Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

RAILWAY INVESTIGATION REPORT
R04W0035

YARD DERAILMENT

CANADIAN NATIONAL
SYMINGTON YARD ASSIGNMENT YATS-02-17
MILE 145.20, SPRAGUE SUBDIVISION
WINNIPEG, MANITOBA
17 FEBRUARY 2004

Canada

Railway Investigation Report

Yard Derailment

Canadian National
Symington Yard Assignment YATS-02-17
Mile 145.20, Sprague Subdivision
Winnipeg, Manitoba
17 February 2004

Report Number R04W0035

Summary

On 17 February 2004, Canadian National Yard Assignment YATS-02-17 was performing switching operations at Symington Yard in Winnipeg, Manitoba. At approximately 1150 central standard time, the movement derailed 17 intermodal container car body platforms at switch W4RE at the east end of the west receiving tracks (Mile 145.20 of the Sprague Subdivision). Approximately 1600 feet of track was damaged. There were no injuries, and no dangerous goods were involved in the occurrence.

Ce rapport est également disponible en français.

Other Factual Information

The Accident

On 17 February 2004, Canadian National (CN) Yard Assignment YATS-02-17 (the train) was performing routine switching operations at Symington Yard in Winnipeg, Manitoba. This yard is one of three major classification yards currently operated by CN in Canada. Between 1100 and 1200 central standard time,[1] a yard train crew, consisting of two conductors, was assigned to build a train using a Beltpack.[2] One conductor was located in the head-end locomotive to provide point protection during the eastward portion of the movement. The second conductor (the Beltpack operator) was controlling the movement using the Beltpack and performing other required switching activities.

The crew had a company vehicle and driver (chauffeur) to assist with the switching operation. In Symington Yard, CN routinely gives the crew rides during switching operations when the equipment must be moved over longer distances. When a ride is provided, it is not uncommon for the Beltpack operator to control the movement while riding in the front seat of a vehicle. In this occurrence, the conductor controlling the movement operated the Beltpack from the front passenger seat of the chauffeured vehicle.

The crew assumed ground control of the power switches[3] from the yard tower. These switches control the east end of the west receiving (WR) tracks. The locomotive coupled to the cars on track WR04 and then pulled them eastward onto the switching lead. The vehicle followed the movement out of WR04 at which time the Beltpack operator observed the adjacent track (WI03) to be clear. He brought the movement to a controlled stop on the switching lead track, just east of electric power switch WR4E (see Photo 1).

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1 All times are central standard time (Coordinated Universal Time minus six hours).

2 Beltpack is a trademark name registered to CANAC Inc. In this report, Beltpack refers to the computer-based remote control system that enables the operator to control microprocessor-equipped switching locomotives from a remote location.

3 A power switch with field or ground control is an electrically powered switch that can be operated from either a yard tower or from the ground. Railway yard instructions outline procedures that allow control of the switch to be passed from the tower to the field to facilitate switching operations.

Photo 1. View looking westward into classification tracks at switch WR4E, Symington Yard (TSB photo). Switch aligned for movement into track WI03.

With the movement stopped, the vehicle drove eastward along the north roadway, then turned westward to stop alongside switch WR4E. The Beltpack operator exited the vehicle and walked in front of it to switch WR4E. He pushed the button on the side of the switch stand to engage the power switch to line it for track WI03. The Beltpack operator observed the switch points line for the intended route and believed that he had seen a green switch target light. The Beltpack operator returned to the vehicle, waited briefly, and was then driven westward alongside track WI03, approximately 400 feet ahead of the movement (see Figure 1).

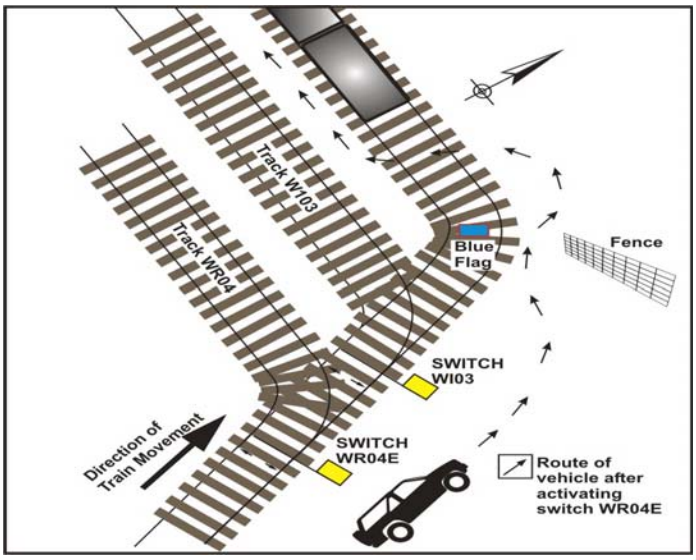

Figure 1. Symington Yard, west receiving tracks

The Beltpack operator activated the reverse position on the Beltpack, commencing the westward movement into track WI03. The lead truck of the lead car, WC 36137, a loaded flat deck

intermodal car, successfully negotiated power switch WR4E and proceeded into the intended route. However, the trailing truck of that car and the following cars took the diverging route into track WR04 and began to derail. The Beltpack operator, who was travelling in the chauffeured vehicle well in advance of and facing away from the movement, was unaware that cars were derailing. The movement continued to accelerate, reaching a maximum speed of 8 mph. A CN employee observed the movement derailing and notified the yard tower. The yard tower instructed the Beltpack operator to stop the movement, which was then brought to a controlled stop. Nine intermodal cars, totalling 17 car body platforms, had derailed. There were no injuries and no dangerous goods were involved in the derailment.

Recorded Information

The following time line was compiled from the WR4E switch logs, from the Beltpack event recorder download, and from visual observations at the site. The times are approximate and have been rounded to the nearest minute.

- 1121 – The switch tender put the east end of west receiving tracks under ground control. Switch WR4E was in the normal position lined for track WI03. The green light of the switch target was illuminated, indicating that the switch was in correspondence and locked for that route.

- 1124 – Switch WR4E was manually activated by push button to line it in the reverse position for track WR04. The yellow light of the switch target was illuminated, indicating that the switch was in correspondence and locked for that route.

- 1141 – An eastward movement out of track WR04 was initiated. The movement reached a maximum speed of 15 mph.

- 1146 – The movement stopped just east of switch WR4E.

- 1148 – Switch WR4E was manually activated by push button to line it for track WI03 (see Photo 2). The switch target lights did not illuminate, indicating that the switch had not locked and that the switch was positioned at some point in mid-throw.

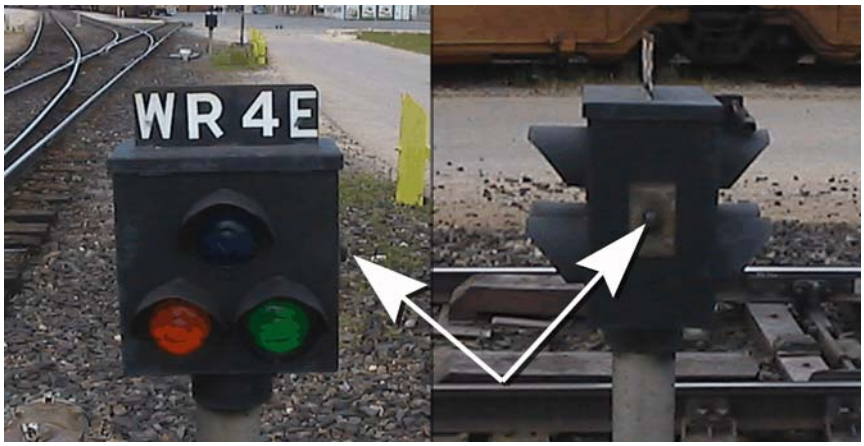

Photo 2. Two views of switch WR4E (left: looking west, right: looking south). Arrows indicate the location of the manual activation button. Switch target lights are not visible when standing to the north side of the switch, looking south.

- 1149 – The movement began to shove westward over switch WR4E.

- 1150 – After the lead truck of the lead car passed over the switch points, switch WR4E returned to the reverse position, lined and locked for track WR04. The switch target yellow light illuminated, indicating that the switch was in correspondence and locked for that route.

- 1154 – The movement was brought to a controlled stop after reaching a maximum speed of 8 mph and after travelling approximately 1600 feet.

Site Examination

The north rail of track WR04 was rolled over. The south rail of track WR04 was canted at an approximate 45-degree angle. Damage to both rails of the track extended from the place at which the trailing truck of the lead car stopped, back to the frog at switch WR4E. Approximately 1600 feet of track WR04 was damaged. There was no damage observed to track WI03. There were no pre-derailment track defects near the derailment that might have contributed to the accident.

The lead truck of the lead car, WC 36137, a stand-alone intermodal car, had proceeded down track WI03. The trailing truck proceeded into track WR04, resulting in car WC 36137 straddling the two tracks at an approximate 45-degree angle. The 16 intermodal car body platforms following car WC 36137 derailed in track WR04. All car bodies remained upright and coupled together. The derailed wheels on the north side were resting on the ties or on the web of the overturned rail. The south-side car wheels were resting predominantly on the web of the canted south rail. Inspection of the derailed cars determined that there were no pre-existing mechanical defects that might have contributed to the accident.

Yard Movement, Crew, and Weather Information

The yard movement, which was composed of 2 locomotives and 29 car body platforms, was about 1800 feet long and weighed approximately 1400 tons. Yard track speed is limited to a maximum of 15 mph.

The yard crew consisted of two conductors who had been trained in Beltpack operations. The crew members were qualified for their positions, familiar with yard operations, and met fitness and regulatory rest requirements. The Beltpack operator had been trained in Beltpack operations in September 1995 and had been continually using Beltpack since then. The operator had not received any subsequent formal Beltpack training, nor is it required under the current regulations. However, CN does periodically monitor the performance of employees operating Beltpacks.

At the time of the derailment, the weather was -8°C, with a slight breeze and overcast skies.

Particulars of the Track

Track structure in the derailment area consisted of 100-pound jointed rail, manufactured between 1953 and 1979. The rail was laid in 30- to 39-foot sections on 11-inch tie plates and fastened with three spikes per tie. The ties were a mix of No. 1 and No. 2 softwood ties, spaced approximately 21 inches apart. The ballast was crushed rock. A No. 10 left-hand turnout, equipped with Sampson switch points, provided access to track WR04. The turnout and track had been inspected in accordance with company and regulatory requirements. All track components were determined to be in good condition.

Power Switch WR4E

Power switch WR4E operated the switch points at the turnout for track WR04. The switch was an Alstom GRS Model 6 electric switch machine, with an external throw rod and no mid-stroke restoration feature. The switch stand target was equipped with blue, yellow, and green lights that are used to indicate switch position to an approaching train and to control access to track WR04. The mechanical box, containing the motor and electrical circuitry to operate the switch, was not heated. The switch was well maintained and appeared to be in good condition. All connections and contacts involved in the snubbing circuit were checked with no exceptions noted.

The switch machine contains an electrical damping feature, known as dynamic snubbing, that slows the switch point as it moves. When operated, the electric motor generates a current at the completion of each stroke, which slows and stops the rotation of the armature. Without this feature, the switch point would move so quickly that it would likely bounce off the stock rail and not lock into position, leaving the point in mid-throw. Periodically, these switch machines have been known to experience a loss of dynamic snubbing due to electrical resistance from condensation, frost, or carbon build-up on the contacts in the circuitry.

Power Switch Testing

Following the derailment, and again on 16 April 2004, CN Signals & Communication personnel tested power switch WR4E to simulate a loss of dynamic snubbing. During the simulation, the mechanical box was opened and a piece of paper was placed between contacts in the circuitry. The switch was then activated to line for track WI03. The switch points were observed to move quickly, contact the stock rail as intended, then bounce off and roll back, leaving the switch points in mid-throw. When this occurred, none of the switch target lights illuminated.

Using a lining bar, the switch points were manually moved to line and lock in the reverse position. Once the switch was in correspondence and locked for track WR04, the yellow light on the switch target illuminated.

Canadian Rail Operating Rules

All Beltpack movements must be made in accordance with the *Canadian Rail Operating Rules* (CROR) and General Operating Instructions (GOI) and bulletins of the railway.

CROR Rule 104 governs hand-operated switches. This rule also applies when a power field or ground control switch is operated by hand. Section (f) of Rule 104 states that "When a switch has been turned, the points must be examined and the target, reflector or light, if any, observed to ensure that the switch is properly lined." Section (k) (iii) of CROR Rule 104 identifies that "a movement may foul a track connected by a hand-operated switch provided that the switch is properly lined before the movement passes over it." In CN's Winnipeg Terminal Operating Manual dated 01 December 2000, Section 6.1.4 further stipulates that "A switch equipped with indicator lights, of which none are illuminated when switch is under ground control, is to be regarded as defective and movements must not be made over such switch."

All train and engine movements in Symington Yard are governed by CROR Rule 105. This rule states that "Unless otherwise provided by signal indication, a train or engine using other than a main track must operate at reduced speed and be prepared to stop short of the red flag or the red light prescribed by rule 40.1." Section (a) of Rule 105 indicates that employees must use discretion to be able to stop within half the range of vision of a track unit.

CROR Rule 115 governs pushing equipment. Section (a) of Rule 115 states that: "When equipment is pushed by an engine, a crew member must be on the leading car or on the ground, in a position to observe the track to be used and to give signals or instructions necessary to control the movement." An Exception to Section (a) indicates that: "A crew member need not be so positioned when the portion of the track to be used is seen or known to be clear." CN's addition to Rule 115 contains a Special Instruction [Section (c)], identifying what this Exception means in practice:

> Seen or known to be clear is defined as seeing the portion of the track to be used as being clear and remaining clear of equipment and as having sufficient room to contain equipment being pushed. This determination must be made by a crew member, yard supervisor or other qualified employee who can observe the track and has radio contact with the

employee controlling the movement. Where a track that has been seen to be clear, and no access to that track is possible by another movement, the track may be considered as "known to be clear".
NOTE: When it can be determined that other movements are not on duty or not performing work in the track(s) to be used, the requirement of "known to be clear" can be considered to be fulfilled continuously.

Point Protection of Train Movements

In the United States, the Federal Railroad Administration (FRA) has identified a leading contributory factor in train accidents during switching operations to be the failure of train crews to provide adequate point protection for the train movement.[4] Transportation Safety Board of Canada (TSB) statistics identify a similar trend in Canada. Of 896 yard derailments and collisions reported from 1999 to 2003, 36 per cent involved a failure to protect the point of the movement.

Inadequate point protection, resulting from the application of the exception to CROR Rule 115, was identified as a contributing factor in the following recent accidents:

1. On 09 December 2003, Canadian Pacific Railway train C-56-09 was performing switching operations at Carseland, Alberta. While making a reversing movement, the train collided with a trackmobile and a tank car loaded with anhydrous ammonia (Dangerous Goods Universal Code UN 1005).

2. On 05 April 2004, while reversing into a spur track in Emerson, Manitoba, to clear the line for an approaching train, CN train L-533-41-05 pushed the tail-end cars over the spur derail, resulting in the derailment of five cars.

3. On 22 May 2004, CN yard assignment 0800, under operation with a Beltpack, was making a reversing movement in the yard at Sarnia, Ontario. The two lead cars of the movement collided with tank car PPRX 34051, which was loaded with liquefied petroleum gas (UN 1075) and was foul of the track.

4. On 19 June 2004, CN yard assignment 1400, under operation with a Beltpack, was doubling from track CO-35 onto cars in track CO-33 in Symington Yard in Winnipeg, Manitoba. In the process, the movement collided with covered hopper car CN 379013, which was foul of the lead track.

Beltpack Operations

Beltpack is a remote-control method of operating a locomotive. This method was approved by Transport Canada for yard switching and humping operations and was introduced in Canada in the late 1980s. Since its introduction, it has become the primary means of locomotive and train

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[4] *Interim Report on the Safety of Remote Control Locomotive Operations* (page 12), Federal Railroad Administration, May 2004.

control in yard operations. At Symington Yard, approximately 80 per cent of yard movements are controlled using Beltpack. On a daily basis, an average of 1500 to 1800 cars are humped using Beltpack, and 20 to 22 trains are built using this method.

In Canada, Beltpack operations are performed by conductors. In 1991, a Canadian Railway Office of Arbitration (CROA) ruling designated conductors as Beltpack operators. Switching movements operated by Beltpack will normally involve two conductors, with one conductor placed at each end of the movement. When "pitch and catch" is utilized, control of the movement can be transferred between two Beltpack operators. At other times, as in this occurrence, one Beltpack operator performs the switching operation while a second conductor provides point protection. In addition, for yard areas designated as point-protected zones, and as permitted by CROR and the railway's GOI, a single Beltpack operator can perform humping or switching operations.

During Beltpack operations, the operator uses an Operator Controller Unit (OCU), which is a small three- to five-pound box clipped to a vest. The OCU permits the operator to remotely activate a number of locomotive controls. The OCU transmits the operator's commands to the locomotive. These commands are received by special radio equipment installed in the locomotive. The commands are then processed by the on-board computer, which initiates the appropriate locomotive response.

Vehicle-Assisted Beltpack Operations

CN conducts Beltpack operations from a chauffeured vehicle in several of its yards in eastern Canada. This deviation from conventional Beltpack operations, in which the Beltpack operator rides the point of the movement, was implemented several years ago. No formal risk assessment was performed before implementing this process. Currently, neither CN nor Transport Canada have guidelines or procedures about using a vehicle to assist with Beltpack movements.

Operating Crew Training Requirements

Regulation CTC-1987-3 Rail, effective 12 March 1987, outlines the minimum Qualification Standards for Operating Crews (QSOC). This regulation states that a railway company shall establish and provide the necessary training to satisfy the regulation. Transport Canada is the regulatory authority that ensures that all core training subjects are contained in the railway's training material. After an initial review of the material, the regulator is not required to conduct any further review. In addition, there are no mechanisms in place to allow changes to the training criteria for locomotive engineers and conductors.

According to the regulation, locomotive engineers must qualify in six core subjects and in two additional components on locomotive operation and train handling. Conductors must qualify in the same six core subjects and one additional component on passenger evacuation procedures. Conductors are not required to qualify in the locomotive operation and train handling components. Railways must requalify locomotive engineers and conductors every three years.

In addition to the mandatory QSOC training, CN provides 10 days of initial Beltpack training to conductors who are involved in yard service. While CN does do periodic performance

monitoring, it does not provide any regular Beltpack refresher training, nor is it required to under the current regulations. In addition, the regulation does not require a component on using a Beltpack as part of the mandatory QSOC requalification training.

It is Transport Canada's view that regulation CTC 1987-3 Rail is outdated and should be revised. Transport Canada is considering creating a working group to revise this regulation.

Safety Management and Performance Targets at Symington Yard

At CN, safety is a core value that is embodied in its Risk Management Policy. Procedures for many routine tasks are in place and are regularly monitored through a performance monitoring program. As an example, supervisors must conduct 10 performance monitoring sessions each month on operating staff. These sessions contribute to safety management by ensuring compliance with rules and procedures. The results are tracked and monitored at a corporate level. In addition, CN has established an occupational safety and health committee along with a safety reporting process.

Performance targets and standards are in place at CN. CN has communicated these standards to the operating employees at Symington Yard. An example of a performance target is summarized in division notice PRN 4029/02, which sets out guidelines for achieving maximum productivity during humping operations. This notice indicates that a speed of 15 mph is to be used when pulling out of certain tracks and a speed of 10 mph is to be used when pushing up the crest of the hump. Similarly, division notice PRN 4058/3 sets out standards for inbound and outbound movements, including the expectation that a speed of 15 mph should be used for switching wherever possible.

CN acknowledges that there may be occasions when such speeds are not possible and that employees must use discretion to ensure that movements can be stopped within half the range of vision of a track unit, in accordance with CROR Rule 105 (a). However, employees feel pressured to meet production targets and feel that these time pressures may have an impact on their safety. Employees also indicated that they had been regularly approached for an explanation if yard movements were made at less than track speed.

Analysis

There were no equipment or track defects observed that contributed to this occurrence. The analysis will focus on the operation of the power switch, on Beltpack operations conducted with assistance from a vehicle, on the exception to CROR Rule 115, on regulatory overview regarding Beltpack operations, and on human performance issues.

The Accident

When the Beltpack operator activated the power switch, he observed the switch points line for the intended route into track WI03. The operator then turned without looking at the switch target light and returned to the vehicle. In doing so, the operator did not fully comply with the requirements of CROR Rule 104 and CN's Winnipeg Terminal Operating Manual. While the

operator believed that he had properly observed the target light, recorded information confirmed that the target light did not illuminate. This also indicated that the switch had malfunctioned and did not lock for the intended route.

Lining a power switch that is under ground control is a two-part process. The two parts have never been independent of one another. The movement of the switch points, in conjunction with the observed target light, confirm the status of the switch. In the yard environment, operating crews routinely operate power switches many times each day. In most cases, the switch operates without incident and lines for the intended movement. However, in this case, the Beltpack operator did not verify the status of the switch target light. Having seen the switch points move and line for the intended route, as the points had usually done in the past, the operator assumed that the switch was lined and locked. While errors of omission are common in routine skill-based tasks, such as lining a switch, they are often easily detected and corrected without any significant consequence.

The switch malfunction was consistent with a loss of dynamic snubbing, which is known to be caused by electrical resistance from condensation, frost, or carbon build-up on the contacts within the circuitry. Considering that the box containing the circuitry was not heated and that the temperature at the time of the derailment was -8°C, it is likely that condensation or frost on the contacts caused the switch to malfunction. Had the operator observed that the switch target lights did not illuminate, re-activating the switch may have corrected the problem.

The lead truck of the lead car traversed switch WR4E and proceeded down the intended route into track WI03. As confirmed by the switch logs, the switch point then relined to the reverse position and locked for track WR04. It is likely that car movement caused the unsecured switch to move and reline under the car, sending the trailing truck and subsequent cars into track WR04. As the train was shoved down tracks WI03 and WR04 simultaneously, the orientation of the lead car exerted lateral force on the trailing truck. This force was transferred to the north rail of track WR04, causing it to roll over as the train progressed, resulting in the derailment of the trailing cars. Since the Beltpack operator was travelling in the vehicle well in advance of and facing away from the movement, as permitted by the exception to CROR Rule 115, the movement was unmonitored and the severity of the derailment was increased.

Switch Target Light Design and Vehicle Placement

The target lights are designed to be viewed from the point of an approaching movement. As such, each light is covered by a sun shade and located below the eye level of a standing switch operator. This design limits the ability of an operator standing beside the switch stand to observe the target light without stepping in front of the switch box.

The position of the chauffeured vehicle also contributed to the error going undetected by the operator. While using a chauffeured vehicle may reduce the risk of operator injury that is associated with riding the point while controlling a movement, it may introduce additional operational risk. For example, since the vehicle had stopped beside the switch, the operator could not clearly observe the switch target light when seated in the vehicle. While the target light may be visible from the vehicle in some positions, there are no regulatory or company requirements regarding the optimal placement of a vehicle when assisting with switching

operations. The combination of the switch target light design and the position of the vehicle alongside the switch reduced opportunities to view the switch target light and correct the error before resuming the movement.

Use of Vehicle and Chauffeur to Expedite Yard Movements

The Symington Yard chauffeured vehicle is essentially a tool to expedite yard operations and does not relieve operating employees of the responsibility to comply with rules or instructions. It has become common practice in Symington Yard for Beltpack operators to ride in the vehicle while controlling train movements. While CROR and CN's GOI are explicit about a number of switching and yard operation procedures, neither regulatory nor company guidelines have been established for vehicle use during Beltpack operations.

Using a vehicle to expedite yard operations is not inherently unsafe. However, this occurrence demonstrates that changes to work processes, without adequate risk assessment, can potentially minimize existing safety defences by circumventing the existing process. Once the error of failing to check the switch target light had been made, the placement of the vehicle beside the switch, rather than alongside the point of the movement, eliminated an additional opportunity to observe the switch target light. Furthermore, the placement of the vehicle well ahead of the train, while in compliance with CROR Rule 115, left the movement virtually unmonitored, which increased the severity of the derailment.

Procedural guidelines dealing with the placement of vehicles when used to assist in switching operations could have mitigated these circumstances and ensured that existing defences were maintained and potentially enhanced. The lack of regulatory or company guidelines for the use of a vehicle when assisting with Beltpack switching operations increases the risk for errors and accidents to occur.

Exception to CROR Rule 115

The FRA has identified inadequate point protection for train movements as a leading cause of train accidents in switching operations. TSB statistics identify a similar trend in Canada. From 1999 to 2003, records show that there was inadequate point protection in 36 per cent of yard derailments and collisions.

According to CROR Rule 115, when equipment is shoved by an engine, a crew member must be on the leading car or on the ground in a position to observe the track to be used and to give signals or instructions necessary to control the movement. An exception to the rule waives this requirement when the portion of the track to be used is seen or known to be clear. Since the Beltpack operator had observed the intended route (adjacent track WI03) earlier in the move, the conditions needed to apply the exception had been fulfilled. As a result, he was relieved of the requirement to ride the point and was permitted to control the train from the front seat of a vehicle, ahead of the movement, while still in compliance with the rule.

In this occurrence, had conventional point protection been provided, or had procedural guidelines dealing with the placement of vehicles when used to assist in switching operations been in place, the operator would have had additional opportunities to recognize the error of

failing to verify the signal and the derailment may have been avoided. Failing that, the severity of the derailment would likely have been reduced through closer monitoring of the train. The broad interpretation and permissive nature of the exception to CROR Rule 115 was a factor in this occurrence and in the other reported derailments and collisions. The use of the exception to Rule 115 presents the risk that the progress and route of a train movement may not be adequately monitored and protected.

Regulatory Overview of Beltpack Operator Training

Regulation CTC-1987-3 Rail outlines minimum Qualification Standards for Operating Crews (QSOC). The regulation was introduced at a time when a conventional operating crew consisted of a locomotive engineer, who was responsible for the operation of the train, and a conductor, who was in charge of the train and responsible for its contents. Beltpack operations were introduced to yard operations after the regulation came into effect. Since his initial training, the conductor in control of the movement had received no subsequent instruction nor was he required to requalify in Beltpack operation under the current regulations.

Transport Canada oversees the regulation, ensuring that core training subjects are represented in the material. CN's current QSOC training meets the regulatory requirements. The regulation requires conductors to re-qualify in their core components every three years, but contains no core component on Beltpack operation. Furthermore, the regulation does not require that conductors trained in Beltpack operation receive any basic instruction in locomotive operation or train handling considerations, even though they may be required to build substantial trains and move them at speeds of up to 15 mph within yard limits. As written, the regulation fails to ensure that Transport Canada review the specific content of training material for train crews at regular intervals. In addition, the regulation does not provide a mechanism that requires changes to the training criteria as the rail industry evolves. Regulatory overview of training and requalification of Beltpack operators has not kept pace with improvements in technology and operations.

Balancing Safety and Production

All organizations must constantly strive to balance the demands placed upon them to run a profitable enterprise without exposure to undue levels of risk. The effective management of safety requires the ability to make incremental improvements. In the case of Symington Yard, organizational structures are in place to monitor safety issues and continually improve safety. Despite these structures, there is an indication that measures taken by CN to increase productivity in Symington Yard could potentially have a negative impact on the level of safety in its yard operations.

Findings as to Causes and Contributing Factors

1. Although the conductor had activated the switch and observed the switch points move, he did not observe the switch target light to confirm that the switch was locked in position.

2. When activated, the switch lined for the movement into WI03, but did not properly lock. It is likely that frost build-up on the switch contacts resulted in a loss of dynamic snubbing and caused the switch to malfunction.

3. In combination, the switch target light design and the position of the vehicle alongside the switch reduced opportunities to view the switch target light and correct the error before resuming the movement.

4. Under the movement of the train, the unsecured switch returned to and locked in its reverse position under the lead car. As a result, the trailing portion of the train movement travelled down adjacent track WR04, initiating the roll over of the north rail and causing the derailment.

5. The location of the Beltpack operator in a vehicle, well in advance of and facing away from the movement, as permitted by the exception to *Canadian Rail Operating Rules* (CROR) Rule 115, left the movement unmonitored and increased the severity of the derailment.

Findings as to Risk

1. The lack of regulatory or company guidelines for the use of a vehicle when assisting with Beltpack switching operations increases the risk for errors and accidents to occur.

2. The use of the exception to CROR Rule 115 presents the risk that the progress and route of a train movement may not be adequately monitored and protected.

Other Finding

1. Regulatory overview of training and requalification of Beltpack operators has not kept pace with improvements in technology and operations.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 25 January 2005.