Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

RAIL TRANSPORTATION SAFETY INVESTIGATION REPORT R18M0037

EMPLOYEE FATALITY

Canadian National Railway Company
Assignment L57211-04
Mile 1.03, Pelletier Subdivision
Edmundston Yard
Edmundston, New Brunswick
04 December 2018

Canada

ABOUT THIS INVESTIGATION REPORT

This report is the result of an investigation into a class 2 occurrence. For more information, see the Policy on Occurrence Classification at www.tsb.gc.ca

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.

TERMS OF USE

Citation

Transportation Safety Board of Canada, *Rail Transportation Safety Investigation Report* R18M0037 (released 26 January 2021).

Transportation Safety Board of Canada
200 Promenade du Portage, 4th floor
Gatineau QC K1A 1K8
819-994-3741; 1-800-387-3557
www.tsb.gc.ca
communications@tsb.gc.ca

Rail transportation safety investigation report R18M0037

Cat. No. TU3-11/18-0037E-PDF
ISBN: 978-0-660-36810-8

This report is available on the website of the Transportation Safety Board of Canada at www.tsb.gc.ca

Le présent rapport est également disponible en français.

Table of contents

RAIL TRANSPORTATION SAFETY INVESTIGATION REPORT R18M0037

EMPLOYEE FATALITY

Canadian National Railway Company
Assignment L57211-04
Mile 1.03, Pelletier Subdivision
Edmundston Yard
Edmundston, New Brunswick
04 December 2018

Executive summary

On 04 December 2018, at approximately 0827 Atlantic Standard Time, a cut of 2 cars loaded with mixed freight rolled uncontrolled westward on the west lead track at Canadian National Railway Company (CN) Edmundston Yard in Edmundston, New Brunswick. The leading car struck a trailing locomotive travelling in the opposite direction. The conductor trainee, who was standing on the northeast footboard of the locomotive, was trapped between the locomotive and the leading car and was fatally injured. No rolling stock derailed, and no dangerous goods were involved.

During switching activities before the occurrence, the cut of 2 cars had been moved approximately 4380 feet without the air brakes having been applied. During winter operations, applying brakes regularly conditions the brakes to prevent snow and ice from building up between the brake shoes and the wheels. To carry out the next movement, the crew had to temporarily leave the cut of cars on the west lead track. The crew considered the cars to be attended and applied the emergency brakes. However, ice contamination during the previous movements had made the brakes less effective, and, as a result, the total

retarding force generated by the brakes of the 2 cars was insufficient to prevent the cut of cars from rolling uncontrolled. If the brakes on rolling stock are not properly conditioned in winter conditions, their effectiveness can be compromised, increasing the risk of an uncontrolled movement.

In November 2018, CN had issued a notice regarding train operations in winter conditions that reminded employees of the requirement to regularly condition the brakes on rolling stock. This directive allows some latitude to locomotive engineers, who can adjust some tasks, such as brake conditioning, according to their personal experience. This practice is acceptable as long as in-train forces are not increased and control of the train is not compromised. However, if the various directives, rules, and operating instructions in effect are not properly interpreted and applied, the safety of railway operations could be compromised, increasing the risk of an accident.

When the conductor realized that the cut of cars was rolling uncontrolled, it had already passed the fouling point of switch EA04. Given the speed of the cut of cars, the track gradient in the area, and the presence of snow on the ground, the conductor was unable to take any action to stop the cut of cars. Rule 112 of the *Canadian Rail Operating Rules*, railway instructions, and employee training do not clearly define the factors and risks that must be taken into account for employees to determine whether they are in close enough proximity to take effective action to stop an uncontrolled movement of equipment.

RAIL TRANSPORTATION SAFETY INVESTIGATION REPORT R18M0037

EMPLOYEE FATALITY

Canadian National Railway Company
Assignment L57211-04
Mile 1.03, Pelletier Subdivision
Edmundston Yard
Edmundston, New Brunswick
04 December 2018

1.0 FACTUAL INFORMATION

On 04 December 2018, at approximately 0827,[1] Canadian National Railway Company (CN) assignment L57211-04 was operating in Edmundston Yard at Mile 1.03 of the CN Pelletier Subdivision in Edmundston, New Brunswick (Figure 1).

[1] All times are Atlantic Standard Time.

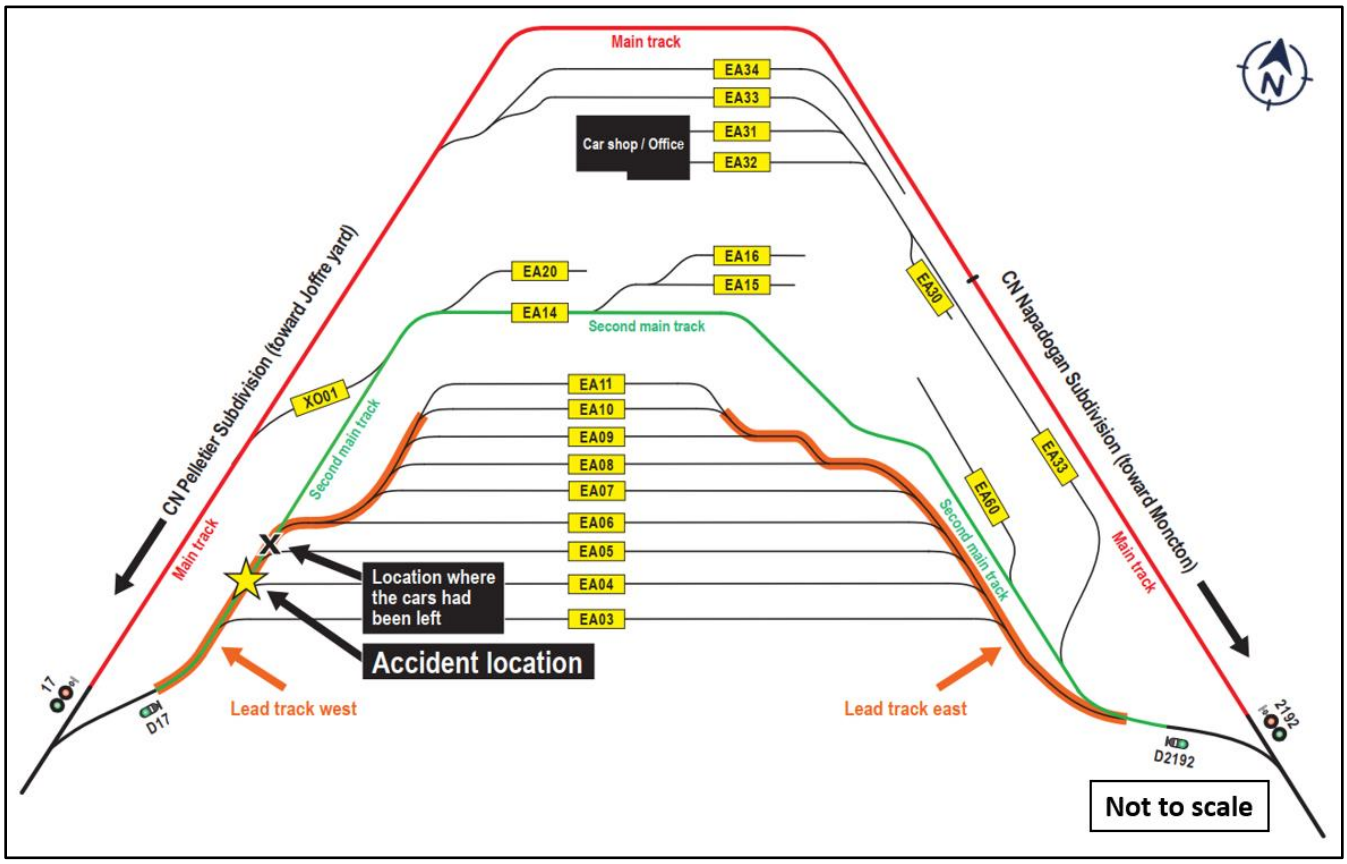
Figure 1. Occurrence site (Source: Google Maps, with TSB annotations)

The assignment consisted of 2 locomotives (CN 9418 and CN 4792), coupled end-to-end, and a crew composed of a locomotive engineer (LE), a conductor, and a conductor trainee undergoing on-the-job training. The LE and the conductor had been working for CN for 11 and 5 years, respectively. The trainee had been hired by CN on 03 September 2018, and, at the time of the occurrence, he had been working for the company for 13 weeks. He had finished conductor trainee basic training at the CN Training Centre in Winnipeg, Manitoba, on 19 October 2018, which included training in the *Canadian Rail Operating Rules* (CROR) and CN's *General Operating Instructions* (GOI). He had completed 21 tours of duty in Edmundston Yard, including 6 shifts with the same crew. The crew members were qualified for their respective positions, were familiar with the yard, and met fitness and rest standards.

During normal switching operations in Edmundston Yard, the LE remains in the locomotive, while the conductor and, in this occurrence, the trainee, perform duties such as lining up switches, coupling and uncoupling cars, and applying handbrakes. The LE operates the locomotive in either forward or reverse, as instructed (by radio or hand signals) by the conductor or trainee, as applicable.

Edmundston Yard has 2 main tracks, 11 yard tracks, and several service tracks, as well as a car shop and administrative office (Figure 2).

Figure 2. Diagram of Canadian National Railway Company's Edmundston Yard, showing the location of the accident (Source: TSB)



At Edmundston Yard, train speed is governed by the applicable provisions of Rule 105(c)[2] of the CROR and by CN Time Table 84.[3] According to these provisions, trains must not exceed 10 mph in the yard. In addition, according to Rule 83(c) of the Summary Bulletin in effect at the time of the occurrence,[4] when switching in the yard, air brakes must be applied through the entire consist.

---

2 "In addition to moving at REDUCED speed, a movement using a non-signalled siding or using other non-main tracks so designated in special instructions, must operate at a speed that will allow it to stop within one-half the range of vision of a track unit." (Source: Transport Canada, *Canadian Rail Operating Rules* [CROR] [18 May 2018], Rule 105: Operation on non-main track, p. 41).

3 Canadian National Railway Company, Eastern Canada Region, Champlain Sub-region, Time Table 84 (July 2016).

4 Canadian National Railway Company, Rule 83 (c) Summary Bulletin for the Months of November–December 2018 and January 2019.

1.1 The occurrence

The sequence of events (Appendix A) was established from a review of available information, including radio communication records, data from the locomotive event recorder on lead locomotive CN 9418, and interviews.

At the beginning of the work shift, at 0730, during a job briefing, the crew members had agreed on the tasks to be carried out.

The first movement involved coupling the locomotive consist to a cut of 2 loaded cars (IANR 624584 and BCOL 730875) standing on track EA05 in order to move car BCOL 730875 to the lead track and return car IANR 624584 to track EA05.[5] During these operations, the LE, who was at the controls of locomotive CN 9418, temporarily placed car BCOL 730875 on the lead track with the emergency brakes[6] applied. The assignment crew then moved car IANR 624584 to track EA05. During this movement, the LE applied the air brakes on the car for 53 seconds over a distance of approximately 210 feet. When car IANR 624584 was left on track EA05, the trainee applied the handbrake. A brake effectiveness test was then performed, as required, before the locomotive consist was uncoupled. The assignment was then coupled to car BCOL 730875, which had been left on the lead track, in order to move it to track EA08. During this movement, the air brakes on the car were applied twice, once for 43 seconds and again for 39 seconds, for a total distance of approximately 845 feet. Car BCOL 73087 was left on track EA08 with its emergency brakes applied.

The locomotive consist then travelled to the west side of the yard (via track EA11) to assemble car HS 3205, located on track EA10, and car BCOL 730875, which had been temporarily left on track EA08 during the previous movement.

The following activities were carried out:

- The locomotive consist reversed onto track EA10 and was coupled to car HS 3205.
- The assignment (locomotive consist and car HS 3205) proceeded from track EA10 to track EA08 (via the west lead track), for a total distance of approximately 2200 feet. During this movement, the air brakes on car HS 3205 were applied for 5 seconds.
- The assignment (locomotive consist and car HS 3205) was coupled to car BCOL 730875.

---

5 Car IANR 624584 was blocking car BCOL 730875 for subsequent switching operations.

6 An emergency brake application occurs when the air brakes are fully applied on a car or train, rapidly reducing the air pressure in the brake pipes until it reaches zero, either because the brake pipe has separated or because the operator has reduced the air pressure.

- A sense and braking unit (SBU)[7] was installed on the trailing end of car BCOL 730875.

The next step was to pick up additional cars on track EA04. To do this, the crew had to temporarily leave the cut of 2 cars (HS 3205 and BCOL 730875) on the west lead track, east of switch EA05 West.

The following operations were successively carried out, starting at 0820:45:

- The assignment (locomotive consist and cut of 2 cars) travelled onto the west lead track and stopped on that track east of switch EA05 West, a distance of about 4380 feet.
- The crew applied the emergency brakes on the cut of cars using the SBU as a means of securement, and the 2 cars (HS 3205 and BCOL 730875) were uncoupled.
- At 0826:34, the locomotive consist moved approximately 200 feet westward on the west lead track before coming to a stop just after switch EA04 West in preparation for the next movement.

The crew was now ready to pick up the cars on track EA04. The conductor stepped onto the east platform of trailing locomotive CN 4792 in the locomotive consist. The trainee, after reversing switch EA04 West, stepped up onto the first step of the northeast footboard of trailing locomotive CN 4792.

The trainee then instructed the LE by radio to reverse 20 car lengths (approximately 1200 feet) eastward, toward track EA04. The LE was sitting in the cab while he backed up the locomotive consist.

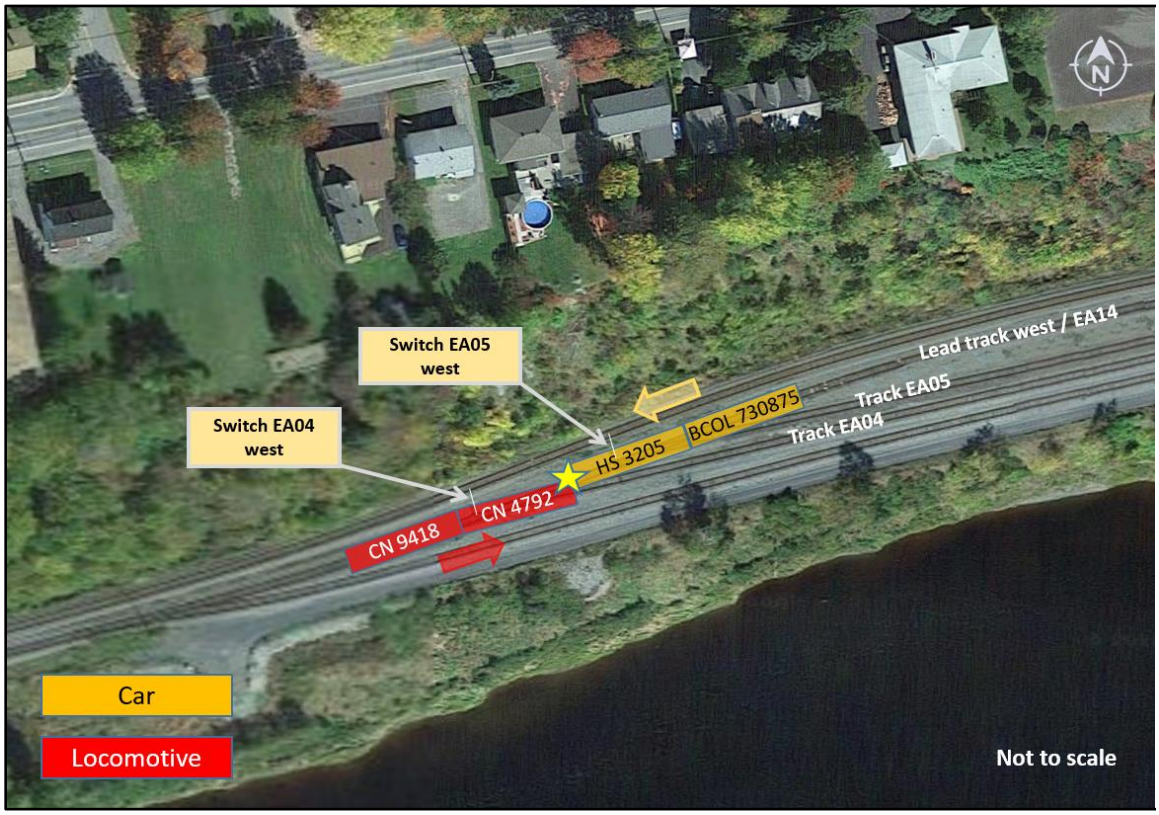
Unnoticed by the crew, the cut of 2 cars (HS 3205 and BCOL 730875) began to roll uncontrolled westward on the west lead track. As soon as the conductor realized that the cut of cars was moving (at 0827:27), he instructed the LE by radio to immediately stop the locomotive consist and attempted to warn the trainee. The LE applied the locomotive emergency brakes, which quickly brought the locomotive consist to a stop.

However, the runaway cut of 2 cars had already passed the fouling point of switch EA04, after travelling approximately 100 feet. About 3 seconds later, car HS 3205 collided with trailing locomotive CN 4792 (Figure 3). The trainee, who was on the first step of the northeast footboard of locomotive CN 4792, was trapped between the locomotive and car HS 3205 and received fatal injuries.

---

7 A sense and braking unit (SBU) is a device mounted on the rear coupler of the last car that is connected to the brake pipe by a coupling head. Each SBU has a unique identification number. The SBU is one of the components of the train information and braking system (TIBS). It is activated automatically when the air pressure in the brake pipe rises to 10 psi. When an SBU is installed on a train, both a communications test and an emergency brake application component test must be performed. The LE can initiate an emergency brake application using the toggle switch on the TIBS input and display unit in the locomotive cab. The brake pipe pressure drops to 0 psi when the SBU valve is opened.

Figure 3. Position of rolling stock after the accident (Source: Google Maps, with TSB annotations)



At the time of the occurrence, the sky was overcast and the temperature was –6 °C. The wind was from the northwest at 13 km/h. There was about 15 cm of snow on the ground, and some of the railway tracks were covered with ice and snow. In the week before the occurrence (between 28 November and 04 December), a total of almost 23 mm of rain and more than 20 cm of snow was recorded in the immediate area.

1.2 Site examination

At the occurrence site, the 2 locomotives of the locomotive consist and the cut of 2 cars were straddling the west lead track as well as the EA05 West and EA04 West turnouts. No rolling stock had derailed, and the tracks were undamaged.

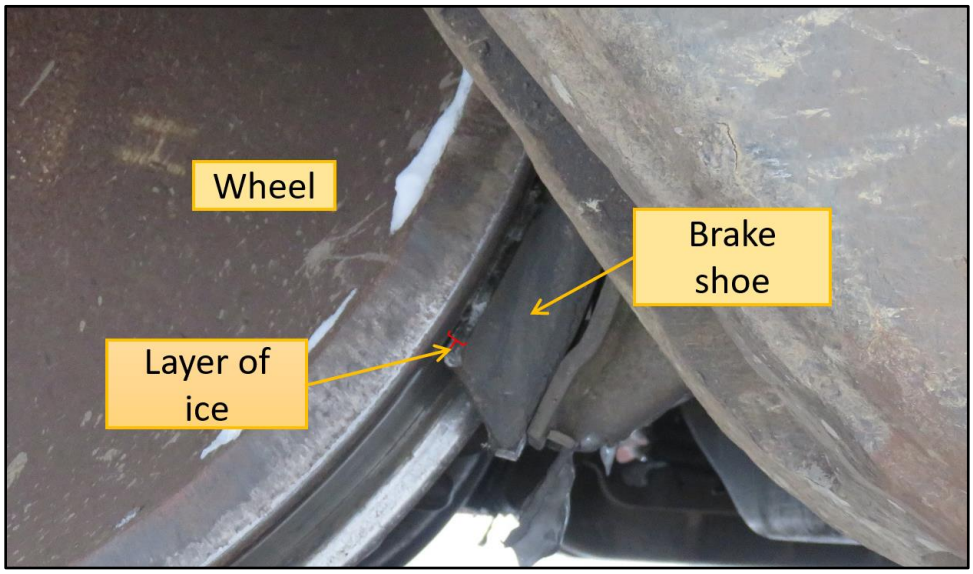
Lead locomotive CN 9418 was facing west and was stopped on the switch points at the EA04 West turnout. No damage to the locomotive was observed.

Trailing locomotive CN 4792 was facing east, had entered track EA04, and was stopped on the EA04 West turnout frog. It was approximately 10 feet from car HS 3205. At the northeast corner of the locomotive, damage was observed on the locomotive pilot, the safety railings, the ladder, and the footboard.

Car HS 3205 was coupled to car BCOL 730875 and was stopped on the switch points at the EA05 West turnout. The southwest corner of car HS 3205 and the end and side ladders were dented.

There was snow and ice around the brake shoes on all of the trucks of car HS 3205. The brake cylinder pressure on the car[8] was approximately 70 psi, and the brake piston was extended. All brake shoes were applied against the wheels. A layer of ice was visible between the brake shoes on 7 of the 8 wheels of the car (Figure 4).

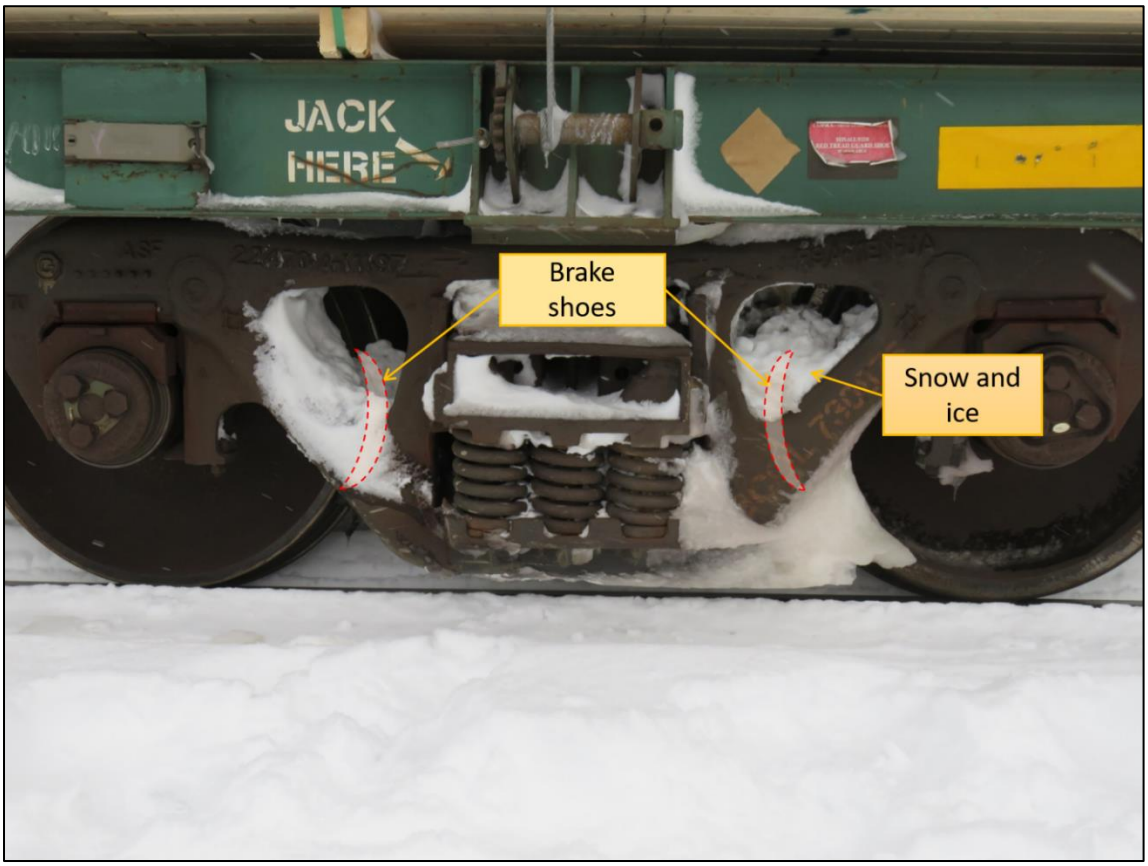
Figure 4. Layer of ice between a wheel and a brake shoe on car HS 3205 (Source: TSB)



Car BCOL 730875 was stopped east of the EA05 West turnout frog. No damage was visible on this car. There was a significant buildup of snow and ice on all of the car's trucks and around the brake shoes (Figure 5).

8 The pressure on the occurrence cars was measured approximately 11 hours after the occurrence.

Figure 5. Truck of car BCOL 730875, with dotted lines showing brake shoes hidden by snow and ice (Source: TSB)



The brake cylinder pressure on the car was approximately 72 psi, and its piston was extended. All brake shoes on the car were applied to the wheels of the car.

1.3 Subdivision information

The Pelletier Subdivision consists of a single main track from Edmundston (Mile 0.0) to St-André Junction (Mile 86.9) in St-André-de-Kamouraska, Quebec. Train traffic is governed by the centralized traffic control system in accordance with the CROR, supervised by a rail traffic controller located in Montréal, Quebec.[9]

The track is a Class 4 track under the Transport Canada–approved *Rules Respecting Track Safety*, also known as the Track Safety Rules. The maximum allowable speed on the subdivision is 55 mph for freight trains. Rail traffic consists of 6 trains per day, for a total annual tonnage of about 19 million gross tons.

[9] At the time of the occurrence, rail traffic control on the Pelletier Subdivision was supervised by the CN rail traffic control centre in Montréal, Quebec. Since September 2020, CN's rail traffic control activities in Canada have been centralized in Edmonton, Alberta.

1.4 Edmundston Yard information

Edmundston Yard is located at the junction of the CN Napadogan and Pelletier subdivisions. The yard starts at Mile 219.25 of the Napadogan Subdivision and extends to Mile 1.8 of the Pelletier Subdivision. The yard tracks are considered part of the Pelletier Subdivision.

Edmundston Yard is in an urban area between an escarpment and the Saint John River. Switching at Edmundston Yard is primarily performed from the east end of the yard, and cars are left at the eastern fouling point of the yard tracks. At the west end of the yard, several tracks are used for train switching and marshalling operations.

The yard has approximately 10 miles of track and 32 turnouts. Local yard crews[10] operate approximately 30 cars per day using the yard's east and west tracks.

1.5 West lead track information

The west lead track consists of 100-pound bolted rail manufactured by the Dominion Steel Company in 1945, laid on 10-inch double-shouldered tie plates and fastened with 2 spikes at each tie. The rails are box-anchored every third tie. The ballast consists of crushed rock ranging from ½ inch to 2 inches in diameter. The west lead track has an average descending grade to the west of approximately 0.4%; however, where the 2 cars had been left, east of switch EA05 West, there is a section of 0.7% descending grade to the west over a distance of 250 feet.

Turnouts for tracks EA04 and EA05 are size 8, rail-bound manganese,[11] equipped with switch point protectors.

The Track Safety Rules require track inspections, which had taken place. The last visual inspection had been performed on 29 November 2018, and no defects were found.

1.6 Air brake system

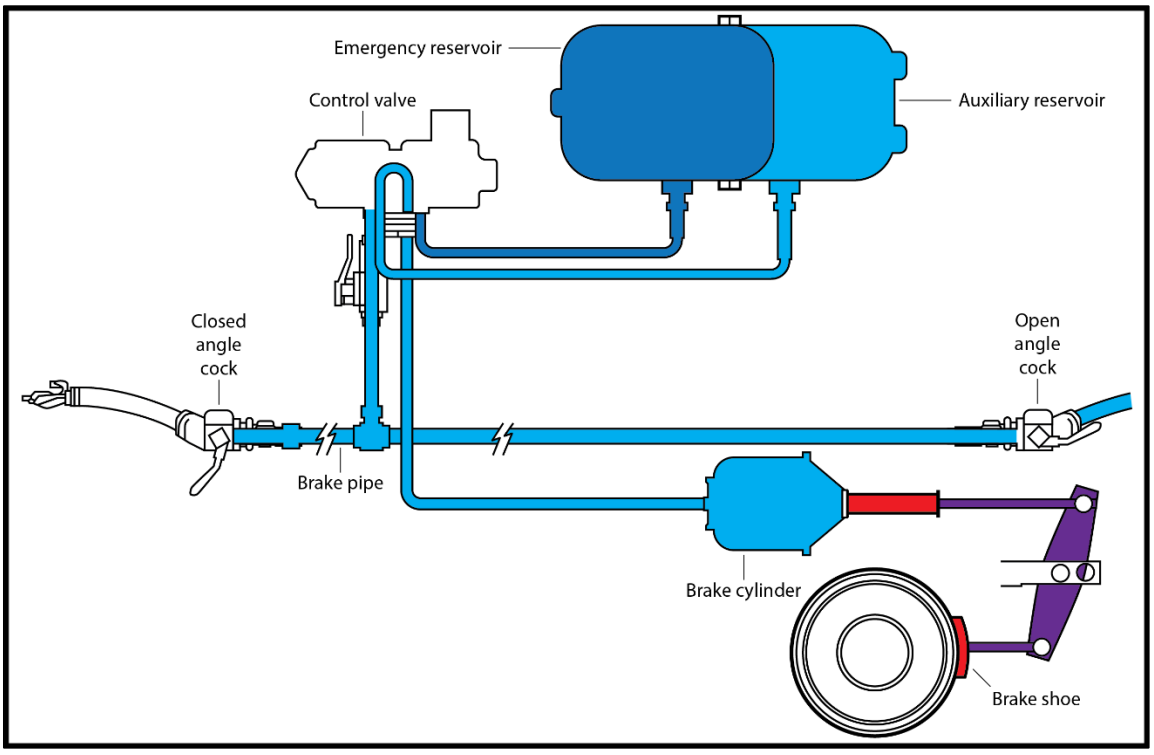
A rail car air brake system comprises 4 main components: brake pipe, control valve, air reservoirs, and brake cylinder (Figure 6). The brake pipe connects the cars to each other, up to the lead locomotive. It supplies compressed air to the reservoirs on the rolling stock and signals the control valve to apply or release the brakes.

---

10 A total of 12 conductors, LEs, and trainees were working at Edmundston Yard in December 2018. In addition to performing switching in the yard, employees were bringing cars to local companies.

11 Such turnouts have a rail-bound manganese steel frog.

Figure 6. Rail car air brake system (Source: TSB)



Each car has 2 air reservoirs: an auxiliary reservoir and an emergency reservoir. The auxiliary reservoir supplies air to the brake cylinder when the service brakes are applied. When the emergency brakes are applied, the brake cylinder receives compressed air from both the emergency reservoir and the auxiliary reservoir, which generates a greater braking force than service braking.

The control valve acts as intermediary between the brake pipe, the air reservoirs, and the brake cylinder. This valve reacts to air pressure changes within the brake pipe. When the pressure drops, the control valve supplies compressed air to the brake cylinder, and the brake shoes push against the wheels of the car. When brake pipe pressure increases, the brakes release.

1.7 Rule 112 of the *Canadian Rail Operating Rules*

To complete rail switching and ensure safe train operations, railways rely on crews to interpret and apply the CROR and GOI correctly when carrying out work tasks. There are generally no physical defences to safeguard against the incorrect application of rules. All of the safety defences are administrative and rely solely on the operating crew correctly applying the operating rules in each situation they encounter.

CROR Rule 112 states the following:

> When equipment is left unattended, it must be secured to prevent it from moving unintentionally.
>
> In the application of this rule:

(i) Equipment is considered unattended when an employee is not in close enough proximity to take effective action to stop the equipment should it move unintentionally.

[…]

(c) Yard Tracks

When equipment is left unattended in a yard track, to prevent equipment from moving unintentionally, it must be secured by using at least one of the following:

- hand brakes; unless otherwise indicated in special instructions, a minimum number applied as indicated in (g) and tested for effectiveness;
- bowled terrain;
- retarders;
- wheel chocks or skates;
- air brakes, not connected to an air source, for up to 2 hours when:
  - (i) there are 10 or more cars;
  - (ii) the air brake system is sufficiently charged to ensure proper brake application;
  - (iii) the brake pipe is fully vented at a service rate or has an emergency brake application; and
  - (iv) on freight equipment, the angle cock is left fully open. If required to be left longer, an employee must observe that the equipment has not moved, the air brake pistons remain extended, and the hand brakes (when used) are still applied. Such results must be communicated to another employee. This observation must be carried out at consecutive intervals of 2 hours or less. If any change in the condition of the above items is observed, hand brakes must be applied as indicated in (g); or

[…]

(d) Exceptional weather situations, such as high winds or other unusual conditions, must be factored when determining securement requirements. In addition, previously secured equipment may require additional means of securement. Special instructions may contain location specific requirements where extreme weather events are prevalent.

[…][12]

Rule 112 of the CROR states that "unattended" equipment must be secured and specifies some circumstances when additional means of securement may be required. The definition of "unattended" has a direct impact on yard operations, since Rule 112 requires crews to adopt additional physical or mechanical means of securement when cars are deemed to be "unattended."

12 Transport Canada, TC O 0-167, *Canadian Rail Operating Rules* (CROR) (18 May 2018), Rule 112: Securing Unattended Equipment.

Under Rule 112, crew members must decide whether they are in close enough proximity to take effective action to stop unintended movements of rolling stock. If so, the rolling stock is considered attended, and no additional means of securement is required.

If rolling stock that not coupled to motive power and that is deemed to be attended starts to roll unintentionally, the crew may have to take action by boarding the moving equipment at the right place and applying the handbrake — a manoeuvre that entails several elements of risk. Its effectiveness depends on numerous factors, such as track gradient, the initial distance and position of the crew member in relation to the equipment, the speed of the uncontrolled movement of the rolling stock, weather and ground conditions, and the effectiveness of the handbrakes.

In this occurrence, the crew considered the cars to be attended, and, therefore, concluded that they did not need additional means of securement, despite the fact that the assignment would travel approximately 1200 feet away to be coupled to cars on track EA04. Consequently, the cut of 2 cars was secured on the west lead track with the emergency brakes applied, but without any handbrakes.

If the cut of cars had been considered "unattended," it would have been secured on the west lead track with the handbrakes applied to both cars, followed by a brake effectiveness test, in accordance with Rule 112.

1.7.1 Securement of rolling stock in Edmundston Yard

At Edmundston Yard, all yard switching operations were performed with the brake pipe charged with air. During switching operations, the employees systematically considered all cars that were temporarily left on any yard track to be attended, while the crew continued to work in the vicinity of these cars or on other tracks.

Because the employees considered the cars to be attended, whenever they needed to be temporarily left on a track, only the emergency brakes were applied to secure them. The emergency brake application was initiated either by uncoupling the locomotive consist[13] or by using the SBU, if the last car of a cut of cars was equipped with one.

Rolling stock was deemed to be "unattended" only after all switching operations involving that equipment were completed and no further movement of the rolling stock was planned. The equipment was then secured by applying the required number of handbrakes[14] and performing a brake effectiveness test, in accordance with current regulations, to confirm that the rolling stock was properly secured.

---

13 When a locomotive consist is uncoupled, the flexible hose connecting the cars detaches and allows air to escape from the brake pipe, automatically triggering an emergency brake application.

14 The number of handbrakes to be applied is determined in accordance with the table *Minimum Number Requirements for Hand Brakes* of CROR Rule 112 (Appendix C).

1.8 CN notices

In December 2017, CN issued the Atlantic Zone Educational Notice *Are You Close Enough?*[15] This educational notice was intended to remind employees of the provisions in section (i) of Rule 112, which stipulate that employees must be "in close enough proximity to take effective action" to prevent an undesirable action or outcome.

On 06 November 2018, CN issued System Notice No. 910, entitled *Winter Operation,*[16] to remind employees about train handling and other operational requirements that could be adversely affected by cold winter conditions. The points covered included

- policy standardizing established train-handling procedures,
- brake conditioning in winter conditions,
- slowing or controlling speed,
- stopping trains,
- train-handling instructions on descending grade, and
- pushing equipment (ice in flangeway).

The notice also stated that snow and ice accumulation on braking surfaces and in brake rigging can dramatically reduce the effectiveness of train brake systems.

According to the notice, since stopping distances may increase during winter operating conditions, train operations must be adjusted accordingly. For example, it is critical to keep the brake equipment conditioned for service by applying the brakes frequently, which keeps the braking surfaces clear of ice and snow. The notice also states that brake conditioning is especially important when snow and ice accumulation between the wheels and the brake shoes is more likely, when there is blowing snow, or when snow is accumulating on or over top of the rail.

The notice concludes by stating that LEs must apply their knowledge, skill, and professional judgment in the course of their duties.

The notice does not provide specific guidance on conditioning brakes while switching in a yard setting. When switching in a yard with a limited number of cars, LEs typically use the locomotive brakes to control speed, since the car brakes are not required to stop the train.

In this occurrence, the LE was aware of System Notice No. 910 but thought that it applied only on the main track. When switching in the yard, he was primarily using and conditioning the locomotive brakes, not the car brakes.

1.9 Brake conditioning

Brake conditioning on rolling stock serves to remove snow, ice, or other debris from the braking surfaces to ensure that the brakes are in good working order. Conditioning consists

---

15 Canadian National Railway Company, Atlantic Zone Educational Notice, *Are You Close Enough?* (December 2017).

16 Canadian National Railway Company, System Notice No. 910, *Winter Operation* (06 November 2018).

of applying the air brakes long enough to allow the brake shoes to warm up sufficiently to remove snow, ice, or other debris that may have built up.

Several variables affect brake conditioning, including the condition of the brake system, ambient temperature, and weather conditions.

The CN *Locomotive Engineer Operating Manual* specifies the following:

> Stopping distances may increase during winter operating conditions. To keep braking surfaces clear of ice and snow and the brake equipment conditioned for service, it is critical to apply the brakes at frequent intervals.
>
> During an automatic brake application, allow the locomotive brake cylinder pressure to build to a maximum of 10 PSI for brief intervals as required, to keep the locomotive brakes conditioned.[17]

According to data from the locomotive event recorder from the lead locomotive:

- At about 0755:11, the brakes on car IANR 624584 were applied for 53 seconds over approximately 210 feet as the car travelled westward on track EA05.
- At about 0801:42, the brakes on car BCOL 730875 were initially applied for 43 seconds over approximately 445 feet as the car moved westward on track EA11.
- At about 0802:56, the brakes on car BCOL 730875 were applied once more, for 39 seconds over approximately 400 feet, as the car travelled westward on track EA08.

The brakes were applied on the rolling stock during each of these movements, conditioning the brakes.

At about 0826:21, cars HS 3205 and BCOL 730875 were left on the west lead track, east of switch EA05 West, after their emergency brakes were applied using the SBU. At that time, the last brake application on either of those cars had been performed nearly 25 minutes earlier.

1.10 Employee training

Railway companies develop and administer their own training and certification programs according to their needs. At CN, initial training for employees (including employees in Edmundston Yard) is generally given at its Winnipeg training centre.

Some of the training courses lead to a certificate of qualification that must be renewed after a specified period. These courses include those on CROR, transportation of dangerous goods, and first aid.

Rules-qualified employees must renew their qualifications every 3 years. When they requalify, they are encouraged to seek clarification on any rule, they must review the CROR, and they must pass an exam and other courses required under the *Railway Employee Qualification Standards Regulations*.

---

[17] Canadian National Railway Company, *Locomotive Engineer Operating Manual*, Form 8960 (01 May 2016), section G2.6: Winter Operation – Conditioning the Brakes, pp. 72–73.

At the end of this training, the employee joins a regular team and actively participates in daily operations. This on-the-job training allows the employee to get used to working on site, to become familiar with the territory, to gain practical experience, and to clarify aspects of the work that present logistical difficulties. During this training, the supervisor, other crew members, and the trainer observe and evaluate the employee.

At CN, an informal network of contact persons facilitates knowledge-sharing and provides employees with the opportunity to discuss all aspects of their work, including the interpretation of rules and instructions in effect, with their peers. These contact persons include instructors at the Winnipeg training centre, all local and regional supervisors, and on-the-job trainers. The investigation determined that employees in Edmundston Yard often had difficulty reaching the appropriate contact persons.[18] Moreover, the information given varied, depending on the subject matter and the contact person who was consulted. The interpretation of rules, notices, and other information provided by various contact persons was sometimes different, contradictory, or incomplete.

As part of its investigation, the TSB interviewed 10 of the 12 operating employees working at Edmundston Yard and determined the following:

- Interpretation of CROR Rule 112 varied among the employees in Edmundston Yard. For example, some employees thought that the rolling stock remained attended during some switching and that it was therefore unnecessary to use additional means of securement.
- Interpretation of the CN Educational Notice *Are You Close Enough?* also varied among these employees. For example, some employees thought that they were close enough as long as they were performing switching in the area of the cars, whereas others did not.
- Some crews did not consistently apply the requirements in CN System Notice No. 910 *Winter Operation*. For example, employees decided whether to condition the brakes on the rolling stock on the basis of their individual interpretations, rather than on the environmental conditions described in the notice.

1.10.1 Training of the trainee

The trainee's training lasted several weeks, allowing him to cover most aspects of the work for which he had been hired. After successfully completing the in-class training portion, he had moved on to the next phase, on-the-job training, during which he was evaluated on more than 50 different aspects of the daily tasks performed.[19] The results of these

---

18 At the time of the occurrence, 2 supervisors and 1 on-the-job trainer at Edmundston Yard were designated as contact persons.

19 The daily tasks appear on a list established by CN that covers information on the train, train documentation, radio communications, activities en route, switching, rolling stock securement, train marshalling, and other items.

evaluations indicated that he took his work seriously, met the company's expectations, and performed his tasks in a satisfactory manner.

1.11 Inspection of the rolling stock

Following the occurrence, the 2 locomotives (CN 9418 and CN 4792) and cars BCOL 730875 and HS 3205 underwent an overall mechanical inspection as well as a detailed inspection of the brake system and its components.

The 2 locomotives were in good mechanical condition, as were the brake shoes on both locomotives. A brake test performed in the shop determined that the brake system of the locomotive consist was functioning properly.

Car BCOL 730875 is a centrebeam bulkhead flat car with a total gross weight at the time of the occurrence of 252 000 pounds, and car HS 3205 is a box car with a total gross weight at the time of the occurrence of 270 000 pounds.

The mechanical inspection of car BCOL 730875 did not reveal any defects in the brake system components. Visual inspection of the brake shoes revealed that they were damp but had no visible defects.

The mechanical inspection of car HS 3205 revealed a defect in the retainer valve of the air brake system,[20] as well as mechanical issues, including

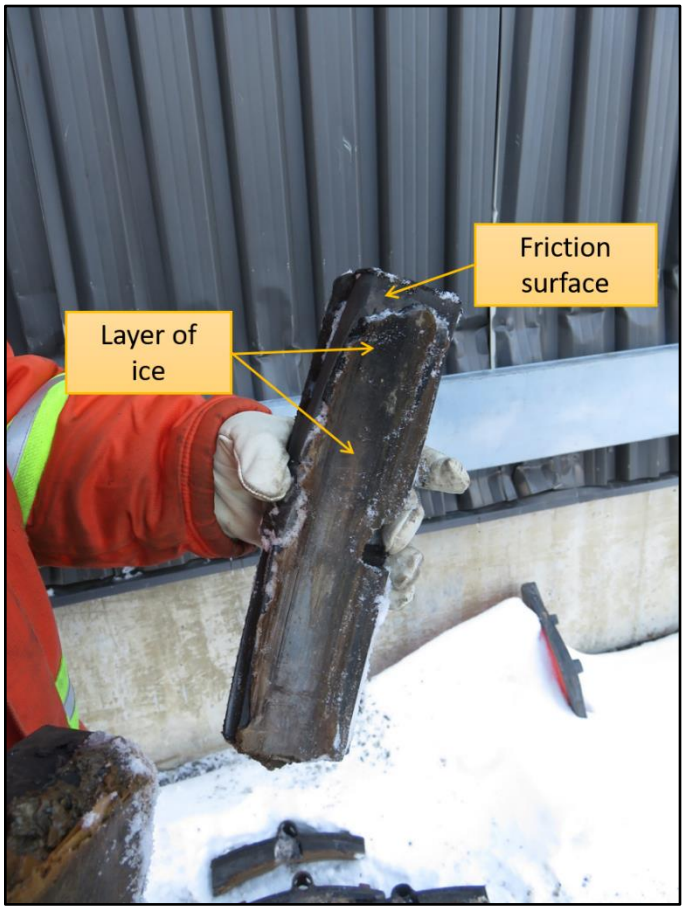
- wear of the constant contact side bearings,
- sagging of the brake beams and the brake heads on worn parts of the truck side frames; and
- uneven alignment of the brake beam.

[20] A defective retainer valve does not compromise the effectiveness of the emergency brakes.

The defective components are not part of the pre-departure inspection[21] required by Transport Canada's *Railway Freight Car Inspection and Safety Rules*.

Visual inspection of the brake shoes on car HS 3205 revealed that some of the shoes were unevenly worn between the top and bottom pads of the friction material. In addition, a layer of ice with an average thickness of approximately 4 mm covered 7 of the 8 brake shoes (Figure 7).

Figure 7. Layer of ice on a brake shoe of car HS 3205 (Source: TSB)



1.12 Braking effectiveness

The braking effectiveness of rolling stock depends on the force exerted by the brake shoes on the wheels, and on the coefficient of friction of the contact surface between the shoes and the wheels.

1.12.1 Brake force and net braking ratios

Following the occurrence, brake force testing was conducted on cars BCOL 730875 and HS 3205 (Appendix B). These tests assess the brake forces at the interface between the brake shoes and wheel thread during brake application. The net braking ratios[22] for each car are then calculated from these data (Table 1).

---

21 Transport Canada, *Railway Freight Car Inspection and Safety Rules* (last revised 09 December 2014), at https://www.tc.gc.ca/eng/railsafety/freight-car-330.htm (last accessed on 24 April 2020).

22 The net braking ratio of rolling stock is defined as the ratio of the force exerted by the brake shoes to the total weight of the rolling stock.

Table 1. Total brake force and net braking ratios for the cars in the cut of cars

Car	Full-service air brake application*		Emergency brake**		Hand brake***	
	Brake force (pounds)	Net braking ratio (%)	Brake force (pounds)	Net braking ratio (%)	Brake force (pounds)	Net braking ratio (%)
BCOL 730875	22 337	7.8	26 397	9.2	29 718	10.4
HS 3205	14 733	5.2	16 559	5.8	14 740	5.2

* Maximum of 64 psi in the brake cylinder.
** Maximum of 77 psi in the brake cylinder.
*** Applied with 100 foot-pounds of torque at the brake wheel.

For new rolling stock, Association of American Railroads standard S-401[23] establishes minimum net braking ratios for the application of air brakes[24] (between 8.5% and 13%) and handbrakes[25] (at least 10%).

1.12.2 Retarding brake force and coefficient of friction between brake shoe and wheel

The retarding brake force on the cut of 2 cars in this occurrence can be calculated by taking into account the force of gravity, train resistance, brake forces, and the coefficient of friction between the brake shoe and the wheel.

The static coefficient of friction (when the car is stationary) for standard freight car brake shoes ranges from 0.45 (when the contact surface between the shoe and the wheel is completely clean and dry) to 0.27 (in wet conditions).[26] When there is ice at the interface between the brake shoe and the wheel, the coefficient of friction is much lower, as low as 0.05.[27]

The cut of cars weighed a total of 522 000 pounds and was on a 0.7% descending grade. Based on these parameters, the longitudinal force exerted by gravity was 3654 pounds, while the train resistance[28] was 316 pounds. Therefore, the minimum retarding force required to hold the cars on the 0.7% descending grade was 3338 pounds.

---

23 Association of American Railroads (AAR), *Manual of Standards and Recommended Practices* (MSRP), Section E: Brakes and Brake Equipment, Standard S-401: Brake Design Requirements, section 4.0: Braking Ratio, subsection 4.1 (adopted in 1984, revised February 2014), p. 4.

24 Value based on a pressure reduction of 30 psi in the brake pipe when charged to 90 psi.

25 Value based on applying 125 foot-pounds of torque to the brake wheel.

26 Air Brake Association, *Engineering and Design of Railway Brake Systems*, Figure II-4 (September 1984).

27 A. Mills, "The coefficient of friction, particularly of ice," *Physics Education*, Vol. 43, Issue 2 (June 2008), p. 392.

28 Train resistance includes friction due to wheel and wheel flange contact with the rail, internal friction of the roller bearings, and wind resistance.

To generate such a retarding force, the average coefficient of friction[29] between the brake shoes and the wheels of the 2 cars had to be at least 0.078 when the emergency brakes of both cars were applied.

For car HS 3205, considering the presence of ice on the brake shoes, the average coefficient of friction between the brake shoes and the wheels is set to 0.05, and the emergency brakes would therefore have provided 828 pounds retarding force.

Therefore, to prevent the cut of cars from moving, the second car, BCOL 730875, needed to provide a minimum retarding force of 2510 pounds, requiring an average coefficient of friction of at least 0.095 between the brake shoes and the wheels.

1.13 Conductor positioning and visual performance

In yard switching operations, conductors generally have to position themselves on the leading rolling stock (on a ladder or footboard). CN's GOI state the following: "When riding equipment, ensure that you maintain a firm grip and at least 3 points of contact using hands, crook of arm and feet."[30]

In this occurrence, the trainee was standing on the first step of the northeast footboard of the trailing locomotive. The investigation could not determine with certainty which direction the trainee was looking; however, conductors and LEs tend to use their vision to follow the locomotive's progress, control the movement, and look for obstacles ahead of them on the track. They are therefore used to looking in the direction of travel.

Central (or foveal) vision is centred on a 1° to 2° angle of effective area at the back of the retina; vision on either side of the central point is considered peripheral. Perception of objects moving toward the viewer is affected by the physiological differences in foveal and peripheral vision. People are sensitive to motion in their peripheral vision; however, they are most likely to detect motion if the object follows a linear path along the retina. If that object and the observer converge toward each other at a similar closing rate, the observer will probably fail to notice the object because its position on the retina appears stationary and therefore unremarkable.[31]

---

29 The average coefficient of friction is calculated by dividing the total net retarding force by the total brake force generated by the brakes on the cut of cars.

30 Canadian National Railway Company, *General Operating Instructions* (15 December 2015), section 8: Safe Work Procedures – Safety Rules, item 4.6.9, p. 10.

31 M. Green, "Collision course objects don't make moving retinal images," in *Accidents at Rail-Highway Crossings* (2013), at http://www.visualexpert.com/Resources/trainaccidents.html (last accessed 24 December 2020).

1.14 Operator attention during switching operations

Human attention and capacity to process information are limited. While humans can switch their attention rapidly from one information source to another, they can pay attention to only one information source at a time.[32] In highly practised situations, such as switching operations in a train yard, knowing what information is important to pay attention to and expecting how the situation will unfold is often driven by previous experience.[33] During switching operations, a conductor must perform a number of tasks that require continual and sequential attention. The task of providing guidance to a movement requires focused attention on the cars being switched and the track being used. The conductor must be able to determine the distance from a car while ensuring that the track is safe (i.e., clear of equipment and obstructions on or near the track). The conductor simultaneously communicates instructions to the LE by radio. The LE's expectations are related to their preparedness and influence how quickly they perceive information and take appropriate actions. When LEs receive information contrary to their expectations, their performance tends to be slower.[34,35]

1.15 TSB statistics on occurrences involving unplanned or uncontrolled movements

Between 2010 and 2019, there were 589 occurrence reports to the TSB related to unplanned or uncontrolled movements[36] on all federally regulated railways in Canada (Table 2).

---

32 P. L. Olson, R. Dewar and E. Farber, "Vision, audition, vibration and processing of information" in *Forensic Aspects of Driver Perception and Response*, Third Edition, (Lawyers & Judges Publishing Company, Inc., 2010).

33 G. Klein, "Naturalistic decision-making," *Human Factors*, Vol. 50, Issue 3 (2008), pp. 456–460.

34 G. J. Alexander and H. Lunenfeld, report no. FHWA-TO-86-1, Driver expectancy in highway design and traffic operations, U.S. Department of Transportation (April 1986).

35 American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets*, section 2.2.6.1: Reaction Time, 7th edition (2018), at: ftp://www.ahtd.state.ar.us/Outgoing/Roadway/TRC1805/AASHTO%20A%20Policy%20on%20Geometric%20Design%20of%20Highways%20and%20Streets%202018,%207th%20Edition.pdf.

36 From the *Transportation Safety Board Regulations* (SOR/2014-37), Part 1, Reports, Mandatory Reporting, Accidents, subsection 5(1): "The operator of the rolling stock, the operator of the track and any crew member that have direct knowledge of a railway occurrence must report the following railway occurrences to the Board: […] h) there is an unplanned and uncontrolled movement of rolling stock […]"

Table 2. Unplanned and uncontrolled movements reported to the TSB, 2010 to 2019

Type of unplanned or uncontrolled movement	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Loss of control	2	3	0	3	0	1	4	2	5	1	**21**
Switching without air brakes	10	16	12	24	21	22	18	21	27	31	**202**
Insufficient securement	25	32	44	42	38	37	29	39	34	46	**366**
Total	**37**	**51**	**56**	**69**	**59**	**60**	**51**	**62**	**66**	**78**	**589**

Note: The data summarizing the number of uncontrolled movements each year have not been adjusted to account for variations in the volume of rail traffic.

Uncontrolled movements generally fall into one of the following causal categories:

1. Loss of control: When an LE or remote control operator cannot control a locomotive, a car, a cut of cars, or a train when using the available air brakes of the locomotive or train, or both.
2. Switching without air brakes: When a movement is being switched using the locomotive independent brakes only, with no air brakes available on the cars being switched. The vast majority of these incidents occur in rail yards.
3. Insufficient securement: When a car, a cut of cars, or a train is left unattended and begins to roll uncontrolled, usually due to
   - an insufficient number of handbrakes applied to a car, a cut of cars, or a train, or
   - faulty or ineffective handbrakes on a car (or on several cars).

Of the 589 occurrences

- loss of control was the main factor in 21 (4%) of the cases,
- switching without air brakes was the main factor in 202 (34%) of the cases, and
- insufficient securement was the main factor in 366 (62%) of the cases, including this one.

Since 1994, the TSB has investigated 36 other occurrences that involved uncontrolled movements, including this one, of which 15 (42%) were due to insufficient securement (Appendix D).

1.16 Similar occurrence

In the past 5 years (2015 to 2019), the TSB has investigated 1 occurrence in which a car that had been left in a yard, considered by the employees to be "attended," rolled uncontrolled.

The occurrence happened on 01 March 2016, in Regina, Saskatchewan.[37] A yard crew switching tank cars loaded with asphalt left a tank car on an adjacent subdivision track where there was already a cut of 5 cars. The crew did not apply any handbrakes, as the cars

37 TSB Railway Investigation Report R16W0059.

were secured using the emergency air brakes. When the conductor walked over to an adjacent track to assist a co-worker, the tank car rolled uncontrolled and travelled about 2.7 miles (4.3 km). The car traversed 7 public crossings at grade, each protected by automatic warning devices, and 1 railway interlocking (diamond), before coming to rest in the city of Regina. There were no injuries, and no dangerous goods were involved. Following the occurrence, Transport Canada issued an administrative monetary penalty to the operator for non-compliance with CROR Rule 112.

The TSB investigation report of this occurrence stated that CROR Rule 112(a) stipulates that, when air brakes are used as an additional method of securement, the brake pipe may have an emergency brake application. However, air brakes on freight cars are known to leak, and the rate of leakage is generally unpredictable. In this occurrence, the car's air brakes bled off and released, leaving the car unsecured; it then rolled uncontrolled. The investigation determined that the use of air brakes alone is not an acceptable method of securement to back up or replace the use of handbrakes or other physical or mechanical devices. The TSB concluded that, if rules or instructions permit the use of air brakes alone to secure rolling stock left standing in a yard, there is an increased risk of rolling stock running away uncontrolled.

1.17 Previous recommendation and safety concern regarding uncontrolled movements

As a result of the TSB investigation into the Lac-Mégantic accident in July 2013,[38] the Board recommended that

> [t]he Department of Transport require Canadian railways to put in place additional physical defences to prevent runaway equipment.
>
> **TSB Recommendation R14-04**

This recommendation specifically focuses on the insufficient securement of rolling stock. In response to this recommendation, Transport Canada has implemented several initiatives, including strengthened securement requirements in CROR Rule 112 and a comprehensive monitoring plan for this new rule. The TSB's assessment of this response, as well as previous responses and assessments, are available on the TSB website.[39]

As a result of the investigation into the uncontrolled movement of equipment on the main track in Saskatoon, Saskatchewan,[40] TSB determined that the desired outcome of significantly reducing the number of uncontrolled movements has not yet been achieved despite initiatives by Transport Canada and the industry. Consequently, the Board issued the following safety concern:

---

38 TSB Railway Investigation Report R13D0054.

39 TSB Recommendation R14-04: Prevention of runaway trains: Unattended equipment (19 August 2014), at https://www.bst-tsb.gc.ca/eng/recommandations-recommendations/rail/2014/rec-r1404.html (last accessed 26 December 2020).

40 TSB Railway Investigation Report R16W0074.

The Board is concerned that the current defences are not sufficient to reduce the number of uncontrolled movements and improve safety.

1.18 TSB Watchlist

The TSB Watchlist identifies the key safety issues that need to be addressed to make Canada's transportation system even safer. Unplanned/uncontrolled movement of railway equipment is a Watchlist 2020 issue**.**

In this occurrence, a cut of 2 cars loaded with mixed freight rolled uncontrolled on a yard track and struck a locomotive travelling in the opposite direction. This uncontrolled movement was mainly attributable to insufficient securement of rolling stock.

Between 2010 and 2019, unplanned/uncontrolled movements showed an upward trend, with a peak of 78 occurrences in 2019.

ACTION REQUIRED

While all three categories of unplanned/uncontrolled movements share some common causes, they each require unique strategies either to prevent the occurrences from happening or to reduce the associated risks. TC, the railway companies, and labour unions must collaborate, devise strategies, and implement physical and administrative defences to address each type of uncontrolled movement. For the safety of railway workers and the public, the TSB wants to see a downward trend in the number of such occurrences.

2.0 ANALYSIS

Track conditions and the mechanical condition of the locomotives in the locomotive consist were not factors in this occurrence. The analysis will focus on equipment securement practices in the Edmundston Yard, the mechanical condition of the cut of cars, the effectiveness of the cars' brakes, their conditioning in winter, and the crew's ability to perceive the runaway cars.

2.1 The occurrence

A cut of 2 cars (HS 3205 and BCOL 730875) rolled uncontrolled, descending a grade of approximately 0.7%, and struck the trailing locomotive of a 2-locomotive consist travelling in the opposite direction. When the accident occurred, the conductor trainee, who was standing on the first step of the northeast footboard of the locomotive, was trapped between the locomotive and car HS 3205 and was fatally injured.

The cut of 2 cars had previously been moved by the locomotive consist to the west lead track, east of switch EA05 West, where it had been temporarily left with only the emergency brakes applied. To prepare for the next movement, the locomotive engineer (LE) had moved the locomotive consist westward about 200 feet on the west lead track and stopped it west of switch EA04 West. The trainee, after reversing switch EA04 West, stepped up onto the first step of the northeast footboard of trailing locomotive CN 4792 in the locomotive consist, as he was required to do. The conductor was on the east platform of that locomotive.

The trainee then instructed the LE by radio to reverse the locomotive consist the length of 20 cars eastward, toward track EA04. As the locomotive consist began to back up into track EA04, the cut of 2 cars began to roll uncontrolled westward on the west lead track. As soon as the conductor realized that the cut of cars was moving, he radioed the LE to immediately stop the locomotive consist and tried to warn the trainee. The LE applied the emergency brakes, which quickly brought the locomotive consist to a stop.

However, the cut of 2 runaway cars had already cleared the fouling point at switch EA04 after travelling approximately 100 feet and, about 3 seconds later, the leading car (HS 3205) collided with the trailing locomotive (CN 4792).

2.2 Condition of the brake system on the cars

Mechanical inspection of the brake system on car BCOL 730875 did not reveal any defects in the mechanical or pneumatic components that could have compromised the effectiveness of the brakes.

Visual inspection of the brake shoes on car BCOL 730875 did not reveal any defects. However, the brake shoes were damp, and there was a significant buildup of snow and ice on the car trucks and around the brake shoes.

Mechanical inspection of the brake system on car HS 3205 revealed several issues affecting the various system components. These components are not part of the pre-departure

inspection required by regulations; however, defects in them could reduce the braking force on some of the wheels of the car and lead to uneven wear of the brake shoes.

Visual inspection of the brake shoes on car HS 3205 revealed that some of the shoes were unevenly worn. In addition, a layer of ice with an average thickness of approximately 4 mm covered 7 of the 8 brake shoes. It may be difficult to remove such a layer of ice through brake conditioning over a short handling period at low speeds.

2.3 Braking effectiveness

In this occurrence, in order for the cut of 2 cars to remain stationary on the 0.7% descending grade, the emergency brakes applied to both cars had to generate a total retarding force of at least 3338 pounds. However, the total retarding force generated by the brakes of the 2 cars was insufficient, as the cut of cars rolled uncontrolled.

The brakes on car HS 3205 showed several issues, reducing their performance. In addition, 7 of the 8 brake shoes were contaminated with ice, making braking ineffective. Considering the presence of ice on the brake shoes, the average coefficient of friction between the brake shoes and the wheels was 0.05, and the emergency brakes would therefore have provided only 828 pounds retarding force.

The brakes on car BCOL 730875 were functioning satisfactorily, and the brake shoes showed no visible defects but were damp. To compensate for the reduced braking effectiveness of car HS 3205, this car would have had to generate sufficient retarding force to keep the cut of cars stationary. To achieve this, the emergency brakes of car BCOL 730875 had to provide a retarding force of 2510 pounds, which required an average coefficient of friction of at least 0.095 between the brake shoes and the wheels.

Under normal conditions, when the contact surface between the shoe and the wheel is damp and the brakes are operational, this coefficient of friction is approximately 0.27. However, since the cut of cars rolled uncontrolled, the average coefficient of friction must have been less than 0.095. This reduced coefficient of friction was likely due to the presence of snow and ice between the brake shoes and wheels on this car. Before being secured on the west lead track, the cut of cars had been moved approximately 4380 feet in the yard, on tracks that were covered with snow and ice, which then built up on the trucks of the car, contaminating the brake shoes. Furthermore, the brake shoes on this car may have built up snow and ice when it travelled to Edmundston Yard.

When the cut of cars was left on the west lead track, the braking effectiveness of car HS 3205 was reduced because of ice contamination on 7 of its 8 brake shoes. The braking effectiveness of car BCOL 730875 was also compromised by the contamination of its brake shoes from snow and ice that had probably built up as it was moved through the yard.

2.4 Brake conditioning in winter conditions

According to the CN *Locomotive Engineer Operating Manual*,[41] in winter, it is important to condition the air brakes to ensure that ice or snow does not build up on the brake shoes. Automatic air brakes should, therefore, be applied frequently on all cars in a moving train for long enough to warm up the brake shoes sufficiently to remove any snow, ice, or other debris that has built up.

To assemble the cut of 2 cars (BCOL 730875 and HS 3205) in the right order to meet operational requirements, each car had been moved several times through the yard, on tracks that were covered with snow and ice. As long as the cars remained coupled to the locomotive consist, most of the braking force required to bring the movement to a stop came from the locomotives. During these movements, the brakes on car HS 3205 were not conditioned, while those on car BCOL 730875 were conditioned twice, the last time about 25 minutes before the collision.

During switching operations, the LE relied mainly on the locomotive brakes to control the speed and stop the movement. The brakes of the 2 cars had not been conditioned when the cut of cars was moved over a distance of approximately 4380 feet. Therefore, snow and ice had built up between the brake shoes and the wheels. Consequently, the total retarding force generated by the brakes of the 2 cars was insufficient to prevent the cut of cars from rolling uncontrolled on a descending grade of about 0.7%.

If the brakes on rolling stock are not properly conditioned in winter conditions, their effectiveness can be compromised, increasing the risk of an uncontrolled movement.

2.5 Employee training

At CN, initial training for employees (including employees in the Edmundston Yard) is generally provided at its training centre in Winnipeg, Manitoba. After the courses are completed, a period of on-the-job training follows. This allows the employee to get used to working on site, to become familiar with the territory, to gain practical experience, and to clarify aspects of the work that present additional challenges.

CN has an informal network of contact persons who facilitate knowledge-sharing and provide employees with the opportunity to discuss all aspects of their work, including the interpretation of rules and instructions in effect, with their peers.

At Edmundston Yard, employees often found it difficult to reach these contacts to obtain information on the various rules and instructions. Also, various contacts sometimes provided different or contradictory interpretations and information. In addition, employees had differing individual interpretations of *Canadian Rail Operating Rules* (CROR) Rule 112, the CN notice *Are You Close Enough?,* and the CN notice *Winter Operations*, which addressed

[41] Canadian National Railway Company, *Locomotive Engineer Operating Manual*, Form 8960 (01 May 2016), section G2.6: Winter Operation – Conditioning the Brakes, pp. 72–73.

brake conditioning. Employees were not all aware of the fact that track grades in the yard exceeded 0.4% in certain locations.

According to the CN notice *Winter Operations*, the brakes on rolling stock need to be regularly conditioned. This directive allows some latitude to LEs, who can adjust some tasks, such as brake conditioning, according to their personal experience. This practice is acceptable as long as in-train forces are not increased and control of the train is not compromised.

However, if the various directives, rules, or operating instructions in effect are not properly interpreted and applied, the safety of railway operations could be compromised, increasing the risk of an accident.

2.6 Securement of rolling stock in Edmundston Yard

At Edmundston Yard, during switching operations, employees systematically considered all cars temporarily left on any yard track to be attended while the crew worked in the vicinity of these cars or on other tracks. As in this occurrence, such cars were temporarily left on the track with only the emergency brakes applied, no handbrakes applied, and no brake effectiveness test performed.

According to Rule 112 of the *Canadian Rail Operating Rules* (CROR), rolling stock is deemed to be attended when an employee is in close enough proximity to take effective action to stop the equipment should it move unintentionally. This suggests that an employee "in close enough proximity" is always able to stop runaway rolling stock (for example, by applying the handbrakes on moving equipment). However, applying handbrakes on equipment that is rolling uncontrolled is hazardous: such equipment can quickly reach a high speed and employees could place themselves in a vulnerable position when attempting to reach the rolling stock and climb onto it. Moreover, success in securing runaway rolling stock depends on numerous factors, such as position and initial distance of the employee in relation to the rolling stock, number of cars in the runaway cut of cars, track gradient, ambient lighting, weather, ground conditions (presence of snow or obstacles), and condition and effectiveness of the handbrakes on the rolling stock. All of these factors must be taken into consideration before employees can determine whether they are in close enough proximity to take effective action to stop the equipment should it move unintentionally.

When the cut of cars was temporarily left on the west lead track, the employees considered it to be attended.

When the conductor (who was located on the east platform of the trailing locomotive of the locomotive consist) realized that the cut of cars was moving, it had already passed the fouling point of switch EA04 West. Given the speed of the cut of cars, the track gradient in the area, and the presence of snow and ice on the ground, the conductor was unable to take any action to stop the cut of cars.

CROR Rule 112 affords some latitude to employees in applying the relevant provisions. These provisions must be accurately and uniformly interpreted by all employees when they determine whether they are in close enough proximity to take effective action to stop the equipment should it move unintentionally. However, CROR Rule 112, railway instructions, and employee training do not clearly define the factors and risks that must be taken into account when employees make this determination.

2.7 Crew's ability to perceive the runaway cut of cars

Immediately before the collision, the LE was in the cab of the leading locomotive. The trainee, after reversing switch EA04 West, stepped onto the first step of the northeast footboard of the trailing locomotive. The conductor was standing on the platform of that locomotive. As the locomotive consist began to back up eastward, toward track EA04, the trainee, conductor, and LE would likely have focused their vision and attention on the current movement and the next switching operations they had to perform. The trainee's field of view was likely oriented toward track EA04, and the uncontrolled cut of cars would have been in his peripheral vision.

Since the locomotive consist and the runaway cars converged, and the vision and attention of the crew members were focused on their own tasks, it was unlikely that they would have detected the uncontrolled movement in their peripheral vision. As the locomotive and the cut of cars converged, neither the LE nor the trainee conductor noticed the approaching cars. The conductor, who was standing on the locomotive platform, noticed the runaway cars about 3 seconds before the collision, possibly because of his forward-facing position.

3.0 FINDINGS

3.1 Findings as to causes and contributing factors

These are conditions, acts or safety deficiencies that were found to have caused or contributed to this occurrence.

1. A cut of 2 cars (HS 3205 and BCOL 730875) rolled uncontrolled, descending a grade of approximately 0.7%, and struck the trailing locomotive of a 2-locomotive consist travelling in the opposite direction.

2. When the accident occurred, the conductor trainee, who was standing on the first step of the northeast footboard of the locomotive, was trapped between the locomotive and car HS 3205 and was fatally injured.

3. The cut of 2 cars had previously been moved by the locomotive consist to the west lead track, where it had been temporarily left with only the emergency brakes applied.

4. When the cut of cars was temporarily left on the west lead track, the employees considered the cars to be attended.

5. The brake effectiveness of car HS 3205 was reduced because of ice contamination on 7 of its 8 brake shoes, and the brake effectiveness of car BCOL 730875 was also compromised by the contamination of its brake shoes from snow and ice that had probably built up as it was moved through the yard.

6. Because the brakes of the 2 cars had not been conditioned when the cut of cars was moved over a distance of approximately 4380 feet, snow and ice had built up between the brake shoes and the wheels. Consequently, the total retarding force generated by the brakes of the 2 cars was insufficient to prevent the cut of cars from rolling uncontrolled on a descending grade of about 0.7%.

7. When the conductor realized that the cut of cars was moving unintentionally, it had already passed the fouling point of switch EA04 West. Given the speed of the cut of cars, the track gradient in the area, and the presence of snow and ice on the ground, the conductor was unable to take any action to stop the cut of cars.

8. Rule 112 of the *Canadian Rail Operating Rules*, railway instructions, and employee training do not clearly define the factors and risks that must be taken into account for employees to determine whether they are in close enough proximity to take effective action to stop an uncontrolled movement of equipment.

3.2 Findings as to risk

These are conditions, unsafe acts or safety deficiencies that were found not to be a factor in this occurrence but could have adverse consequences in future occurrences.

1. If the brakes on rolling stock are not properly conditioned in winter conditions, their effectiveness can be compromised, increasing the risk of an uncontrolled movement.

2. If the various directives, rules, or operating instructions in effect are not properly interpreted and applied, the safety of railway operations could be compromised, increasing the risk of an accident.

3.3 Other findings

These items could enhance safety, resolve an issue of controversy, or provide a data point for future safety studies.

1. The brakes on car HS 3205 showed several issues, reducing their performance.

2. Since the locomotive consist and the runaway cars converged, and the vision and attention of the crew members were focused on their own tasks, it was unlikely that they would have detected the uncontrolled movement in their peripheral vision.

4.0 SAFETY ACTION

4.1 Safety action taken

4.1.1 Transportation Safety Board of Canada

On 21 March 2019, the TSB sent Rail Safety Advisory (RSA) 02/19 entitled "Securement of cars that are considered 'attended' during yard switching operations" to Transport Canada (TC), with a copy to the Canadian National Railway Company (CN), the Canadian Pacific Railway (CP), and the Railway Association of Canada.

The RSA refers to uncontrolled movements in yards in 2018 involving cars that employees considered to be attended (Appendix E). It states that, during yard switching operations, cars that are left on the track are considered "attended" if the crews are working in the vicinity. As a result, in the Edmundston Yard, when these cars are left on a track, they are typically secured with air brakes only.[42]

In the RSA, the TSB indicates that this rule implies that an employee in "proximity" would be able to take effective action to stop an unintentional movement of equipment. However, as in this occurrence, employees are normally engaged in other work activities and may not always be able to take effective action to stop the equipment, should it move unintentionally. Furthermore, if equipment does roll unintentionally, the crew members would have to climb onto the moving equipment to take action, placing them in a hazardous situation.

4.1.2 Transport Canada

TC conducted an investigation into this occurrence under the *Canada Labour Code,* Part II. The primary purpose of its investigation was to understand the circumstances surrounding the occurrence to prevent a similar occurrence, to determine whether there were violations of the *Canada Labour Code*, Part II, and determine what compliance activities, if any, should be taken. When the investigation was completed on 15 July 2019, TC issued a letter of non-compliance to CN for non-compliance with *Canadian Rail Operating Rules* (CROR) Rule 112 (c) (Securing Unattended Equipment – Yard Tracks) and with CROR Rule 108 (Precautions While Switching).

In July 2020, TC responded to TSB's RSA indicating that it considered the cars to be unattended and noted the letter of non-compliance that had been issued to CN. In addition, TC stated its intention to further engage with industry to ensure there is accurate understanding of unattended equipment and to determine whether additional guidance is required.

---

[42] Had the 2 cars been considered "unattended," handbrakes would have been applied to both cars. If handbrakes had been used, a handbrake effectiveness test would have been performed to ensure that the cars were properly secured.

4.1.3 Canadian National Railway Company

On 08 December 2018, CN issued bulletins 1256 and 1266, in effect for the Napadogan and Pelletier subdivisions, regarding cars left unattended in Edmundston Yard:

> Effective immediately, it is prohibited to leave, at all time [*sic*], less than 10 cars on the lead track at the west end of Edmundston Yard.

On 05 April 2019, CN responded to TSB RSA 02/19, indicating that CROR Rule 112 was sufficiently clear and explaining that special instructions were already in place with regard to sections (i) and (iv) of Rule 112. The company also clarified that it had already issued a special instruction that at least one handbrake must be applied and a brake effectiveness test carried out for equipment considered unattended on main track, subdivision track, siding, or any high-risk location.

4.1.4 Canadian Pacific Railway

On 28 May 2019, CP replied to TSB RSA 02/19, indicating that the definition of "unattended" of CROR Rule 112 was clear. It explained that, as part of the company's process, CP had investigated the 4 uncontrolled movements of cars in CP yards in 2018 to determine their underlying cause. CP determined that these occurrences had been caused by unsecured equipment and that the rolling stock had not been considered "attended" according to CP rules.

CP explained that, to conform to the requirements of CROR Rule 112, it trains its employees to understand the difference between "unattended" and "attended" when they perform switching activities. CP instructions indicate that, when crews are uncertain whether they are in close enough proximity to take effective action, equipment involved in yard switching operations must be considered "unattended" and must be secured. CP indicated that it had met individually with the employees involved in these 4 occurrences to re-educate them on CP's rules and procedures.

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 16 December 2020. It was officially released on 26 January 2021.

APPENDICES

Appendix A – Sequence of events

All events in Table A1 occurred on 04 December 2018.

Table A1. Sequence of events

Start date	Event
0730:00	The shift begins with a safety briefing, reading of documents, and validation of the list of switching tasks to be carried out.
0740:00	The locomotive engineer (LE) takes control of the locomotive consist set out on track EA11 from lead locomotive CN 9418, coupled to trailing locomotive CN 4792.
0746:19	The locomotive consist backs up eastward on the lead track and stops just after switch EA05 East. The conductor trainee reverses switch EA05 East.
0749:01	The locomotive consist moves westward on track EA05 and couples to cars IANR 624584 and BCOL 730875. The LE checks the coupling, after which the trainee connects air to car IANR 624584.
0751:55	The assignment reverses eastward with cars IANR 624584 and BCOL 730875, then stops on the lead track, just after switch EA05 East. The trainee restores switch EA05 East to the normal position, and the assignment proceeds westward on the lead track before stopping just after switch EA05 East.
0754:06	The trainee uncouples car BCOL 730875, which is then left on the lead track with the emergency brakes applied; the assignment backs up eastward with car IANR 624584 and stops just after switch EA05 East.
0754:45	The trainee reverses switch EA05 East, and the assignment proceeds westward on track EA05 with car IANR 624584.
0755:11	The LE applies the air brakes on car IANR 624584 for 53 seconds.
0756:05	The assignment stops on track EA05 and the trainee applies the handbrake on car IANR 624584; the LE performs a handbrake effectiveness test on car IANR 624584.
0757:52	After uncoupling from car IANR 624584, the assignment backs up eastward on track EA05 and stops just after switch EA05 East.
0759:02	The trainee restores switch EA05 East to the normal position and the locomotive consist moves westward on the lead track to couple to car BCOL 730875.
0759:35	The LE checks the coupling, after which the trainee connects air to car BCOL 730875 and the assignment advances westward on the lead track.
0801:42	The LE applies the air brakes on car BCOL 730875 for 43 seconds.
0802:04	The assignment stops in front of switch EA08 East; the trainee reverses switch EA08 East.
0802:53	The assignment advances westward on track EA08.
0802:56	The LE applies the air brakes on car BCOL 730875 for 39 seconds.
0803:36	The assignment stops on track EA08 and the trainee uncouples car BCOL 730875; the brake pipe is released, and the emergency brakes of the car are applied.
0804:09	The locomotive consist reverses eastward on track EA08 and stops just after switch EA08 East. The trainee restores switch EA08 East to the normal position.
0805:05	The locomotive consist advances westward on track EA11. After a brief stop on the way to allow the trainee to step off the train near car HS 3205 (which was on track EA10), the locomotive consist stops just after switch EA10 West. The conductor reverses switch EA10 West.

Start date	Event
0807:58	The locomotive consist reverses eastward on track EA10 and couples to car HS 3205. The LE checks the coupling, after which the trainee connects air to car HS 3205 and releases its hand-brake.
0810:31	The assignment advances westward on track EA10 and then proceeds on the west lead track.
0811:13	The LE applies the air brakes on car HS 3205 for 5 seconds.
0811:18	The assignment stops just after switch EA08 West. The conductor reverses switch EA08 West and the assignment reverses eastward on track EA08 before coupling to car BCOL 730875.
0815:47	After the LE checks the coupling, the assignment proceeds about 50 feet westward on track EA08 and stops. The trainee installs the sense and braking unit (SBU) on the east end of car BCOL 730875 and connects air to that car.
0820:45	The assignment advances westward on the west lead track.
0825:55	The assignment stops on the west lead track, east of switch EA05 West. The conductor and the trainee step off lead locomotive CN 9418.
0826:04	The assignment advances about 150 feet westward and stops. The trainee turns off the brake valve between trailing locomotive CN 4792 and car HS 3205. The LE, using the SBU, initiates the emergency braking of cars HS 3205 and BCOL 730875.
0826:21	The trainee uncouples cars HS 3205 and BCOL 730875 from the locomotive consist and leaves them east of switch EA05 West.
0826:34	The locomotive consist advances westward about 200 feet before coming to a stop west of switch EA04 West.
0826:53	The trainee reverses switch EA04 West.
0827:08	The conductor steps onto the front platform (facing east) of trailing locomotive CN 4792, and then the trainee steps onto the first step of the northeast footboard.
0827:13	The trainee instructs the LE by radio to back up the length of 20 cars.
0827:18	The locomotive consist backs up eastward on track EA04.
0827:27	The conductor notices that cars HS 3205 and BCOL 73087, which had been left earlier, are rolling uncontrolled westward. He radios the LE to immediately stop the locomotive consist.
0827:27	The LE applies the emergency brakes on the locomotive consist.
0827:30	Car HS 3205 collides with locomotive CN 4792.
0827:30	The trainee is trapped between trailing locomotive CN 4792 and car HS 3205 and is fatally injured.

Appendix B – Brake force testing conducted on cars BCOL 730875 and HS 3205

Table B1 gives the brake force values (in pounds) measured during brake force tests conducted on cars BCOL 730875 and HS 3205 using the specialized SMART SHOE device, model R-143-WH, factory calibrated in accordance with Association of American Railroads standard S-4024, *Brake Shoe Force Measurement Devices – Performance Specification*.

Table B1. Brake force values measured during brake force tests conducted on car BCOL 73085

Shoe	End	Full-service air brake* (pounds)	Emergency brake** (pounds)	Hand brake*** (pounds)
1	A	2653	3150	3123
2	A	2976	3584	3513
3	A	3133	3859	3720
4	A	2853	3435	3390
5	B	2242	3480	4472
6	B	3076	2804	3978
7	B	2490	2448	3529
8	B	2914	3637	3993
Total	**–**	**22 337**	**26 397**	**29 718**

* Maximum of 64 psi in the brake cylinder.
** Maximum of 77 psi in the brake cylinder.
*** Applied with 100 foot-pounds of torque at the brake wheel.

Table B2. Brake force values measured during brake force tests conducted on car HS 3205

Shoe	End	Full-service air brake* (pounds)	Emergency brake** (pounds)	Hand brake*** (pounds)
1	A	2796	3448	3446
2	A	2386	3087	2745
3	A	829	863	496
4	A	992	793	641
5	B	2730	3168	2827
6	B	620	500	460
7	B	1704	2241	1887
8	B	2676	2459	2238
Total	**–**	**14 733**	**16 559**	**14 740**

* Maximum of 64 psi in the brake cylinder.
** Maximum of 77 psi in the brake cylinder.
*** Applied with 100 foot-pounds of torque at the brake wheel.

Appendix C – Minimum number of hand brakes required for securing equipment or movements left unattended per Rule 112(g) of the *Canadian Rail Operating Rules*

Total Trailing Tons:	Average Grade is Equal To or Less Than												
	0.2%	0.4%	0.6%	0.8%	1.0%	1.2%	1.4%	1.6%	1.8%	2.0%	2.2%	2.4%	> 2.4%
0 - 2000	2	2	2	4	6	6	8	10	10	12	12	14	100% Hand Brakes
> 2000 - 4000	2	2	4	6	8	12	14	16	18	20	22	26	
> 4000 - 6000	2	6	6	10	14	16	20	24	28	30	34	38	
> 6000 - 8000	4	6	8	12	18	22	26	32	36	42	46	52	
> 8000 - 10000	4	6	10	16	22	28	34	40	46	52	58	66	
> 10000 - 12000	4	8	12	20	26	34	40	48	56	64	72	80	
> 12000 - 14000	6	8	14	22	30	40	48	58	66	76	84	96	
> 14000 - 16000	6	10	16	26	36	46	56	66	76	88	98	110	
> 16000 - 18000	6	10	18	28	40	50	62	74	86	100	112	126	
> 18000 - 20000	8	12	20	32	44	58	70	84	98	112	128	146	
> 20000 - 22000	8	12	22	36	50	64	78	94	110	100% Hand Brakes			
> 22000 - 24000	8	12	24	38	54	70	86	104	122				
> 24000 - 26000	10	14	26	42	58	76	94	112	134				
> 26000 - 28000	10	14	28	46	64	82	104	124	148				
> 28000 - 30000	12	16	30	50	68	90	110	136	162				
> 30000	12	16	34	52	74	96	120	148					

Source: Transport Canada, TC O 0-167, *Canadian Rail Operating Rules* (CROR) (18 May 2018), Rule 112: Securing Unattended Equipment.

Appendix D – TSB investigations involving uncontrolled movements

Occurrence number	Date	Description	Location	Cause
R18M0037 (this occurrence)	2018-12-04	Employee fatality, Canadian National Railway Company, assignment L57211-04, Mile 1.03, Pelletier Subdivision	Edmundston, New Brunswick	Insufficient securement
R18Q0046	2018-05-01	Non-main-track uncontrolled movement and derailment of rolling stock, Quebec North Shore and Labrador Railway, Cut of cars	Sept-Îles, Quebec	Switching without air
R18H0039	2018-04-14	Uncontrolled movement of rolling stock, Canadian Pacific Railway, remote control locomotive system, yard assignment T16-13, Mile 195.5, Belleville Subdivision	Toronto, Ontario	Loss of control
R18E0007	2018-01-10	Uncontrolled movement of rolling stock, Canadian National Railway Company, freight train L76951-10, Mile 0.5, Luscar Industrial Spur	Leyland, Alberta	Loss of control
R17W0267	2017-12-22	Employee fatality, Canadian National Railway Company, extra yard assignment Y1XS-01	Melville, Saskatchewan	Switching without air
R17V0096	2017-04-20	Non-main-track uncontrolled movement, collision, and derailment, Englewood Railway, Western Forest Products Inc., Cut of cars	Woss, British Columbia	Switching without air
R16W0242	2016-11-29	Uncontrolled movement, collision, and derailment, Canadian Pacific Railway, Ballast train BAL-27 and freight train 293-28, Mile 138.70, Weyburn Subdivision	Estevan, Saskatchewan	Loss of control
R16T0111	2016-06-17	Uncontrolled movement of railway equipment, Canadian National Railway Company, Remote control locomotive system, 2100 west industrial yard assignment, Mile 23.9, York Subdivision, MacMillan Yard	Vaughan, Ontario	Loss of control
R16W0074	2016-03-27	Uncontrolled movement of railway equipment, Canadian Pacific Railway, 2300 remote control locomotive system training yard assignment, Mile 109.7, Sutherland Subdivision	Saskatoon, Saskatchewan	Switching without air
R16W0059	2016-03-01	Uncontrolled movement of railway equipment, Cando Rail Services, Co-op Refinery Complex, Mile 91.10, Canadian National Railway Company, Quappelle Subdivision	Regina, Saskatchewan	Insufficient securement
R15D0103	2015-10-29	Runaway and derailment of cars on non-main track, Canadian Pacific Railway, Stored cut of cars, Mile 2.24, Outremont spur	Montréal, Quebec	Insufficient securement
R15T0173	2015-07-29	Non-main-track runaway, collision, and derailment, Canadian National Railway Company, Cut of cars and train A42241-29, Mile 0.0, Halton Subdivision, MacMillan Yard	Concord, Ontario	Switching without air

Occurrence number	Date	Description	Location	Cause
R13D0054	2013-07-06	Runaway and main-track derailment, Montreal, Maine & Atlantic Railway, Freight train MMA-002, Mile 0.23, Sherbrooke Subdivision	Lac-Mégantic, Quebec	Insufficient securement
R12E0004	2012-01-18	Main-track collision, Canadian National Railway Company, Runaway rolling stock and train A45951-16, Mile 44.5, Grande Cache Subdivision	Hanlon, Alberta	Insufficient securement
R11Q0056	2011-12-11	Runaway train, Quebec North Shore and Labrador Railway, Freight train LIM-55, Mile 67.20, Wacouna Subdivision	Dorée, Quebec	Loss of control
R09D0053	2009-09-09	Non-main-track collision, VIA Rail Canada Inc. locomotive 6425, VIA Rail Canada Inc. Montréal Maintenance Centre, Montréal, Quebec	Montréal, Quebec	Switching without air
R09T0057	2009-02-11	Runaway and non-main-track train derailment, Southern Ontario Railway, 0900 Hagersville Switcher, Mile 0.10 and Mile 1.9 Hydro Spur	Nanticoke, Ontario	Insufficient securement
R08V0270	2008-12-29	Non-main-track train runaway and collision, Kettle Falls International Railway, Waneta Turn Assignment, Mile 141.20, Kettle Falls Subdivision	Waneta, British Columbia	Loss of control
R07H0015	2007-07-04	Runaway rolling stock, Canadian Pacific Railway, Runaway cut of cars, Mile 119.5, Winchester Subdivision	Smiths Falls, Ontario	Insufficient securement
R07V0109	2007-04-23	Non-main-track train derailment, Kootenay Valley Railway (KVR), 0700 Trail Yard Assignment, Mile 19.0, Rossland Subdivision	Trail, British Columbia	Loss of control
R06V0183	2006-09-03	Runaway and derailment, White Pass and Yukon Route, Work Train 114, Mile 36.5, Canadian Subdivision	Log Cabin, British Columbia	Loss of control
R06V0136	2006-06-29	Runaway/derailment, Canadian National Railway Company, Freight train L-567-51-29, Mile 184.8, Lillooet Subdivision	Near Lillooet, British Columbia	Loss of control
R05H0011	2005-05-02	Runaway and main-track train collision, Ottawa Central Railway, Freight Train No. 441, Mile 34.69, Alexandria Subdivision	Maxville, Ontario	Insufficient securement
R04V0100	2004-07-08	Uncontrolled movement of railway rolling stock, Canadian National, Train M-359-51-07, Mile 57.7, Fraser Subdivision	Bend, British Columbia	Loss of control
R03T0026	2003-01-21	Yard collision, Canadian Pacific Railway, Car No. HOKX 111044, Mile 197.0, Belleville Subdivision	Agincourt, Ontario	Switching without air
R03T0047	2003-01-22	Yard collision, Canadian National Railway Company, Tank Car PROX 77811, Mile 25.0, York Subdivision	Toronto, Ontario	Switching without air

Occurrence number	Date	Description	Location	Cause
R99D0159	1999-08-27	Runaway cars, Canadian National Railway Company, Mile 69.4, CN Kingston Subdivision, Wesco Spur	Cornwall, Ontario	Insufficient securement
R98M0029	1998-09-24	Main track runaway, collision, and derailment, Matapédia Railway Company, Canadian National Train No. A402-21-24, Mile 105.4, Mont-Joli Subdivision	Mont-Joli, Quebec	Insufficient securement
R98M0020	1998-07-31	Main track runaway and collision, VIA Rail Canada Inc. Passenger Train No. 14, and an Uncontrolled five-pak movement, Mile 105.7, Matapédia Railway Company, Mont-Joli Subdivision	Mont-Joli, Quebec	Insufficient securement
R97C0147	1997-12-02	Runaway/derailment, Canadian Pacific Railway, Train No. 353-946, Laggan Subdivision	Field, British Columbia	Loss of control
R96C0172	1996-08-12	Main Track Collision, Canadian National, Train 117 and an Uncontrolled Movement of 20 Cars, Mile 122.9, CN Edson Subdivision	Near Edson, Alberta	Insufficient securement
R96C0209	1996-10-09	Runaway cars, Canadian Pacific Railway, CP 0700 yard assignment, Mile 166.2, Willingdon Subdivision, Clover Bar exchange track	Edmonton, Alberta	Insufficient securement
R96T0137	1996-04-24	Runaway of five tank cars, Canadian National, Mile 0.0, Hagersville Subdivision	Nanticoke, Ontario	Insufficient securement
R96C0086	1996-04-13	Runaway train, Canadian Pacific Railway, Freight Train No. 607-042, Mile 133.0, Laggan Subdivision	Field, British Columbia	Loss of control
R95M0072	1995-12-14	Runaway cars, Canadian National Train No. 130-13, Mile 0.0, Pelletier Subdivision	Edmundston, New Brunswick	Insufficient securement
R94V0006	1994-01-18	Runaway train, CN North America, Mile 175, Grande Cache Subdivision	Latornell, Alberta	Loss of control

Appendix E – Uncontrolled movements in yards in 2018 involving cars that employees considered to be attended

TSB occurrence number	Date	Subdivision	Mile	Occurrence summary
R18V0009	2018-01-12	Yale	112.7	The Canadian National Railway Company (CN) east lead assignment with locomotive CN 7279 had cars listed for track PF30. The crew inadvertently shoved past track PF30, toward track PF31, and stopped just short of entering track PF31. At the same time, the conductor decided to remove the handbrake in track PF30 and allowed the cars to roll towards the movement. As the crew began pulling back to clear the PF30 switch, The cars rolled foul of the lead (at the east end), resulting in car CN 412224 colliding with car WC 22176. Car CN 412224 was pulled eastward, derailing the A-end set of trucks. The safety appliances on car WC 22176 sustained damage. There were no injuries, and no dangerous goods were involved.
R18E0010	2018-01-14	Slave Lake	154.1	A CN train crew, preparing to lift cars from track HA10, applied handbrakes on the south end and released the handbrakes on the north end when the cars began to roll northward, striking the derail and derailing car AEX 19628 (1 set of trucks on the A-end). There were no injuries, and no dangerous goods were involved.
R18W0025	2018-01-26	Carberry	0.0	A Beltpack assignment at the Canadian Pacific Railway (CP) Winnipeg Yard, while pulling east out of track NW03, derailed 3 cars. Car COER 880187, carrying a load of lumber, and car TTGX 700045, a loaded automobile flat car, landed on their sides. Car SOO 115068, an empty covered hopper car, remained upright. This was an uncontrolled movement and collision between TTGX 700045 that had been left in track NW01, rolled out of the track, and contacted the Beltpack assignment.
R18V0031	2018-01-31	Yale	112.8	The CN Thornton transfer assignment derailed 2 cars while switching in the yard. Car CN 371843 derailed upright (A-end), and car CNLX 10076 derailed upright (B-end). There were no injuries and no dangerous goods were involved.
R18C0023	2018-03-02	Brooks	175.0	In CP Alyth Yard, the CE31 east-end switcher shoved a cut of 13 cars into the east end of track VT06. The switcher then pulled out to the lead. While the switcher was on the lead, the cut of cars that had been left in track VT06 rolled eastward, making contact with their locomotives.
R18T0061	2018-03-24	Kingston	319.7	A CN train assignment, while servicing customer tracks, had set out car UTLX 902454 into customer track U221, and returned to their train on the adjacent track. While pulling on the adjacent track, car UTLX 902454 rolled uncontrolled and collided with the train, resulting in the derailment of the following cars: • UTLX 902454, loaded with butyl acrylates (UN 2348) came to rest on a 45-degree angle with all wheels derailed. ,

TSB occurrence number	Date	Subdivision	Mile	Occurrence summary
				• PROX 23024, loaded with styrene monomer (UN 2055),, came to rest upright, with all wheels derailed, • UTLX 902486, loaded with butyl acrylates (UN 2348), came to rest upright with all wheels derailed. There were no injuries. The track sustained minor damage. No leaks or exposures were reported.
R18E0058	2018-04-05	Camrose	93.7	A CN train assignment set out 2 cars onto track OR16, returned to the train on track OR17, and pulled to spot for their next cut. Rail car NCIX 173 (loaded covered hopper car) rolled out of track OR16 and struck car NCIX 6826, which was stopped on the lead coming out of track OR17. Car NCIX 173 derailed upright, with one axle on the A-end on the ground. There were no injuries, and no dangerous goods were involved.
R18E0060	2018-04-08	Wainwright	263.9	A CN Walker Yard assignment at the east end of track CF74 shoved single car AEX 20057 onto track CF74 and made a light engine move onto track CF78. Upon exiting track CF78, locomotive CN 7504 sideswiped car AEX 20057, which had rolled uncontrolled eastward out of track CF74, causing car AEX 20057 to derail on its side. There were no injuries, and no dangerous goods were involved.
R18W0106	2018-04-22	Watrous	190.9	The CN Saskatoon Beltpack yard assignment, holding onto 24 cars on the east lead, was sideswiped by a cut of cars that rolled out of the east end of track SC30. Empty open gondola cars AIMX 15336 and AIMX 15284, both of which were in track SC30, derailed upright with damage to their safety appliances. These cars collided with GACX 6244 (empty potash car), causing damage to its safety appliances. There were no injuries, and no dangerous goods were involved.
R18T0095	2018-05-11	Halton	0.0	A CN yard assignment, operating with locomotive CN 7265, set off 6 cars on a grade and cut-away. Car TFOX 1533, from the yard assignment, sideswiped cars BAEX 1249 and CNIS 417187 on a departing freight train. There was no derailment. There were no injuries, and no dangerous goods were involved.
R18Q0056	2018-06-19	Taschereau	0.4	A CN yard assignment, while switching in Senneterre Yard between tracks AS05 and AS06, shoved a cut of 31 cars westward at approximately 5 mph toward track AS06. Empty dangerous car PROX 16012 (residue, last contained sulfuric acid, UN 1830) from the movement collided (cornered) with empty centrebeam car CN 626188, which rolled back out toward the lead from track AS05. There were no injuries and no leaks. Both empty cars sustained minor damage.
R18W0197	2018-08-01	Sprague	149.6	CN Symington Yard assignment was shoving eastward into track WI03 with 26 cars and 2 locomotives when cars in track WI01 rolled uncontrolled westward and side-collided with car DTTX 759279. Car DTTX 759279 (5-pak) derailed upright, its west-end truck on the west-end

TSB occurrence number	Date	Subdivision	Mile	Occurrence summary
				platform. The following cars sustained damage to their safety appliances due to the sideswipe: DTTX 727134 (sodium hydroxide solution — UN 1824), DTTX 466263, GTW 675106, DTTX 657369, DTTX 745724, DTTX 475954, and DTTX 742268. The fuel tank on locomotive CN 7251 was punctured but not leaking. Locomotive CN 252 sustained damage to its hand rail. There were no injuries and no leaks.
R18V0214	2018-08-11	Cascade	111.0	A CP cut of cars rolled out of track BT14 at the east end of Coquitlam Yard and collided with a single box car as it was being kicked toward track BT16. There were no injuries and no dangerous goods were involved. There was no derailment. Some damage was reported.
R18C0094	2018-09-29	Brooks	174.1	Three CP locomotives rolled uncontrolled while on the Fast Track diesel shop in Alyth Yard. A fourth locomotive had been disconnected just before the uncontrolled movement. As a result, locomotive CP 8519 collided with locomotives CP 3127 and CP 2315, which were secured on the Fast Track. Both locomotives (CP 8519 and CP 3127) sustained damage. There were no injuries, and no leaks were reported.
R18W0264	2018-10-15	Quappelle	89.0	A CN Beltpack assignment, operating with 3 locomotives and 89 empty cars, set out a cut of cars on the main track and proceeded into track RA35 (customer facility). During the movement, cars on the main track began to roll uncontrolled and collided with the movement, resulting in car GATX 68294 (residue, last contained asphalt) derailing on its side and car DBUX 250296 (residue, last contained asphalt) derailing upright. There was an impact to main track operations. There were no injuries and no leaks.
R18M0037 (this occurrence)	2018-12-04	Pelletier	219.4	A CN train assignment, while reversing towards track 4 at the west end of Edmundston Yard, collided with a car foul of the track. The conductor stopped the movement with emergency broadcast as the conductor trainee, riding the side of the car, was struck and fatally injured. Emergency Services and Coroner responded.