. With the view of the train partially obstructed, the guard was unable to detect the initial movement of the train, and did not immediately recognize the need to lower the gates and protect the level crossing.

Findings as to risk

1. If an in-charge locomotive engineer is too far away from the level crossing that needs to be protected, the risk of misperception, and thus of collision, increases.
2. If there is no other warning when a train resumes its movement, the defences in place (that is, the gates) may not be activated, thereby increasing the risk of collision.

Safety action

Safety action taken

Transportation Safety Board of Canada

On 29 May 2013, the Transportation Safety Board (TSB) issued Rail Safety Advisory 05-13, about the synchronization of highway traffic lights. In this advisory, the TSB mentions some defects with regard to the synchronization between the traffic lights at the corner of Boulevard des Capucins and the railway operations. The traffic lights, which control westbound vehicles driving on Boulevard des Capucins entering the White Birch Paper mill from the right lane, turn yellow, then red, when the level crossing gates are lowered. However, it was noted that the traffic light displayed a horizontal green arrow, which indicated that road traffic could proceed, while a train was stationary on the level crossing and the gates were down.

Transport Canada

On 13 June 2013, Transport Canada (TC) Quebec Surface Regional Officers met with representatives of the City of Québec, the White Birch Paper mill, and Canadian National Railway (CN) to review the operation of the systems at this level crossing. During the meeting, improvements to various systems were discussed, including the train detection system, the traffic light system, the cabin operator system located in the gatehouse at the White Birch Paper mill, and the interconnection between them. Several solutions were examined, including the possibility of modifying the pedestrian crossing warning system to provide priority triggering of the traffic lights.

After follow-up by TC, VIA Rail Canada Inc. (VIA) now ensures that locomotive engineers conduct one continuous movement when travelling back over crossings and that a locomotive engineer is at the tail end at all times.

VIA Rail Inc.

Following the occurrence, VIA issued Bulletin LOQ2013-21, and amended its procedures so that trains no longer stop upon exiting Gare du Palais. VIA also changed its refuelling point to move it away from the level crossing.

This report concludes the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on 24 September 2014. It was officially released on 3 October 2014.

Visit the Transportation Safety Board's website (www.bst-tsb.gc.ca) for information about the Transportation Safety Board and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.