



## **RAILWAY OCCURRENCE REPORT**

### **YARD COLLISION AND DERAILMENT**

**CANADIAN PACIFIC LIMITED  
TWO YARD SWITCHING ASSIGNMENTS  
MILE 92.77, INDIAN HEAD SUBDIVISION  
REGINA, SASKATCHEWAN  
18 OCTOBER 1994**

**REPORT NUMBER R94W0243**

## **MANDATE OF THE TSB**

The Canadian Transportation Accident Investigation and Safety Board Act provides the legal framework governing the TSB's activities. Basically, the TSB has a mandate to advance safety in the marine, pipeline, rail, and aviation modes of transportation by:

- conducting independent investigations and, if necessary, public inquiries into transportation occurrences in order to make findings as to their causes and contributing factors;
- reporting publicly on its investigations and public inquiries and on the related findings;
- identifying safety deficiencies as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- conducting special studies and special investigations on transportation safety matters.

It is not the function of the Board to assign fault or determine civil or criminal liability. However, the Board must not refrain from fully reporting on the causes and contributing factors merely because fault or liability might be inferred from the Board's findings.

## **INDEPENDENCE**

To enable the public to have confidence in the transportation accident investigation process, it is essential that the investigating agency be, and be seen to be, independent and free from any conflicts of interest when it investigates accidents, identifies safety deficiencies, and makes safety recommendations. Independence is a key feature of the TSB. The Board reports to Parliament through the President of the Queen's Privy Council for Canada and is separate from other government agencies and departments. Its independence enables it to be fully objective in arriving at its conclusions and recommendations.



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

## Railway Occurrence Report

### Yard Collision and Derailment

Canadian Pacific Limited  
Two Yard Switching Assignments  
Mile 92.77, Indian Head Subdivision  
Regina, Saskatchewan  
18 October 1994

Report Number R94W0243

#### *Synopsis*

On 18 October 1994, at approximately 0403 central standard time (CST), a yard assignment, consisting of four locomotives, collided with two empty rail cars of another yard assignment. The two empty rail cars were destroyed and a locomotive was damaged. Four thousand litres of diesel fuel leaked from the damaged locomotive. Track damage was minor. There were no injuries.

The Board determined that the collision was the result of the evolution of an unsafe operating practice that permitted a main track switch to be left in the reversed position.

Ce rapport est également disponible en français.

*Table of Contents*

	Page
1.0 Factual Information .....	1
1.1 The Accident .....	1
1.2 Injuries .....	1
1.3 Damage to Equipment .....	2
1.4 Dangerous Goods .....	2
1.5 Other Damage .....	2
1.6 Personnel Information .....	2
1.7 Method of Train Control .....	2
1.8 Weather .....	3
1.9 Recorded Information .....	3
1.10 Occurrence Site .....	3
1.10.1 The Equipment .....	3
1.10.2 The Switch .....	3
1.11 Other Information .....	4
1.11.1 Operating Procedures .....	4
1.11.2 Canadian Rail Operating Rules .....	4
1.11.3 Switch Targets .....	5
2.0 Analysis .....	7
2.1 Introduction .....	7
2.2 Consideration of the Facts .....	7
2.2.1 Switch Target Observation .....	7
2.2.2 Reversed Main Track Switches .....	7
2.2.3 Train Control .....	8
3.0 Conclusions .....	9
3.1 Findings .....	9
3.2 Cause .....	9
4.0 Safety Action .....	11

TABLE OF CONTENTS

---

4.1	Action Taken .....	11
4.1.1	Yardmaster's Duties .....	11
4.2	Safety Concern .....	11
4.2.1	Safety Management .....	11

## *1.0 Factual Information*

### *1.1 The Accident*

The Regina Yard in Regina, Saskatchewan, is a major flat switching facility located between Mile 89.8 and Mile 98.5 of the Indian Head Subdivision. At any time, several yard assignments are engaged in train marshalling activities in the yard.

At approximately 0300 central standard time (CST), 18 October 1994, the 2230 Yard Assignment left the westward main track via the east yard switching lead onto the Lanigan Subdivision to perform switching at the Ipsco plant, located at Mile 6.0. The crossover switches leading from the westward main track at Mile 92.77 to the switching lead were left in the reversed position. The crew members requested the yardmaster to line the crossover switches back to normal. The yardmaster verbally confirmed that he would do so. However, he became busy in the yard office and did not complete this task as he had indicated. The yard foreman of the 2230 Yard Assignment also notified the yard foreman of the 2359 Yard Assignment that the switches might still be in the reversed position. The locomotive engineer of the 2359 Yard Assignment overheard this communication.

At approximately 0400 CST, the locomotive engineer of the 2359 Yard Assignment was in the vicinity of the crossover and he took it upon himself to line the switch on the switching lead back to normal. He did not return the switch on the westward main track to normal as it appeared to him to be aligned for the main track from his position at the other crossover switch. The locomotive engineer had never handled these switches before.

At about the same time as the locomotive engineer of the 2359 Yard Assignment was lining the switching lead, the 0001 Yard Assignment, consisting of four locomotives, left the vicinity of the yard office and, with the permission of the yardmaster, was travelling eastward, in reverse, against the designated current of traffic on the westward main track. The yard foreman was riding on the south corner side ladder of the leading end of the leading unit, directing the movement.

The 0001 Yard Assignment movement was without incident until the yard foreman noticed a red switch target displayed for their track. He radioed the locomotive engineer to stop and a brake application was initiated. However, the movement followed the crossover and collided with two empty cars being shoved westward on the switching lead by the 2359 Yard Assignment.

### *1.2 Injuries*

There were no injuries as a result of this occurrence.

### *1.3 Damage to Equipment*

The two rail cars, an empty hopper car (PTEX 38156) and an empty boxcar (SLR 701), were destroyed. The leading locomotive on the 0001 Yard Assignment sustained heavy damage.

### *1.4 Dangerous Goods*

Four thousand litres of fuel oil leaked from the damaged fuel tank of the leading locomotive of the 0001 Yard Assignment. Most of the spilled fuel was recovered.

### *1.5 Other Damage*

Approximately 150 feet of track was damaged, and there was damage to one crossover switch.

### *1.6 Personnel Information*

The crew of the 2230 Yard Assignment consisted of a yard foreman, a yard helper and a locomotive engineer.

The crew of the 2359 Yard Assignment consisted of a locomotive engineer, in the cab of the controlling locomotive, and a yard foreman and yard helper, on the ground away from the collision site.

The crew of the 0001 Yard Assignment consisted of a yard foreman, riding on the leading locomotive, and a yard helper and a locomotive engineer, located in the cab of the controlling locomotive.

The crew members of all three yard assignments were familiar with the Regina Yard, were qualified for their respective positions and met fitness and rest standards established to ensure the safe operation of railway equipment.

### *1.7 Method of Train Control*

The subdivision is double main track and runs east to west through Regina. There is a current of traffic, with the north main track designated westward track and the south main track, eastward. Movements on the main tracks through Regina are made in accordance with "Yard Limits" (Rule 93 of the Canadian Rail Operating Rules (CROR)). An Automatic Block Signal System (ABS) governs the use of blocks in the direction of traffic only. Movement against the current of traffic requires the authority of the yardmaster. The Centralized Traffic Control System (CTC), authorized by the CROR and controlled by the rail traffic controller (RTC), is used to control movements from either direction entering the main track within yard limits at Regina. The last CTC signal on either side of the Regina yard limits governs movements to the first ABS signal.

The maximum speed limit on the westward main track through the yard is 30 mph for both passenger and freight trains. The maximum allowable speed is further restricted to 25 mph when a movement is not headed by the controlling locomotive. The maximum speed limit on the eastward main track is 75 mph for passenger trains and 60 mph for freight trains with both slowed to a maximum of 35 mph between Mile 91.5 and Mile 95.1. However, there is no scheduled passenger service on this subdivision at this time.

### *1.8 Weather*

It was calm and misty, with a temperature of nine degrees Celsius.

## *1.9 Recorded Information*

The event recorder data recovered from the controlling locomotive of the 0001 Yard Assignment showed the beginning of a brake cylinder pressure increase in the locomotive brakes at a time of 0402:51 CST while the train was travelling at a recorded speed of 23.6 mph. At a time of 0402:57 CST, six seconds later, the recorded speed dropped to 13.3 mph and the brake cylinder pressure rose to 24 pounds per square inch (psi). The recorded movement was 174 feet during the six-second interval. One second later, at 0402:58 CST, the recorded speed suddenly decreased to 8.2 mph and brake pipe pressure was lost, signifying an emergency application of the train brakes. The locomotive had moved forward 16 feet. At 0403:02 CST, after having travelled an additional 21 feet, the locomotive stopped.

## *1.10 Occurrence Site*

### *1.10.1 The Equipment*

The two yard assignments came to rest with the leading locomotive of the 0001 Yard Assignment derailed at the switching lead crossover switch and wedged into empty hopper car PTEX 38156 and empty boxcar SLR 701. The two rail cars were derailed and pushed northward. Markings were evident on the rail heads and ties of the switching lead beginning approximately 10 feet eastward from the main track switch mast. The derailed equipment remained upright.

### *1.10.2 The Switch*

The switch mast for the crossover switch from the main track was located north of the main track and equipped with a 36-inch mast and standard reflectorized targets. The top target consisted of a green eight-inch square and an eight-inch-diameter red circle. A red oblong, measuring 18 inches by 15 inches, was mounted below the top targets. When the switch was reversed, the two red targets were displayed to through traffic. The yard is not lit in the accident area.

The switch throw mechanism was secured by a standard railway padlock which was found to have been locked in place at the time of the accident.

## *1.11 Other Information*

### *1.11.1 Operating Procedures*

To expedite movement, a practice had developed in the Regina Yard wherein the yardmaster would line switches for departing trains or yard movements to relieve crew members from this responsibility. This procedure had apparently evolved after the implementation of caboosless train operation in December 1987 which resulted in all crew members being situated at the head end of trains on the locomotives. In most cases, the yardmaster would be within proximity to the switch and could easily assume this responsibility. In this instance, the yardmaster was at the yard office which is located about 4,400 feet from the switches involved.



*1.11.2 Canadian Rail Operating Rules*

CROR Rule 104 states in part that "main track switches must be lined and locked for the main track when not in use", and that:

When directed by GBO [General Bulletin Order], clearance, train order or special instructions, and protection has been provided against all affected trains or engines, a main track switch may be left lined and locked in the reversed position. When not so directed, it must not be left in the reversed position unless in charge of a switchtender or a crew member who must be in position to restore the switch to its normal position before it is fouled by a train or engine approaching on the main track.

Furthermore, CROR Rule 104 specifies that: "... the conductor and locomotive engineer must, when practicable, ensure that switches manually operated by their crew members are left in the normal position...."

There were no special provisions in place to allow for a main track switch to be left in the reversed position in the Regina Yard.

*1.11.3 Switch Targets*

It is generally accepted that a visual target has to subtend a minimum of 12 minutes of arc for reasonably accurate recognition. An 8-inch target would subtend 12 minutes of arc at 191 feet and an 18-inch target, at 430 feet. Colour perception is similarly compromised by distance. Colour perception starts to deteriorate at about 30 minutes of arc and is totally lost when 5 minutes of arc is reached. An 18-inch target would subtend 30 minutes of arc at 172 feet and 5 minutes of arc at 1,031 feet.



## 2.0 *Analysis*

### 2.1 *Introduction*

The 0001 Yard Assignment approached the crossover operating in compliance with company procedures and government safety standards. The red reflectorized targets indicating the reversed switch were not observed by the yard assignment foreman until it was too late to stop the movement. The reversed switch diverted the yard assignment into the side of the other movement. Based on rail markings, the collision occurred approximately 10 feet east of the main track switch mast. Therefore, the analysis will address the areas of switch target visibility, switch handling and operating procedures involving main track switches in yards.

### 2.2 *Consideration of the Facts*

#### 2.2.1 *Switch Target Observation*

As indicated by the event recorder, the point of impact was at a recorded time of 0402:58 CST when a sudden drop in speed was recorded and a brake pipe pressure depletion, likely from hose pipe separation or impact damage, was depicted. It is calculated, therefore, that the movement travelled approximately 190 feet with a service brake application before the collision. Considering that the switch target is located approximately 10 feet before the point of impact, the red switch target was then first observed by the yard foreman when the leading end of the movement was approximately 180 feet from the switch. If five seconds is allowed for the yard foreman to react to his observation and radio the locomotive engineer who, in turn, had to react and apply the brakes, this distance may have been in the area of 350 feet as the movement was travelling at 34.6 feet/second (23.6 mph).

Given that neither red switch target would be visible before 429.7 feet and given the misty conditions and darkness, it is apparent that the yard foreman was observant in noticing the indications of a reversed switch from a distance of approximately 350 feet.

#### 2.2.2 *Reversed Main Track Switches*

In this instance, there was no provision for the crew of the 2230 Yard Assignment to leave the switch in the reversed position and, therefore, CROR requirements were not respected. The arrangement developed by yard crews to facilitate yard movements with the advent of caboosless trains cannot be correctly exercised unless the yardmaster is in the immediate area and able to normalize the switch as soon as the movement is clear. It is suspected that this practice was originally initiated under such circumstances; i.e., the yardmaster was in the immediate area of the switch, but gradually evolved to the system employed in the Regina Yard. This procedure did not apparently evoke concern that a main track switch could be left for periods of time in a reversed position.

#### 2.2.3 *Train Control*

The system of train control employed in the yard provides signal protection for a misaligned switch on the main tracks if the direction of travel is with the current of traffic; i.e., the ABS block indicators

display a stop indication if a switch is reversed. The last CTC signal, controlled by the RTC, similarly could not display a clear signal if such a condition existed in the first block, thus protecting trains moving into the yard. However, the system does not provide signal protection for movement in the yard against the current of traffic such as in the subject instance. It is possible that through trains could be diverted to run against the current of traffic by the RTC. Such a scenario could see trains moving at track speed without the benefit of the ABS, relying on the switch targets to provide warning of a misaligned switch.

It would seem that the arrangement in the Regina Yard increases the probability that main track switches would be left in the reversed position which, when coupled with the limited advance warning that switch targets provide, creates a safety risk.

### *3.0 Conclusions*

#### *3.1 Findings*

1. The 0001 Yard Assignment was operated in accordance with company procedures and government safety standards.
2. Leaving main track switches in other than "normal" can create an unsafe condition.
3. Trains or engines moving against the current of traffic in the Regina Yard do not receive signal indication for open switches.
4. Standard reflectorized switch targets provide marginal advance warning of a misaligned switch.
5. The practice that evolved in the Regina Yard increased the risk of main track switches being left in the reversed position.

#### *3.2 Cause*

The collision was the result of the evolution of an unsafe operating practice that permitted a main track switch to be left in the reversed position.



## 4.0 *Safety Action*

### 4.1 *Action Taken*

#### 4.1.1 *Yardmaster's Duties*

Following this accident, Transport Canada (TC) conducted a field audit of the operating practices in the Regina Yard. TC's audit revealed that the yard operation did not comply with CROR Rule 104(b), in that the operating crews were leaving the main track switches reversed and unattended without proper authority. As a result of TC's review, Canadian Pacific Limited (CP) counselled all yardmasters working in the Regina Yard regarding the proper interpretation and application of pertinent CROR rules, specifically Rule 104(b). A subsequent TC field audit revealed that CP had corrected the problem and that safe railway operations were being conducted at the Regina Yard.

### 4.2 *Safety Concern*

#### 4.2.1 *Safety Management*

Transportation accidents are rarely attributable to a single cause; typically, a set of conditions interact with a series of actions, resulting in an accident or incident.

In the Regina Yard, it was normal for the yardmaster to line the switches for departing trains or yard movements and relieve the crew members of this responsibility. This practice was intended to expedite movements; however, it was not formally part of the yardmaster's job. Furthermore, this practice was not in agreement with the CROR or, as subsequently indicated, was not acceptable to the company. Yet, for this practice to have continued over an extended period of time, it required at least implicit supervisory concurrence.

The corrective measures taken by CP may prevent further accidents under similar circumstances in this yard. However, the Board is concerned that the ongoing work practices of the yardmaster may be indicative of shortcomings in senior management's overview of operations at the yard level, and that such latent unsafe conditions could combine with another series of actions, resulting in further occurrences in other yards.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board, consisting of Chairperson, John W. Stants, and members Zita Brunet and Maurice Harquail, authorized the release of this report on 23 January 1995.*

## **TSB OFFICES**



**HEAD OFFICE****HULL, QUEBEC\***

Place du Centre  
4<sup>th</sup> Floor  
200 Promenade du Portage  
Hull, Quebec  
K1A 1K8  
Phone (819) 994-3741  
Facsimile (819) 997-2239

**ENGINEERING**

Engineering Laboratory  
1901 Research Road  
Gloucester, Ontario  
K1A 1K8  
Phone (613) 998-8230  
24 Hours (613) 998-3425  
Facsimile (613) 998-5572

**REGIONAL OFFICES****ST. JOHN'S, NEWFOUNDLAND**

Marine  
Centre Baine Johnston  
10 Place Fort William  
1<sup>st</sup> Floor  
St. John's, Newfoundland  
A1C 1K4  
Phone (709) 772-4008  
Facsimile (709) 772-5806

**GREATER HALIFAX, NOVA SCOTIA\***

Marine  
Metropolitain Place  
11<sup>th</sup> Floor  
99 Wyse Road  
Dartmouth, Nova Scotia  
B3A 4S5  
Phone (902) 426-2348  
24 Hours (902) 426-8043  
Facsimile (902) 426-5143

**MONCTON, NEW BRUNSWICK**

Pipeline, Rail and Air  
310 Baig Boulevard  
Moncton, New Brunswick  
E1E 1C8  
Phone (506) 851-7141  
24 Hours (506) 851-7381  
Facsimile (506) 851-7467

**GREATER MONTREAL, QUEBEC\***

Pipeline, Rail and Air  
185 Dorval Avenue  
Suite 403  
Dorval, Quebec  
H9S 5J9  
Phone (514) 633-3246  
24 Hours (514) 633-3246  
Facsimile (514) 633-2944

**GREATER QUÉBEC, QUEBEC\***

Marine, Pipeline and Rail  
1091 Chemin St. Louis  
Room 100  
Sillery, Quebec  
G1S 1E2  
Phone (418) 648-3576  
24 Hours (418) 648-3576  
Facsimile (418) 648-3656

**GREATER TORONTO, ONTARIO**

Marine, Pipeline, Rail and Air  
23 East Wilmot Street  
Richmond Hill, Ontario  
L4B 1A3  
Phone (905) 771-7676  
24 Hours (905) 771-7676  
Facsimile (905) 771-7709

**PETROLIA, ONTARIO**

Pipeline and Rail  
4495 Petrolia Street  
P.O. Box 1599  
Petrolia, Ontario  
N0N 1R0  
Phone (519) 882-3703  
Facsimile (519) 882-3705

**WINNIPEG, MANITOBA**

Pipeline, Rail and Air  
335 - 550 Century Street  
Winnipeg, Manitoba  
R3H 0Y1  
Phone (204) 983-5991  
24 Hours (204) 983-5548  
Facsimile (204) 983-8026

**EDMONTON, ALBERTA**

Pipeline, Rail and Air  
17803 - 106 A Avenue  
Edmonton, Alberta  
T5S 1V8  
Phone (403) 495-3865  
24 Hours (403) 495-3999  
Facsimile (403) 495-2079

**CALGARY, ALBERTA**

Pipeline and Rail  
Sam Livingstone Building  
510 - 12<sup>th</sup> Avenue SW  
Room 210, P.O. Box 222  
Calgary, Alberta  
T2R 0X5  
Phone (403) 299-3911  
24 Hours (403) 299-3912  
Facsimile (403) 299-3913

**GREATER VANCOUVER, BRITISH COLUMBIA**

Marine, Pipeline, Rail and Air  
4 - 3071 Number Five Road  
Richmond, British Columbia  
V6X 2T4  
Phone (604) 666-5826  
24 Hours (604) 666-5826  
Facsimile (604) 666-7230

\*Services available in both official languages