



TSB Recommendation R14-04

Physical defences to prevent runaway equipment

The Transportation Safety Board of Canada recommends that the Department of Transport require Canadian railways to put in place additional physical defences to prevent runaway equipment.

| | |
|---|--------------------------|
| Rail transportation safety investigation report | R13D0054 |
| Date the recommendation was issued | 19 August 2014 |
| Date of the latest response | March 2025 |
| Date of the latest assessment | March 2025 |
| Rating of the latest response | Satisfactory in Part |
| File status | Active |

Summary of the occurrence

On 06 July 2013, shortly before 0100 Eastern Daylight Time, eastward 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, UN1267, and 2 box cars derailed. As a result of the derailment, 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 Megantic Yard. A total of 47 people were fatally injured, and there was environmental contamination of the downtown area, and the adjacent river and lake.

The Board concluded its investigation and released report R13D0054 on 19 August 2014.

Rationale for the recommendation

In this accident, the train was secured at Nantes both with hand brakes and locomotive air brakes. However, a proper hand brake effectiveness test had not been conducted to ensure that the hand brakes alone would hold the train. When the locomotive supplying air pressure to the train was shut down, the air brake system leaked off in less than 1 hour. The force from the hand brakes was not sufficient to secure the train, and the train rolled away.

Both air brake and hand brake systems are subject to failure, as the technology is not fail-proof. For example, air brake systems are prone to leakage and suffer from limitations in maintaining brake cylinder pressure. Furthermore, when brake pressure is low, its ability to generate an emergency brake application is compromised. Hand brake devices also have significant limitations, in that they do not provide feedback to the operator about the force applied, and often do not provide the required braking force due to their design and other mechanical and physical factors.

Within the railway industry, these limitations in technology are addressed with the expectation that there will always be strict compliance with the operating rules. For equipment securement, reliance is placed on *Canadian Rail Operating Rules* (CROR) Rule 112, company special instructions and training. However, TSB investigations into runaways revealed that the sequence of events very often included a misapplication of the rule, such as an improper hand brake effectiveness test or the application of an insufficient number of hand brakes. This means that no matter how well the rule is worded, it will not always be strictly complied with, thereby introducing vulnerability into the safety system.

Rules are administrative defences and, invariably, there will be instances where practices in the field will deviate from written rules and procedures. Even with clear and comprehensive rules, it has been demonstrated over the years that depending solely on the correct application of rules is not sufficient to maintain safety in a complex transportation system. The concept of “defence in depth” has shaped the thinking in the safety world for many years. Layers of defences, or safety redundancy, have proven to be a successful approach in many industries, to ensure that a single-point failure does not lead to catastrophic consequences.

There are physical defences to protect against the risk of runaway equipment, and these include derails, wheel chocks, mechanical emergency devices, and locomotive auto-start systems to maintain air pressure. New technology is available, such as GPS-equipped devices that can be applied to a hand brake chain, allowing for the remote monitoring of the hand brake status. In addition, some existing technology, such as reset safety controls and sense and braking units, with minor programming changes, can offer additional protection.

Advanced air brake control valves, such as electronically controlled pneumatic (ECP) brakes, can provide added protection by overcoming some of the inherent limitations of the traditional air brake systems. In addition to other operational benefits, ECP brakes protect against brake cylinder leakage, and will monitor brake pipe pressure and automatically generate an emergency brake application if the brake pipe pressure gets low. With ECP brakes, the brake pipe is solely dedicated to continuously supplying air, to keep all of the reservoirs charged on the train.

The National Transportation Safety Board (NTSB) recently made a recommendation to address the need for redundant protection, such as wheel chocks and derails, to protect against runaway trains (NTSB Recommendation R-14-03 Urgent). The recommendation is derived from the NTSB’s investigation into the collision between 2 Chicago Transit Authority trains that occurred on 30 September 2013, in Forest Park, Illinois.

The TSB has pointed out the need for robust defences to prevent runaways since 1996 (TSB Railway Investigation Report R96C0172). From that time, there have been over 120 runaways in Canada that have affected main-track operations. Equipment runaways are low-probability events, but as this accident demonstrates, they can have extreme consequences, particularly if they involve dangerous goods. As demonstrated in Lac-Mégantic, the cost to human life and our communities can be incalculable. 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

Previous responses and assessments

October 2014: response from Transport Canada

Transport Canada (TC) will fully implement this recommendation.

On 29 October 2014, TC issued an Emergency Directive pursuant to Section 33 of the *Railway Safety Act*, requiring railways to improve their operating practices with respect to the securement of railway equipment. Specifically, railways were ordered (in part) to

- use standardized hand brake charts;
- ensure the adequacy of hand brake applications through hand brake effectiveness testing;
- use additional physical securement mechanisms/measures (a list was provided);
- apply hand brakes to the locomotive(s) in addition to those on the cars;
- use air brakes in addition to hand brakes on trains or equipment left unattended on the main track; and
- verify every 2 hours by a qualified employee the securement of cars left unattended on the main track during switching, picking up or setting off enroute.

TC will be developing monitoring procedures to ensure operators adhere to the outlined requirements.

Also on 29 October 2014, TC issued a Ministerial Order, pursuant to Section 19(1)(a) of the *Railway Safety Act*, requiring companies to formulate rules to address the provisions of the Emergency Directive permanently. The rules are to be filed with TC within 180 days of the issuance of the order. TC will continue to work with the railway industry to identify and address any possible residual risks well in advance of the rule submission deadline. Should any unforeseen vulnerabilities be identified that are not addressed sufficiently in the Rule proposed by industry, TC would issue an amended Emergency Directive to immediately address any such issues.

TC will hire additional specialized staff to strengthen oversight related to train securement and to monitor compliance with these additional levels of defence to prevent runaways. Rail Safety personnel will

- develop and implement targeted oversight requirements related to new rule(s) focused directly on securing trains; and
- identify and challenge any technical gaps in railways' risk assessments and provide technical advice/direction on new securement rules, special instructions, and daily bulletins/safety issues identified by inspectors in the field.

Furthermore, as of 01 April 2015, enforcement action for any instances of non-compliance will include the option of issuing fines in the event of contraventions to the *Railway Safety Act*, and its rules and regulations.

Recognizing that technological solutions may provide for additional improvements to mitigate risks of runaway trains in the coming years, TC will intensify its collaboration with industry through the Railway Research Advisory Board to help lead the implementation of technologies to enhance railway safety. In July 2014, TC signed a Memorandum of Cooperation with the U.S. Federal Railroad Administration to facilitate further information exchange, and to help in identifying technical cooperation projects. TC will also initiate a strategic research initiative program to investigate alternatives that would enhance brake system performance, focusing on braking systems and train securement technologies. Such technologies will be developed under, but not limited to, the following themes: remote brake application systems, wayside temperature detectors, and hand brake monitoring devices.

Through these measures, TC will provide for multiple layers of defence for securement to prevent runaway trains.

November 2014: TSB assessment of the response (Satisfactory Intent)

TC has accepted the TSB recommendation.

The Emergency Directive issued in October 2014 (expiring 29 April 2015) addresses many of the weaknesses in the CROR rules pertaining to the securement of equipment. For example, the Emergency Directive mandates the use of a hand brake chart specifying the minimum number of hand brakes required, taking into consideration the tonnage of the train and the grade of the track. In addition, train securement must be confirmed by a hand brake effectiveness test, followed by the application of the hand brakes on the lead locomotives and air brakes on the entire train, adding additional levels of defense. Moreover, the required use of both air brakes and hand brakes on standing equipment while switching, and verification of its status every 2 hours, further reduces the risk of runaway equipment in those situations. The Emergency Directive also mandates the use of additional physical defenses, such as derails, mechanical emergency devices, and mechanical lock parking brakes in addition to the existing defences. These additional measures strengthen the existing rules for securement of equipment.

The Ministerial Order issued in October 2014 requires railways to submit for approval new rules respecting the securement of railway equipment. The new rules are intended to address the provisions of the Emergency Directive on a permanent basis. It is anticipated that further improvements will be made during the final rule making process to ensure it is clearly written

to enhance correct application and to ensure that any gaps identified in the current hand brake chart are addressed. It is clear that TC requires any rules submitted to contain specific provisions to enhance safety, such as enhanced securement practices and the use of additional physical defenses.

The Board acknowledges the industry concerns with using additional physical defences on main track, including the possibility of introducing new risks. However, the TSB recommendation does not prescribe a specific solution. We believe that a one-size-fits-all approach may not be suitable and that different solutions may be required in different operating environments (e.g. main track, sidings, rail yards, etc.). As part of the rule making process, it is up to industry, in collaboration with TC, to consider potential risks and to determine the most appropriate solutions to be used under different circumstances.

TC has also committed to taking a number of additional measures, such as hiring more staff to enhance monitoring and inspection activities, and using administrative monetary penalties to strengthen enforcement activities when there is non-compliance. Through the Railway Research Advisory Board, TC stated it will also help lead the implementation of technologies to enhance railway safety, and will initiate a strategic research initiative program to investigate alternatives that would enhance brake system performance, focusing on braking systems and train securement technologies.

The Board is pleased with the safety action taken to date and with the accelerated pace of the proposed safety action. These actions include multiple layers of defence such as clarifying the rules for securement, physical defences and enhanced monitoring. If the proposed measures are fully implemented, the risk of runaway equipment will be significantly reduced. As the proposed rules have not yet been developed, and the changes in regulatory oversight (staffing levels, activities, enforcement, and research) are ongoing, some of which will not take place until 2015 or later, the outcome cannot be known until the process is finalized. Therefore, the Board considers the response to Recommendation R14-04 to show **Satisfactory Intent**.

February 2015: response from the Railway Association of Canada

The Emergency Directive (ED) that was issued on 29 October 2014 requires additional physical defences. Under Section 19 of the *Railway Safety Act* (RSA), the RAC prepared a new securement rule for railway equipment and has circulated the rule for consultation. Under Section 20 of the RSA, the RAC will file a change to the *Railway Locomotive Inspection and Safety Rules* regarding the Reset Safety Control (RSC) and its use relating to train securement.

February 2015: response from Transport Canada

TC requires railway companies to meet standardized requirements for hand brake application and has put into effect additional physical defences to secure trains.

March 2015: TSB assessment of the responses (Satisfactory Intent)

The RAC is preparing to submit new rules for train securement on behalf of the member railways as required by TC's Order, dated 29 October 2014. As the proposed rules have not yet been finalized and must be approved by TC, the outcome cannot be known until the process is completed. Therefore, the Board considers the responses to the recommendation to show **Satisfactory Intent**.

January 2016: response from the Railway Association of Canada

A new securement rule came into effect as of 15 October 2015. The rule requires additional physical defences for equipment securement. The RAC submitted a change to the *Locomotive Inspection and Safety Rule* with regards to RSC improvement and the change was approved by TC.

January 2016: response from Transport Canada

Transport Canada issued a Ministerial Order, pursuant to Section 19(1)(a) of the *Railway Safety Act*, requiring railway companies to formulate rules to address the securement of railway equipment. Following extensive consultations with the industry, the newly revised *Canadian Rail Operating Rules* - Rule 112 was approved by the Minister of Transport and came into effect on 15 October 2015. With respect to Rule 112 (c),¹ Rail Safety Inspectors will be asked to note if they see any instances where industry is unclear on this section of the rule.

In conjunction with the new rule, railway special instructions will contain additional detail for employees regarding these requirements.

With respect to safety control equipment on locomotives, the *Railway Locomotive Inspection and Safety Rules*, which were updated on 03 July 2015, contains the following requirement:

Section 29. Safety Control Equipment

29.4 It must be communicated to affected railway employees when a locomotive is equipped with a safety control system with roll-away protection.

Companies are able to determine the most effective way to communicate with their employees whether it be, for example, by written instruction, by equipping the locomotives with stickers or both.

¹ (c) When equipment is left unattended in a yard, at least one physical securement or mechanical device must be utilized.

March 2016: TSB assessment of the responses (Satisfactory in Part)

TC issued a Ministerial Order resulting in new *Canadian Rail Operating Rules* (CROR) relating to the securement of railway equipment, which came into effect on 15 October 2015. TC's Rail Safety inspectors have been instructed to take note of any instances where industry is unclear on the new rules. The RAC submitted a change to the *Locomotive Inspection and Safety Rules* with regards to RSC improvement and the change was approved by TC.

The recommendation asked TC and industry to put in place additional physical defences to prevent runaway equipment. The Board acknowledges the effort that has gone into revising CROR Rule 112. In addition, as the new rule is sufficiently complex, any instances where a railway is unclear on the new rules will need to be addressed. However, despite these actions, the number of occurrences involving runaway equipment has increased in the past year (i.e., 42 occurrences in 2015 compared to 30 occurrences in 2014 and a 5-year average of 36). More needs to be done to ensure that the risk of runaway equipment is reduced and appropriately mitigated.

These physical defences should not rely on air brakes due to their lack of reliability. As air brakes are known to leak and the rate of leakage is generally unpredictable, this defence would not be a sufficient back-up to the hand brakes. Until an assessment of the effectiveness of the new rules is conducted, it will not be known if they are achieving the desired outcome. The Board considers the responses to the recommendation to be **Satisfactory in Part**.

February 2017: response from Transport Canada

Transport Canada has put in place a significant number of measures to improve railway safety including more stringent requirements for the securement of unattended railway equipment, regulations prescribing fines for contraventions to the *Railway Safety Act*, and a new liability and compensation regime for federally regulated railways.

TC imposed stricter requirements for securing unattended trains by issuing an Emergency Directive under the *Railway Safety Act* requiring railway companies to meet standardized requirements for handbrake application and requiring additional physical defences to secure trains.

In October 2015, Transport Canada approved a strengthened Rule 112 of the *Canadian Rail Operating Rules* respecting train securement. Handbrakes are the first line of defense in preventing equipment from rolling away. Sufficient handbrakes will prevent equipment movement in all weather conditions and over virtually unlimited periods of time. The revised rules provides industry with a comprehensive handbrake application chart to respond to various operating situations, which once applied, must be confirmed by another employee with the appropriate level of knowledge. For example, the rules would require a train weighing between 10,000 and 14,000 tons on a grade of 1% to be secured with 26 handbrakes, in addition to handbrakes on all leading locomotives on the train. In addition to handbrakes, railway equipment must be secured by additional physical means listed in the rules when

unattended on main track, siding track, subdivision track and high risk locations. The revised rules provide the additional requirements that have to be met when air brakes are used as the additional means of securement.

Additional funding to increase the safety of the movement of dangerous goods by rail has been allocated to support increased inspection capacity and improved training for stronger and more consistent oversight across the country; enhanced systems for testing, classifying, registering and mapping dangerous goods and their movements, and to support better risk management; increased federal contributions for local investments in safer railway crossings to help prevent accidents; and additional support for first responders to provide better tools and the information required to better protect communities.

TC's oversight activities include monitoring the safety of railway companies' operations, as well as compliance with rules, regulations and standards through audits and inspections, and taking appropriate enforcement action as required. Oversight of the new rules has been integrated into the oversight plan and continues to be an area of priority. While the new rules are more comprehensive than their predecessors, Railway Safety Inspectors have not found that industry is unclear on the application of the rule. When non-compliance is found, appropriate action is taken.

On 01 April 2015, new *Administrative Monetary Penalty Regulations* came into force under the *Railway Safety Act*. Administrative Monetary Penalties are fines issued by Transport Canada to corporations or individuals for contraventions to the *Railway Safety Act*, or regulations and rules made under the Act.

In its reassessment of March 2016, the Transportation Safety Board stated that the number of occurrences involving uncontrolled movement of railway equipment had increased (i.e., 42 occurrences in 2015 versus 30 occurrences in 2014). However, it is important to note that these occurrences covered numerous operational scenarios such as unintentional movement of equipment in railway yards while employees were actively assembling trains, or when railway equipment moved uncontrolled and was stopped by a derail (a device placed on the track to act as an additional means of defence as permitted in Rule 112).

In correspondence dated 20 December 2016 to Transport Canada, the Transportation Safety Board identified a malfunction of the reset safety control with rollaway protection system on certain locomotives. Specifically, there was an occurrence reported to the TSB (R16W0242) whereby the rollaway protection on one locomotive did not function as expected and resulted in a train moving for about 1 minute at a speed of about 1 mile per hour for approximately 80 feet. The existence of this defect condition in other locomotives of the same series was confirmed through additional testing. Given that this defect condition could exist with other locomotive models and could reasonably be expected to result in a situation where a person could be injured and constitutes a threat to safe railway operations, Transport Canada took immediate action and, on 22 December 2016, TC issued an Order pursuant to section 32.01 of the *Railway Safety Act* requiring railway companies to implement certain safety measures regarding the use of reset safety control with rollaway protection.

Additionally, and pursuant to section 36 of the *Railway Safety Act*, railway companies were ordered to file with the Minister of Transport certain information regarding locomotive models in service and results of testing on locomotives equipped with rollaway protection. The department is reviewing the data which has been submitted by railway companies and will take any necessary actions in the interest of safe railway operations based on the findings of this review.

Transport Canada has taken meaningful actions to address Recommendation R14-04. The department continues to monitor implementation of the rule and to monitor companies for compliance.

March 2017: response from the Railway Association of Canada

A new securement rule came into effect as of 15 October 2015. The rule requires additional physical defences for equipment securement.

The industry continues to work with TC to improve these rules.

March 2017: TSB assessment of the responses (Satisfactory in Part)

In October 2015, Transport Canada approved a strengthened Rule 112 of the *Canadian Rail Operating Rules* respecting train securement. The revised rules provide industry with a comprehensive hand brake application chart to respond to various operating situations, which, once applied, must be confirmed by another employee with the appropriate level of knowledge. In addition to hand brakes, railway equipment must be secured by additional physical means listed in the rules when unattended on main track, siding track, subdivision track and high-risk locations.

Oversight of the new rules has been integrated into TC's oversight plan and continues to be an area of priority. TC has allocated additional funding to support increased inspection capacity and improved training for stronger and more consistent oversight of the movement of dangerous goods by rail across the country. While the new Rule 112 is more comprehensive, TC's Railway Safety inspectors have not found that industry is unclear on the application of the rule. However, when non-compliance is found, appropriate action is taken.

The total number of occurrences involving uncontrolled movements has remained unchanged in the past year (i.e., 42 occurrences in 2016 compared to 42 occurrences in 2015 and a 5-year average of 39). The Board recognizes that uncontrolled movements cover numerous operational scenarios, including situations when employees are actively assembling trains. Of the 42 occurrences in 2016, 27 involved uncontrolled movements where the securement was inadequate. This was a decrease of 6 as compared to 2015 when there were 33 similar occurrences. However, the number of these occurrences in 2016 was slightly higher than the 5-year average of about 26.

Situations where inadequate securement has resulted in uncontrolled movements include

- no hand brakes applied or insufficient number of hand brakes applied;

- air bleeds off of cars left standing with an emergency air brake application and the train air brakes subsequently release; and
- faulty or ineffective hand brake(s).

These situations must continue to be monitored and addressed on a priority basis as part of TC's oversight for the strengthened Rule 112. In addition, as air brakes are known to leak and the rate of leakage is generally unpredictable, this defence should not be considered a sufficient back-up to hand brakes.

The Board is encouraged that TC has implemented a number of initiatives, including a strengthened rule and a comprehensive oversight plan for the new rule. However, as the desired outcome of significantly reducing the number of uncontrolled movements has not yet been achieved, the Board considers the responses to the recommendation to be **Satisfactory in Part**.

January 2018: response from the Railway Association of Canada

The RAC and industry actively worked with TC to strengthen the securement rule 112. A new rule is currently out for stakeholder consultation, and soon to be filed with the Minister. Although the rule in effect is understood and applied correctly, the new rule is clearer and is therefore easier for the end user to understand and apply.

In response to an emergency directive, the RAC and industry are researching rollaway protection application as a secondary line of defense for securement, including conducting a risk assessment and evaluating potential changes to the locomotive safety rules to add defined parameters on the requirements for rollaway technology. This work is being done in conjunction with TC and enhancements to CROR Rule 112.

In regards to TSB data, it should be recognized that changes to TSB reporting criteria in 2014 increased the number of occurrences being reported and needs to be considered when making comparisons to the 5 year average. Also, as noted in TSB's latest re-assessment, occurrences classified by them as "uncontrolled movements" include a number of operational occurrences, many of which are low speed or low risk as they occur in locations with safety protections in place.

February 2018: response from Transport Canada

Since the tragic accident in Lac-Mégantic, Transport Canada has put in place a significant number of measures to improve railway safety including more stringent requirements for the securement of unattended railway equipment, improved regulations regarding companies' safety management systems, regulations prescribing fines for contraventions to the *Railway Safety Act*, improved tank car standards, emergency response plans, and a new liability and compensation regime for federally regulated railways. A detailed list of measures can be found at <http://www.tc.gc.ca/eng/mediaroom/infosheets-menu-7564.html>.

The Transportation Safety Board's Recommendation R14-04 specifically addressed the securement of unattended trains and recommended that Transport Canada require Canadian railways to put in place additional physical defences to prevent runaway equipment.

Following the accident, Transport Canada imposed stricter requirements for securing unattended trains by issuing an Emergency Directive under the *Railway Safety Act* requiring railway companies to meet standardized requirements for handbrake application and requiring additional physical defences to secure trains.

Transport Canada approved a strengthened Rule 112 of the *Canadian Rail Operating Rules* in October 2015 respecting train securement. Handbrakes are the first line of defense in preventing equipment from rolling away. Sufficient handbrakes will prevent equipment movement in all weather conditions and over virtually unlimited periods of time. The revised rules provides industry with a comprehensive handbrake application chart to respond to various operating situations, which once applied, must be confirmed by another employee with the appropriate level of knowledge. For example, the rules would require a train weighing between 10,000 and 14,000 tons on a grade of 1% to be secured with 26 hand brakes, in addition to handbrakes on all leading locomotives on the train. In addition to handbrakes, railway equipment must be secured by additional physical means listed in the rules when unattended on main track, siding track, subdivision track and high risk locations. The revised rules provide the additional requirements that have to be met when air brakes are used as the additional means of securement.

Additional funding to increase the safety of the movement of dangerous goods by rail has been allocated to support increased inspection capacity and improved training for stronger and more consistent oversight across the country; enhanced systems for testing, classifying, registering and mapping dangerous goods and their movements, and to support better risk management; increased federal contributions for local investments in safer railway crossings to help prevent accidents; and additional support for first responders to provide better tools and the information required to better protect communities.

Transport Canada's oversight activities include monitoring the safety of railway companies' operations, as well as compliance with rules, regulations and engineering standards through audits and inspections, and taking appropriate enforcement action as required. Oversight of the new rules has been integrated into the oversight plan and continues to be an area of priority. While the new rules are more comprehensive than their predecessors, Railway Safety Inspectors have not found that industry is unclear on the application of the rule. When non-compliance is found, appropriate action is taken.

On April 1, 2015, the new *Administrative Monetary Penalties Regulations* came into force under the *Railway Safety Act*. Administrative monetary penalties are fines issued by Transport Canada to corporations or individuals for contraventions to the *Railway Safety Act*, or regulations and rules made under the Act. A list of Railway Administrative Monetary Penalties issued by Transport Canada can be found at <https://www.tc.gc.ca/eng/railsafety/railsafety-975.html>.

The Transportation Safety Board has reassessed Transport Canada's response to the recommendation on previous occasions. In its reassessment of March 2016 and March 2017, the Transportation Safety Board noted that the number of occurrences involving uncontrolled movement of railway equipment had remained unchanged over the last two years (i.e., 42 occurrences in 2015 and 2016 versus 30 occurrences in 2014). However, both TC and TSB noted that these occurrences covered numerous operational scenarios such as unintentional movement of equipment in railway yards while employees were actively assembling trains. It is also important to note that in a number of cases, railway equipment moved uncontrolled and was stopped by a derail (a device placed on the track to act as an additional means of defence as permitted in Rule 112).

TC and TSB have each put significant effort into analyzing the RODS data regarding uncontrolled movements and each organization has presented the other its data analysis methodology. Discussions continue with the aim of finding a common way to categorize and present the data which can lead to a deeper understanding of the causes.

In correspondence dated December 20, 2016 to Transport Canada, the Transportation Safety Board identified a malfunction of the reset safety control with rollaway protection systems on certain locomotives. Specifically, there was an occurrence reported to the TSB (R16W0242) whereby the rollaway protection on one locomotive did not function as expected and resulted in a train moving for about 1 minute at a speed of about 1 mile per hour for approximately 80 feet.

The existence of this defect condition in other locomotives of the same series was confirmed through additional testing. Given that this defect condition could exist with other locomotive models and could reasonably be expected to result in a situation where a person could be injured and constitutes a threat to safe railway operations, Transport Canada took immediate action and on December 22, 2016 issued an Order pursuant to section 32.01 of the *Railway Safety Act* requiring railway companies to implement certain safety measures regarding the use of reset safety control with rollaway protection. Additionally, and pursuant to section 36 of the *Railway Safety Act*, railway companies were ordered to file with the Minister of Transport certain information regarding locomotive models in service and results of testing on locomotives equipped with rollaway protection.

The department has reviewed the data which has been submitted by railway companies and has met with industry to discuss approaches to modify locomotive control software to address the issues raised. Industry is actively developing revised performance criteria for rollaway protection to address the gaps which have been identified in the current criteria. Following on this work, submissions are expected for amendments to associated rules. Once received, TC will analyze the submissions as per the *Railway Safety Act* to determine if they should be approved.

Transport Canada has taken meaningful actions to address Recommendation R14-04. The department continues to monitor implementation of the rule and to monitor companies for compliance.

Separately, the Railway Association of Canada (RAC) is consulting with affected associations/organizations regarding changes it is proposing to submit to incorporate requirements for exceptional circumstances not otherwise provided for in the previous version of the rule. It is expected RAC will file the revisions with the department by March/April 2018.

March 2018: TSB assessment of the responses (Satisfactory in Part)

Since 2014, Transport Canada has put in place various measures to improve railway safety, including:

- more stringent requirements in the revised rules for the securement of unattended railway equipment, such as additional physical means when unattended on main track, siding track, subdivision track and high-risk locations;
- improved regulations regarding companies' safety management systems;
- regulations prescribing fines for contraventions to the *Railway Safety Act*; and
- a new liability and compensation regime for federally regulated railways.

TC has continued to monitor implementation of CROR Rule 112 and companies for compliance.

In December 2016, after being notified of a locomotive defect relating to securement, TC issued an Order requiring railway companies to file with the Minister of Transport certain information regarding the locomotive models in service and the results of testing on locomotives that are equipped with rollaway protection. After receiving and reviewing the submitted information, TC met with industry to discuss approaches to modify the locomotive control software in order to address the issues raised.

Over the past year, the RAC and industry have been researching rollaway protection application as a secondary line of defence for securement. Upon completion of this work, submissions will be developed to amend the associated rules. TC will review the submitted amendments to determine if they should be approved.

The Board is encouraged that TC took immediate action on the identified locomotive defect, and that various approaches are being assessed to ensure that locomotive rollaway protection can be safely used as secondary line of defence for securement. The Board acknowledges that TC has continued to monitor implementation of CROR Rule 112 and to monitor companies for compliance.

In 2017, there were 62 occurrences involving uncontrolled movements, the second-highest in the past 10 years. When the 10-year average (2008-2017) of 54.1 uncontrolled movements per year is compared to the most recent 5 years (2013-2017),² the average number of uncontrolled

² Prior to 2014, "reportable railway incidents" included occurrences resulting directly from the operation of rolling stock where there is "runaway rolling stock". In 2014, the TSB Regulations were updated, which included a number of revisions and clarifications to reportable occurrences. For example, the term "runaway rolling stock" was changed to "unplanned and uncontrolled movement of rolling stock". Although it was

movements per year increased by 10% to 59.8. 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 responses to Recommendation R14-04 to be **Satisfactory in Part**.

February 2019: response from the Railway Association of Canada

The RAC and industry actively worked with TC to strengthen the securement rule 112. In 2018, the RAC filed revisions to the rule with the Minister. These were approved and went into effect on May 18, 2018. The revised rule is written to make the instructions easier to understand and is restructured to provide a situation-based layout, which will assist compliance. The revision also includes new instructions to guide users on how to respond to occasional exception circumstances that were not otherwise provided for in the previous version of the rule.

In response to an emergency directive, the RAC and industry continue to research rollaway protection application as a secondary line of defense for securement, including conducting a risk assessment and evaluating potential changes to the locomotive safety rules to add defined parameters on the requirements for rollaway technology.

In regard to TSB data, it should be recognized that changes to TSB reporting criteria in 2014 increased the number of occurrences being reported and needs to be considered when making comparisons to the 5-year average. Also, as noted in TSB's latest reassessment, occurrences classified as "uncontrolled movements" include a number of operational occurrences, many of which are low speed or low risk as they occur in locations with safety protections in place.

February 2019: response from Transport Canada

The Transportation Safety Board's Recommendation R14-04 primarily addressed the securement of unattended trains and recommended that Transport Canada require Canadian railways to put in place additional physical defences to prevent runaway equipment.

Following the accident, Transport Canada imposed stricter requirements for securing unattended trains by issuing an Emergency Directive under the *Railway Safety Act* requiring railway companies to meet standardized requirements for handbrake application and requiring additional physical defences to secure trains.

Transport Canada approved a strengthened Rule 112 of the *Canadian Rail Operating Rules* in October 2015 respecting train securement. Handbrakes are the first line of defense in preventing equipment from rolling away. Sufficient handbrakes will prevent equipment movement in all weather conditions and over virtually unlimited periods of time. The rules provides industry with a comprehensive handbrake application chart to respond to various

clarified as to what is considered an "unplanned and uncontrolled movement of rolling stock", the criteria for reporting this type of occurrence remained the same.

operating situations, which once applied, must be confirmed by another employee with the appropriate level of knowledge. In addition to handbrakes, railway equipment must be secured by additional physical means listed in the rules when unattended on main track, siding track, subdivision track and high risk locations. The revised rules provide the additional requirements that have to be met when air brakes are used as the additional means of securement. In 2018, Rule 112 was revised to incorporate requirements for exceptional circumstances not otherwise provided for in the previous version of the rule. The amendments prescribe the specific actions which must be taken when the full application of the requirements of 112 (a) or (b) are not possible in the following scenarios: mechanical defect is encountered enroute, equipment is derailed or coupled to derailed equipment, or separation is required for clearing a crossing for emergency vehicles.

Reset safety control with rollaway protection

In correspondence dated December 20, 2016 to Transport Canada, the Transportation Safety Board identified a malfunction of the reset safety control with rollaway protection systems on certain locomotives. Specifically, there was an occurrence reported to the TSB (R16W0242) whereby the rollaway protection on one locomotive did not function as expected and resulted in a train moving for about 1 minute at a speed of about 1 mile per hour for approximately 80 feet.

The existence of this defect condition in other locomotives of the same series was confirmed through additional testing. Given that [t]his defect condition could exist with other locomotive models and could reasonably be expected to result in a situation where a person could be injured and constitutes a threat to safe railway operations, Transport Canada took immediate action and on December 22, 2016 issued an Order pursuant to section 32.01 of the *Railway Safety Act* requiring railway companies to implement certain safety measures regarding the use of reset safety control with rollaway protection. Additionally, and pursuant to section 36 of the *Railway Safety Act*, railway companies were ordered to file with the Minister of Transport certain information regarding locomotive models in service and results of testing on locomotives equipped with rollaway protection.

TC reviewed the submissions filed by companies and observed some of the testing conducted by companies. It was determined that various alert systems exist with different configurations and performance requirements, depending on the type, the manufacturer specifications and companies' setting preferences. Testing demonstrated that speed activation for the rollaway protection functionality, ranged from 0.5 mph to 4 mph. Testing also showed that the system would automatically reset itself when speed activation had been reached but then dropped below the pre-set threshold during the timeout period (when topography could cause the movement to decelerate for instance). Finally, railways are currently testing their safety control systems to verify rollaway protection functionality.

In recognition of these issues, industry has been working to develop new technology and conducted analyses to support a revision to the *Railway Locomotive Inspection and Safety Rules* which would contain the design specification, performance, inspection and testing

requirements specific for locomotives equipped with rollaway protection technology. However this work is not yet completed.

Uncontrolled movements of railway equipment

Railway companies are required to report occurrences to the TSB in accordance with the requirements in the *Transportation Safety Board Regulations*. One category of occurrences which must be reported is the unplanned and uncontrolled movement of rolling stock. Uncontrolled movement is a broad category of occurrences that captures a number of situations that while similar, vary by cause, circumstances and risk. However, it is important to note that few uncontrolled movements are related to the securement of unattended equipment and that they occur most often in yards, for example, when railway employees are making-up trains.

The TSB has provided TC with the number of occurrences it has determined to be an uncontrolled movement.

Actions taken by Transport Canada

Transport Canada reviews all occurrence data provided by TSB and follow-ups with railway companies as required to gather information which can lead to a deeper understanding of the causes.

In TC's analysis of the data, the following has been determined:

| Year | Total Carloads originating in Canada* (thousand) | Total Occurrences ** | Number of Cars Involved | | | Number of Occurrences Involving Dangerous Goods (none involved the release of DGs) | Location of Occurrence | | | Investigated by TSB |
|------|--|----------------------|-------------------------|----|----------|--|------------------------|----------------|------|---------------------|
| | | | 1-5 | >5 | Un-known | | Main Track | Non-Main Track | Yard | |
| 2015 | 4,831 | 58 | 42 | 15 | 1 | 14 | 1 | 12 | 45 | 2 |
| 2016 | 4,846 | 51 | 26 | 23 | 2 | 10 | 2 | 11 | 38 | 4 |
| 2017 | 5,225 | 62 | 39 | 20 | 3 | 18 | 5 | 9 | 48 | 2 |
| 2018 | - | 65 | 60 | 5 | 0 | 14 | 4 | 14 | 47 | 4 |

* Source: Rail Trends 2018 Published by The Railway Association of Canada. Accessed at www.railcan.ca

** Source: Transportation Safety Board

Both TC and TSB noted that these occurrences covered numerous operational scenarios with the majority occurring in yards while employees were actively assembling trains. The number of uncontrolled movements has remained relatively static over the last four years despite an increase in rail traffic. It is also important to note that in a number of cases, railway equipment

moved uncontrolled and was stopped by a derail (a device placed on the track to act as an additional means of defence as permitted in Rule 112).

Railway Operating Employees work in a dynamic environment, where human error can cause occurrences due to a combination of factors such as knowledge, experience, and supervision. The risk of accident or injury caused by human factors is not easily addressed by the regulator. Given there is no one measure that can address the numerous scenarios which can result in an uncontrolled movement of railway equipment, TC continues to take action in the following areas:

Oversight of railways and enforcement of regulatory requirements with respect to uncontrolled movements

Transport Canada's oversight activities include monitoring the safety of railway companies' operations, as well as compliance with rules, regulations and engineering standards through audits and inspections. TC has a number of enforcement tools and takes appropriate action in cases where non-compliance or safety concerns are found. For the occurrences of uncontrolled movements in 2017, TC issued 6 letters of non-compliance and a letter of warning for violations of the CROR. In addition, TC issued a Notice of Violation under the *Railway Safety Administrative Monetary Penalties Regulations*. In 2018, TC issued a Notice in response to one occurrence and a Notice and Order in response to two other occurrences. A complete list of enforcement action and measures to mitigate threats to rail safety is available at: <https://www.tc.gc.ca/eng/railsafety/railsafety-569.htm>.

In response to uncontrolled movement of an attended train which resulted in the fatalities of three crew members, and given the exact cause of the accident is still under investigation by the TSB, and as a precaution to prevent further accidents in similar circumstances, TC issued a ministerial order under the *Railway Safety Act* to all railway companies mandating the use of handbrakes should a train be stopped on a mountain grade after an emergency use of the air brakes.

Employee knowledge and experience in safe train operations

Transport Canada continues its work to ensure the operating employee training and qualification policy framework is up-to-date, effective, and reflective of the needs of an evolving and dynamic railway industry. The department is working toward a regulatory proposal in the *Canada Gazette*, Part I in early 2020.

In addition, in 2018, TC developed a guideline for remote control locomotive (RCL) systems. The guideline is informed by work conducted by TC from 2016-2018, which was presented to members of the Advisory Council on Railway Safety. TC examined areas such as qualification/training/experience, mitigating measures to reduce the risk of accidents or incidents, mainline operation, train speed and crew size. TC also conducted industry site visits (where operating procedures and training programs were observed), and reviewed Transportation Safety Board (TSB) occurrence data and United States regulatory requirements

and guidance. The guideline recommends that railways take actions including establishing common standards to be implemented by all railway in two key areas: training and qualification of employees and RCL operation. This guideline has been provided to stakeholders for comment and will be finalized early in 2019.

In conclusion, Transport Canada has taken meaningful actions to address Recommendation R14-04. The department continues to monitor implementation of the rule and to monitor companies for compliance. In addition, TC continues to work with stakeholders [to] take action to reduce the number of uncontrolled movements.

March 2019: TSB assessment of the responses (Satisfactory in Part)

To gain a deeper understanding of the causes of uncontrolled movements, Transport Canada (TC) reviewed all TSB-reportable occurrences of this type and followed up with the railway companies as required. As there is no one measure that can address the numerous scenarios involving uncontrolled movements, TC continued to take action in the following areas:

- In 2018, CROR Rule 112 was revised to incorporate requirements for exceptional circumstances not otherwise provided for in the previous version of the rule. The amendments prescribe the specific actions to be taken if the full application of Rule 112(a) or Rule 112(b) is not possible in the following scenarios: mechanical defect is encountered en route, equipment is derailed or coupled to derailed equipment, or separation is required for clearing a crossing for emergency vehicles.
- TC's oversight activities (through inspections and audits) included the monitoring of railway companies' operations with respect to compliance with rules and regulations that relate to uncontrolled movements.
- TC has a number of enforcement tools and takes appropriate action in cases where non-compliance or safety concerns are found. In 2018, TC issued a Notice in response to one occurrence and a Notice and Order in response to two other occurrences.
- In February 2019, in response to the uncontrolled movement of an attended train that resulted in 3 crew member fatalities, TC issued a ministerial order to all railway companies mandating the use of hand brakes should a train be stopped on a mountain grade after an emergency use of the air brakes.
- TC continued its work to ensure that the operating employee training and qualification policy framework is up to date and effective. TC is working toward a regulatory proposal to be published in the *Canada Gazette*, Part I in early 2020.
- In 2018, TC developed a guideline for remote control locomotive (RCL) systems. This guideline was provided to stakeholders for comment and is expected to be finalized in early 2019.

In addition to TC's actions, the Railway Association of Canada and industry has continued to research rollaway protection applications as a secondary line of defence for securement, including conducting a risk assessment and evaluating potential changes to the locomotive safety rules to add defined parameters on the requirements for rollaway technology.

In 2018, there were 66 occurrences involving uncontrolled movements, the second-highest in the past 10 years. Uncontrolled movements continue to pose a risk to the rail transportation system. Despite actions taken, the current defences do not seem sufficient to reduce the number of uncontrolled movements and improve safety. Therefore, the Board considers the responses to Recommendation R14-04 to be **Satisfactory in Part**.

December 2019: response from the Railway Association of Canada

We want to reiterate that regarding the TSB data, it should be recognized that changes to TSB reporting criteria in 2014 increased the number of occurrences being reported and needs to be considered when making comparisons to the 5-year average. Also, as noted in TSB's latest reassessment, occurrences classified as "uncontrolled movements" include a number of operational occurrences, many of which are low speed or low risk as they occur in locations with safety protections in place.

However, the Railway Association of Canada (RAC) and industry, in consultation with Transport Canada (TC), are currently working on revising the relevant section of the *Railway Locomotive and Safety Rules* (the Rules), to properly cover the use, inspection and testing of safety control system with rollaway protection application as a secondary line of defense for securement. RAC and industry are expecting to file proposed changes to the Rules in Q1-2020.

December 2019: response from Transport Canada

Train securement and the prevention of uncontrolled movements continue to be important areas of Transport Canada's oversight of railway companies.

Transport Canada's approach to uncontrolled movements consists of following key elements:

1. Following-up on TSB Occurrence data to gather additional information
 - Rail Safety has a follow-up procedure to provide inspectors with clear guidance when to follow-up on TSB occurrences and what information to collect
2. Conducting inspections to operating rules
 - Inspections in yards, inspection of crews on the road, inspection of secured equipment
3. Examining the data for trends
4. Taking additional actions based on data analysis and findings of follow-ups, results of inspections, and in response to high-risk occurrences.

Transport Canada reviews all occurrence data provided by TSB. The following table provided the key points from the review of preliminary 2019 data.

| Year | Total | Number of Cars Involved | | | DGs | Location of Occurrence | | | Stopped by Derail | TSB Investigated |
|------|-------|-------------------------|----|----------|-----|------------------------|----------------|------|-------------------|------------------|
| | | ≤5 | >5 | Un-known | | Main Track | Non-Main Track | Yard | | |
| 2015 | 58 | 42 | 15 | 1 | 14 | 1 | 12 | 45 | - | 2 |
| 2016 | 51 | 26 | 23 | 2 | 10 | 2 | 11 | 38 | 13 | 4 |
| 2017 | 62 | 39 | 20 | 3 | 18 | 5 | 9 | 48 | 12 | 2 |
| 2018 | 66 | 63 | 3 | 0 | 15 | 5 | 14 | 47 | 16 | 4 |
| 2019 | 72 | 66 | 6 | 0 | 14 | 3 | 18 | 51 | 14 | 1 |

Additionally, TC has broken uncontrolled movements into 7 subcategories which allow TC to better understand the circumstances in which the events are occurring. The 72 occurrences in 2019 (preliminary data) can be categorized as follows:

- Switching – Yard: 40
- Switching – En route: 9
- Mechanical failure: 11
- Third party (customer) loading procedures: 1
- Vandalism: 7
- Severe weather conditions: 2
- Loss of control: 2

The data show that uncontrolled movements occur in a wide variety of scenarios and that multiple causal factors can lead to this type of occurrence. In looking at the 2019 data:

- the majority of uncontrolled movements (71%) occurred in yards,
- occurrences generally involved fewer than five cars,
- 3 occurrences were on main track (one is being investigated by the TSB (CP derailment in Field BC, in Feb 2019). TC is conducting an investigation under the *Canada Labour Code*). Fourteen uncontrolled movements were stopped by a derail.

Further, in TC's review of the occurrences shows that rule violations are not a significant cause of occurrences but that human factors are a key consideration. Many uncontrolled movements occur when employees are active conducting switching operations. Switching can be conducted using a traditional locomotive engineer and conductor or two conductors using remote control locomotive. Switching may also include kicking cars – i.e., the release of cars under their own momentum allowing them to roll freely into classification tracks. Contributing factors which need further consideration include: loss of situational awareness, years of experience (newer employees tend to work in yards and high staff turnover can lead to inexperienced workers being paired), supervision, training, workload, and fatigue.

There are few occurrences on main track; however, they are higher risk involving more cars, higher speeds, and public crossings.

Transport Canada continues to respond to emerging situations related to train securement: to determine whether there are gaps in the regulatory regime, to determine whether additional guidance is required, to conduct analysis to support regulatory changes, and to take enforcement action as required.

- Addressing identified gaps in the regulatory regime or in guidance material
 - Policy work currently underway to amend the *Railway Employee Qualification Standards Regulations*. The anticipated new requirements would reflect changes in the evolving railway industry, and cover elements such as new occupational categories and minimum qualification standards for employees, instructors and examiners. The department is working toward a regulatory proposal in the *Canada Gazette*, Part I in 2021.
 - In 2019, a remote control locomotive (RCL) guideline was published on the department's website (<https://www.tc.gc.ca/eng/railsafety/guideline-78.html>). It recommends that railways take actions in areas such as training and qualification of employees in RCL operation.

In recognition of issues raised by Transport Canada, industry has been working to revise the *Railway Locomotive Inspection and Safety Rules* for requirements specific for locomotives equipped with rollaway protection. Industry has provided additional information to support analysis of the issue and Transport Canada will determine its next steps regarding regulatory action once it has been assessed.

- Conducting analysis
 - TC engaged outside expertise to respond to the two TSB rail safety advisory letters issued to TC following occurrence R19C0015 in February 2019 to assess the securement of trains on high descending grades. TC has been in discussions with industry to establish permanent rules governing trains stopped in emergency on heavy and mountain grades.
 - Reviewing data from yard occurrences of uncontrolled movements to determine whether additional rules could be effective in reducing the number of occurrences.
- Responding to emerging situations
 - On February 8, 2019, TC issued a ministerial order that required railways to secure a train with handbrakes when stopped in emergency on a mountain grade.
 - Inspectors use the compliance and safety tools in the *Railway Safety Act* in response to occurrences and to address non-compliance or a threat to safety uncovered during an inspection.

March 2020: TSB assessment of the responses (Satisfactory in Part)

Transport Canada's (TC) approach to uncontrolled movements consists of 4 elements:

- Following up on TSB occurrence data to gather additional information
- Conducting operating rules compliance inspections
- Examining the data for trends

- Taking additional actions based on data analysis and findings of follow-ups, results of inspections, and in response to high-risk occurrences.

Based on examining data trends, TC responds to emerging situations related to train securement. These follow-up activities help determine whether there are gaps in the regulatory regime, whether additional guidance is required, and whether to take enforcement action.

In 2019, TC and industry made progress in a number of areas including the following:

- TC continued its work to amend the *Railway Employee Qualification Standards Regulations*. The anticipated new requirements will reflect changes in the evolving railway industry, and cover elements such as new occupational categories and minimum qualification standards for employees, instructors and examiners. The department is working toward a regulatory proposal in the *Canada Gazette*, Part I in 2021.
- A remote control locomotive (RCL) guideline was published on the department's website (<https://www.tc.gc.ca/eng/railsafety/guideline-78.html>). The guideline recommends that railways take actions in areas such as training and qualification of employees in RCL operation.
- Industry has continued its work to revise the *Railway Locomotive Inspection and Safety Rules* for requirements specific to locomotives equipped with rollaway protection. Industry has provided additional information to support analysis of the issue and TC will determine its next steps regarding regulatory action once it has been assessed.
- On 08 February 2019, TC issued a ministerial order requiring railways to secure a train with hand brakes when stopped in emergency on a mountain grade.
- TC has been in discussions with industry to establish permanent rules governing trains stopped in emergency on heavy and mountain grades.

In 2019, there were 78 occurrences of uncontrolled movements involving rolling stock, the highest in the past 10 years. Uncontrolled movements continue to pose a risk to the rail transportation system. Despite actions taken, the current defences have not been sufficient to reduce the number of uncontrolled movements to improve safety.

Therefore, the Board considers the responses to Recommendation R14-04 to be **Satisfactory in Part**.

January 2021: response from the Railway Association of Canada

The Railway Association of Canada (RAC) and industry, in consultation with Transport Canada (TC), submitted to TC in June 2020, a proposed revision to the relevant section of the *Railway Locomotive and Safety Rules* (the Rules), to properly cover the use, inspection and testing of safety control system with rollaway protection application as a secondary line of defense for securement. The RAC is looking forward to receiving a positive response from TC to its proposed changes to the Rules.

Also, early in 2020, the RAC and industry filed with TC a new proposed rule for train securement on a mountain grade. This new rule was approved by TC in April 2020 and is now in effect. This will bring additional improvement to train securement when operating in a mountain grade territory.

Finally, the RAC and an industry working group were in the process of updating the *Canadian Rail Operating Rules* (CROR) to address areas identified for clarifications and improvements. One of those areas was the switching operations. However, in September 2020, TC issued a Ministerial Order requiring railway companies, and local railway companies to revise the CROR to incorporate provisions governing switching operations. The RAC and industry accelerated the development of these switching provisions within the CROR, and plan to file the switching provisions with TC by June 1st, 2021.

January 2021: response from Transport Canada

Train securement and the prevention of uncontrolled movements continue to be important areas of Transport Canada's oversight of railway companies. For example, in May 2018, Rule 112 of the *Canadian Rail Operating Rules* (CROR) was updated to establish stronger safety requirements and ensure a consistent approach to industry-wide securement.

Building on this progress, Transport Canada continues to monitor TSB's data on uncontrolled movements and is taking a multi-faceted approach to addressing this serious issue. Transport Canada's analysis of TSB data has identified that the majority of uncontrolled movements occur in yards and that switching activities was the primary cause of all uncontrolled movements (primarily categorized as switching without air by the TSB). To address this issue, Transport Canada has taken considerable action:

- On October 8, 2020, a Ministerial Order was issued to railway companies to revise the CROR to codify processes, procedures and criteria to reduce the safety risks when conducting switching operations and reduce the incidence of uncontrolled movements during switching activities.
- In April 2020, Rule 66 of the *Canadian Rail Operating Rules* was approved by TC to ensure that effective safety procedures are applied to all trains that come to emergency stops on heavy and mountain grades. TC also issued a Ministerial Order that requires railway companies to report to Transport Canada all occurrences requiring emergency stops on grades.
- Work with the Railway Association of Canada is ongoing to support a revision to the *Railway Locomotive Inspection and Safety Rules* which would contain the design specification, performance, inspection and testing requirements specific for locomotives equipped with rollaway protection technology.
- Consultations on proposed amendments to the *Railway Employee Qualification Standards Regulations* will be launched by March 2021.

March 2021: TSB assessment of the responses (Satisfactory in Part)

This recommendation is related to the TSB Watchlist 2020 key safety issue of “Unplanned/uncontrolled movements of rail equipment” that create high-risk situations that may have catastrophic consequences. It is also linked to Recommendation R20-01, in which the Board recommended that “the Department of Transport work with the railway industry and its labour representatives to identify the underlying causes of uncontrolled movements that occur while switching without air, and develop and implement strategies and/or regulatory requirements to reduce their frequency.”

Transport Canada (TC) continues to oversee and monitor train securement rules compliance by railway companies. According to TC, the update to Rule 112 of the *Canadian Rail Operating Rules* (CROR) in 2018 has contributed to establishing stronger safety requirements and a consistent approach to industry-wide securement.

TC also continues to monitor the TSB data related to uncontrolled movements, which indicate that, over the last 10 years, 70% of the uncontrolled movements occurred in yards, primarily as a result of switching activities without the use of air brakes.

As a result of its analysis of the data, in April 2020, TC approved CROR Rule 66, a new rule to ensure that effective safety procedures are applied to all trains that come to emergency stops on heavy and mountain grades. Furthermore, on 08 October 2020, TC issued a ministerial order requiring railways to revise the CROR in order to reduce safety risks and reduce the incidence of uncontrolled movements during switching activities. Following the issuance of this Order, the Railway Association of Canada (RAC) and industry have accelerated their efforts toward updating the switching provisions within the CROR, which are planned to be filed with TC by 01 June 2021.

Finally, TC plans to launch consultations in March 2021 for proposed amendments to the *Railway Employee Qualification Standards Regulations*.

The RAC and industry, in consultation with TC, submitted to TC, in June 2020, a proposed revision to the relevant section of the *Railway Locomotive and Safety Rules* (the Rules) to properly cover the use, inspection and testing of safety control systems with rollaway protection application as a secondary line of defence for securement. The RAC is looking forward to receiving a positive response from TC to its proposed changes to these Rules.

In 2020, there were 50 reported occurrences of uncontrolled movements involving rolling stock. However, the 2020 data also indicate an overall reduction in the total number of occurrences reported to the TSB, which was likely influenced by the impact of COVID-19 on the transportation industry and other disruptions in service.

Despite actions taken, the current defences have not been sufficient to significantly reduce the number of uncontrolled movements to improve safety. Until the consultations with the railway industry and its labour representatives have occurred, strategies have been developed and physical defences are implemented, uncontrolled movements will continue to pose a risk to the

rail transportation system. Therefore, the Board considers the responses to Recommendation R14-04 to be **Satisfactory in Part**.

November 2021: response from the Railway Association of Canada

The Railway Association of Canada (RAC) and the railway industry have been actively working on initiatives aimed at reducing and controlling risk associated with “runaway equipment”.

These initiatives include:

1. In 2020, the Railway Association of Canada (RAC) and the railway industry filed with TC a new proposed rule for train securement on a mountain grade. This new rule was approved by TC in April 2020 and is now in effect. This brings additional improvement to train securement when on a mountain grade.
2. In September 2020, TC issued MO 20-09 requiring railway companies and local railway companies to revise the *Canadian Rail Operating Rules* (CROR) to incorporate provisions governing switching operations. CROR were revised and filed with the Minister on June 1, 2021. These rules were approved by the Minister on July 29, 2021 and came into effect on October 28, 2021.
3. The RAC and industry, in consultation with TC, submitted to TC in June 2020 a proposed revision to the relevant sections of the *Railway Locomotive Inspection and Safety Rules* to properly cover the use, inspection and testing of safety control systems with rollaway protection as a secondary means of securement. On March 10, 2021, TC issued MO 21-02 requiring amendments to the *Railway Locomotive Inspection and Safety Rules* as well as the CROR to set performance standards for locomotives equipped with roll-away protection, and revisions that will clarify when a train is unattended and must be secured as per the rules. The new proposed rules are to be filed with the Minister by March 10, 2022.
4. Also on March 10, 2021, TC issued MO 21-01 requiring railway companies and local railway companies to immediately implement safety measures designed to ensure that an accident caused by the unintentional release of the air brakes does not occur.
5. The RAC, railway industry, Transport Canada and the Transportation Safety Board of Canada, have established the Rail Data Working Group (RDWG). The RDWG works to address selected data issues and improve reporting and presentation of rail safety statistics. Among the current priorities of the RDWG is work to improve the requirements relating to reporting and categorization of uncontrolled movements.

December 2021: response from Transport Canada

Train securement and prevention of uncontrolled movements continues to be a top priority for Transport Canada’s rail safety oversight regime, and the department is committed to full implementation of this recommendation. To address this serious issue, Transport Canada has taken considerable action in several key areas:

Performance of brake systems:

- In May 2018, Rule 112 of the *Canadian Rail Operating Rules* (CROR) was updated to establish stronger safety requirements and ensure a consistent industry-wide approach to securement.
- In April 2020, Rule 66 of the *Canadian Rail Operating Rules* was approved by TC to ensure that effective safety procedures are applied to all trains that come to emergency stops on heavy and mountain grades. Transport Canada also issued a Ministerial Order that requires railway companies to report to Transport Canada all occurrences requiring emergency stops on grades.
- To complement these measures, Transport Canada requires companies (through MO 20-08, issued April 27, 2020 and MO 21-04, issued July 30, 2021) to report instances of emergency brake applications (EBAs) and their circumstances to the department to better understand and identify measures to address the risks stemming from these occurrences. Renewal of this Order enables the department to gather information concerning emergency brake applications, which will inform the department's way forward in this area (to date, the relatively small amount of data means it is too soon to establish trend analysis).
- Transport Canada has been actively engaged with Canada Pacific on the implementation of their automated brake effectiveness technology using wheel temperature detectors to measure how well air brakes on rail cars are working throughout a trip that would lead to earlier and more accurate detection of defective brakes. In November 2020, Transport Canada approved an exemption to the *Railway Freight and Passenger Train Brake Inspection and Safety Rules* that would allow these detectors to be used on CP's unit grain trains operating between Western Canada and Ports in Vancouver.

Uncontrolled movements during switching activities:

- On September 29, 2020, the department issued Ministerial Order (MO) 20-09 to revise the CROR to codify processes, procedures and criteria to reduce the safety risks when conducting switching operations and reduce the incidence of uncontrolled movements during switching activities.
- Building on the progress, Transport Canada issued two Ministerial Orders on March 10, 2021 to address the risks to safety posed by uncontrolled movements:
 - MO 21-01 requires railway companies to implement safety measures to prevent unintentional release of air brakes; and
 - MO 21-02 requires railway companies to amend the CROR and *Railway Locomotive Inspection and Safety Rules* to set performance standards for locomotives equipped with rollaway protection.

Physical defences to prevent runaway equipment:

Work is underway with the Railway Association of Canada to implement the Ministerial Orders (MO 21-01 and MO 21-02) – revisions to the *Railway Locomotive Inspection and Safety Rules* and the *Canadian Rail Operating Rules* must be submitted to the Minister by March 10, 2022 and will

incorporate more specific design and performance parameters for locomotives equipped with rollaway protection technology and clarify the definition of attended versus unattended equipment. Ultimately, these revisions will strengthen the system of physical defences against uncontrolled movements. Building on this work, the department will:

- Conduct a review of international train securement practices, with an emphasis on safety measures on mountainous terrain (2022);
- Conduct testing of available braking technology, with a specific focus on effectiveness in winter conditions (2022/23); and
- Continue analysis of emergency brake applications report by the railways to assess the underlying factors and identify options to address them.

March 2022: TSB assessment of the responses (Satisfactory in Part)

This recommendation is related to the TSB Watchlist 2020 key safety issue of “Unplanned/uncontrolled movements of rail equipment” that create high-risk situations that may have catastrophic consequences. It is also linked to Recommendation R20-01, in which the Board recommended that “the Department of Transport work with the railway industry and its labour representatives to identify the underlying causes of uncontrolled movements that occur while switching without air, and develop and implement strategies and/or regulatory requirements to reduce their frequency.”

Transport Canada (TC) is pursuing its efforts to reinforce train securement rules in order to prevent uncontrolled movements. Following measures undertaken since 2018, TC issued ministerial orders requiring companies to report instances of emergency brake applications on heavy and mountain grades to better understand and identify measures to address risks arising from that type of occurrence.

TC is also involved with Canadian Pacific Railway Company in the implementation of its automated brake effectiveness technology that uses wheel temperature detector data, which could lead to a more accurate detection of defective brakes on freight cars.

Regarding uncontrolled movements during switching activities, TC issued 2 additional ministerial orders during the last year, requiring railway companies to implement additional safety measures to prevent unintentional releases of air brakes and requiring railway companies to amend the CROR and *Railway Locomotive Inspection and Safety Rules* to set performance standards for locomotives equipped with rollaway protection. The Board notes that efforts for the implementation of these orders are currently under way with the RAC and are required to be submitted to the Minister by March 2022.

In 2021, there were 50 reported occurrences of uncontrolled movements involving rolling stock, similar to the number for 2020 (51). Although the 2021 data (as well as the 2020 data) indicate a reduction in the number of occurrences of uncontrolled movements as compared to previous years, it is unknown what influence the impact of COVID-19 on the transportation industry and other disruptions in service may have had.

The TSB, TC, RAC, and the railway industry established the Rail Data Working Group; the Board is hopeful that this initiative will lead to improved rail occurrence reporting and rail statistics.

Until TC's consultations with the railway industry and its labour representatives have been completed, strategies have been developed, and physical defences are implemented, uncontrolled movements will continue to pose a risk to the rail transportation system.

Therefore, the Board considers the responses to Recommendation R14-04 to be **Satisfactory in Part**.

December 2022: response from Transport Canada

Train securement and prevention of uncontrolled movements continue to be a top priority for Transport Canada's rail safety program, and the department is committed to full implementation of this recommendation.³

To address this serious issue, Transport Canada has taken considerable action in several key areas:

Ministerial Orders previously issued to address uncontrolled movements have resulted in the following permanent rule changes:

- In April 2020, Rule 66 of the *Canadian Rail Operating Rules* (CROR) was approved by TC to ensure that effective safety procedures are applied to all trains that come to emergency stops on heavy and mountain grades. This rule change is currently in force. Transport Canada also issued a Ministerial Order that requires railway companies to report to Transport Canada all occurrences requiring emergency stops on grades.
- In October 2021, Rules 113-113.7 of the CROR were updated and added to establish procedures and criteria to reduce the safety risks when conducting switching operations and reduce the incidence of uncontrolled movements during switching activities. Rule 70 implemented speed restrictions when switching is conducted with a remotely controlled locomotive. These rule changes are currently in force.
- In May 2022 the Department approved additional changes to the CROR with the addition of Rule 109 which establishes the duties required of the locomotive engineer when temporarily exiting the controlling locomotive cab on a standing movement. Rule 112 was also amended to clarify when equipment is considered unattended. This rule change is currently in force.
- In May 2022, the *Railway Locomotive Inspection and Safety Rules* were revised to strengthen requirements that must be met for a controlling locomotive equipped with a safety control system with roll-away protection, including how and when the system

³ All responses are those of the stakeholders to the TSB in written communications and are reproduced in full. The TSB corrects typographical errors and accessibility issues in the material it reproduces without indication but uses brackets [] to show other changes or to show that part of the response was omitted because it was not pertinent.

must activate. The revisions also provide for a comprehensive testing scheme to ensure the rollaway system is functioning as intended. This rule change is currently in force; however, some elements which required changes to equipment have a later coming into force date.

Preliminary data from the TSB for 2022 (43 occurrences as of Nov 11) shows the number of uncontrolled movements for 2022 is on track to be the lowest since 2010 and is showing a continued downward trend since 2020. The department is encouraged by these improvements and is continuing to analyze the occurrence data to understand how the measures taken have impacted the number of occurrences.

As previously reported, TC has gathered information concerning emergency brake applications that occurred between July 1, 2020, and September 1, 2022, this through Ministerial Orders MO20-08 and MO21-04. TC Rail Safety will be engaging with both the Transportation Safety Board (TSB) and the Railway Association of Canada (RAC) through the existing tripartite Data Working Group, to discuss the results and to suggest next steps.

Recognizing the effects winter conditions can have on brakes, and as part of TC comprehensive response to R22-02 (which required a schedule for the installation of automatic parking brakes on freight cars, prioritizing unit trains in mountain grade territory), TC has established a research contract with the National Research Council Canada to evaluate the cold weather performance of freight car air brake systems used in the Canadian railway industry. The main goal of this research is to better understand the performance and operations of freight car air brakes under controlled and repeatable cold weather conditions.

TC continues to take broad measures through analysis of data and information gathered from industry, oversight by inspectors, rule changes and research on identified issues which are showing positive results through a decrease in the number of occurrences.

January 2023: response from the Railway Association of Canada

In addition to the update provided in November, 2021:

1. The RAC and industry, in consultation with TC, submitted to TC in June 2020 a proposed revision to the relevant sections of the *Railway Locomotive [Inspection] and Safety Rules* to properly cover the use, inspection and testing of safety control systems with rollaway protection as a secondary means of securement. On March 10, 2021, TC issued MO21-02 requiring amendments to the *Railway Locomotive Inspection and Safety Rules* as well as the CROR to set performance standards for locomotives equipped with roll-away protection, and revisions that will clarify when a train is unattended and must be secured as per the rules. The new proposed rules were due to be filed with the Minister by March 10, 2022.

Also on March 10, 2021, TC issued MO21-01 requiring railway companies and local railway companies to immediately implement safety measures designed to ensure that an accident caused by the unintentional release of the air brakes does not occur.

On March 10, 2022, the RAC filed amendments to the *Railway Locomotive Inspection and Safety Rules* as well as the CROR in response to MO21-02. The amendment to the CROR also included the changes that had previously been implemented to comply with MO21-01.

On May 9, 2022, Transport Canada approved the amendments to the *Railway Locomotive Inspection and Safety Rules* as well as the CROR. The new rules came into force on October 1, 2022.

2. The RAC, industry, Transport Canada and the Transportation Safety Board of Canada, have established the Rail Data Working Group (RDWG). The RDWG works to address selected data issues and improve reporting and presentation of rail safety statistics. Among the current priorities of the RDWG is work to improve the requirements relating to reporting and categorization of uncontrolled movements.

The industry, through the Rail Data Working Group, has proposed to the TSB changes to the occurrence categories of uncontrolled movements that, if implemented, would allow for better trend analyses of the underlying causes of uncontrolled movements. The industry and TSB have agreed to a trial period until the year-end of 2022 in which the industry provides examples of reports which should reside within the new proposed categories.

3. On July 25, 2022 TC issued MO22-04 in response to TSB Recommendation R22-01 of Investigation Report R19C0015 which requires, “that the [Department of Transport] establish enhanced test standards and [time-based maintenance requirements for] brake cylinders on freight cars operating on steep descending grades in cold ambient temperatures”. The MO requires federal and provincial railways to revise the Railway Freight and Passenger Train Brake Inspection and Safety Rules (TBR) to reduce the risk posed to train operations in cold weather.

The MO is in two phases. Phase 1 applies to all railways and filing was due November 30, 2022. Phase 2 applies to freight cars operating on steep descending grades in cold ambient temperatures and filing is due May 31, 2023.

On November 30, 2022 the RAC filed an amendment to the *Railway Freight and Passenger Train Brake Inspection and Safety Rules* (TBR) in regard to Phase 1 of the MO. The Minister has 60 days to respond.

The RAC intends to file a further amendment to the TBR by May 31, 2023 in regard to Phase 2 of the MO.

4. On July 25, 2022 TC and the industry began assembling a working group to assess the readiness, effectiveness and safety implications of automatic parking brakes (APB), especially in the context of cold weather operations. The working group is currently establishing a Terms of Reference and scope of work.

March 2023: TSB assessment of the response (Satisfactory in Part)

This recommendation is related to the TSB Watchlist 2022 key safety issue of “Unplanned/uncontrolled movements of rail equipment” that create high-risk situations that may have catastrophic consequences. It is also linked to the following recommendations:

- Recommendation R20-01, in which the Board recommended that “the Department of Transport work with the railway industry and its labour representatives to identify the underlying causes of uncontrolled movements that occur while switching without air, and develop and implement strategies and/or regulatory requirements to reduce their frequency.”
- Recommendation R22-02, in which the Board recommended that “the Department of Transport require Canadian freight railways to develop and implement a schedule for the installation of automatic parking brakes on freight cars, prioritizing the retrofit of cars used in bulk commodity unit trains in mountain grade territory.”

Despite the actions taken to improve safety and prevent uncontrolled movements, the trend of uncontrolled movements between 2010 and 2019 was on an upward trajectory, with a peak of 78 occurrences in 2019. Although the 2020 to 2022 data indicate a reduction in the number of such occurrences as compared to previous years, there is no statistically significant trend. Furthermore, this decrease may be due in part to the impact of COVID-19 on the rail industry as well as other disruptions to service in 2020 and 2021. In 2022, there were 52 uncontrolled movements; this number is slightly below the average for 2010 to 2022 (57) and similar to the number of occurrences in 2020 and 2021 (51 and 50, respectively).

In its response, Transport Canada (TC) indicated that it is committed to full implementation of this recommendation. In the 2020 to 2022 timeframe, TC approved several changes to the *Canadian Rail Operating Rules*, including the approval of new Rule 66 in April 2020, updates and additions to Rules 113-113.7 in October 2021, and new Rule 109 in May 2022. In May 2022, the *Railway Locomotive Inspection and Safety Rules* were also revised.

In addition, in response to TSB Recommendation R22-02, TC has established a research contract with the National Research Council Canada to evaluate the cold weather performance of freight car air brake systems used in the Canadian railway industry.

TC is continuing to analyze data and information gathered from industry, oversight by inspectors, rule changes, and research on identified issues to understand how the measures taken have affected the number of occurrences.

The Board recognizes the efforts and actions by TC. Although there are expected to be safety benefits with the rule changes, the Board cautions that the defence in-depth concept of system safety design cannot be satisfied solely through additional layers of administrative defences. TSB Recommendation R14-04 specifically focuses on additional physical defences. It is only through the use of additional layers of physical defences that the risk of runaway equipment can be effectively mitigated. Therefore, the Board considers TC’s response to Recommendation R14-04 to be **Satisfactory in Part**.

December 2023: response from Transport Canada

Addressing the multi-faceted issue of uncontrolled movement of railway equipment remains a priority for Transport Canada (TC), including ensuring that current physical defences are effective. To this end, the department has not only strengthened its regulatory framework to minimize the risk associated with uncontrolled movements, but has also made substantial strides in researching technology aimed at mitigating this risk. Other important elements, such as human factors and training, must be considered as an integral component to any effective mitigation strategy to address the issue of uncontrolled movements resulting in runaway equipment.

On July 25, 2022, TC issued Ministerial Order MO 22-04, mandating a two-phase submission of revisions to the *Railway Freight and Passenger Train Brake Inspection and Safety Rules* by the railway industry. The primary objective of these measures was to mitigate the risk of uncontrolled movements, fostering nationally consistent standards for enhanced air brake performance. The updates codify performance standards and will ensure that air brakes are more effective at preventing uncontrolled movements, including in cold weather. More specifically, Phase 1 of the revisions, approved by TC on January 30, 2023, and effective May 1, 2023, strengthens regular air brake inspection requirements. Phase 2 of the rule revisions, submitted to TC by the Railway Association of Canada on behalf of its members on May 31, 2023, were approved by TC on September 29, 2023. These revisions establish test standards and periodic maintenance requirements for air brake cylinders and are scheduled to come into force on December 1, 2025.

TC committed significant resources in 2022 to advancing research that thoroughly assess the readiness, effectiveness, and safety implications of automatic parking brakes (APB), with a specific focus on cold weather scenarios to evaluate safe operations in Canada. TC entered into 2 contracts—one with the Volpe National Transportation Systems Center (Volpe) and another with the National Research Council Canada (NRC). In its final report submitted to TC in August 2023, Volpe emphasized that APB technologies are not advanced enough to be implemented at present. Volpe also highlighted several challenges that indicate that further development is required to ensure that APBs can consistently and reliably perform in a variety of real-world scenarios. The NRC's research and testing focused on assessing the safety implications of APBs in cold-weather conditions. The NRC's testing revealed significant brake force reduction on APB-equipped brake tests, which reinforces the need for real-world track testing, as well as further improvements of APBs by manufacturers. The NRC is also testing the impacts of cold weather on traditional air brake systems. TC indicated that the feasibility of deploying this technology will be evaluated following progress on testing and research. A working group was established with railway companies to consider the design and safety parameters of APB technology; the working group met 7 times in total. This research has shown that the current state of readiness and availability of APBs suggest that further development and testing by the manufacturers are necessary. TC will continue to actively monitor the progress and development of the APBs. By doing so, we can stay informed about advancements and ensure that they align with the desired outcome. This approach mitigates potential risks associated with premature implementation and maximizes the chances of APBs.

Equally important, TC continues to advance its research efforts on human factors and new technologies. TC will continue to actively monitor the progress and development of other technologies such as automatic parking brakes to stay informed about advancements and, as appropriate, ensure that they align with the desired outcome of maximizing the ability of these new technologies to reduce uncontrolled movements of railway equipment. In addition, TC has initiated a research contract that will assess human factors related to uncontrolled movement incidents in the rail industry. Furthermore, the initiative will study safety protocols from other safety-critical sectors to gain best practices for human factors related to dangerous operations. This TC-guided study will thoroughly explore human factors, potential technological solutions, and operational behaviors. The project aims to develop a guidance document for Canadian railway operators, highlighting best practices to mitigate the risk of uncontrolled movements.

These actions are complemented by the numerous operating rule changes that have been made to strengthen operating procedures to reduce uncontrolled movements. This includes new rule provisions for the securement of trains stopped on mountain grade, use of hand-brakes, and requirements for locomotives that are equipped with roll-away protection.

It is important to note that while uncontrolled movements had been on an upward trajectory from 2010 to 2019 (up to a peak of 78 in 2019), since 2020 the number of uncontrolled movements has been on a downward trend. To better understand and report on progress made, TC is committed to continuing to support the work of the existing tripartite Data Working Group with the Transportation Safety Board of Canada (TSB) and the Railway Association of Canada (RAC).

January 2024: response from the Railway Association of Canada

Regarding Phase 1 of MO 22-04, the *Railway Freight and Passenger Train Brake Inspection and Safety Rules* (TBR) were approved by the Minister on January 30, 2023 and came into force on May 1, 2023. Regarding Phase 2 of MO 22-04, the TBR were further amended and subsequently approved on September 29, 2023. These rules come into force on December 1, 2025.

The efforts made by the rail industry since the Lac-Mégantic disaster to mitigate risks associated with uncontrolled movements have gone beyond additional layers of administrative defences and these efforts support the defence in depth concept. Further efforts have been made since the Field Hill accident to mitigate risk, irrespective of whether trains are attended on main track, and the industry continues working with Transport Canada on new initiatives, such as the viability of automatic parking brakes. Although some of these efforts may be governed through rules, in many cases they also include changes to equipment, procedures and employee training and therefore, there is no single point of failure. The TSB should also recognize that railways now have Safety Management Systems, a regulatory requirement, through which risks are identified and mitigated and safety processes are audited for effectiveness.

RAC disagrees that “[i]t is only through the use of additional layers of physical defences that the risk of runaway equipment can be effectively mitigated.” Physical defences are layers that can mitigate risk but all layers—organizational, procedural, managerial, etc.—also mitigate risk.

RAC believes that the efforts to date have effectively mitigated the risk of runaway equipment. Much of the data referenced by the TSB does not relate to main track occurrences nor those that create “high-risk situations that may have catastrophic consequences.” Moreover, relying on total numbers of uncontrolled movement occurrences to determine trends in risk mitigation is overly simplistic and inaccurate because these numbers do not account for main track versus non-main track occurrences, level of potential consequence, or normalization of data using gross ton miles.

The Rail Data Working Group determined shortfalls with the uncontrolled movement occurrence data categories. It subsequently updated the categories of uncontrolled movements. The new categories are: Securement, Switching, Loss of Control, and Vandalism. Sub-categories for environmental effects, third party handling, and equipment failure would be considered uncontrolled movements, though under an “other” category. The RDWG also agreed to identify occurrences that were successfully mitigated with a derail.

The number of main-track UMs per year decreased from 7.9 in the 1996-2013 period to 3.6 in the 2014-2022 period – a 55% improvement. When accounting for higher traffic levels in the 2014-2022 period (normalizing the data), the improvement is actually 67% compared to the 1996-2013 period (i.e., there was only $\frac{1}{3}$ as many main-track UMs per GTM).

Based on these points, RAC believes that R14-04 should be closed.

March 2024: TSB assessment of the response (Satisfactory in Part)

This recommendation is related to the TSB Watchlist 2022 key safety issue of “Unplanned/uncontrolled movements of rail equipment” that create high-risk situations that may have catastrophic consequences. It is also linked to the following recommendations:

- Recommendation R20-01, in which the Board recommended that “the Department of Transport work with the railway industry and its labour representatives to identify the underlying causes of uncontrolled movements that occur while switching without air, and develop and implement strategies and/or regulatory requirements to reduce their frequency.”
- Recommendation R22-02, in which the Board recommended that “the Department of Transport require Canadian freight railways to develop and implement a schedule for the installation of automatic parking brakes on freight cars, prioritizing the retrofit of cars used in bulk commodity unit trains in mountain grade territory.”

In its response, Transport Canada (TC) indicated that it is committed to addressing the multi-faceted issue of uncontrolled movement of railway equipment, including ensuring that current physical defences are effective. To this end, TC strengthened its regulatory framework and

advanced work in researching technology aimed at mitigating the risk associated with uncontrolled movements.

On 25 July 2022, TC issued Ministerial Order MO 22-04, requiring a 2-phase submission of revisions to the *Railway Freight and Passenger Train Brake Inspection and Safety Rules* by the railway industry in order to mitigate the risk of uncontrolled movements by setting standards for enhanced air brake performance. TC approved Phase 1 of the revisions on 30 January 2023; these revisions came into effect on 01 May 2023 and strengthen regular air brake inspection requirements. The revised *Railway Freight and Passenger Train Brake Inspection and Safety Rules* require companies to formulate and adhere to a train brake winter operating plan, which must include measures for speed restrictions, testing, and inspections and which are intended to decrease the risk of derailment caused by train brake failure in cold weather. TC approved Phase 2 of the revisions to the *Railway Freight and Passenger Train Brake Inspection and Safety Rules* on 29 September 2023; these revisions will come into effect on 01 December 2025. The revised *Railway Freight and Passenger Train Brake Inspection and Safety Rules* will establish test standards and periodic maintenance requirements for air brake cylinders. More specifically, the modified rules will permit the use of new technology-based testing of air brakes performed by automated trackside wheel temperature detectors, referred to as the Brake Effectiveness Test (BET). The rules will also introduce requirements for the replacement of brake cylinders every 14 years on freight cars operating in mountain grades in cold weather.

TC also initiated a research study that will assess human factors related to uncontrolled movements in the rail industry. This TC-guided study will thoroughly explore human factors, potential technological solutions, and operational behaviours. The study aims to develop a guidance document for Canadian railway operators, highlighting best practices to mitigate the risk of uncontrolled movements.

These actions are complemented by operating rule changes that have been made to strengthen operating procedures to reduce uncontrolled movements. This includes new rule provisions for the securement of trains stopped on a mountain grade, use of hand brakes, and requirements for locomotives that are equipped with roll-away protection.

The Board is encouraged by the safety action taken to date, which includes the strengthening of defences against runaway trains, such as updated rules, enhanced monitoring, and the use of technological solutions such as automated trackside wheel temperature detectors.

The trend of uncontrolled movements between 2010 and 2019 was on an upward trajectory, with a peak of 78 occurrences in 2019. The 2020 to 2023 data show a reduction in the number of reported occurrences as compared to previous years (43 in 2020, 49 in 2021, 49 in 2022, and 33 in 2023). In addition, the number of occurrences in 2023 is the lowest reported over the last 10 years and is below the 10-year average of 58 reported between 2013 and 2022. While the number of uncontrolled movements has decreased since 2020, the number of occurrences reported in 2020 and 2021 may be due in part to the impact of COVID-19 on the rail industry as well as other disruptions to service. Despite this recent decrease in occurrences, additional data

are required to determine whether this is a statistically significant trend and whether the defences that are in place are, in fact, achieving the desired outcome.

Notwithstanding this recent decrease in reported occurrences and improvements to administrative defences, the Board believes that additional layers of physical defences are the most effective means to reduce the risk of uncontrolled movements. Therefore, the Board considers TC's response to Recommendation R14-04 to be **Satisfactory in Part**.

Latest response and assessment

December 2024: response from Transport Canada

Over the past decade, Transport Canada has dedicated significant time, effort, and resources to addressing the issue of train securement and uncontrolled movements. These efforts have included requiring additional physical defences for equipment securement under the *Canadian Rail Operating Rules* and the *Railway Locomotive Inspection and Safety Rules*, as well as implementing numerous regulatory changes and focused oversight to ensure industry compliance.

The Transportation Safety Board (TSB) has categorized uncontrolled movements into three types: insufficient securement of rolling stock, switching without the use of air brakes, and loss of control. The issue of switching without the use of air brakes is also linked to Recommendation R20-01. In its rationale for the issuance of R20-01, the Board highlighted an upward trend in unplanned and uncontrolled movements between 2009 and 2018. During this period, the average annual increase across all categories was 1.67 occurrences, with 86% of the total increase attributed to incidents involving switching without air brakes. In response, Transport Canada required and approved revisions to the *Canadian Rail Operating Rules* (CROR), introducing new requirements for switching operations under CROR Rule 113. Since the revised rules came into force in October 2021, based on the data available, incidents involving uncontrolled movements during switching without air brakes have significantly decreased, along with the overall number of all occurrences related to unplanned and uncontrolled movements.

Furthermore, early research into the human factors contributing to uncontrolled movement incidents in the rail industry revealed no previously unidentified issues. Ongoing efforts to address these concerns are being managed through existing regulatory frameworks, particularly the proposed *Railway Personnel Training and Qualifications Regulations*. The research highlighted that better training, with a focus on shadowing more experienced personnel, was the top recommendation. Pre-published in the *Canada Gazette*, Part I, on 14 December 2024, the proposed regulations aim to expand safety requirements to cover two additional critical positions—remote control locomotive operators (RCLOs) and rail traffic controllers (RTCs)—and introduce crew resource management provisions and establish guidelines for pairing less experienced employees with more seasoned counterparts.

The training types required under the new regulations will include:

- On-the-job training
- Knowledge training
- Familiarization training
- Continuing training
- Certificate renewal training
- Crew resource management (CRM)

Continuing training will address elements not covered in the initial knowledge-based training, such as new equipment, procedural changes, regulatory requirements, exemptions, and inspection findings.

The proposed regulations would also require companies to provide on-the-job training and familiarization training to certificate holders that have not carried out their duties in the previous 12 months for a variety of different reasons, such as illness or leave.

Transport Canada acknowledges the progress made in reducing the frequency of all types of uncontrolled movements, highlighting this as a significant achievement. However, Transport Canada remains committed to continued collaboration with the TSB, the Federal Railroad Administration (FRA), the railway industry, and unions to monitor trends in uncontrolled movements and take appropriate actions when necessary to further reduce their frequency. These actions may include further strengthening preventative measures.

Transport Canada remains committed to supporting technological advancements that can enhance safety and security in rail operations, including reducing the risk of uncontrolled movements. This includes advancing further testing of automatic parking brake technology, with a specific emphasis on evaluating its performance in cold weather conditions.

Finally, due to the extensive efforts made to address train securement and uncontrolled movements, which have led to a significant reduction in the frequency of unplanned and uncontrolled incidents, Transport Canada believes this recommendation has been effectively addressed and recommends that it be closed.

March 2025: response from the Railway Association of Canada

In order to address uncontrolled movements (UM), it is important to understand that there are different types and underlying causes of uncontrolled movements. TSB data has not historically identified these differences, but in response to the efforts of a tri-partite working group (the Rail Data Working Group) consisting of the TSB, TC and the rail industry, the TSB recategorized this data to allow for a common understanding and to enable more accurate trend identification and analysis. For example, this effort has introduced categories and subcategories that better reflect underlying causes; the level of potential consequence and where physical controls, such as derails, mitigated an occurrence.

RAC's review of the data⁴ shows a marked reduction in uncontrolled movements, especially when the data is normalized to take into consideration variations in annual volumes (measured using gross ton-miles [GTM]):

Total UMs

When normalizing for traffic levels, UMs decreased from 0.134 UMs per billion GTM in 1996-2013 to 0.099 in 2014-2024 – a 26% improvement.

Comparing the latest 5 years (2020-2024) versus the previous 5 years (2015-2019), there is a reduction in UMs from an average of 64.6 per year to 45.8 per year, a 29% improvement (the rate per GTM also improved by 29%, as traffic levels in these two periods were about the same).

Main track UMs

The number of main-track UMs per year decreased from 8.2 in the 1996-2013 period to 3.5 in the 2014-2024 period – a 57% improvement. When normalizing for traffic levels, the reduction is greater, from 0.020 main-track UMs per billion GTM in 1996-2013 down to just 0.006 in 2014-2024 – a 68% reduction.

Comparing the latest 5 years (2020-2024) versus the previous 5 years (2015-2019), there is a reduction in main-track UMs from an average of 4.2 per year to 2.6 per year, a 38% improvement (the rate per GTM also improved by 38%, as traffic levels in these two periods were about the same).

These reductions are a result of the many actions taken since the 2013 Lac-Mégantic occurrence. Based on risk assessments of different types of hazards and occurrence causes, industry has identified and implemented mitigating measures to reduce risk, such as:

- rules on:
 - attending and securing equipment, including after emergency brake applications on grade; consideration for exceptional weather conditions, e.g. winter conditions; temperatures; high winds; addition of minimum handbrake charts; and
 - switching, including with air; coupling/uncoupling.
- enhanced training and efficiency testing;
- use of available physical controls that have been tested in the railway environment, e.g. derail(s); track where rail physically ends; and bowled terrain research; retarders; wheel chocks; skates; and
- implementation of technology to improve brake condition and enhance brake testing, e.g. brake effectiveness testing (BET); use of high-definition images generated by train inspection portals to enhance equipment safety inspections.

⁴ Analysis conducted on 06 January 2025, using RODS, where the latest occurrence in RODS was on 13 December 2024.

Under Ministerial Order (MO) 22-04, the *Railway Freight and Passenger Train Brake Inspection and Safety Rules* (TBR) were updated to establish enhanced test standards and time-based maintenance requirements for brake cylinders on freight cars operating on steep descending grades in cold ambient temperatures. These changes were approved by the Minister on:

- Phase 1: 30 January 2023 (in-force date: 01 May 2023)
- Phase 2: 29 September 2023 (in-force date: 01 December 2025)

Regarding automatic parking brake (APB) technology, TC and industry established a working group to assess the viability and readiness of APBs. Implementation factors related to APB technologies were reported on by the Volpe group and testing of APBs was completed in the NRC's Cold Climate Chamber. It was determined that APB technologies are not ready for nor widely available for use in the rail industry.

Through their individual safety management systems, railways are also taking ongoing actions to reduce the potential for uncontrolled movements.

It is the combination and redundancy created by all these levels of protection (organizational, procedural, managerial, and physical) that are reducing the number of UMs.

Based on these points, RAC believes that R14-04 and R20-01 should be closed.

March 2025: TSB assessment of the response (Satisfactory in Part)

This recommendation is related to the TSB Watchlist 2022 key safety issue of “Unplanned/uncontrolled movements of rail equipment,” which create high-risk situations that may have catastrophic consequences. It is also linked to Recommendation R22-02, in which the Board recommended that “the Department of Transport require Canadian freight railways to develop and implement a schedule for the installation of automatic parking brakes on freight cars, prioritizing the retrofit of cars used in bulk commodity unit trains in mountain grade territory.”

In its response, Transport Canada (TC) indicated that it had dedicated significant time, effort, and resources to addressing the issue of train securement and uncontrolled movements. This work includes requiring additional administrative defences for equipment securement under the *Canadian Rail Operating Rules* (CROR) and the addition of physical defences in the form of rollaway protection for controlling locomotives under the *Railway Locomotive Inspection and Safety Rules*, as well as implementing numerous regulatory changes and focused oversight to ensure industry compliance.

TC also undertook research to identify the human factors contributing to uncontrolled movements. The research highlighted the need for better training, with a focus on less experienced personnel shadowing more experienced personnel. The human factors-related items identified will be addressed through the proposed *Railway Personnel Training and Qualifications Regulations*, which will repeal and replace the *Railway Employee Qualification Standards Regulations*. The proposed regulations include new provisions for crew resource

management as well as requirements for pairing less experienced employees with more experienced colleagues.

TSB testing conducted as part of investigation R19C0015⁵ has shown that the application of hand brakes required by CROR Rule 66 could be insufficient to secure a train in many circumstances due to, among other items, human performance limitations resulting in lower-than-expected minimum torque values. This supports the need for physical defences such as APB technology to enhance safety and prevent uncontrolled movements of railway rolling stock.

The number of uncontrolled movements between 2010 and 2019 was on an upward trajectory, with a peak of occurrences in 2019. The number of occurrences in 2023 and 2024 is below the 10-year average. TC continues to rely on improvements to its regulatory framework to address train securement. The safety actions taken to date are positive steps that are expected to improve safety. However, as indicated in the preamble to this recommendation, rules are administrative defences and, invariably, there will be instances where practices in the field will deviate from written rules and procedures. Even with clear and comprehensive rules, it has been demonstrated over the years that depending solely on the correct application of rules is not sufficient to maintain safety in a complex transportation system. Layers of defence, or safety redundancy, have proven to be a successful approach in many industries to ensure that a single-point failure does not lead to catastrophic consequences.

There are physical defences that can offer additional protection against the risk of uncontrolled movements. Among these is the APB technology that TC is assessing as detailed in its responses to active Recommendation R22-02.

Notwithstanding the recent decrease in reported occurrences and improvements to administrative defences, the Board believes that additional layers of physical defence are the most effective means to reduce the risk of uncontrolled movements. Therefore, the Board considers TC's response to Recommendation R14-04 to be **Satisfactory in Part**.

File status

The TSB is monitoring TC's progress to reduce the risk of uncontrolled movements.

This deficiency file is **Active**.

⁵ TSB Rail Transportation Safety Investigation Report R19C0015.