Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

RAILWAY INVESTIGATION REPORT R16T0111

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
17 June 2016

Canada

Transportation Safety Board of Canada
Place du Centre
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

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Summary

On 17 June 2016, at about 2335 Eastern Daylight Time, the Canadian National Railway Company (CN) remote control locomotive system 2100 west industrial yard assignment was performing switching operations at the south end of CN's MacMillan Yard, which is in the Concord industrial district of Vaughan, Ontario. The assignment was pulling 72 loaded cars and 2 empty cars southward from the yard onto the York 3 main track in order to clear the switch at the south end of the Halton outbound track to gain access to the west industrial lead track (W100) switch. The assignment helper attempted to stop the assignment to prepare to reverse into track W100, in order to continue switching for customers. However, the assignment continued to move. It rolled uncontrolled for about 3 miles and reached speeds of up to 30 mph before stopping on its own at about Mile 21.1 of the York Subdivision. There were no injuries. There was no release of dangerous goods and no derailment.

Le présent rapport est également disponible en français.

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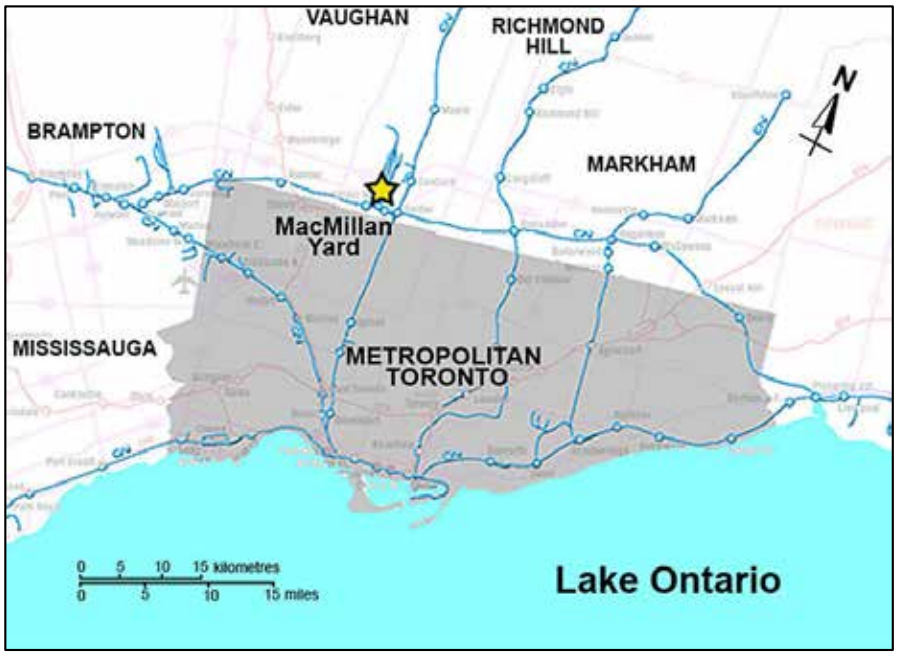
1.0 *Factual information*

On 17 June 2016, the Canadian National Railway Company (CN) remote control locomotive system (RCLS) 2100 west industrial yard assignment was performing switching operations at the south end of MacMillan Yard. The yard is located in the Concord industrial district of Vaughan, Ontario, in the Greater Toronto Area (Figure 1). At the time of the occurrence, the assignment consisted of 2 head-end locomotives (CN 7230 and CN 207) and 74 cars (72 loaded and 2 empty cars). The first car behind the locomotives was dangerous goods tank car UTLX 208275, which was loaded with a flammable liquid (UN3475).[1] Locomotive CN 7230 was set up to operate using RCLS. Including the locomotives, the assignment was 4537 feet long and weighed 9116 tons (Appendix A).

Figure 1. Location of Canadian National Railway Company MacMillan Yard (Source: Railway Association of Canada, *Canadian Railway Atlas*, with TSB annotations)



MacMillan Yard (Figure 2) is CN's main classification yard in Eastern Canada, where rail traffic is distributed by flat switching or "humping"[2] rail cars into various tracks for placement on different trains. MacMillan Yard operations are conducted under *Canadian Rail Operating Rules* (CROR) Rule 105. Train movements are restricted to speeds of up to 15 mph and must be able to stop within half the range of vision of equipment. The yard processes up

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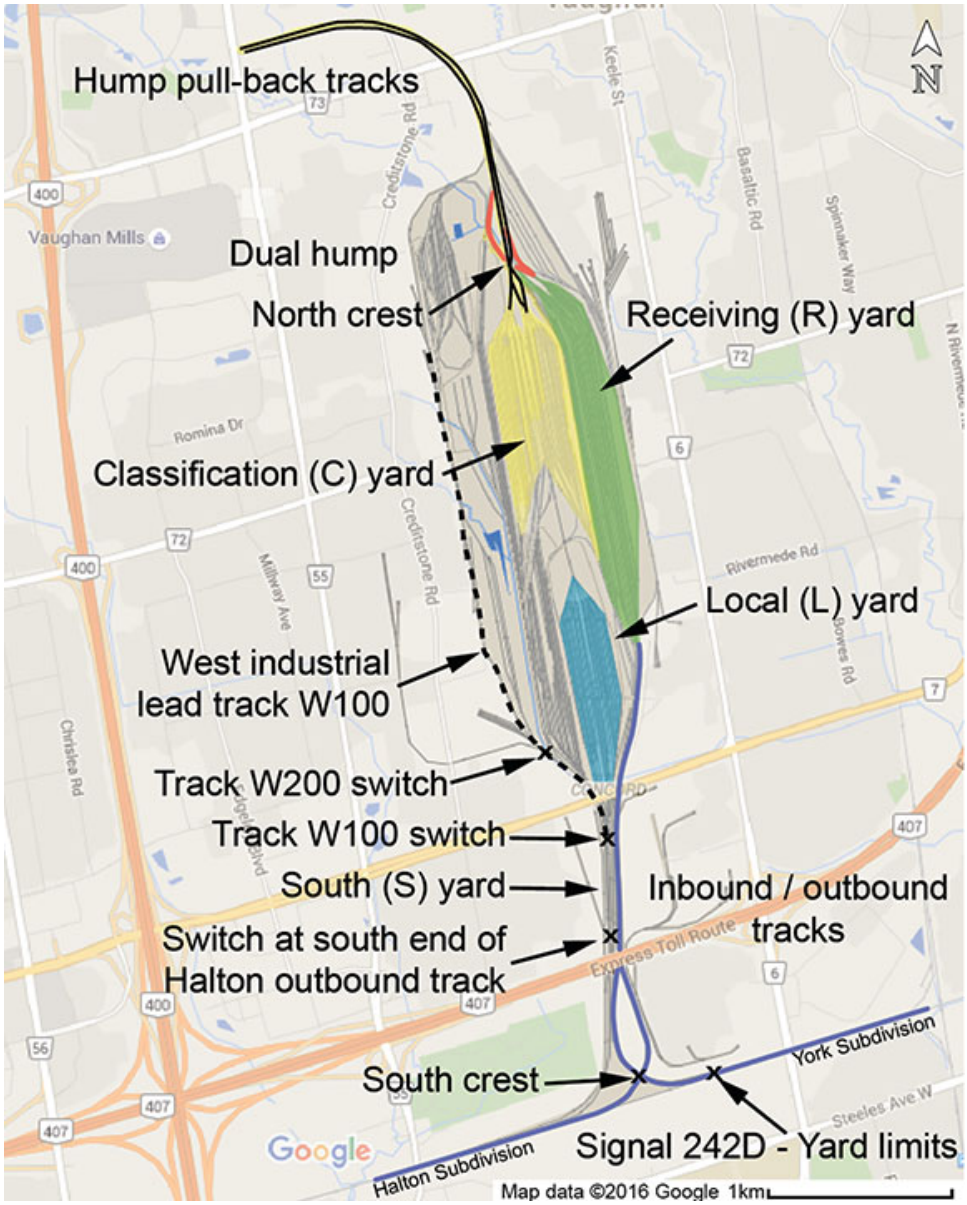
1 The *2016 Emergency Response Guidebook*, published jointly by the U.S. Department of Transportation and Transport Canada, describes UN3475 as an ethanol and gasoline mixture, with more that 10% ethanol.

2 Humping refers to an operation in which a group of rail cars (a "cut") are pulled up a "hump" or hill onto a pullback track, then are slowly pushed, uncoupled, and released as they reach the crest of the hump. The released cars then roll freely down the hump toward a designated track, with both speed and direction automatically controlled.

to 1 million cars annually.[3] On any given day, there are 15 to 20 assignments working in the yard. There are up to 150 operating employees working at various jobs (local, yard, humping operations) at MacMillan Yard. Most MacMillan Yard assignments and some work assignments are operated by 2 qualified conductors, each equipped with an RCLS Beltpack,[4] enabling either crew member to control the locomotive.

Figure 2. Layout of Canadian National Railway Company MacMillan Yard (Source: Google Maps, with TSB annotations)



[3] In 2017, the yard processed approximately 900 000 cars.

[4] Beltpack is the trademark designating the technology that enables locomotives to be controlled remotely. It was developed and marketed by CANAC Railway Services Inc., a former CN subsidiary and is now registered to Cattron Intellectual Property Corporation.

In this occurrence, the assignment crew consisted of a foreman, who was in charge of coordinating the switching activities, and an assignment helper. Both crew members were qualified for their positions and met fitness and rest standards.

They were assisted by a trainmaster. Trainmasters oversee MacMillan Yard operations. Their duties include

- ensuring train crew compliance with the CROR and CN's *General Operating Instructions* (GOI),
- working with locomotive engineers (LEs) and conductors to make sure that trains are on time, and
- conducting job briefings with all crews at the start of their shift. This normally consists of a brief conversation in person or by telephone to discuss work for the day and focuses on safety, for example, by highlighting recent occurrences. Crews usually print their own paperwork, although trainmasters may occasionally provide a switch list with instructions for the crew.

1.1 The incident

At about 2030[5] on 17 June 2016, the assignment crew foreman and assignment helper reported for work at MacMillan Yard. The foreman had expected to work as a yard helper. However, because the regular foreman for the west industrial yard assignment was on vacation, the employee was designated the foreman for that assignment.

The crew did not have much experience working on this particular assignment, so the foreman contacted the trainmaster by telephone and requested a more detailed job briefing. The trainmaster advised the crew to first review the west industrial job aid booklet, which included a customer map of the west industrial lead track (W100) as well as customer spotting requirements.

At about 2050, the trainmaster met with the assignment crew for the job briefing and provided the crew with a marked-up switch list. The trainmaster and assignment crew reviewed the job aid and discussed the preferred method for building the assignment, because the required setup was different from most other MacMillan Yard assignments. They reviewed how to build the setup of cars, looked at the tracks involved, and discussed the work and the various ways that it could be completed.

While discussing the workload, the trainmaster referred to the west industrial job aid, particularly page 82, which detailed how to build the setup to facilitate switching the west industrial lead from the south. The trainmaster read aloud the train build, as itemized, and

5 All times are Eastern Daylight Time.

identified that the cars on both the north end and the south end of the movement would require air. The trainmaster instructed the crew to

- build the train setup for south control,
- put air on the cars listed,
- take their spots to the W100,
- do both the spots and pulls on the W100 and W200 first, and
- do the south yard (S-yard) pull last.

After the initial job briefing, the trainmaster drove the crew members to their locomotives. Before the crew members got out of the trainmaster's vehicle, the trainmaster conducted a second job briefing, reminding the crew to refer to the job aid and reiterating the switching and air brake requirements. During the job briefings, neither the length and tonnage of the assignment nor the risks associated with moving all 74 cars to the west industrial yard in a single move were discussed.

Upon completion of these job briefings, the trainmaster believed that a specific reference to the need to spot some customers' cars with operative freight car air brakes made it clear that air should be run through the entire train air brake line before the assignment proceeded to track W100, so that all equipment would have operative air brakes. However, the crew understood this to mean that air must be applied only to the specific cars mentioned before they were left at some customer facilities.

The crew members then boarded the lead locomotive, armed the Beltpack, and carried out the preliminary inspection and tests. At about 2120, the crew members went to the local yard (L-yard) to build the assignment. They began pulling cars from different tracks to assemble the train in order to facilitate the spotting of cars at various customer facilities. The crew coupled the air hoses on some portions of the assignment but planned to finish coupling the air hoses and to charge the train brakes after moving to the west industrial tracks. Consequently, there were no air brakes on any of the cars.

The assignment crew planned to pull all the cars at once, which required the assignment to access the York Subdivision main track in order to clear the switch at the south end of the Halton outbound track. Once the assignment had cleared the switch, the assignment crew planned to reverse the assignment into track W100 to gain access to customer locations on the west side of the yard. The crew also intended to supply air to the head-end cars (south end) that needed air brakes before delivery to customers once the assignment had reversed into track W100.

At approximately 2335, the assignment had been assembled and began pulling 74 cars southward from the yard onto the York 3 yard track. The assignment helper was positioned on the locomotive platform and was controlling the assignment using a Beltpack while the foreman, also with a Beltpack, was positioned on the ground at the switch at the south end of the Halton outbound track. Because of the weight of the assignment and the ascending 0.35% grade, the assignment initially had difficulty moving and could reach a speed of only about 4 mph while pulling southward.

At 2340:26, the assignment stopped at Signal 242D, located at Mile 24.2 of the York Subdivision, to wait for eastbound intermodal train Q120 to arrive and pass. The crew waited for a permissive signal indication that would allow them to access the York Subdivision main track, because they needed to move eastward on the York Subdivision to be able to clear the switch at the south end of the Halton outbound track.

At 2359:22, train Q120 had passed, and the assignment helper received a permissive indication and began to pull the assignment forward while the foreman communicated over the radio the distance required to clear the switch. After the assignment had reached a speed of about 8 mph, to prepare to stop the assignment at the request of the foreman, the assignment helper applied the locomotive independent brake and reduced the Beltpack speed selector to the "Coast B" position, then the "Coast" position.[6] However, the assignment continued to move, and the helper realized it was unable to stop.

After the assignment had travelled about 2000 feet, the assignment helper placed the Beltpack brake selector in the emergency position. Since there was no supply of air in the train air brake line, emergency brakes were not available on any of the freight cars, and the assignment continued to accelerate. The helper advised the foreman that the assignment was uncontrolled. The foreman made an emergency radio broadcast and called the rail traffic controller (RTC).

The RTC immediately protected the uncontrolled movement by lining the power switches from the York Subdivision to the Bala Subdivision, where there were no conflicting movements. The assignment continued to roll uncontrolled, reaching a speed of almost 30 mph.

At 0014:25, the assignment came to a stop on an ascending grade at Mile 21.1 of the York Subdivision before accessing the Bala Subdivision.

At the time of the incident, the sky was clear, winds were 12 km/h from the northeast, and the temperature was 21 °C.

1.2 Subdivision information

The CN York Subdivision extends from MacMillan Yard (Mile 25.0) to Pickering Junction (Mile 0.0). There are multiple main tracks from Mile 25 to Mile 23.92, double main track from Mile 23.92 to Mile 12.33, and single main track from Mile 12.33 to Mile 0.0. Train movements are controlled by the centralized traffic control system (CTC), as authorized by the CROR, and supervised by an RTC located in Toronto. The junction switch for the Bala Subdivision is at Mile 18.72.

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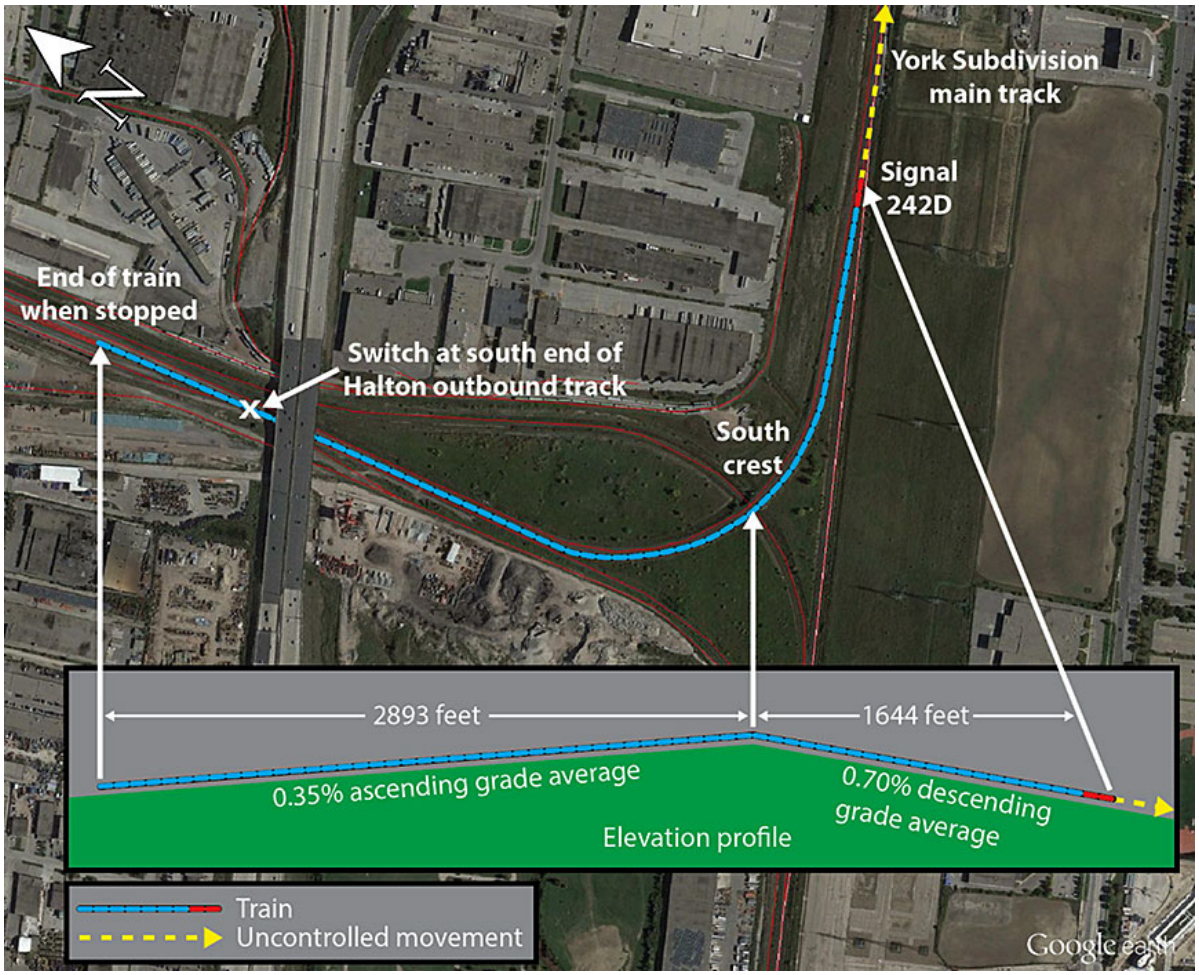
6 The positions available on the Beltpack speed selector are Max, 10, 7, 4, Couple, Coast, Coast B, and Stop. When the speed selector is set to Coast, Coast B, or Stop, the Beltpack applies full independent brakes when the speed drops below 0.5 mph.

1.3 MacMillan Yard track profile

Yards are generally designed with a bowl-shaped profile to protect against freight cars rolling uncontrolled onto the main track during switching and/or humping operations. MacMillan Yard has a descending grade from both the north and south end of the tracks toward the centre of the yard, giving it such a bowl-shaped profile. At the south end of the yard, the south crest of the bowl is located 1644 feet west of Signal 242D (Figure 3), on top of the Halton Subdivision railway overpass. There is a 0.35% ascending grade for trains approaching the south crest from the north. There are no signs identifying the location of the south crest to train or assignment crews. Over the crest, there is an eastward 0.70% descending grade approaching Signal 242D and extending onto the York Subdivision.

Figure 3. Location of the assignment when stopped at Signal 242D and related track profile (Source: Google Earth, with TSB annotations)



1.4 Hump assignments

Humping and switching operations are carried out mainly at the north end of MacMillan Yard, where the classification tracks and receiving yard are located. Other RCLS assignments work in other parts of the yard and service some nearby customers.

At the north end of the yard, there are 3 dual-control hump RCLS assignment crews working each day, consisting of 1 foreman each; the remainder of the RCLS yard assignment crews operate as 2-person crews. The crews working at the north end of the yard generally switch short cuts of cars without the use of air brakes. Because cars are protected by the bowl-shaped topography of the yard, crews allow them to move under their own momentum. These yard crews do not usually access the main track to perform their regular duties.

1.5 West industrial yard assignment

The west industrial yard assignment operates 7 days a week in CN's MacMillan Yard. Reporting at 2100 daily, the assignment crew spots and lifts freight cars from customer facilities along the industrial tracks on the west side of MacMillan Yard. The crew typically receives a switch list, builds the train in the southeast portion of the yard, and then proceeds to the west industrial tracks via track W100. Most customers are serviced in the west industrial yard while the assignment is shoving northward. This area of the yard is not typically used by other assignments.

At the beginning of the shift, the assignment foreman receives a list of cars that need to be delivered to customers. The crew then proceeds to the L-yard to assemble the cars, which are placed in an order that facilitates the switching work to be performed later. Since some customers require air brakes when the cars are left at their facilities, those cars are placed next to the locomotives. At the discretion of the foreman, the train air brake line can be coupled and charged when assembling the train in the L-yard or once the cars have been shoved onto track W100.

The amount of switching performed each day depends on the number of cars to be delivered to customers, so the workload can vary. When the assignment is pulled from the L-yard to access track W100, it must clear the switch at the south end of the Halton outbound track. There is room for approximately 52 cars (3100 feet) between the switch and Signal 242D. If the assignment does not have enough room to clear the switch, the crew can either ask for a permissive signal and enter the York Subdivision to gain more track or move the cars to track W100 in separate cuts.

1.5.1 Regular foreman on the west industrial yard assignment

The regular foreman on the west industrial yard assignment was one of the most senior employees at MacMillan Yard, with 30 years of experience. This foreman had worked on the assignment since 2008 and had developed the west industrial job aid. The foreman's typical days off were Thursday and Friday. On these days, and at other times when the regular foreman was not available, the assignment was staffed from the yard spare board.

The regular foreman usually limited the cut of cars taken to the west industrial tracks to 60 cars and rarely accessed the main track to complete switching. If more than 60 cars were required, they were taken to the west industrial yard in multiple trips. When building a setup of any length, the regular foreman placed cars to be spotted with air at the head end of the assignment and charged those cars with air before proceeding to the west industrial tracks. This provided additional freight car air brakes to assist in controlling the assignment

while the crew spotted other cars that required air. It also allowed cars that did not require air to be "kicked" or switched at the customer facility.

In the past, trainees were assigned to work on the west industrial yard assignment as part of their on-job training so that they could benefit from the regular foreman's knowledge and experience. However, due to the workload of the assignment, the time that trainees could spend using a Beltpack was sometimes limited. Following several conflicts with trainees over following proper procedures, the regular foreman had refused to accept trainees for more than 2 years before this incident. During this time, CN management assigned trainees to the west industrial job on the regular crew's days off, in an effort to provide trainees with some experience on the assignment. However, on such days, there was often less traffic, resulting in shorter trains, and the trainees did not go to all customers in the industrial yard. Consequently, during these 2 years, trainees received very little exposure to the west industrial yard assignment.

1.5.2 West industrial job aid

Most job aids for MacMillan Yard are kept in the CN Greater Toronto Area Job Aids Manual. The regular foreman produced a job aid to assist other crews in performing the duties of the west industrial yard assignment. The document described the preferred order for building the train before proceeding to the west industrial tracks. The job aid described the logistics of setting up movements as well as spotting and lifting cars in customer tracks. This included locations where cars were required to be spotted with air brakes applied. The job aid provided the following guidance for building the setup:

> **Building your setup at south**
>
> Ideally, when building the setup at south it is best to build in the following order although it can be varied to accommodate what customer have to be serviced.
>
> From north to south:
> Norampac
> BWW 142
> BWW 141
> Steel centre
> Lumber bulkheads
> Lumber boxcar
> Metro
> Axiall
> KIK
>
> The KIK, Axiall, Metro and Lumber would have air in them.
>
> This will allow you to kick the Norampac and BWW cars into the clear track in the support yard on the W100 as they will need to be runaround to spot from the other end. Cars can be kicked in at 4mph and will roll in nicely. The steel can then be shoved into W116 or W115. If you need to go up the W200, then the Metro and Lumber cars can be set out of the way. The W200 can be done. Rehumps put into W117 and grab the Metros and Lumber. Afterwards

> Norampac can be pulled and doubled to the BWW's, put in W117 and take the loads and spot.[7]

The job aid did not

- suggest limits on the number of cars that could be moved to track W100 in a single cut;
- suggest limits on tonnage and length of assignments that could be moved to track W100 in a single cut;
- specifically state when air should be applied through all or part of the assignment to assist with train control when accessing the main track and/or proceeding to the west industrial tracks via track W100; or
- provide the location of the south crest of the yard or discuss the effect of the 0.70% descending grade extending southward from the crest to the York Subdivision main track.

1.5.3 South yard job aid

For comparison, the S-yard job aid provides the following guidance for assignments switching in the S-yard:

> **S Yard**
>
> The switch to access S-yard is the tall stand switch located just north of the Hwy 407 overpass on the Halton outbound. There is a steep grade in all directions from the switch at the top of the hill, so caution should be used when in S-yard. The pullback continues all the way back to the signal at Snider West and is protected just before the light by a derail. It is good for 40-50 cars.
>
> It is an extremely steep grade and when pulling cars from S031, air MUST be applied to the cars and a MAXIMUM of 18 cars can be pulled back at one time. Due to the varying length of the cars for S042, when handling loads onto the pullback, the movement should be kept to about 14 cars at a time WITH AIR, exercising caution and keeping the movement as close to the switch as possible. This movement MUST be pulled back at a speed that will allow stopping as close to the switch as possible. If the cut is pulled back too far, the engine will not be able to shove it up the hill due to the grade.[8]

1.6 Rules and instructions on use of air brakes when operating remote control locomotive systems

Most switching operations in MacMillan Yard are performed without the use of train air brakes, and crews put air on cars only when customers specifically require this.

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7 Canadian National Railway Company, CN Greater Toronto Area Job Aids Manual, "West Industrial," p. 82.

8 Ibid., p. 83.

The CROR recognize that rules cannot cover all situations and that train crews must exercise some judgment to provide safe operations. Specifically, CROR Rule 106 (Crew Responsibilities) states the following:

> All crew members are responsible for the safe operation of movements and equipment in their charge and for the observance of the rules. Under conditions not provided for by the rules, they must take every precaution for protection.[9]

The CROR provide for circumstances in which train air brakes are required for transfer movements. Specifically, CROR Rule 64 states the following:

> 64. TRANSFER REQUIREMENTS
>
> (i) The locomotive engineer must verify that there are sufficient operative brakes to control the transfer, confirmed by a running test as soon as possible.
>
> (ii) Except where cautionary limits or block signals provide protection, transfers must have air applied throughout the entire equipment consist. The last three cars, if applicable, must be verified to have operative brakes.
>
> (iii) A transfer carrying dangerous goods must have air applied throughout the equipment when operating within any method of control.
>
> (iv) Remote control locomotives in transfer service may only operate on the main track when a qualified operator is equipped with an operative operator controlled unit (OCU). Each qualified operator, to a maximum of two, must have an operative OCU.[10]

However, the movement in this occurrence was not considered a transfer movement described under CROR Rule 64, according to CROR Rule 65:

> 65. ENGINE IN YARD SERVICE REQUIREMENTS
>
> An engine in yard service that is required to enter main track to double over, take head room or cross over a main track will not be considered a train or transfer except in application of Rules 301-315 and 560-578.[11]

The CROR requirements for air brakes on transfer movements are reiterated in CN's GOI:

> Sufficient braking effort to control the movement confirmed by a running brake test as soon as possible. Transfers operating in OCS territory, or carrying Dangerous goods must have air applied throughout the equipment. The last three cars, if applicable must be verified to have operative brakes on Transfers operating in OCS territory.[12]

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9 Transport Canada, TC O 0-167, *Canadian Rail Operating Rules* (27 July 2015), Rule 106: Crew Responsibilities.

10 Ibid., Rule 64: Transfer Requirements.

11 Ibid., Rule 65: Engine in Yard Service Requirements.

12 Canadian National Railway Company, *General Operating Instructions* (effective 15 December 2015), Section 7.13.

With respect to transfer movements, the GOI further state that

> Prior to departure, the Locomotive Engineer or the Remote Control operator must verify that there is sufficient braking effort to control the transfer as determined by a running brake test.[13]

The GOI define a running brake test as a "test of brakes performed on a moving train to ascertain the brakes are operational."[14]

Section 6 of the GOI, Remote Control Locomotives, does not state when air brakes are required to be cut in and does not specify any restrictions on the number of cars or tonnage that may be handled by an RCLS operator.[15]

No guidance in CN's GOI or the CN Macmillan Yard Operating Manual required the movement in this occurrence to be conducted using train air brakes, even when accessing the main track.

1.7 Assignment crew and trainmaster experience

At the time of the incident, both members of the assignment crew were generally unaware of the location of the south crest of the MacMillan Yard bowl, and the effect that the train length and tonnage could have on train handling while descending a 0.70% grade with only locomotive independent brakes available to control the assignment.

As conductors, the assignment crew had received little training on train handling,[16] and such training was not required.

1.7.1 Assignment foreman

The assignment foreman had started conductor training in February 2014 and had qualified as a conductor in August 2014, after having completed approximately 70 training trips. At the time of the occurrence, the assignment foreman had about 22 months of continuous service as a qualified conductor with CN.

The foreman had worked on the assignment twice as a trainee. Since qualifying as a conductor, the foreman had worked as a helper on the west industrial yard assignment fewer than 5 times and was expecting to work as a helper on the night of the occurrence.

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13 Ibid., Section 7.9(f).

14 Ibid., Section 7.1.

15 Ibid., Section 6.

16 Train handling refers to managing the operating characteristics of a train over a given territory. These include train length, tonnage, weight distribution, and train slack action in response to undulating terrain, grade, and curvature over which the train is operated. Train operators must have sufficient experience to anticipate the train's buff and draft response and must adapt the train's operation using throttle and train air brakes to negotiate changes in terrain as well as to comply with signal indications and RTC instructions.

1.7.2 Assignment helper

The assignment helper had started conductor training in July 2014 and had qualified as a conductor in January 2015, after having completed approximately 70 training trips. At the time of the occurrence, the assignment helper had 17 months of service as a qualified conductor with CN. However, during that time, the helper had been laid off on 2 occasions, for a total of 4 months. The helper had returned from the last layoff in May 2016, about 1 month before the occurrence.

The helper had worked on the assignment twice as a trainee. Since qualifying as a conductor, the helper had worked on the assignment about 11 times as a helper. However, the helper had not worked on the assignment since returning from layoff in May 2016.

1.7.3 Trainmaster

On the night of the occurrence, the trainmaster on duty worked a shift from 1800 to 0600 and was the only trainmaster on duty in the yard. The trainmaster had about 25 years of experience with CN and had worked in car control, customer service, risk management, and accounting before working as a trainmaster. The trainmaster had about 12 years of operational experience and was qualified as an LE, a conductor, and an RCLS operator.

1.8 Operational experience

Knowledge, skill, judgment, and experience are critical factors that directly affect an operating crew's ability to operate safely. Operating crews that work in yards must understand the nuances of switching manoeuvres directly affected by train length, tonnage, and speed, and must be able to control a train using automatic air brakes, locomotive independent brakes, or a combination of both. To accomplish this, hands-on experience with operating equipment and familiarity with the topographic features of the territory are essential.

1.8.1 Crew experience and familiarity with MacMillan Yard

Work on available local assignments was posted for bidding. The positions were awarded to the most senior employees who had submitted bids. Some positions were more desirable than others because of the rate of pay, days off, and hours of work. Typically, the evening and night shifts were the least desirable. Yard positions are often regarded as the least desirable, as the pay rates are the lowest.

When no job bids were received for a specific position, the position was normally awarded to employees with the least seniority. As a result, it was not unusual for 2 junior employees at a terminal to be paired together to work yard assignments, particularly during the evening and night shifts. In this occurrence, although both west industrial yard assignment crew members were qualified, they had limited experience working on that assignment. In contrast, companies in other transportation industries, such as aviation, have policies in

place to minimize the risk that 2 operators with limited experience on a given route or task will work together.[17]

To assess the effect that experience (seniority) had on familiarity with MacMillan Yard, RCLS and conductor training, and the west industrial yard assignment work, TSB investigators conducted interviews with 15 RCLS-qualified conductors, which included the assignment crew. This represented a 10% sampling of all MacMillan Yard operating employees. The following observations were made:

- The challenges of the west industrial yard assignment intimidated many of the less experienced conductors, who sought to avoid it when possible.
- More experienced qualified RCLS conductors who had worked on the west industrial yard assignment preferred to move the cars to track W100 in 2 separate cuts.
- During RCLS training, the trainers often took control of the RCLS equipment to ensure that yard productivity requirements were met.
- During the initial week of RCLS training, locomotives were not always available; therefore, some trainees received limited practical training.
- Newly qualified conductors were regularly required to train new trainees.

Seven of the 15 conductors interviewed had less than 28 months of operational experience at MacMillan Yard (Appendix B). The following observations were made about these conductors:

- When working as trainees in MacMillan Yard, all 7 conductors reported that they had received training from newly qualified conductors ("green vests").[18]
- The first day that 2 of the conductors were deemed fully qualified, they were tasked with supervising another trainee. In both of these cases, the employees refused because they did not feel they had sufficient experience in the yard.
- When working as trainees, 4 of the 7 conductors never received training on the west industrial yard assignment, and the remaining 3 had trained on that assignment only a few times. As a result, all 7 had little operational experience on that assignment.
- Newly qualified conductors intentionally avoided the west industrial yard assignment because they did not feel adequately trained for it.
- At least 4 of the 7 conductors, including the assignment crew involved in this incident, did not understand the effect that an assignment's length and weight had on train handling when using only locomotive independent brakes to control an assignment.

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17 TSB Aviation Investigation Report A13H0001.

18 New operations employees wear green vests, typically for the first 2 years of service, to identify them and to promote coaching and mentoring of less experienced employees. The green vests are replaced by orange vests after the 2 years' service are completed.

1.9 Remote control locomotive system

The RCLS consists of 3 components:

1. a remote control locomotive(s) (RCL);
2. an onboard control computer, mounted inside the RCL to interface with the controls; and
3. an OCU, commonly referred to as a Beltpack. The OCU is a lightweight remote-control device that attaches to the operator's safety vest.

Crew members can pass control of the locomotives back and forth as required ("pitch and catch"), but only 1 crew member can have control at a time. Either operator can activate an emergency brake application at any time, whether or not the operator is in control.

The OCU is equipped with (but not limited to) a speed selector, a forward and reverse selector, and a brake selector that includes an emergency brake feature (Figures 4 and 5).

Figure 4. Operator control unit

Figure 5. Operator control unit attached to an operator's vest

Beltpack operators choose a pre-selected speed of up to 15 mph, after which the operator does not have to manipulate the controls, as the RCLS takes the required actions to reach and maintain that speed. The system applies either the throttle or the brakes of the locomotives to maintain the pre-selected speed at ± 0.5 mph. The system adapts to train and terrain characteristics reactively, without taking the train length, tonnage, or slack into account.

1.10 Canadian National Railway Company use of remote control locomotive systems

Historically, a yard crew consisted of 3 employees, including an LE, a yard foreman to coordinate yard movements, and a yard helper. The yard foreman and the helper provided yard movement instructions by radio to the LE, who controlled the locomotive.

RCLS operations were introduced in Canada in the late 1980s. This technology was approved by Transport Canada (TC), and its use is governed by the CROR. It was initially used only during humping operations at CN. However, in the mid-1990s, its use was expanded to flat

switching in CN yards and, in certain circumstances, on the main track. The introduction of RCLS operations eliminated the role of the LE in yard operations. Control of the locomotive became the responsibility of a yard foreman and/or a yard helper, who were typically qualified conductors.

MacMillan Yard was one of the original locations where RCLS operations were implemented. All switching assignments at MacMillan Yard are RCLS operations. Some yard assignments also travel on the main track using RCLS, to transfer from one yard to another or to travel to a customer siding to perform switching. The speed on RCLS yard assignments is limited to 15 mph, and the CROR restrict RCLS locomotives operating as a transfer on the main track to 15 mph as well. However, there are no tonnage or length restrictions.

1.11 Canadian National Railway Company remote control locomotive system training

Operating employees generally prefer road work (main-track trains) to yard work and tend to transfer to a terminal that offers road work as soon as their seniority permits. With the exception of those who have chosen to remain at MacMillan Yard because they prefer the regular schedule that yard work affords, operating employees working at MacMillan Yard tend to have less service and experience.

New CN operating employees must first qualify as conductors. Since all assignments at MacMillan Yard operate using RCLS, new hires receive their RCLS training in conjunction with the regular conductor training program.

The CN conductor training consisted of the following components:

- 7-week orientation and rules training;
- 1 week of Beltpack training;
- a minimum of 60 trips under the guidance of a qualified conductor; and
- 2 personal training days when the trainee conducts switching in a controlled environment and is evaluated by a trainer.

The Beltpack training portion was made up of a classroom component and a practical component under the supervision of an instructor. Once the classroom and practical components were completed successfully, trainee conductors put their knowledge into practice by working with regular RCLS assignments. The on-job training trips were divided between freight service (main-track) and yard RCLS assignments. CN conductor training continues until the conductor trainee is deemed qualified by a local manager, which usually takes about 5 to 7 months.

1.12 Training and qualification of railway operating employees

1.12.1 Railway Rules Governing Safety Critical Positions

The TC-approved *Railway Rules Governing Safety Critical Positions* were developed pursuant to section 20 of the *Railway Safety Act*.[19] Section 3 of those rules states the following:

> A "Safety Critical Position" is herein defined as:
>
> 1. any railway position directly engaged in operation of trains in main track or yard service; and
> 2. any railway position engaged in rail traffic control.
>
> Any person performing any of the duties normally performed by a person holding a Safety Critical Position, as set out in section 3 above, is deemed to be holding a Safety Critical Position while performing those duties.[20]

1.12.2 Canadian Railway Employee Qualification Standards Regulations

In Canada, federally regulated railways must abide by the *Railway Employee Qualification Standards Regulations*,[21] issued in 1987. These regulations establish the minimum qualifications for LEs, transfer hostlers, conductors, and yard foremen. They apply to all railway employees performing the duties of the specified occupational category, whether or not the employee is unionized. An excerpt from the regulations is provided in Appendix C.

Since the regulations came into force, there have been significant operational changes within the rail industry, including the following: crew size has been reduced, RCLS operations have been widely implemented across the country, and the use of management crews qualified through accelerated training has become common at both CN and Canadian Pacific Railway (CP). Despite these significant changes in railway operations, the regulations have not been modified in over 31 years.

When the regulations came into effect, most railway operating employees were unionized, and the use of management crews was not widespread. At that time, there was a graduated promotion from unionized brakeman / yard helper to conductor / yard foreman and then to LE. As the industry and the technology evolved, the role of brakeman was eventually eliminated, 2 years of experience as a brakeman was no longer required, and all new operating employees were hired as conductors. As a result, new unionized employees were considered to be qualified as yard helper, conductor, and yard foreman as soon as they completed their conductor training course.

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19 Government of Canada, *Railway Safety Act* (1985, c. 32 [4th Supp.]).

20 Transport Canada, TC O 0-17, *Railway Rules Governing Safety Critical Positions* (16 June 2000), section 3, at https://www.tc.gc.ca/eng/railsafety/rules-tco17-358.htm (last accessed 24 April 2018).

21 Transport Canada, SOR/87-150, *Railway Employee Qualification Standards Regulations* (16 March 1987).

Although the regulations require railway companies to file and report to TC information on their employee qualification program and any changes made to the program, the filings can be in the form of a summary and do not necessarily include all course content. While TC may occasionally conduct a cursory review of company submissions, the regulations do not require TC to review course content in detail or approve the content.

Over the years, training delivery has changed, and unionized conductor training has been accelerated to the point that some new conductor candidates can now qualify within 6 months.

Subsection 19(2) of these regulations requires that a railway company establish and modify its employee training programs in consultation with the trade unions representing its employees in the respective occupational categories. Therefore, qualification requirements such as course content, experience required for qualification (time served in the trade or number of trips), and graduated qualification for unionized candidates in all occupational categories are negotiated between the company and the respective trade unions.

1.12.3 Locomotive engineer training

Operating a locomotive is a complex task, and LEs are trained to recognize the characteristics of the train they are operating, such as length, tonnage, and weight distribution within the train. They must also know the characteristics of the territory (i.e., undulating terrain, grade, and curvature) in which they are operating. LEs must anticipate the train's response and adapt its operation to negotiate changes in terrain as well as to comply with signal indications and RTC instructions. To do this, they use the throttle and brakes. In addition, to reduce the forces in-train and between the train and the track, changes to the train speed must be planned and gradual. Under the regulations, LEs are also required to receive recurrent training in locomotive operation and train handling.

1.12.4 Conductor training

The regulations do not require conductors to receive training on locomotive operation or train handling, which would include considerations for tonnage distribution within a train or assignment, the topography of a given area, and the effect it can have on handling and maintaining control of a train.

1.12.5 Training of other railway employees

Training for unionized operating job categories such as RCLS operators and RTCs is not covered by the regulations, but most railways have training plans and manuals in place for those positions. The regulations also contain no minimum experience or course content requirements to carry out the duties of a management LE, conductor, or foreman.

CN encourages operations managers to be qualified in the running trades as conductors or LEs and provides incentives for management crews to maintain their qualifications. All other CN non-union employees are expected to become qualified conductors or LEs unless they are medically unfit to do so. CP has similar practices.

Both railways now periodically use management crews to operate trains at various terminals when necessary. Management crews can be sent to any terminal on the railway network during shortfalls in staffing in a service area.

CN's training for unionized and management railway operating employees met current regulatory requirements.

1.12.6 Railway Safety Act *Review panel final report (2007)*

In December 2006, the Minister of Transport, Infrastructure and Communities initiated the *Railway Safety Act* Review. The review was aimed at identifying gaps in the *Railway Safety Act* and making recommendations to strengthen the regulatory regime to meet the changing nature of the railway industry and its operations. In November 2007, the *Railway Safety Act* Review panel issued its final report, entitled *Stronger Ties: A Shared Commitment to Railway Safety – Review of the Railway Safety Act*.

Section 9.5 of the report dealt specifically with training for operating crews and stated, in part,

> In the United States, the FRA [Federal Railroad Administration] certifies all locomotive crews. As well, the Department of Transportation in the U.S. certifies all aviation and marine crew members. In Canada, Transport Canada also certifies all aviation and marine crew members, but there are no provisions for Transport Canada certification of railway operating employees.
>
> Transport Canada, Rail Safety Directorate has programs in place to address the qualifications of locomotive crews and rail traffic control positions. Nonetheless, there is a perception that because sole responsibility for certification of the candidates rests with the industry, there may not be sufficient objectivity. While consideration was given to recommending alternative approaches to the certification of the running trades, we understand that the current regulation will be superseded by new training rules and that these rules will address this issue.[22]

Consequently, the *Railway Safety Act* Review panel did not issue a recommendation relating to operating crew training.

In recognition that the regulations were out of date and to help address some of the operational changes that had occurred since the regulations were issued, the railway industry, including the Railway Association of Canada, drafted the *Rules Respecting Minimum Qualification Standards for Railway Employees*. In 2009, the rules were submitted to TC for approval. Although TC initially approved the rules, the regulations were never repealed. Consequently, the regulations remain in force to this day.

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22 Transport Canada, *Stronger Ties: A Shared Commitment to Railway Safety – Review of the Railway Safety Act*, section 9: Operational Issues, subsection 9.5: Training for Operating Crews, pp. 163–164, at https://www.tc.gc.ca/en/reviews/railway-safety-act-review/documents/TRANSPORT_Stronger_Ties_Report_FINAL_e.pdf (last accessed 06 April 2018).

1.12.7 Regulatory requirements for operating crews in the United States

Railways in the U.S. are required to ensure that only employees who meet the minimum federal safety standards serve as LEs and conductors. These federal safety standards are specified in the U.S. Department of Transportation *Code of Federal Regulations* (CFR), Title 49, Part 240: Qualification and Certification of Locomotive Engineers (October 2012) and Part 242: Qualification and Certification of Conductors (October 2012). The FRA is responsible for the oversight and enforcement of these regulations.

The standards prescribe the minimum federal safety standards for the eligibility, training, testing, certification, and monitoring of operating employees but do not restrict a railway from adopting and enforcing more stringent requirements. Appendix D provides a summary of the U.S. regulations for operating crews.

1.12.8 Railway Safety Management System Regulations, 2015

On 01 April 2015, the *Railway Safety Management System Regulations, 2015* (SMS Regulations) came into force and replaced the 2001 SMS Regulations. Many of the changes incorporated into the revised SMS Regulations responded to the recommendations from the *Railway Safety Act* Review in 2007 and from a study on rail safety by the Standing Committee on Transport, Infrastructure and Communities in 2008.

Under these regulations, federally regulated railway companies must develop and implement an SMS, create an index of all required processes, keep records, notify the Minister of proposed changes to their operations, and file SMS documentation with the Minister when requested.

Paragraph 5(k) and subsection 28(1) of the SMS Regulations state, in part, that a railway must have a process with respect to scheduling. The scheduling process outlined in the regulations requires that the company apply the principles of fatigue science when scheduling the work of the operating employees. There is no requirement to consider the experience of operating employees who may be paired together for work.

With regard to crew training, sections 25 to 27 of the SMS Regulations require a railway to have a process for managing knowledge. A railway company must establish a list setting out

- the duties that are essential to safe railway operations;
- the positions in the railway company that have responsibility for the performance of each of those duties; and
- the skills and qualifications required to perform each of those duties safely.

A railway company must also include in its SMS a plan for ensuring that an employee or supervisor who performs any of the duties in the list has the skills, knowledge, and qualifications required to perform his or her duties safely, as well as a method for verifying this.

In accordance with these sections of the regulations, CN had a process document outlining its plan for managing knowledge. The document contained the lists required by

subsection 25(1) and the plan and methods required by section 27. In addition to the conductor, LE, and Beltpack operator positions, the CN list included other operational positions. The SMS Regulations do not require individual plans and methods for each position and do not prescribe the training requirements to qualify for each position.

With regard to employees performing train operations, CN identified the duties essential to safe railway operations and the positions performing the duties:

- Operating a train: Conductor
- Operating a locomotive: LE, Beltpack operator, conductor locomotive operator, and hostler
- Controlling train movement: RTC

For each position, the skills and qualifications required to perform essential duties were listed in a document that also outlined the training requirements for the positions. A review of the document revealed that

- conductors have to requalify every 3 years, but there is no practical component required to requalify;
- conductors and RCLS operators do not receive train simulator, train handling, or locomotive operation training;
- there is no requirement for RCLS operators to requalify in Beltpack operation; and
- RTCs must requalify every 3 years, but there is no practical component required to requalify.

Since the SMS Regulations came into effect in 2015, there have been 2 TC audits of CN's plans and methods associated with sections 25 to 27. The first audit was a regional, targeted audit, which focused on qualifications of signal employees who install and test signal devices. The second audit was a corporate audit, which included the skills and qualifications of operating crews.

In comparison, CP had a detailed list of essential duties for LEs and conductors, and a process for ensuring and verifying the required skills and qualifications for the performance of their duties essential to safe railway operations. However, CP did not have such a list or process for RCLS operators and related Beltpack operations. While CP conducted RCLS efficiency testing in an effort to ensure that employees have the requisite skills, qualifications, and knowledge for safe operations, CP did not consider RCLS to be an essential service, and there was no reference to RCLS contained in CP's SMS plan for managing knowledge.

1.13 United States regulatory guidance for use of remote control locomotive systems

In 2002, to better understand the safety implications of remote control locomotive operations, the Federal Railroad Administration (FRA) initiated a research program consisting of several studies.

As a result, in September 2005, the FRA issued the following guidelines to the railroad industry for RCLS main-track terminal operations:

- Maximum locomotive horsepower of 3,000 working HP with a maximum of 8 axles;
- Maximum train length of 1,000 feet (about 20 cars);
- Maximum train speed of 15 mph;
- Prohibited from operating on grades of 0.5 percent or greater that extended more than ¼ mile.[23]

The FRA RCLS guidelines remain in effect today.

After these guidelines were issued, Union Pacific Railroad Company contracted Rail Sciences Incorporated (RSI) to further evaluate RCLS operations. RSI conducted computer simulations and recommended updates to the original FRA guidelines based on the results of its analysis. RSI provided its simulation results to the FRA in a report dated December 2006. The FRA examined the report and analysis and concluded that the analysis was complete and adequately simulated the types of operations that would be encountered in actual RCLS main-track terminal operations. The FRA supported the RSI's conclusions and recommended updated guidelines, which state the following:

- Locomotive consist should not exceed 6,000 total working horsepower, utilizing no more than 12 actual axles;
- Train length (excluding locomotives) should not exceed 3,000 feet;
- Train tonnage (excluding locomotives) should not exceed 4,000 tons;
- Train should not exceed a total of 50 conventional cars and/or platforms;
- No more than 20 multilevel (autorack) cars, regardless of whether they are loaded or empty, may be in the train. Any continuous block of more than 5 multilevel (autorack) cars must be placed at the rear of the train;
- Train speed should not exceed 15 mph;
- Movements should be restricted from operating on any grade greater than 1.0 percent that extends for more than ½ mile.[24]

No such guidelines have been proposed for Canadian railways.

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23 Letter from the Federal Railroad Administration to the Association of American Railroads and the American Short Line and Regional Railroad Association, dated 09 September 2005, as quoted in a letter from the Federal Railroad Administration to the Association of American Railroads, dated 23 February 2007, p. 1.

24 Ibid., p. 2.

1.13.1 *Federal Railroad Administration* Final Report: Safety of Remote Control Locomotive Operations *(2006)*

In March 2006, the FRA published its *Final Report: Safety of Remote Control Locomotive (RCL) Operations.* The report identified human factors issues inherent to RCLS operations that warranted close attention as RCLS technology continued to evolve, including operator training, preparation, and experience:

> Training problems were noted in the following areas:
>
> - *Lack of training for a specific move to be made or specific area of a yard.*
> - *Inadequate on-the-job training.* This includes a lack of consistency and structure in the training, and a lack of preparation for those that provide training.
> - *Insufficient amount of hands-on training.* Some RCLS operators have reported that they did not receive enough hands-on training with the beltpack before becoming qualified as an RCLS operator.[25]

The report also highlighted the potential safety implications of pairing inexperienced crew members together, given the high level of turnover expected across the rail industry.[26]

In the past, many of the employees who were initially trained in the use of RCLS technology had significant railroad experience to draw on. Experienced employees were familiar with railroad safety, operating rules, and the intricacies of working within busy classification yards.[27]

In its report, the FRA issued the following recommended practices in regard to training:

- Railroads should employ instructors who have as much experience and knowledge of RCLS operations as possible.
- Railroads should provide formal "train-the-trainer" courses, so that training is as effective as possible.
- The amount of on-job training should be increased to cover the entire range of locations, operations, and configurations of cuts of cars that RCLS operators will encounter on the job.
- RCLS operators should also have a minimum amount of operating experience as a switchman or engineer before becoming an RCLS operator.
- Training should incorporate train-handling methods, familiarity with and knowledge of basic locomotive systems, and safe operating practices that inform RCLS operators of what they can and cannot do.[28]

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25 Federal Railroad Administration, *Final Report: Safety of Remote Control Locomotive (RCL) Operations* (2006), p. 26.

26 Ibid., pp. 20, 26, and 88.

27 Ibid., p. 20.

28 Ibid., pp. 83–84.

In May 2006, the FRA published the *Final Report: A Comparative Risk Assessment of Remote Control Locomotive Operations Versus Conventional Yard Switching Operations*. The objective of this study was to obtain a better understanding of remote control locomotive operations and their relative safety compared with conventional yard-switching operations. The study focused on yard-switching operations and did not address remote-control locomotive operations on main tracks, spur/industrial tracks, or sidings. The report noted that the FRA had only begun to collect accident data for remote control operations and that the data-collection process would require several years before sufficient data were available to analyze.

1.14 Potential gaps in regulatory oversight in Canada

The TSB reviewed historical and current railway work and training practices for unionized and management operating crews based on previous TSB reports, the *Railway Safety Act* Review panel final report (2007), and relevant regulations in Canada and the U.S. As detailed in the sections that follow, the TSB review identified significant gaps in the *Railway Employee Qualification Standards Regulations.*

1.14.1 Qualification standards

TC certifies all aviation and marine crew members, but there are no provisions for the certification of railway operating employees. The rail industry has the sole responsibility for qualification of the candidates. Since there is no independent regulatory oversight for the qualification of operating crews in Canada, there may not be sufficient objectivity concerning operating crew qualification training.

The U.S. regulations require that a practical training component be completed in order for an operating employee in any occupational category to qualify or requalify in a given position. Whereas Canadian regulations require that candidates for LE and transfer hostler positions demonstrate that they have the requisite theoretical and practical skills required to qualify initially, there is no practical training required for requalification of LEs, transfer hostlers, or conductors. The Canadian regulations contain qualification standards for on-job training instructors for LEs and transfer hostlers but no requirement for on-job training instructors for conductors or foremen. This means that an inexperienced, newly qualified conductor or foreman could be requested to act as an on-job training instructor for subsequent conductor candidates.

Furthermore, since the regulations apply only to company employees, it is difficult to ensure that contract instructors who are not company employees are qualified to deliver training or act as examiners for any occupational category.

1.14.2 Graduated qualification

In the past, there was a more graduated approach to operating crew qualification, which presented more opportunities for mentoring as new operating employees gained experience. With the loss of the brakeman position, conductors operating RCLS, and the accelerated

training process, the opportunities for mentoring that previously existed within crews are now limited.

The regulations contain graduated qualification systems for unionized LEs, their on-job training instructors, and transfer hostler candidates, but not for any of the remaining occupational categories, which includes yard foreman. Consequently, some operating employees may not acquire sufficient on-job experience to work independently and safely in all situations.

1.14.3 Remote control locomotive system operations

The *Railway Employee Qualification Standards Regulations* came into force in 1987, before the widespread implementation of RCLS technology in the rail industry. The regulations do not contain an operational category for RCLS operators, nor do they require employees in any operational category to receive training specific to RCLS operations. Similarly, there is no requirement for RCLS operators to requalify in RCLS operation.

1.14.4 Conductors

In Canada, conductors normally operate RCLS yard assignments, using a Beltpack, within rail yards. These assignments can enter the main track to take up head room to assist with switching operations. Conductors can also operate transfers on the main track for distances of up to 20 miles at speeds of up to 15 mph, with no tonnage or train length restrictions. Conductors receive little training in locomotive operation or train handling, and the current regulations do not require such training.

Furthermore, the regulations do not require a junior employee to work with an experienced employee to enhance opportunities for mentoring. Currently, conductors with less than 2 years' experience are often paired together when working on RCLS assignment crews.

1.14.5 Management crews

Since company managers and supervisors are not unionized, they do not have to meet the same requirements for duration of training, number of trips, and experience as unionized staff.

A new manager may take accelerated training and subsequently become responsible for signing off on training and qualifying new employees, although the manager may have little experience.

Management crews can be sent anywhere in the country to make up for shortfalls in staffing in a service area. As a result, management crews may operate trains over any subdivision without having adequate familiarization training.[29]

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[29] TSB Railway Investigation Report R15V0046.

1.14.6 Rail traffic controllers

Although RTCs are involved in most aspects of train operations and are responsible for the safe movement of trains over a given territory in accordance with existing rules, bulletins, and company instructions, there is no occupational category and no corresponding training or requalification requirements for them.

1.14.7 Regulatory oversight

The regulations contain no requirements for course training material, test content, or test delivery for any of the operational categories.

U.S. regulations require course training material or tests to be reviewed, critiqued, or certified by the regulator. Canadian regulations have no such requirements. Although railways provide TC with information related to the railway training program, TC does not assess the adequacy of the railway training program and provides no further oversight with regard to the training of railway operating employees.

Operating employees can be laid off for extended periods, up to several years. Most railways, including CN, have policies in place outlining steps for familiarization or refresher training in preparation for reintegration in the workforce. However, there are no regulatory requirements for mandatory familiarization or refresher training when operating employees return to work for any of the operational categories.

1.15 TSB investigations outlining deficiencies in operating crew training regulations

Since 2002, the TSB has investigated 5 occurrences (including the fatality of a crew member) directly related to deficiencies in operating crew training and the related gaps in the regulations (Appendix E).[30]

1.15.1 TSB Railway Investigation Report R02W0060

TSB Railway Investigation Report R02W0060 determined the following:

- The LE was first trained in 1976 and had never received any subsequent practical instruction on the use of locomotive high-capacity extended-range dynamic brake or the risks associated with its use in train-handling operations.
- Training for LEs had not kept pace with improvements in dynamic-brake technology and train-handling methodologies.
- The current LE training, as overseen by TC under the existing regulations, may not be adequate.

[30] TSB railway investigation reports R16W0074, R15V0046, R13W0260, R04W0035, and R02W0060.

- The regulations contained no requirement for a practical component to be completed for an LE to requalify and missed an opportunity to familiarize LEs with new equipment and train-handling techniques.

TC responded to the report and indicated that, in fall 2003, it would begin a review of the *Railway Employee Qualification Standards Regulations*. Based on the results of the review, TC would make recommendations to the industry concerning LE training and dynamic testing.

1.15.2 TSB Railway Investigation Report R04W0035

TSB Railway Investigation Report R04W0035 determined that regulatory oversight of training and requalification of RCLS operators had not kept pace with improvements in technology and operations.

TC acknowledged that the regulations were outdated and should be revised. TC was considering creating a working group to revise the regulations.

1.15.3 TSB Railway Investigation Report R13W0260

TSB Railway Investigation Report R13W0260 determined the following:

- The conductor trainee, who was unfamiliar with the territory and working without direct supervision, misapplied a number of safety-critical operational procedures.
- Although railways file with TC a description of all employee training programs and subsequent changes related to each occupational category, the adequacy of the training programs was not assessed by the regulator.
- TC provided no further oversight with regard to the training of railway operating employees.

The investigation identified that, in 2009, TC approved the *Rules Respecting Minimum Qualification Standards for Railway Employees*, which were to come into force once the regulations were repealed. Under the new rules, conductor trainees would also receive on-job training under the direction of a training instructor for the duration of the training period. However, to date, the rules are not in place, and the regulations have not been repealed.

1.15.4 TSB Railway Investigation Report R15V0046

TSB Railway Investigation Report R15V0046 determined the following:

- Unlike operating employees whose primary job is to operate trains, management employees who operate trains on a part-time basis are not likely to gain the same level of experience, proficiency, and familiarity with the territory.
- The current regulatory framework does not adequately address the requirements for training, certification, and territory familiarization for railway management employees who operate trains.

1.15.5 TSB Railway Investigation Report R16W0074

TSB Railway Investigation Report R16W0074 determined the following:

- If safeguards are not in place to ensure that crews are not only qualified, but also possess sufficient operational experience, there is an increased risk for operational errors and accidents to occur.
- If the current Canadian *Railway Employee Qualification Standards Regulations* are not updated, gaps will remain, and TC will not be able to conduct effective regulatory oversight and enforcement of training programs for management and unionized operating crews, RCLS operators, RTCs, and contract trainers, increasing the risk of unsafe train operations.

1.16 Other TSB investigations involving training or experience while switching using remote control locomotive systems

The TSB has investigated 5 other occurrences involving RCLS switching operations (Appendix G). A review of these investigations revealed that, in 4 of the 5 cases, the inexperience of the operating crew played some role in the occurrence.

- TSB Railway Investigation Report R16W0074 determined that operating crew inexperience played a role in the occurrence.
- TSB Railway Investigation Report R07T0270 determined that crew inexperience and inadequate training contributed to the occurrence.
- TSB Railway Investigation Report R07V0213 determined that management crew inexperience, inadequate management crew training, and the implementation of an operational change related to RCLS switching operations contributed to the accident. Although a risk assessment was conducted for the change involved, it was inadequate to identify all the hazards and mitigate the risks of switching long, heavy cuts of cars on a descending grade.
- TSB Railway Investigation Report R07W0042 determined that crew inexperience, inadequate training, and some form of distraction that occurred while conducting RCLS switching operations contributed to the accident.

1.17 Best practices in developing competence

The Rail Safety and Standards Board in the United Kingdom published a guidance document entitled *Good Practice Guide on Competence Development*. The guide, developed in consultation with the railway industry, was intended to provide best practices for developing comprehensive systems to manage competence rather than simply ensuring compliance with regulations.[31]

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[31] U.K. Rail Safety and Standards Board, *Good Practice Guide on Competence Development*, document No. RS/100, Issue 1 (March 2013).

"Competence" refers to the overall ability to function effectively in a position and results from the combination of functional, technical, and non-technical skills. According to the guide, non-technical skills include situational awareness, decision making, and workload management, which have been shown to play a key role in incidents and accidents.[32]

The Office of Rail Regulation in the United Kingdom published a guide entitled *Developing and Maintaining Staff Competence*. The guide recognizes that training programs should be sufficient to prepare individuals to handle expected operations and that experience, obtained under supervision, allows individuals to carry out progressively more complex tasks:

> Training and development seeks to create a level of competence for the individual or team, sufficient to allow individuals or teams to undertake the operation at a basic level. Initially this will be under direct supervision, which will become less direct. Over time, as knowledge and practical experience grows, operations can be carried out at a more complex level.[33]

The guide recognized that competence development is an important contributor to managing risks, specifying that the first step in developing a competence management system is to identify activities that affect operational safety and that are critical for controlling risk.[34] This will allow a combination of risk control measures to be identified and actions taken to develop competence where this is required to manage risks.[35]

1.18 TSB Lac-Mégantic investigation and Recommendation R14-04

On 06 July 2013, shortly before 0100, eastbound Montreal, Maine & Atlantic Railway freight train MMA-002, which had been parked unattended for the night on the main track at Nantes, Quebec, Mile 7.40 of the Sherbrooke Subdivision, started to roll. The train travelled about 7.2 miles, reaching a speed of 65 mph. At about 0115, while approaching the centre of the town of Lac-Mégantic, Quebec, 63 tank cars carrying petroleum crude oil (UN 1267) and 2 box cars derailed. As a result of the derailment, 47 people were fatally injured. About 6 million litres of petroleum crude oil spilled. There were fires and explosions, which destroyed 40 buildings, 53 vehicles, and the railway tracks at the west end of Mégantic Yard. There was environmental contamination of the downtown area and the adjacent river and lake.

Since 1996, the TSB has pointed out the need for robust defences to prevent runaways, yet runaways have continued to occur in Canada. While equipment runaways are generally considered rare, they can also be high-risk events and have extreme consequences,

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32 Ibid., p. 8.

33 U.K. Office of Rail Regulation, *Developing and Maintaining Staff Competence*, second edition, Railway Safety Publication 1 (2007), p. 2.

34 U.K. Rail Safety and Standards Board, *Good Practice Guide on Competence Development*, document No. RS/100, Issue 1 (March 2013), p. 15.

35 Ibid., pp. 16–17.

particularly if they involve dangerous goods, as demonstrated by the Lac-Mégantic occurrence. For this reason, the Board recommended that

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

1.18.1 Actions by Transport Canada and industry following TSB Recommendation R14-04

On 29 October 2014, TC issued its emergency directive on additional physical defences for trains with operating locomotives that are left on the main track. It stated the following:

> 4a) Ensure that when equipment or movement are [*sic*] left unattended on **main track**, in addition to any securement requirements in Rule 112 of the CROR, at least one additional physical securement measure or mechanism is also used. The additional physical securement measures or mechanisms must prevent equipment from uncontrolled motion and must be one or more of the following:
>
> - Permanent derails used within their design specifications;
> - Mechanical emergency devices;
> - Mechanical lock parking brake once approved by the Association of American Railroads (AAR);
> - Reset Safety Control (RSC) with roll-away protection where air pressure is maintained or auto start is provided;
> - Moving the equipment to a track protected with derails or bowled terrain verified by survey or track profile; or
> - Other appropriate physical securement device accepted by Transport Canada.[36]

TC also required railway companies to formulate rules to address the securement of railway equipment. Following extensive consultations with the industry, the newly revised CROR Rule 112 was approved by the Minister of Transport and came into effect on 15 October 2015.[37] Entitled "Leaving Unattended Equipment," the rule included 7 control measures that could be used as a secondary means of physical securement to reduce the risk of uncontrolled movements.

1.18.2 Board reassessment of Transport Canada's response to TSB Recommendation R14-04 (March 2018)

In March 2018, the Board reassessed TC's response to Recommendation R14-04 and acknowledged that TC has continued to monitor implementation of CROR Rule 112 and to

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[36] Transport Canada, Emergency Directive Pursuant to Section 33 of the *Railway Safety Act* (29 October 2014), Securement of Railway Equipment, p. 2.

[37] Transport Canada, TC O 0-167, *Canadian Rail Operating Rules* (CROR) (26 December 2013), Rule 112: Leaving Unattended Equipment.

monitor companies for compliance. However, in 2017, there were 62 occurrences involving uncontrolled movements, the second-highest annual total in the past 10 years. When the 10-year average (2008–2017) of 54.1 uncontrolled movements per year is compared with the most recent 5 years (2013–2017), the average number of uncontrolled movements per year has increased by 10% to 59.8. The reassessment indicated that

> Uncontrolled movements continue to pose a risk to the rail transportation system. As the current defences do not seem sufficient to reduce the number of uncontrolled movements and improve safety, the Board considers the response to the recommendation as being **Satisfactory In Part.**

1.19 TSB Railway Investigation Report R16W0074 and safety concern

On 27 March 2016, at about 0235 Central Standard Time, while switching in Sutherland Yard in Saskatoon, Saskatchewan, CP 2300RCLS training yard assignment was shoving a cut of cars into track F6. As the assignment was brought to a stop, empty covered hopper car EFCX 604991 uncoupled from the train, unnoticed by the crew. The car rolled uncontrolled through the yard and onto the main track within cautionary limits of the Sutherland Subdivision. The car travelled about 1 mile and over 2 public automated crossings before coming to a rest on its own. There were no injuries and there was no derailment. No dangerous goods were involved.

The investigation determined that, despite TC and industry initiatives, the desired outcome of significantly reducing the number of uncontrolled movements has not yet been achieved. Consequently, the Board was concerned that the current defences are not sufficient to reduce the number of uncontrolled movements and improve safety.

1.20 TSB occurrence statistics involving unplanned/uncontrolled movements

Before July 2014, the TSB Regulations defined a "reportable railway incident" as an incident resulting directly from the operation of rolling stock, in which "there is runaway rolling stock."[38] In July 2014, the TSB Regulations were revised, and this was changed to require reporting of any incident in which "there is an unplanned and uncontrolled movement of rolling stock."[39] While the criteria for reporting remained the same, the 2014 change was made to clarify what was meant by "runaway rolling stock."

From 2008 to 2017, there were 541 occurrences reported to the TSB related to unplanned and uncontrolled movements among all railways in Canada (Table 1).

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38 Transportation Safety Board of Canada, SOR/92-446, *Transportation Safety Board Regulations*, "reportable railway incident," paragraph (f). These regulations were repealed in 2014.

39 Transportation Safety Board of Canada, SOR/2014-37, *Transportation Safety Board Regulations*, paragraph 5(h) (last amended 01 July 2014).

Table 1. TSB occurrences involving unplanned and uncontrolled movements between 2008 and 2017

Reason for unplanned or uncontrolled movement	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Loss of control	6	0	2	3	0	3	0	1	4	2	**21**
Switching without air	17	14	10	16	12	24	21	22	18	21	**175**
Securement	25	37	25	32	43	42	38	35	29	39	**345**
Total	**48**	**51**	**37**	**51**	**55**	**69**	**59**	**58**	**51**	**62**	**541**

Uncontrolled movements generally fall into 1 of 3 causal categories:

1. Loss of control: When a car, a cut of cars, or a train is left standing while attended, and available air brakes or locomotive systems cannot hold it or an LE or a Beltpack operator cannot control it using the available air brakes.
2. Switching without air: When a movement is switching with the use of the locomotive independent brakes only (i.e., no air brakes are available on the cars being switched). When an uncontrolled movement occurs, this can result in the cars exiting a yard, siding, or customer track and entering the main track.
3. Securement: When a car, a cut of cars, or a train is left unattended and begins to roll away uncontrolled, usually because
   - no hand brake has been applied or insufficient hand brakes have been applied;
   - a car (or cars) is equipped with faulty or ineffective hand brakes; and/or
   - the train air brakes release for various reasons.

Table 2 provides a breakdown of the occurrences by consequences.

Table 2. Consequences of uncontrolled movements

Consequence	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Derailment of 1 to 5 cars	23	29	18	22	26	26	28	28	27	28	255
Derailment of more than 5 cars	5	1	0	0	2	2	0	1	2	1	14
Collision	24	30	24	32	28	40	35	32	23	34	302
Affected the main track*	9	4	4	7	7	10	6	4	5	5	61
Involving dangerous goods	16	12	8	10	7	14	17	14	9	18	125
Injuries or fatalities	1	1	0	0	2	49	0	0	1	1	55

* Originated on the main track, moved onto the main track, or fouled the main track.

Of the 541 occurrences, the primary factor was loss of control, as in this occurrence, in 21 (4%); switching without air in 175 (32%); and insufficient securement in 345 (64%). As well, there were 302 unplanned/uncontrolled movements (56%) that resulted in a collision, and 61 (11%) that affected the main track. Of the 21 unplanned/uncontrolled movements that involved loss of control, as in this occurrence, 14 of them affected the main track.

Since 1994, in addition to this occurrence, the TSB has investigated 29 other occurrences that involved uncontrolled movements (Appendix F). The most significant of these occurrences was the 2013 Lac-Mégantic accident.

2.0 Analysis

No equipment or track defects were considered contributory to this occurrence. The analysis will focus on the actions of the crew that led to the uncontrolled movement, the effect of track gradient and train weight when operating without operative freight car air brakes, job briefings and job aids, employee operational experience on the west industrial yard assignment, regulatory oversight of training and qualifications, and statistics on uncontrolled movements.

2.1 The incident

At the south end of MacMillan Yard, the south crest of the bowl is on top of the Halton Subdivision railway overpass, about 1644 feet west of Signal 242D. There is a 0.35% ascending grade for trains approaching the south crest from the north. Once trains have passed over the crest, there is an eastward 0.70% descending grade approaching Signal 242D and extending east onto the York Subdivision. In this incident, the assignment had just accessed the York Subdivision main track when it began to roll uncontrolled eastward, ultimately rolling for about 3 miles.

The CN remote control locomotive system (RCLS) 2100 west industrial yard assignment crew had planned to pull all 74 cars at once. This required the assignment to gain access to the York Subdivision main track and move southward a distance of approximately 20 car lengths in order to clear the switch at the south end of the Halton outbound track before reversing to access track W100. The crew had not supplied air to the head-end cars, leaving only the locomotive independent brakes to control the assignment as it accessed the main track.

2.1.1 Effect of track gradient and weight of the assignment

The assignment consisted of 2 head-end locomotives, 72 loaded cars, and 2 empty cars. The 2 empty cars were in the head-end third of the train, located 17 and 19 car lengths from the head end, respectively. The assignment was 4537 feet long and weighed 9116 tons. Apart from the 2 empty cars, the assignment's weight was relatively equally distributed throughout the length of the assignment.

The assignment was assembled and began pulling the 74 cars southward from the yard onto the York 3 yard track. The assignment helper was located on the locomotive platform and controlled the assignment using a Beltpack, while the foreman was positioned on the ground at the track W100 switch. The assignment initially had difficulty moving and could reach a speed of only about 4 mph while pulling southward because of the weight of the assignment and the 0.35% ascending grade approaching the south crest.

When the assignment stopped at Signal 242D, the 24th car behind the locomotives was located on the south crest, 1644 feet west of the signal. About 36% of the assignment length and weight was located on the 0.70% descending eastward grade, and about 64% of the length and weight remained on the 0.35% northward descending grade. Consequently, the

assignment could come to a controlled stop at Signal 242D using only the available locomotive independent brakes.

The assignment waited at Signal 242D for a permissive signal indication that would allow it to access the York Subdivision main track to move eastward, so that it could clear the switch at the south end of the Halton outbound track, then shove back to access the track W100 switch. At 2359:22, the helper received the expected permissive signal indication and began to pull the assignment eastward while the foreman communicated the distance required to clear the switch over the radio. After accessing the main track, the assignment reached a speed of about 8 mph. To prepare to stop the assignment at the request of the foreman, the helper applied the locomotive independent brakes, but the assignment continued to accelerate.

The assignment had pulled about 1245 feet eastward to clear the switch at the south end of the Halton outbound track, which placed about 64% of the assignment length (about 2900 feet of a total of 4537 feet) and weight (about 5830 tons of a total of 9116 tons) on the 0.70% descending eastward grade. With about 64% of the assignment length and weight occupying the 0.70% eastward descending grade, the locomotive independent brakes alone were unable to control the assignment.

The helper advised the foreman that the assignment was uncontrolled. The foreman made an emergency radio broadcast and called the rail traffic controller (RTC). The RTC immediately protected the uncontrolled movement by lining the power switches from the York Subdivision to the Bala Subdivision, where there were no conflicting movements. The quick reaction by the foreman and the RTC to protect the uncontrolled assignment minimized the risk of collision and of a more serious outcome.

The helper placed the assignment into emergency, but with no supply of air in the train air brake line, emergency brakes were not available on any of the freight cars. Emergency application of the locomotive independent brakes was insufficient to stop the assignment. The assignment continued to accelerate and roll uncontrolled, reaching a speed of almost 30 mph before stopping on an ascending grade at Mile 21.1 of the York Subdivision, just before it would have accessed the Bala Subdivision.

2.2 MacMillan Yard operating procedures and job aids

The south-yard (S-yard) job aid provided specific guidance outlining the steep grade in all directions and advising caution when in the S-yard. It also indicated the number of cars that should be handled and stated that air must be applied to all cars for specific tracks.

The regular foreman who worked on the west industrial yard assignment usually limited the cut of cars to be taken to the west industrial tracks to no more than 60 cars. If more than 60 cars were required, the cars would be taken to the west industrial yard in multiple trips. However, this guidance was not contained in the west industrial job aid booklet. The job aid stated that the cars destined for KIK, Axiall, Metro, and Lumber "would have air in them,"

but did not indicate whether the air should be applied during the build or just before the cars were left at the customer facilities. Furthermore, the job aid did not

- suggest limits on the number of cars that could be moved to track W100 in a single cut;
- suggest limits on tonnage and length of assignments that could be moved to track W100 in a single cut;
- specifically state that air should be applied through all or part of the assignment to assist with train control when accessing the main track and/or proceeding to the west industrial tracks via track W100; or
- provide the location of the south crest of the yard or discuss the effect of the 0.70% descending grade extending southward from the crest onto the York Subdivision main track.

The west industrial job aid did provide useful information for performing the work. However, the job aid was unclear as to when air should be applied to some or all of the cars and did not identify all the risks associated with taking head room on the York Subdivision when moving cars to the west industrial yard. If yard assignment job aids do not identify all hazards that switching assignments may encounter while working, there is an increased risk that assignment crews may encounter a situation or topography that could result in an uncontrolled movement.

2.3 Job briefing

Since the crew did not have much experience working on this particular assignment, the foreman contacted the trainmaster and requested a more detailed job briefing. The trainmaster recognized that the crew was inexperienced with the assignment and advised the crew to review the west industrial job aid.

The trainmaster then met with the assignment crew for a job briefing and provided the crew with a marked-up switch list. The trainmaster and assignment crew reviewed how to build the assignment setup and discussed the work that was necessary and the various ways to complete the work. The trainmaster closely followed the job aid, particularly page 82, which detailed how to build the setup to facilitate switching the west industrial lead from the south. The trainmaster read aloud the train build, as itemized, and identified which cars in the train build would require air. The trainmaster conducted a second job briefing just before the assignment crew started working, reminding the crew to refer to the job aid and reinforcing the switching and air brake requirements.

However, the job briefing discussions did not specifically mention the number of cars that should be moved at one time, the length and tonnage of the assignment, or the hazards associated with moving all 74 cars to the west industrial yard in a single move.

While the job briefings provided useful guidance to the assignment crew, they did not identify all of the hazards that the crew could encounter, and the job aid contained ambiguous guidance as to when air should be supplied to the cars being moved. Consequently, there was a misunderstanding between the trainmaster and the crew about

the availability and use of freight car air brakes. The trainmaster understood the job aid guidance to mean that all equipment being moved should have operative air brakes, whereas the crew understood the guidance to mean that air must be applied to the cars before they were left at some customer facilities. This misunderstanding was neither identified nor resolved during the job briefings.

2.4 Procedures and use of air brakes

Clear procedures and crew experience contribute greatly to crews working safely. In this occurrence, a lack of clear direction and crew inexperience contributed to the crew's decision to delay connecting air to the cars until the assignment had arrived at the west industrial tracks.

The yard crew were aware that they had a significant number of cars to move and limited windows of opportunity between departing trains when they could move the assignment to the west industrial tracks. Although they had begun to connect air hoses on the cars to be spotted with air, they did not complete the coupling of the air hoses. They had planned to charge the train brakes after the assignment has been moved to the west industrial tracks. They were also unaware that they needed to connect the train air brakes to assist in controlling the assignment when it accessed the York Subdivision main track before shoving back into the yard.

Most switching in MacMillan Yard is conducted with the use of locomotive independent brakes only. Although RCLS transfers are required to be operated with air brakes throughout the train, RCLS yard switching assignments can access the main track with only functional locomotive brakes and no air brakes on any of the cars. There was nothing in the *Canadian Rail Operating Rules* (CROR), Canadian National Railway Company (CN) *General Operating Instructions* (GOI), MacMillan Yard Operating Manual, or the west industrial job aid booklet to assist an inexperienced yard crew to identify when train air brakes were required for a movement within the yard. Furthermore, neither the CROR nor the GOI specified any limitations for the size of a movement that may be handled by RCLS operations. Based on these considerations, the procedures available to the assignment crew did not provide sufficient guidance to decide when a yard movement was too long and too heavy to rely solely on the locomotive independent air brakes to control the movement.

2.5 Lack of experience on the west industrial yard assignment

Both members of the assignment crew had successfully completed the conductor and RCLS training program. The assignment foreman had 22 months of service as a qualified conductor and the assignment helper had 17 months of service as a qualified conductor. Since the regular foreman on the west industrial assignment had refused to work with trainees in the 2 years preceding the incident, the assignment crew had trained on the west industrial assignment only twice, when the regular foreman was not working.

Once qualified as a conductor, the foreman had tried to avoid the west industrial yard assignment and had exercised seniority to work on the main track as much as possible. As a

result, the foreman had worked on that assignment fewer than 5 times in 2 years. On the night of the occurrence, the foreman had voluntarily bid the west industrial yard assignment as a helper and was comfortable working in that position, knowing that a more experienced employee would act as foreman. However, when the foreman arrived for the shift and realized that the regular foreman was away and that he had been promoted into the position for the night, the foreman expressed concerns to the trainmaster and requested a job briefing in order to become familiarized with the work that needed to be done.

Although both employees had close to 2 years of experience working as conductors at MacMillan Yard, they had limited training and work experience on the west industrial yard assignment and on that area of the yard. Neither crew member had previously worked as a foreman on the assignment.

The west industrial yard assignment differed from other switching assignments in the yard, as it regularly involved switching with operative air brakes on some or all of the freight cars in an area of the yard that was not used by other assignments. The assignment crew's experience came primarily from working on other assignments at MacMillan Yard, for which switching was carried out with no operative air brakes on freight cars, as assignments were protected by the yard's bowl-shaped topography. Consequently, the assignment crew did not have sufficient operational experience to safely perform the tasks of the west industrial yard assignment at MacMillan Yard.

2.6 Conductor training

Under the *Railway Employee Qualification Standards Regulations*, locomotive engineers (LEs) are required to receive recurrent training in locomotive operation and train handling. Operating a locomotive is a complex task. LEs are trained to recognize the characteristics of the train they are operating, such as length, tonnage, and weight distribution within the train. They must also know the characteristics of the territory (i.e., undulating terrain, grade, and curvature) in which they are operating. LEs must anticipate the train's response and adapt its operation to negotiate changes in terrain as well as to comply with signal indications and RTC instructions.

In Canada, conductors normally operate RCLS yard assignments within rail yards but can enter the main track to take up head room if required to facilitate switching operations. Conductors can also operate transfers on the main track for distances of up to 20 miles at speeds of up to 15 mph, with no restrictions on tonnage or train length. However, conductors receive little training in locomotive operations and train handling, and the current *Railway Employee Qualification Standards Regulations* do not require such training. While the assignment crew members were aware of the assignment's length and weight, they lacked the knowledge to fully understand the effect of these factors on train handling while descending a 0.70% grade with only locomotive independent brakes available to control the assignment.

2.7 Operational experience

Once an employee completes a conductor training program, the employee continues to gain competence through on-job experiential learning, which is the process of learning through experience and observation of more experienced employees performing the work properly. To ensure that employees benefit fully from learning while working, they must also have the time and opportunity to reflect on and analyze their work. Experiential learning is an important component of an overall training program, enhancing an employee's judgment, skills, and ability to work safely.

As outlined in the United Kingdom's Rail Safety and Standards Board *Good Practice Guide on Competence Development*, initial qualification provides assurance of competence in routine tasks; however, the ability to cope with more complex situations that require judgment is developed through experience, preferably obtained under supervision.

The CROR acknowledge that all possible operating scenarios cannot be addressed by the rules and provide scope for crews to take additional precautions in such situations, stating, "Under conditions not provided for by the rules, they must take every precaution for protection." In other words, the CROR acknowledge the important role that crew judgment plays in enhancing safety.

In this occurrence, a crew with more experience and knowledge of the effects of grade, train weight, and train handling may have realized the challenges of controlling a movement of this size without train air brakes and taken additional precautions. However, a crew that meets the qualifications but lacks experience may be unprepared to exercise this level of judgment.

A Federal Railroad Administration report on RCLS operations raised the concern that new hires trained as RCLS operators need time to develop knowledge and skill in railway operations. The report also identified the risks of pairing inexperienced crew members together given the high level of turnover expected across the rail industry. The report further highlighted a lack of training for a specific movement or area of the yard as a contributor to previous accidents involving RCLS operations.

Several TSB railway investigations have identified inexperience of operating crews (both management and unionized) as a factor that contributed to several incidents and accidents. In this occurrence, both operating crew members lacked operational experience working on the west industrial yard assignment, but they were paired together to work as the assignment crew. Among other factors, this inexperience played a role. If safeguards are not in place to ensure that crews possess sufficient operational experience to work a given assignment, there is an increased risk of operational errors and accidents.

2.8 Pairing of inexperienced operators

Despite little experience working on the west industrial assignment, the foreman was designated that role because he was the most senior member of the assignment crew. There

is no regulatory requirement or guidance outlining the time or experience that a conductor requires before assuming the role of yard foreman.

During the investigation, multiple examples were gathered of recently qualified employees being assigned to act as foreman or trainer, in some cases on their first day as a qualified conductor, without the operational experience to work safely in all cases. Since yard positions are typically assigned to operating employees with the least seniority, it is not uncommon for a yard crew to consist of 2 conductors with limited operational and RCLS experience.

2.9 *Regulatory oversight of* Railway Employee Qualification Standards Regulations

The *Railway Employee Qualification Standards Regulations* came into force over 31 years ago, in 1987. Since that time, there have been significant operational and technological changes within the rail industry. Since 2003, Transport Canada (TC) has recognized the need to update the regulations. However, a 2009 attempt to update these regulations and to add rules was not completed. As a result, the regulations have not kept pace with the railway operating environment as it has evolved.

Although sections 25 to 27 of the *Railway Safety Management System Regulations, 2015* (SMS Regulations) cover some aspects of crew training, the approach varies among railways. The SMS Regulations do not require individual plans and methods for each position or prescribe the training requirements to qualify for each position. Consequently, each company SMS plan may contain different information. For example, Canadian Pacific Railway (CP) does not include RCLS operators in its plan, whereas CN does. Significant gaps remain in

- qualification standards,
- graduated qualification,
- RCLS operations,
- conductor training,
- management crew training and experience, and
- regulatory oversight.

If the current *Railway Employee Qualification Standards Regulations* are not updated, gaps will remain, and TC will not be able to conduct effective regulatory oversight and enforcement of training programs for safety-critical positions such as management and unionized operating crews, RCLS operators, RTCs, and contract trainers, increasing the risk of unsafe train operations.

2.10 *Unplanned/uncontrolled movements*

Not all uncontrolled movements have major consequences like those at Lac-Mégantic. Since uncontrolled movements can occur for a variety of reasons, different mitigation strategies are required. There are administrative defences (e.g., CROR and company operating

instructions) and physical defences (i.e., derails and wheel chocks) to protect against the risk of an uncontrolled movement. However, these defences are not always consistently applied.

As a result of the TSB Lac-Mégantic investigation, the Board recommended that TC require Canadian railways to put in place additional physical defences to prevent runaway equipment (TSB Recommendation R14-04). In response, TC implemented a number of initiatives, including strengthening CROR Rule 112 and introducing a comprehensive oversight plan for the new rule. Although the Board was encouraged by the TC initiatives, it noted that the desired outcome of significantly reducing the number of uncontrolled movements has not yet been achieved.

In a subsequent TSB investigation report, which also involved an uncontrolled movement (R16W0074), the Board issued a safety concern stating that the current defences are not sufficient to reduce the number of uncontrolled movements and improve safety.

In this occurrence, an unplanned/uncontrolled movement rolled on the main track for about 3 miles, reaching speeds of up to 30 mph before stopping on its own. Since 2008, there have been 541 occurrences among all railways in Canada reported to the TSB related to unplanned/uncontrolled movements.

Of the 541 occurrences,

- 302 (56%) resulted in a collision;
- 61 (11%) affected the main track;
- loss of control was the primary factor in 21 (4%), as was the case in this occurrence;
- 14 of these 21 movements involving loss of control affected the main track.

The number of occurrences involving uncontrolled movements decreased to 51 in 2016 but increased to 62 in 2017. The 5-year average (2013–2017) was 59.8, about 10% higher than the 10-year average (2008–2017) of 54.1. The number of such occurrences involving uncontrolled movements (i.e., runaway rolling stock) increased by about 10% in the past 5 years, as compared to the 10-year average.

3.0 Findings

3.1 Findings as to causes and contributing factors

1. The crew had not supplied air to the head-end cars, leaving only the locomotive independent brakes to control the 9116-ton, 4537-foot-long assignment as it accessed the main track.

2. To prepare to stop the assignment at the request of the foreman, the assignment helper applied the locomotive independent brakes, but the assignment continued to accelerate.

3. With about 64% of the assignment length (about 2900 feet of a total of 4537 feet) and weight (about 5830 tons of a total of 9116 tons) occupying the 0.70% eastward descending grade, the locomotive independent brakes alone were unable to control the assignment.

4. The helper placed the assignment into emergency, but, with no supply of air in the train air brake line, emergency brakes were not available on any of the freight cars. Emergency application of the locomotive independent brakes was insufficient to stop the assignment.

5. The assignment continued to accelerate and roll uncontrolled, reaching a speed of almost 30 mph before stopping on an ascending grade at Mile 21.1 of the York Subdivision, just before it would have accessed the Bala Subdivision.

6. The west industrial job aid was unclear as to when air should be applied to some or all of the cars and did not identify all the hazards associated with taking head room on the York Subdivision when moving cars to the west industrial yard.

7. The trainmaster understood the job aid guidance to mean that all equipment being moved should have operative air brakes, whereas the crew understood the guidance to mean that air must be applied to the cars before they were left at some customer facilities. This misunderstanding was neither identified nor resolved during the job briefings.

8. The procedures available to the assignment crew did not provide sufficient guidance to decide when a yard movement was too long and too heavy to rely solely on the locomotive independent air brakes to control the movement.

9. The assignment crew did not have sufficient operational experience to safely perform the tasks of the west industrial yard assignment at MacMillan Yard.

10. Conductors receive little training in locomotive operation and train handling, and the current *Railway Employee Qualification Standards Regulations* do not require such training.

11. While the assignment crew members were aware of the assignment's length and weight, they lacked the knowledge to fully understand the effect of these factors on train handling while descending a 0.70% grade with only locomotive independent brakes available to control the assignment.

3.2 Findings as to risk

1. If yard assignment job aids do not identify all hazards that switching assignments may encounter while working, there is an increased risk that assignment crews may encounter a situation or topography that could result in an uncontrolled movement.

2. If safeguards are not in place to ensure that crews possess sufficient operational experience to work a given assignment, there is an increased risk of operational errors and accidents.

3. If the current *Railway Employee Qualification Standards Regulations* are not updated, gaps will remain, and Transport Canada will not be able to conduct effective regulatory oversight and enforcement of training programs for safety-critical positions such as management and unionized operating crews, remote control locomotive system operators, rail traffic controllers, and contract trainers, increasing the risk of unsafe train operations.

3.3 Other findings

1. The quick reaction by the foreman and the rail traffic controller to protect the uncontrolled assignment minimized the risk of collision and of a more serious outcome.

2. Since yard positions are typically assigned to operating employees with the least seniority, it is not uncommon for a yard crew to consist of 2 conductors with limited operational and remote control locomotive system experience.

3. The number of occurrences involving uncontrolled movements (i.e., runaway rolling stock) increased by about 10% in the past 5 years, as compared to the 10-year average.

4.0 Safety action

4.1 Safety action taken

4.1.1 Transport Canada

On 24 June 2016, as a result of this occurrence, Transport Canada (TC) issued a notice to Canadian National Railway Company (CN) citing the fact that CN did not ensure that yard movements at MacMillan Yard have sufficient operative brakes when movements are entering the main track to take head room. TC advised that this situation could result in an uncontrolled movement occupying the main track.

After reviewing and evaluating the corrective measures taken by CN, TC determined that the hazard and condition posing a threat to safe railway operations were addressed. On 25 August 2016, TC issued a letter of sufficient action to CN.

In addition, TC interviewed yard crews at MacMillan Yard to verify their knowledge and understanding of the operating instructions contained in the corrective action plan. TC also interviewed operating supervisors to verify oversight activities, including management safety blitzes and efficiency testing.

Furthermore, TC reviewed CN's risk assessment with CN's senior risk management officer.

TC plans to conduct additional inspections in MacMillan Yard in 2017–2018.

4.1.2 Canadian National Railway Company

Shortly after the incident, CN completed a risk assessment of MacMillan Yard switching operations. A re-enactment was carried out to determine the sufficient number of air brakes needed to stop an assignment, taking into account the grade and tonnage. As a result, new practices were implemented. Among these is a requirement that, when movements are to enter the main track at the south lead, they must have a minimum of 10 operational air brakes.

On 18 June 2016, the day after the occurrence, CN issued Notice No. 1606-18, which stated the following:

> **The following addition will added [*sic*] to item 3.3 of the Macyd Manual effective Immediately.**
>
> **3.3 Operating requirements**
>
> **Headroom moves**
>
> Halton inbound/outbound,York 1, 2 and 3
>
> - Yard movements must have a minimum of 10 cars on air prior to entering mainline

- Yard movements of less than 10 cars will have each car on air prior to entering the mainline[40]

On 20 June 2016, CN issued Operating Bulletin No. 548, which stated the following:

> Refer to Macmillan Yard Operating Manual dated Nov 15 2014, page 13:
>
> 3.3 Operating Requirements
>
> Add the following:
>
> **Headroom moves:**
>
> Halton Inbound/Outbound, York 1, 2 and 3.
>
> - Yard movements must have a minimum of 10 cars on air prior to accepting a signal onto the main track.
> - Yard movements of less than 10 cars must have each car on air prior to accepting a signal onto the main track.[41]

On 06 July 2016, CN issued Operating Bulletin No. 558, which stated the following:

> Operating Bulletin No. 548 dated June 20th is superseded by this Operating Bulletin. […]
>
> Refer to MacMillan Yard Operating Manual, Page 13, add to item 3.3:
>
> **Operating requirements**
>
> Headroom moves for Yard movements:
>
> Halton Inbound/Outbound, York 1, 2 and 3
>
> - Yard movements must have a minimum of 15 cars on air prior to passing the signal onto the main track.
> - Yard movements of less than 15 cars will have each car on air prior to entering the main track.
> - Yard movements making headroom moves must have 6000 tons or less in order to make a headroom move past the signal into CTC.
> - Yard movements making a headroom move past the signal into CTC must not exceed a speed of 4 mph passing the signal and during southward headroom move on the main track until the movement changes direction to shove back into the yard.
> - Yard movements making a headroom move must not exceed 15 car lengths past the signal into CTC.
>
> Note: These restrictions for York 3 start at the signal located at mile 24.2.[42]

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40 Canadian National Railway Company, Notice No. 1606-18 (18 June 2016).

41 Canadian National Railway Company, Operating Bulletin No. 548 (20 June 2016).

42 Canadian National Railway Company, Operating Bulletin No. 558 (06 July 2016).

Following the incident, CN conducted a risk assessment that included a review of topography and air brake use for all CN switching yards in Canada. Based on the review, CN implemented minimum braking requirements for each of the yards. The requirements established the minimum number of freight cars that should have operative air brakes when yard assignments operate on descending grades when departing a yard to take head room to complete switching activities.

4.2 Safety action required

4.2.1 Railway Employee Qualification Standards Regulations

The *Railway Employee Qualification Standards Regulations* came into force over 31 years ago, in 1987. Since that time, there have been significant operational changes in the rail industry, including the following:

- The size of crews has been reduced.
- Remote control locomotive system (RCLS) operations have been widely implemented.
- An accelerated training program has been used to qualify unionized crews.
- The periodic use of management crews has become more widely implemented.

Under the current regulations, locomotive engineers (LEs) are required to receive recurrent training in locomotive operation and train handling. Operating a locomotive is a complex task. LEs are trained to recognize the characteristics of the train they are operating, such as length, tonnage, and weight distribution within the train. They must also be familiar with the characteristics of the territory (i.e., undulating terrain, grade, and curvature) in which they are operating. LEs must anticipate the train's response and must adapt its operation to negotiate changes in terrain as well as to comply with signal indications and rail traffic controller (RTC) instructions.

In Canada, conductors normally operate remote control locomotive systems (RCLS) yard assignments, using a Beltpack, within rail yards. These assignments can enter the main track to take up head room to assist with switching operations. Conductors can also operate transfers on the main track for distances of up to 20 miles at speeds of up to 15 mph, with no tonnage or train length restrictions. Conductors receive little training in locomotive operation or train handling, and the current regulations do not require such training.

In this occurrence, the RCLS assignment crew members were aware of the assignment's length and weight. However, they did not fully understand the effect of these factors on train handling while descending a 0.70% grade with only locomotive independent brakes available to control the assignment. Consequently, the assignment rolled uncontrolled on the main track for about 3 miles and reached speeds of up to 30 mph before stopping on its own at about Mile 21.1 of the York Subdivision.

Since 2002, TSB has conducted 6 investigations (including this occurrence) that were directly related to deficiencies in operating crew training and/or related gaps in the regulations.[43]

Although sections 25 to 27 of the *Railway Safety Management System Regulations, 2015* cover some aspects of crew training, they do not require individual plans and methods for each position and do not prescribe the training requirements to qualify for each position. Consequently, the approach varies among railways. For example, Canadian Pacific Railway (CP) does not include RCLS operators in its plan, whereas CN does. Significant gaps remain in the following areas:

1. Qualification standards
    - There is no independent regulatory oversight for the qualification of railway employees in safety-critical positions in Canada.
    - There is no practical training required for requalification of LEs, transfer hostlers, or conductors.
    - The Canadian regulations contain qualification standards for on-job training instructors for LEs and transfer hostlers, but no requirement for on-job training instructors for conductors or foremen.
    - There is no occupational category and no corresponding training or requalification requirements for RTCs.
    - There is no operational category for RCLS operators, nor do the regulations require employees in any operational category to receive training specific to RCLS or to requalify in RCLS operations.
    - There are no qualification standards for contract instructors (trainers) who are not company employees.
2. Graduated qualification
    - The regulations contain no graduated qualification system for occupational categories, except for unionized LEs, company LE on-job training instructors, and transfer hostler candidates.
3. Conductor training
    - Conductors can operate RCLS assignments as transfers on the main track for distances of up to 20 miles at speeds of up to 15 mph, with no tonnage or train length restrictions and no training in locomotive operation or train handling.
4. Management crew training and experience
    - Management crews do not have to meet the same requirements for duration of training, number of trips, and experience as unionized staff.
    - Management crews may operate trains over any subdivision without having adequate familiarization training.

[43] TSB railway investigation reports R16W0074, R15V0046, R13W0260, R04W0035, and R02W0060.

5. Regulatory oversight
    - The regulations contain no guidance outlining requirements for course training material, test content, or test delivery for railway employees in safety-critical positions.
    - Although TC is provided with railway training programs, it does not assess the adequacy of the training and provides no further oversight with regard to the training of railway employees in safety-critical positions.
    - There are no regulatory requirements for mandatory familiarization or refresher training for any of the operational categories when railway employees in safety-critical positions return to work after a layoff.

TC has recognized the need to update the regulations on several occasions:

- In 2003, TC indicated that it was planning to review the regulations in fall 2003.
- In 2005, TC acknowledged that the regulations were outdated and should be revised; it considered creating a working group to revise the regulations.
- In 2009, TC approved the *Rules Respecting Minimum Qualification Standards for Railway Employees* (Rules), which were to come into force once the regulations were repealed. However, to date, the Rules are not in place, as the regulations have not been repealed.

The 2017–2018 TC Departmental Plan highlighted that TC planned to strengthen the regulatory regime by updating the *Railway Employee Qualification Standards Regulations,* but there has been little progress to date.

Consequently, the regulations have not kept pace with the significant changes in railway operations over the years. The *Rail Safety Management System Regulations, 2015*, requiring railways to have processes for managing knowledge, cover some of the training elements. However, gaps in training remain. If the gaps in the current *Railway Employee Qualification Standards Regulations* are not addressed, railway employees in safety-critical positions may not be sufficiently trained or experienced to perform their duties safely. Additionally, Transport Canada will not be able to conduct effective regulatory oversight and enforcement of training programs. Therefore, the Board recommends that

> the Department of Transport update the *Railway Employee Qualification Standards Regulations* to address the existing gaps for railway employees in safety-critical positions related to training, qualification and re-qualification standards, and regulatory oversight.
>
> **TSB Recommendation R18-02**

This report concludes the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 25 April 2018. It was officially released on 27 June 2018.

Visit the Transportation Safety Board of Canada's website (www.tsb.gc.ca) for information about the TSB and its products and services. You will also find the Watchlist, which identifies the key safety

issues that need to be addressed to make Canada's transportation system even safer. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.

Appendices

Appendix A – Car list with tonnage and weight totals

Car position	Car initial and number	Car type	Load/ empty (L/E)	Weight (tons)	Total weight (tons)	Length (feet)	Total length (feet)
N/A	CN 7230	Locomotive	N/A	130	130	57	57
N/A	CN 207	Locomotive	N/A	129	259	50	107
1	UTLX 208275	Tank	L	128	387	60	167
2	MLLX 97902	Covered hopper	L	141	528	67	234
3	LW 50376	Box	L	126	654	69	303
4	DWC 793617	Box	L	125	779	69	372
5	DWC 794846	Box	L	123	902	69	441
6	DWC 794229	Box	L	126	1028	69	510
7	AGR 78892	Box	L	99	1127	58	568
8	NS 471303	Box	L	137	1264	69	637
9	NS 473152	Box	L	104	1368	69	706
10	MDW 6139	Box	L	128	1496	68	774
11	SOO 600261	Bulkhead flat	L	118	1614	81	855
12	NOKL 734287	Bulkhead flat	L	123	1737	81	936
13	RVPR 9999	Bulkhead flat	L	114	1851	81	1017
14	ATW 300448	Bulkhead flat	L	126	1977	81	1098
15	ATW 273485	Bulkhead flat	L	124	2101	81	1179
16	CN 623852	Bulkhead flat	L	103	2204	81	1260
17	WC 54247	Gondola	E	35	2239	58	1341
18	GNTX 296015	Gondola	L	110	2349	71	1412
19	CEFX 30183	Gondola	E	33	2382	57	1469
20	WC 34011	Hopper	L	119	2501	35	1504
21	WC 34031	Hopper	L	121	2622	35	1539
22	WC 34038	Hopper	L	118	2740	35	1574
23	WC 34046	Hopper	L	117	2857	35	1609
24*	WC 34050	Hopper	L	117	2974	35	1644
25	WC 34030	Hopper	L	118	3092	35	1679
26	WC 34003	Hopper	L	118	3210	35	1714
27	WC 34044	Hopper	L	116	3326	35	1749
28	WC 34045	Hopper	L	118	3444	35	1784
29	WC 34032	Hopper	L	127	3571	35	1819

Car position	Car initial and number	Car type	Load/ empty (L/E)	Weight (tons)	Total weight (tons)	Length (feet)	Total length (feet)
30	WC 34009	Hopper	L	118	3689	35	1854
31	WC 34017	Hopper	L	117	3806	35	1889
32	WC 34014	Hopper	L	118	3924	35	1924
33	WC 34005	Hopper	L	116	4040	35	1959
34	WC 34049	Hopper	L	117	4157	35	1994
35	WC 34002	Hopper	L	117	4274	35	2029
36	WC 34051	Hopper	L	119	4393	35	2064
37	WC 34018	Hopper	L	121	4514	35	2099
38	WC 34006	Hopper	L	121	4635	35	2134
39	IC 97418	Gondola	L	123	4758	71	2205
40	GNTX 297333	Gondola	L	125	4883	71	2276
41	CSXT 491054	Gondola	L	128	5011	71	2347
42	AIMX 14066	Gondola	L	132	5143	69	2416
43	MP 652072	Gondola	L	112	5255	70	2486
44	GNTX 295984	Gondola	L	114	5369	71	2557
45	GNTX 295164	Gondola	L	116	5485	71	2628
46	GNTX 297028	Gondola	L	113	5598	71	2699
47	IC 3710	Gondola	L	130	5728	72	2771
48**	TFOX 88031	Covered hopper	L	129	5857	65	2836
49	ACFX 99966	Covered hopper	L	130	5987	65	2901
50	UTCX 47485	Covered hopper	L	121	6108	66	2967
51	GAPX 5507	Covered hopper	L	124	6232	65	3032
52	GGCX 1418	Covered hopper	L	124	6356	65	3097
53	GGCX 1375	Covered hopper	L	125	6481	65	3162
54	NAHX 581083	Covered hopper	L	125	6606	65	3227
55***	ACFX 37030	Covered hopper	L	121	6730	65	3292
56	ACFX 51380	Covered hopper	L	119	6849	65	3357

Car position	Car initial and number	Car type	Load/ empty (L/E)	Weight (tons)	Total weight (tons)	Length (feet)	Total length (feet)
57	PLCX 42915	Covered hopper	L	119	6968	69	3426
58	GGCX 1426	Covered hopper	L	126	7094	65	3491
59	ACFX 37214	Covered hopper	L	126	7220	65	3556
60	ACFX 39565	Covered hopper	L	125	7345	65	3621
61	GAPX 5549	Covered hopper	L	126	7471	65	3686
62	GGCX 5805	Covered hopper	L	127	7598	65	3751
63	VIPX 45844	Covered hopper	L	128	7726	65	3816
64	UTCX 58956	Covered hopper	L	121	7847	66	3882
65	GPLX 75409	Covered hopper	L	130	7977	65	3947
66	NAHX 570453	Covered hopper	L	129	8106	65	4012
67	GGCX 5835	Covered hopper	L	125	8231	65	4077
68	ACFX 99964	Covered hopper	L	128	8359	65	4142
69	GGCX 5813	Covered hopper	L	126	8485	65	4207
70	GGCX 1291	Covered hopper	L	124	8609	65	4272
71	GGCX 1423	Covered hopper	L	125	8734	65	4337
72	UTCX 46560	Covered hopper	L	126	8860	66	4403
73	PLWX 44534	Covered hopper	L	125	8985	69	4472
74	VIPX 45838	Covered hopper	L	131	9116	65	4537

Notes:

* Car at crest when train stopped at signal.

** Car at crest when train clear of the W100 switch.

*** Car at W100 switch when train stopped at signal.

Appendix B – Familiarity of newly qualified conductors with the west industrial yard assignment

Employee number	Service as qualified conductor	Trained on west industrial as trainee	Trained new employees	Trained by newly qualified conductor	Experience on west industrial once qualified	Time pressure for productivity
1	27 months	No	Yes	Yes	9 days	Yes
2	24 months	No	Yes	Yes	7 days	Yes
3	22 months	No	Yes	Yes	Fewer than 10 times	Yes
4	Assignment foreman – 22 months	2 times	Yes	Yes	Fewer than 5 times	Yes
5	19 months (laid off for 3 of the months)	Yes	Yes	Yes	11 or 12 times	No
6	19 months	No	Yes	Yes	1 time	Yes
7	Assignment helper – 17 months (laid off for 4 of the months)	2 days on relief	Yes	Yes	11 times	Yes

Appendix C – Railway Employee Qualification Standards Regulations

The *Railway Employee Qualification Standards Regulations* state, in part:

General

4. A railway company shall provide employee training necessary for the purposes of these Regulations.

5. (1) No railway company shall permit any employee to work as a locomotive engineer, conductor, or yard foreman unless the employee,

(a) has qualified for that occupational category in accordance with section 14; and

(b) in the case of a locomotive engineer or transfer hostler, has received a passing mark for on-job training in that occupational category. […]

6. A railway company shall provide to its locomotive engineer candidates and transfer hostler candidates sufficient on-job training in respect of the required subjects to enable them to demonstrate to instructors and examiners that they are competent to perform their required duties.

7. No examiner shall issue a passing mark for on-job training to a locomotive engineer candidate or transfer hostler candidate unless the examiner

(a) is satisfied that the candidate is competent to perform his required duties by

(i) obtaining an evaluation of the candidate's competency from the locomotive engineer or transfer hostler with whom the candidate has made student on-job training trips, and

(ii) assessing the candidate's competency in actual locomotive or train operation, or both, depending on the requirements of the occupational category for which the candidate is being examined; and

(b) has completed, signed and placed on the candidate's personnel file a document indicating that the candidate has passed the on-job training.

8. An examiner shall determine the overall mark for a candidate based on written or oral classroom examinations, or both, dealing with the required subjects.

9. An employee undergoing on-job training in order to qualify as a locomotive engineer or transfer hostler may perform the duties of the occupational category for which he is a candidate under the direction of an on-job training instructor for the duration of the employee's training period.

10. (1) A railway company shall, at intervals of not more than three years, have each employee in an occupational category re-examined on the required subjects.

(2) The overall pass mark for re-examination is 80 per cent. […]

12. (1) Within 90 days after the coming into force of these Regulations, a railway company shall file with the Committee two copies of each type of classroom examination and two copies of a detailed description of each method of assessing on-job competence used by the company.

(2) A railway company shall notify the Committee of a change to a type of classroom examination format or method of assessing on-job competence within 90 days after implementing the change. […]

Qualification Standards for Candidates

14. (1) The subjects required for a person to qualify for an occupational category are the subjects listed in those items of the schedule marked with an "X" under the heading that corresponds to the occupational category, excluding those subjects or portions of subjects dealing with equipment that is not used by the railway company that employs the person.

(2) No railway company shall qualify a person for an occupational category unless the person obtains an overall mark of at least 80 per cent in the required subjects.

Qualification Standards for On-job Training Instructors

15. No railway company shall qualify a person as an on-job training instructor for the occupational category of locomotive engineer unless the person

(a) meets the qualification requirements for a locomotive engineer with an overall mark of at least 90 percent; and

(b) completes not less than two years service as a locomotive engineer, including at least three months service in the area where the locomotive engineer is to give the on-job training.

16. No railway company shall qualify a person as an on-job training instructor for the occupational category of transfer hostler unless the person

(a) meets the qualification requirements for a transfer hostler with an overall mark of at least 90 per cent; and

(b) completes not less than one year of service as a transfer hostler, including at least three months service in the area where the transfer hostler is to give the on-job training.

Qualification Standards for Classroom Training Instructors

17. No railway company shall qualify as a classroom training instructor for a required subject a person who has not obtained a mark of at least 90 per cent in a written examination on that subject.

Qualification Standards for Examiners

18. An employee or officer of a railway company who is an on-job training instructor or a classroom training instructor is qualified to act as an examiner on the subjects on which the employee or officer is qualified to give instruction.

Training Programs and Consultation

19. (1) A railway company shall establish employee training programs for each occupational category.

(2) A railway company shall establish and modify its employee training programs in consultation with the trade unions representing its employees in the occupational categories.

(3) Within 90 days after the coming into force of these Regulations, a railway company shall file with the Committee a description of all employee training programs relating to each occupational category.

(4) Within 90 days after any change is made to an employee training program required by subsection (1), a railway company shall file with the Committee a description of the change.

Reporting

20. (1) For each calendar year a railway company shall submit to the Committee, not later than March 31 of the following year, a comprehensive report on its employee training programs.

(2) A report referred to in subsection (1) shall specify

(a) the total number of employees in each occupational category;

(b) the total number of employees who received training in each occupational category;

(c) the number of employees who received training and met the training requirements for each category and the number who failed to meet the training requirements; and

(d) any new or improved techniques or devices adopted in the company's employee training programs.

SCHEDULE

(Section 14)

Item	Subject	Occupational Category			
		Locomotive Engineer	Transfer Hostler	Conductor	Yard Foreman
1.	*Regulations No. 0-8, Uniform Code of Operating Rules*	X	X	X	X
2.	*Railway Radio Regulations*	X	X	X	X
3.	Dangerous Commodities	X		X	X
4.	Train Marshalling	X		X	X
5.	Air Brake Systems and Tests	X		X	X
6.	Locomotive Operation	X	X		
7.	Train Handling	X			
8.	Freight Car and Train Inspection	X		X	X
9.	Passenger Evacuation Procedures			X	

Source: Transport Canada, SOR/87-150, *Railway Employee Qualification Standards Regulations*.

Appendix D – Summary of U.S. Department of Transportation Federal Railroad Administration Code of Federal Regulations, *Title 49, Part 240 and Part 242 – Training program certification requirements*

As indicated in the *Code of Federal Regulations* (CFR), Title 49, Part 240 and Part 242:

- A railway must submit its training programs for locomotive engineers (LEs) and conductors to the Federal Railroad Administration (FRA) for certification. The FRA will review the course material. If the course material does not meet regulatory criteria, the FRA will provide feedback and require the railway to re-submit the material for approval.
- Once the training program for operating employees has been approved by the FRA, the railroad is permitted to certify its employees once they successfully complete the training program.
- When submitting its training programs to the FRA for certification, the railway submission must cover the following sections detailed in Appendix B of CFR 49 Part 240 and Part 242:
    1. General information;
    2. Selection of supervisors of LEs (CFR 49, Part 240 for LEs only);
    3. Training persons previously certified;
    4. Testing and evaluating persons previously certified;
    5. Training, testing and evaluating persons not previously certified;
    6. Monitoring operational performance by certified engineers; and
    7. Procedures for routine administration of certification programs.
- Training must be modified whenever there are changes in technology (e.g., the use of dynamic brake, RCLS, etc.), changes in operating rules (e.g., train securement) or changes in regulatory requirements (e.g., risk assessments). In addition, any revised course material must be re-submitted, reviewed and approved by the FRA.
- Driving convictions or infractions on the driver's license for a perspective operating employee must be considered when determining suitability for employment (Prior Safety Conduct). Failure to meet eligibility requirements for prior safety conduct, reported substance abuse disorders or documented rules compliance issues can result in the rejection of a prospective employee.
- Once employed by a railway, an employee must continue to meet eligibility requirements. Any non-compliance, such as a suspension of the employee's driver's licence, can result in revocation of the employee's railway certification.
- Operating personnel must requalify every 3 years.
- There is no requirement to work 2 years as a conductor prior to commencing training as an LE.
- LEs must pass a practical examination to be certified or re-certified.
- Only certified LEs can operate RCLS equipment.

- Familiarization training is provided for new employees. When an operating employee returns to work after an extended period of absence for any reason, familiarization training is also required.
- All written tests are conducted without open reference books or other materials, except when being tested on the ability to use such reference books or materials.
- Managers must have the same certification and training as unionized staff in order to work as conductors or LEs.

Appendix E – TSB investigations outlining deficiencies in operating crew training regulations

R02W0060 – On 26 April 2002 at about 0100 Central Daylight Time, westward Canadian National Railway (CN) freight train E-201-31-24 was departing Winnipeg, Manitoba, along the north main track of the Redditt Subdivision. As the train traversed a crossover from the north to the south main tracks, 8 cars derailed at Mile 251.3. About 300 feet of track, a roadway underpass, and the line-side fibre-optic system buried in the grade were damaged. As a precaution, 6 homes from an adjacent residential area were evacuated. There were no injuries or release of product.

Regarding operating crew training, the investigation determined the following:

- The locomotive engineer (LE) was first trained in 1976 and had never received any subsequent practical instruction on the use of locomotive high-capacity extended-range dynamic brake (DB) or the risks associated with its use in train-handling operations. This suggests that training for LEs had not kept pace with improvements in DB technology and train-handling methodologies; it further raises a question as to the adequacy of current LE training, as overseen by TC under the existing regulation. Other TSB investigations[44] have also identified the inappropriate use of locomotive DB as a factor that contributed to accidents.
- The regulations contained no requirement for a practical component to be completed for an LE to requalify and missed an opportunity to familiarize LEs with new equipment and train-handling techniques.
- The regulations did not require the regulator to review the content of training material, nor did they outline a mechanism for the regulator to recommend additions or improvements to the training criteria as operations in the rail industry change.

TC responded to the report and indicated that, in fall 2003, it would begin a review of the *Railway Employee Qualification Standards Regulations*. Based on the results of the review, TC would make recommendations to the industry concerning LE training and dynamic testing.

R04W0035 – On 17 February 2004, CN Yard Assignment YATS-02-17 was performing switching operations at Symington Yard in Winnipeg, Manitoba. At approximately 1150 Central Standard Time, the movement derailed 17 intermodal container car body platforms at switch W4RE at the east end of the west receiving tracks (Mile 145.20 of the Sprague Subdivision). At the time of the occurrence, the remote control locomotive system (RCLS) operator was riding in a motor vehicle, well in advance of and facing away from the movement, as permitted by an exception to CROR Rule 115, which left the movement unmonitored. There were no regulatory or company guidelines governing the use of a motor vehicle when assisting with RCLS switching operations. About 1600 feet of track was damaged. There were no injuries, and no dangerous goods were involved.

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44 TSB railway investigation reports R10T0213, R10T0056, R10C0016, R07T0323, R05C0082, and R01W0007.

Regarding operating crew training, the investigation determined the following:

- Regulatory oversight of training and requalification of RCLS operators has not kept pace with improvements in technology and operations.

TC acknowledged that the regulations were outdated and should be revised. TC was considering creating a working group to revise the regulations.

R13W0260 – On 18 November 2013, CN freight train L586 41-18 was switching into the Murphys interchange track at Mile 61.0 of CN's Tisdale Subdivision, near Tisdale, Saskatchewan. At about 1818 Central Standard Time, during the hours of darkness, while reversing westward at approximately 12 mph, the train struck and seriously injured a conductor trainee. The employee was transported by ambulance to hospital, but succumbed to injuries during transport.

Regarding operating crew training, the investigation determined the following:

- The conductor trainee, who was unfamiliar with the territory and working without direct supervision, misapplied a number of safety-critical operational procedures. If conductor trainees work independently, without direct supervision in close proximity, there is an increased risk of error, which can result in an accident.
- If there is a reduced training period, an absence of direct supervision, and a lack of continuity and assessment among trainers, conductor trainees may not apply rules and instructions correctly in the field, which increases the risk of an accident.
- The regulations require railways to file with TC a description of all employee training programs and subsequent changes related to each occupational category. Railways are also required to submit an update report to TC on their employee training programs each year. Although TC is provided with the information, the adequacy of the training program for each respective railway is not assessed. Consequently, once railway companies have satisfied the training, consultation, and reporting requirements of the regulations, TC provides no further oversight with regard to the training of railway operating employees.
- If there is no regulatory oversight of the effectiveness of training programs for railway operating employees, there is an increased risk that these programs may not be sufficiently robust to ensure that trainees have adequate practical experience to work independently and safely.

The investigation identified that, in 2009, TC approved the *Rules Respecting Minimum Qualification Standards for Railway Employees*, which were to come into force once the regulations were repealed. Under the new rules, conductor trainees would also receive on-job training under the direction of a training instructor for the duration of the training period. However, to date, the rules are not in place, as the regulations have not been repealed.[45]

[45] TC's 2017–2018 Departmental Plan highlighted that TC Rail Safety planned to strengthen the regulatory regime by updating the *Railway Employee Qualification Standards Regulations*.

R15V0046 – On 11 March 2015, at about 0130 Pacific Daylight Time, a CP rail traffic controller (RTC) stopped Canadian Pacific Railway (CP) freight train 672-024 near Mile 102 of the Cranbrook Subdivision after the train had departed Cranbrook, British Columbia, and travelled east for 5 miles without authorization. A management crew was operating the train. Although qualified for their respective positions, the management crew members were not familiar with the territory.

With respect to training, the investigation determined the following:

- Unlike operating employees whose primary job is to operate trains, management employees who operate trains on a part-time basis are not likely to gain the same level of experience and familiarity with the territory.
- With shorter training periods, fewer on-job training trips, and fewer prerequisites before starting training, it may be difficult for management employees to acquire the knowledge and experience needed to become fully proficient with operating trains.
- For railway management employees who operate trains, if the regulatory framework does not adequately address the requirements for training, certification, and territory familiarization, trains can be crewed with management employees who are not sufficiently experienced or familiar with the territory, increasing the risk for unsafe train operations.

R16W0074 – On 27 March 2016, at about 0235 Central Standard Time, while switching in Sutherland Yard in Saskatoon, Saskatchewan, CP 2300 RCLS training yard assignment was shoving a cut of cars into track F6. As the assignment was brought to a stop, empty covered hopper car EFCX 604991 uncoupled from the train, unnoticed by the crew. The car rolled uncontrolled through the yard and onto the main track within cautionary limits of the Sutherland Subdivision. The car travelled about 1 mile and over 2 public automated crossings before coming to a rest on its own. There were no injuries and no derailment. No dangerous goods were involved.

Regarding operating crew training, the investigation determined the following:

- The combination of learning the additional tasks associated with RCLS operations and managing the point protection zone, combined with the relative inexperience of the yard crew, contributed to the slip of attention related to the uncoupling.
- If the experience of operating employees is not considered in the makeup of operating crews, there is a risk that pairing inexperienced operators could result in a reduction of safety margins.
- If safeguards are not in place to ensure that crews are not only qualified but also possess sufficient operational experience, there is an increased risk of operational errors and accidents.
- If the current *Canadian Railway Employee Qualification Standards Regulations* are not updated, gaps will remain, and TC will not be able to conduct effective regulatory oversight and enforcement of training programs for management and unionized operating crews, RCLS operators, RTCs, and contract trainers, increasing the risk of unsafe train operations.

Appendix F – TSB investigations involving uncontrolled movements

Occurrence number	Date	Description	Location
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
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
R16W0059	2016-03-01	Uncontrolled movement of railway equipment, Cando Rail Services, 2200 Co-op Refinery Complex assignment, Mile 91.10, Quappelle Subdivision	Regina, Saskatchewan
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
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	Toronto, Ontario
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
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
R11Q0056	2011-12-11	Runaway train, Quebec North Shore and Labrador Railway, Freight train LIM-55, Mile 67.20, Wacouna Subdivision	Dorée, Quebec
R09D0053	2009-09-09	Non–main-track collision, VIA Rail Canada Inc., Locomotive 6425, VIA Rail Canada Inc., Montréal Maintenance Centre	Montréal, Quebec
R09T0057	2009-02-11	Runaway and non–main-track train derailment, Southern Ontario Railway, 0900 Hagersville Switcher, Mile 0.10 and Mile 1.9 of the Hydro Spur	Nanticoke, Ontario

Occurrence number	Date	Description	Location
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
R07H0015	2007-07-04	Runaway rolling stock, Canadian Pacific Railway, Runaway cut of cars, Mile 119.5, Winchester Subdivision	Smiths Falls, Ontario
R07V0109	2007-04-23	Non-main-track train derailment, Kootenay Valley Railway, 0700 Trail yard assignment, Mile 19.0, Rossland Subdivision	Trail, British Columbia
R06V018	2006-09-03	Runaway and derailment, White Pass and Yukon Railway, Work train 114, Mile 36.5, Canadian Subdivision	Log Cabin, British Columbia
R06V0136	2006-06-29	Runaway and derailment, Canadian National Railway Company, Freight train L-567-51-29, Mile 184.8, Lillooet Subdivision	Near Lillooet, British Columbia
R05H0011	2005-05-02	Runaway and main-track train collision, Ottawa Central Railway, Freight train 441, Mile 34.69, Alexandria Subdivision	Maxville, Ontario
R04V0100	2004-07-08	Uncontrolled movement of railway rolling stock, Canadian National Railway Company, Train M-359-51-07, Mile 57.7, Fraser Subdivision	Bend, British Columbia
R03T0026	2003-01-21	Yard collision, Canadian Pacific Railway, Car HOKX 111044, Mile 197.0, Belleville Subdivision, Toronto Yard	Agincourt, Ontario
R03T0047	2003-01-22	Yard collision, Canadian National Railway Company, Tank Car PROX 77811, Mile 25.0, York Subdivision	Toronto, Ontario
R99D0159	1999-08-27	Runaway cars, Canadian National Railway Company, Mile 69.4, Kingston Subdivision, Wesco Spur	Cornwall, Ontario
R98M0029	1998-09-24	Main-track runaway, collision, and derailment, Matapédia Railway, Canadian National Railway Company train A402-21-24, Mile 105.4, Mont-Joli Subdivision	Mont-Joli, Quebec
R98M0020	1998-07-31	Main-track runaway and collision, VIA Rail Canada Inc. passenger train 14 and an uncontrolled five-pak movement, Mile 105.7, Matapédia Railway, Mont-Joli Subdivision	Mont-Joli, Quebec

Occurrence number	Date	Description	Location
R97C0147	1997-12-02	Runaway and derailment, Canadian Pacific Railway, Train 353-946, Laggan Subdivision	Field, British Columbia
R96C0172	1996-08-12	Main-track collision, Canadian National Railway Company, Train 117 and an uncontrolled movement of 20 cars, Mile 122.9, Edson Subdivision	Near Edson, Alberta
R96C0209	1996-10-09	Runaway cars, Canadian Pacific Railway, CP 0700 yard assignment, Mile 166.2, Willingdon Subdivision, Clover Bar exchange track	Edmonton, Alberta
R96T0137	1996-04-24	Runaway of five tank cars, Canadian National Railway Company, Mile 0.0, Hagersville Subdivision	Nanticoke, Ontario
R96C0086	1996-04-13	Runaway train, Canadian Pacific Railway, Freight train 607-042, Mile 133.0, Laggan Subdivision	Field, British Columbia
R95M0072	1995-12-14	Runaway cars, Canadian National Railway Company, Train 130-13, Mile 0.0, Pelletier Subdivision	Edmundston, New Brunswick
R94V0006	1994-01-18	Runaway train, Canadian National Railway Company, Freight train 459-GP-18, Mile 175, Grande Cache Subdivision	Latornell, Alberta

Appendix G – Other TSB investigations involving remote control locomotive system switching operations

R16W0074 – On 27 March 2016, while switching in Sutherland Yard in Saskatoon, Saskatchewan, the Canadian Pacific Railway (CP) 2300 remote control locomotive system (RCLS) training yard assignment was shoving a cut of cars into track F6. As the assignment was brought to a stop, empty covered hopper car EFCX 604991 uncoupled from the train, unnoticed by the crew. The car rolled uncontrolled through the yard and onto the main track within cautionary limits of the Sutherland Subdivision. The car travelled about 1 mile and over 2 public automated crossings before coming to a rest on its own. There were no injuries and no derailment. No dangerous goods were involved.

The investigation determined the following:

- The coupling on car EFCX 604991 was not re-engaged before the entire assignment was shoved westward.
- Because there was no derail in place on the west-end F-yard lead track to protect against uncontrolled movements accessing the main track, the car rolled uncontrolled onto the main track west of Sutherland Yard.
- The combination of learning the additional tasks associated with RCLS operations and managing the point protection zone, combined with the relative inexperience of the yard crew, contributed to the slip of attention relating to the uncoupling.

R15E0173 – On 08 December 2015, a CP switching assignment, which was being operated by an RCLS, derailed 4 loaded tank cars while performing switching operations. Two cars remained upright, 1 car came to rest on its side, and 1 car rolled into a ditch, coming to rest upside down and releasing most of its contents. The cars contained styrene monomer, stabilized (UN 2055), a Class 3 flammable liquid. The released product was confined to the ditch. There were no injuries.

The investigation determined the following:

- The leading end of the movement was not adequately protected.
- From the head-end locomotive, the sightline towards the switch was clear, and the switch target was visible; however, the yard helper on the leading end of the movement did not notice the target and did not notify the foreman in time to stop the movement.
- During RCLS training, employees are monitored and assessed against a set curriculum, and the training period can be extended until the employee demonstrates the required competency. However, at CP, there was no requirement or guidance relating to the time or experience required for a conductor before starting the RCLS training.

R07T0270 – On 17 September 2007, while pulling south on the pullback track with a consist of 67 loaded and 30 empty cars, weighing about 9054 tons, a Canadian National Railway (CN) yard assignment side-collided with the tail end of a CN freight train. The train was departing MacMillan Yard in Vaughan, Ontario, near Toronto, Ontario, at 15 mph on the

Halton outbound track. Two locomotives and 2 cars of the yard assignment derailed. Six cars on the freight train derailed and/or sustained damage, including 2 special dangerous goods tank cars containing chlorine (UN 1017). Approximately 3785 litres of diesel fuel (UN 1202) leaked from the derailed locomotives. There were no injuries.

The investigation determined the following:

- When the CN west control hump yard assignment YWCS60 17 (2200 West) was placed in emergency, the only operable brakes were those of the locomotive and the booster unit. With limited braking capacity, the assignment was too long, heavy, fast, and close to the junction with the occupied Halton outbound route to have been able to stop before colliding with CN train 339.
- Although CN had recently qualified the helper to operate RCLS switching assignments, neither his training nor experience were adequate for switching long, heavy cuts of cars on tracks with descending grades.
- Without a complete understanding of the train's behaviour under braking, and without a list of the cars and tonnage, the RCLS operator could not accurately estimate the stopping distance of this long, heavy train on the descending grade.
- The decision to place a difficult-to-handle train in the hands of an inexperienced operating employee without an adequate job briefing contributed to the collision and derailment.
- While it may be expeditious to switch long cuts of cars relying only on locomotive brakes, this practice makes stopping distances unpredictable and meeting the requirements of Rule 105 unreliable. Without mitigation of this risk, yard collisions involving long, heavy consists will continue to occur.
- While conductor trainees receive basic instruction and testing in handling yard movements as part of their RCLS training, they do not receive specific instruction or practical experience on the effects of tonnage, length, marshalling, or topography on braking distances. In the absence of such training, newly trained personnel may not be adequately qualified to safely operate yard movements at all times.
- The qualifying test to certify conductors in RCLS yard operations was not sufficiently rigorous to evaluate conductor trainee skills under work conditions. Consequently, trainees without the requisite skill or experience were being placed in active service without restrictions.

R07V0213 – On 04 August 2007, a CN RCLS assignment was pulling 53 loaded cars from track PA02 at the north end of Prince George South Yard, in Prince George, British Columbia. While attempting to clear the switch in order to access the classification tracks, the movement ran away northbound, striking another CN freight train, which was entering the north end of the yard. The RCLS assignment struck a tank car loaded with gasoline, derailing it as well as the next tank car ahead, also loaded with gasoline. The tank cars released product, and a fire ensued.

Two locomotives, a slug unit, and a loaded centrebeam flat car in the yard assignment derailed and, along with the 2 tank cars from the other train, were destroyed in a subsequent

fire. Approximately 172 600 litres of fuel (1600 litres of diesel and 171 000 litres of gasoline) was spilled. Most of the fuel was consumed by fire. There were no injuries.

The investigation determined the following:

- The collision occurred when the excessive tonnage of the 53 cars and the descending track gradient of the pullback track combined to exceed the braking capacity of the switching locomotives, and the uncontrolled movement contacted the opposing train at the crossover.
- Although considered qualified from a regulatory perspective for their respective duties, the management employees operating the RLCS switching assignment were inadequately trained and had no experience switching long, heavy cuts of cars on the pullback track descending grade.
- The risk assessment conducted immediately before the accident was inadequate to identify the hazards and mitigate the risks of switching long, heavy cuts of cars on the pullback track's descending grade.
- The practice of temporarily assigning management employees to do the work of experienced operating employees may increase the risk of accidents.

R07W0042 – On 13 February 2007, a CN hump yard assignment was performing switching operations at Symington Yard in Winnipeg, Manitoba. While travelling westward at approximately 6 mph on track ER-08, the hump yard assignment sideswiped another CN train, which was outbound on track ER-04. Four cars from the hump assignment derailed. A total of 9 cars were damaged. No dangerous goods were involved, and there were no injuries.

The investigation determined the following:

- The accident occurred when the hump assignment made an unintentional westward movement and collided with a departing westbound train.
- The leading end of the movement was not adequately protected.
- The operator control unit (OCU) for the RCLS was inadvertently left with the direction command in the forward position when the movement was initiated.
- The RCLS operator was likely distracted by the arrival of a motor vehicle, which led to the failure to change direction on the OCU.
- The location of the RCLS operator in a motor vehicle, in advance of and facing away from the movement, and the use of vehicle mirrors to monitor the movement, made it difficult to determine the direction of travel. These factors delayed the operator's decision to stop the movement, increasing the time and distance the movement travelled in the unintended direction.
- Insufficient training, combined with the operator's limited practical experience, likely contributed to the failure to confirm the direction of travel immediately after initiating the RCLS command.

The lack of regulatory or company guidelines for the use of a vehicle when assisting with RCLS operations increases the risk of errors and accidents.