Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

RAILWAY INVESTIGATION REPORT

R99D0159

RUNAWAY CARS

CANADIAN NATIONAL
MILE 69.4, CN KINGSTON SUBDIVISION
WESCO SPUR
CORNWALL, ONTARIO
27 AUGUST 1999

Canada

Railway Investigation Report

Runaway Cars

Canadian National
Mile 69.4, CN Kingston Subdivision
Wesco Spur
Cornwall, Ontario
27 August 1999

Report Number R99D0159

Summary

On 27 August 1999, at approximately 1040 eastern daylight time, a Canadian National (CN) crew was performing switching operations in the west end of yard CB at Cornwall, Ontario, on the Wesco spur, at Mile 69.4 of the CN Kingston Subdivision, when six tank cars ran away on track CB17. The cars rolled eastward for 475 feet and struck the stop block at the end of the track. At the time of impact, one car derailed and its tank was punctured. Approximately 5 000 gallons of product, a class 3 combustible liquid, NA 1993, was released but was almost all recovered. There were no injuries.

Ce rapport est également disponible en français.

Table of Contents

1.0 Other Factual Information

1.1 The Accident

Canadian National (CN) yard assignment 591 was performing switching operations on the Wesco spur in Cornwall, Ontario. The train crew left two cars on the switching lead, returned with six other cars, and left them standing on track CB17, to the west of six tank cars that had been placed there sometime between 26 July and 05 August 1999. The locomotive then returned to pick up the two cars on the switching lead and move them to track CB17. At that time, the six tank cars started to run away. The leading car, STEX 20520, containing a class 3 combustible liquid, NA 1993, struck the stop block on track CB17. In the impact, the car derailed and its tank was punctured. Approximately 5 000 gallons of product was released but was almost completely recovered.

The crew members had not noticed that the six tank cars left standing further to the east had run away. Witnesses called Cornwall emergency services when they saw the cars with no locomotive slowly roll eastward and strike the stop block. Cornwall police and fire-fighters and one CN police officer responded within minutes of the call. They immediately set up a 1 000-foot safety perimeter and evacuated customers and staff from nearby businesses. Later, the perimeter was reduced to 300 feet. The contaminated area was isolated and access was controlled by the Cornwall and CN police forces.

1.2 Injuries

There were no injuries.

1.3 Damage to Equipment

Car STEX 20520, a Class 111A tank car, derailed and sustained damage to its tank. In the impact, one leg of the end stop block[1] punctured the tank and left a hole measuring about 30 square inches. The end stop block was destroyed.

Car STEX 20520 was loaded with 146 660 pounds of a class 3 combustible liquid, NA 1993, which is not regulated in Canada. The product was declared as heptanol, but analysis of a sample revealed that it was a mixture of solvents with a flash point of 74 degrees Celsius.

1.4 Other Damage

A sand dike was constructed to contain the spill. Nearby inlets to stormwater and sanitary sewers were sealed to prevent the product from entering the sewers. About 5 000 gallons of liquid was released from the car and spilled onto the ground. Over 3 000 gallons were recovered directly and transshipped in tank trucks; the rest flowed into the sewer system or seeped into the ground. The sludge was recovered at the treatment facility, and the soil contaminated by the liquid was collected and hauled away for treatment. The evacuation caused inconvenience and economic losses for nearby businesses.

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[1] Device installed on dead-end tracks to stop runaway cars.

1.5 *Personnel Information*

The crew consisted of a locomotive engineer, a conductor and a trainman. They were familiar with the area, met fitness and rest standards, and were qualified for their respective positions.

1.6 *Occurrence Site Information*

Yard CB (see Figure 1) has five storage tracks; it runs east-west through a business area between a shopping centre and a restaurant. The tracks in yard CB are used to store cars awaiting delivery to local companies.

Track CB17 is 1 500 feet long, has a 1 per cent descending grade eastward, and curves slightly left one degree over approximately 1 000 feet starting at the switch. It consists of 85-pound rails laid in 39-foot bolted lengths. It is a dead-end track equipped with an end stop block.

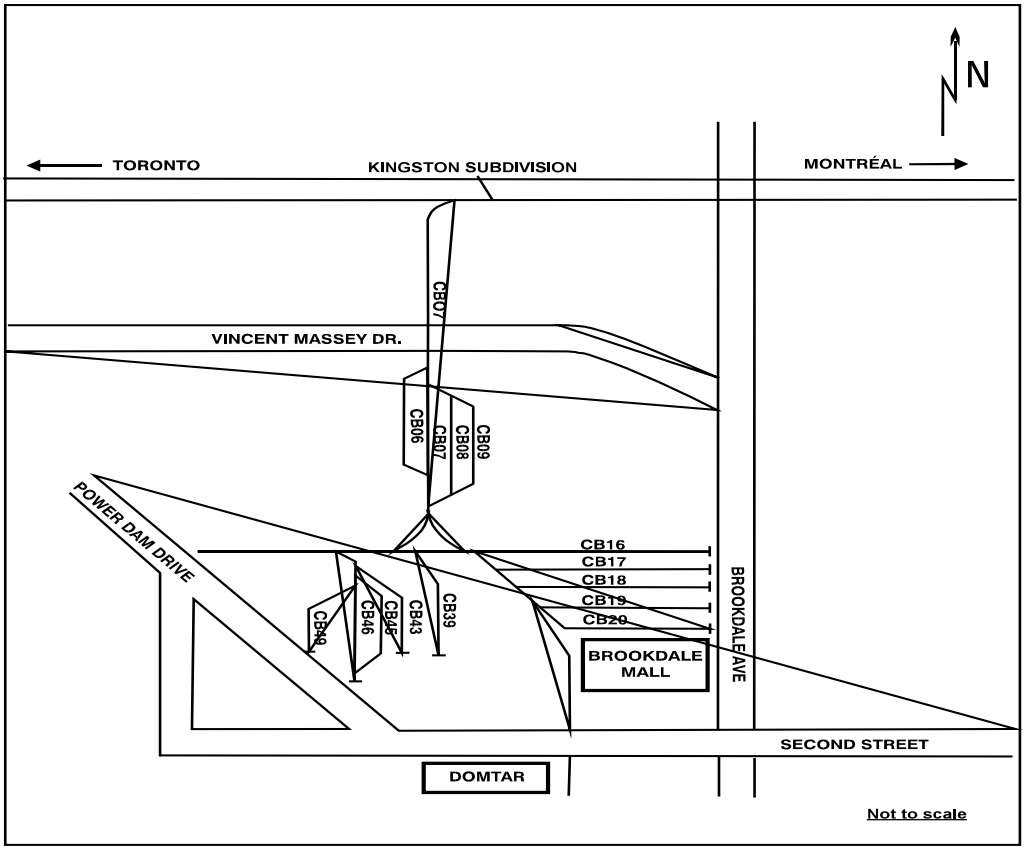

Figure 1 - Layout of Wesco spur and yard CB

1.7 *Train and Switching Operations*

Cornwall yard assignment 591 is a regular assignment serving the industries in Cornwall, such as Domtar and BASF, during regular business hours from Monday to Friday.

On the day of the accident, the crew had to push a draft of eight cars (draft A) onto the switching lead, place the two leading cars in the draft just ahead of the locomotive, then couple to the six tank cars (draft B) standing at the east end of track CB17 in yard CB (see Figure 2). The 14 cars were then to be delivered to various clients. This was a routine operation typically performed several times a week.

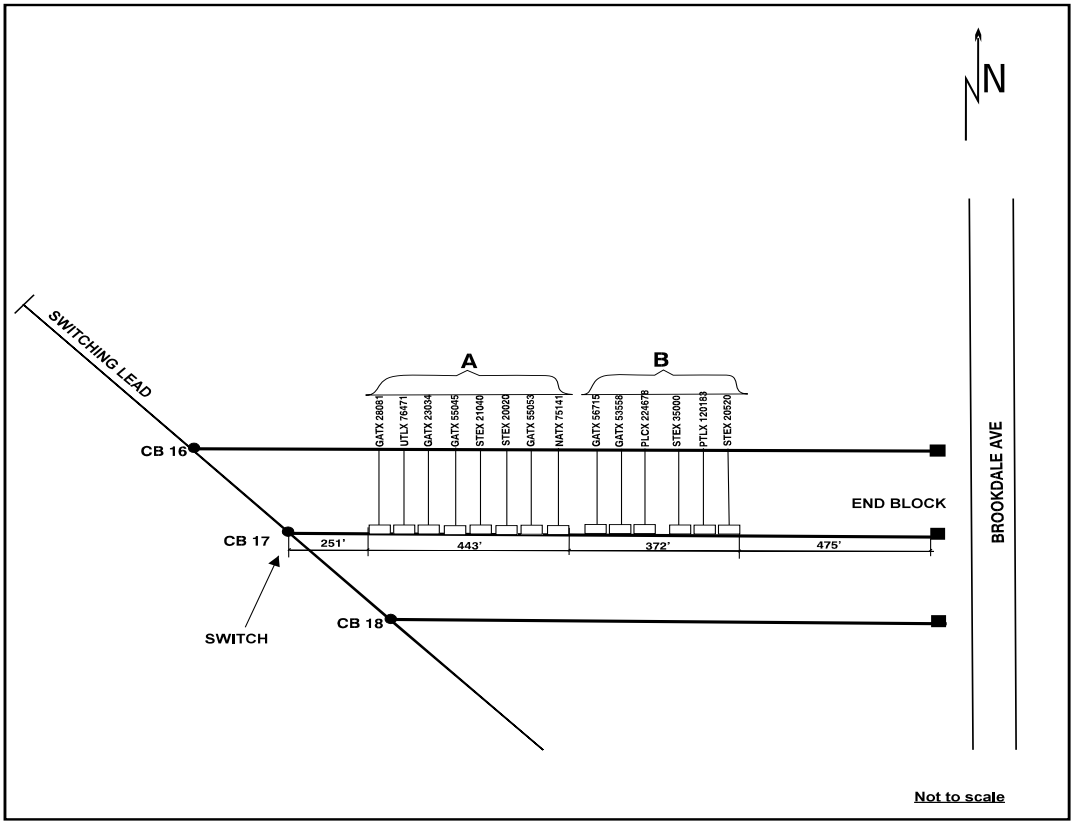

Figure 2 - Arrangement of the cars in drafts A and B

1.8 Weather

The temperature was 26 degrees Celsius, moderate winds were blowing at 4 km/h from the south-east, and the sky was clear.

1.9 Recorded Information

Locomotives GR12 and GR13 were not equipped with event recorders.

1.10 Method of Train Control

The Wesco spur was governed by Canadian Rail Operating Rules (CROR) Rule 105. Rule 105 requires that trains or engines operate at reduced speed and be prepared to stop short of the red flag or red light prescribed by Rule 40.1. CN special instructions require that speed must not exceed 15 mph.

1.11 Operating Instructions and Rules

CN's General Operating Instructions and CROR Special Instructions set out the requirements for rolling stock securement and coupling.

CROR Rule 112 and associated special instructions apply to the securement of rolling stock. Rule 112 reads as follows:

> Unless otherwise directed by special instructions, a sufficient number of hand brakes must be applied on equipment left at any point to prevent it from moving. If left on a siding, it must be coupled to other equipment, if any, on such track unless it is necessary to separate such equipment at a public crossing at grade or elsewhere.

Following the accident in Edson, Alberta, in August 1996, the TSB examined the variability of brake effectiveness (TSB report No. R96C0172). As a result, CN issued the following special instructions to Rule 112:

> **SPECIAL INSTRUCTIONS Rule 112**
>
> [. . .]
>
> 3. **HANDBRAKE CHART** - Unless otherwise provided, the following chart indicates the minimum number of handbrakes that must be fully applied to secure equipment (even when such equipment is left secured by a full application of the air brakes):
>
> | | Minimum Handbrake Application |
> |---|---|
> | 1 car | 1 handbrake |
> | 2 - 19 cars | 2 handbrakes |
>
> [. . .]
>
> 6. **NOTES:**
>
> [. . .]
>
> iii) If cars are not coupled together in a track, and the Minimum Handbrake chart is applicable, the handbrake per car requirement outlined in Special Instruction 3 applies to each separated cut (block) of cars on the track.

There are no special instructions requiring crews to secure cars at the downhill end of an inclined track or to rest them against stop blocks.

Rules 113 and 115 and associated special instructions govern the coupling of cars. Rule 113(a) states that, "Before coupling to equipment at any point, care must be taken to ensure that such equipment is properly secured."

The Special Instruction to Rule 113 reads in part:

> [. . .]
>
> 2. **STRETCHING THE COUPLING** - When coupling to equipment for any purpose, except when humping or flat switching where cars are intentionally let run free, the coupling must be stretched to ensure it is secure.

Rule 115, Pushing Equipment, states in part:

> (a) 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.

All crew members were well aware of the requirements of Rules 112, 113 and 115.

1.12 Car Securement

1.12.1 Statistics on Runaways

The number of occurrences involving runaway cars decreased from 51 in 1996 to 41 in 1997 after the Edson occurrence. In 1998, the number of occurrences rose to 69, then fell to 45 in 1999.

1.12.2 Brake Application

The cars in draft B were in two separate cuts of three cars each. Only car STEX 20520, standing at the east end 475 feet from the stop block, had one brake applied. The hand brake was checked and found to be in good working condition. The mechanism was engaged and the shoes were in contact with the wheels. It was common practice to apply only one brake per draft of cars; this practice had never resulted in an accident before at this yard.

1.13 Car Coupling

During the last movement before the accident, the conductor was near the track CB17 switch and the trainman was watching the coupling between the two cars and the six others they had just positioned to make up draft A. The curve of track CB17 and the cars on track CB16 obstructed their view and prevented the crew members on the ground and the locomotive engineer from seeing the east end of draft A and the west end of draft B.

Draft A was 443 feet long and was standing 251 feet from the switch (see Figure 2). With the six cars coupled, draft B was 356 feet long. The marks made by the wheels of car STEX 20520 indicate that the east end of draft B was 475 feet from the stop block; therefore, draft B only had 372 feet. Since the cars in draft B were not in cuts, the theoretical maximum distance between draft A and draft B must have been less than 16 feet.

1.14 Car Coupling Mechanism

The inspection of all cars standing on track CB17 revealed that the last car in draft B, GATX 56715, had fresh impact marks on parts of the coupler and coupler knuckle. The coupler knuckle, locking mechanism and knuckle thrower were all in the closed position. The coupler knuckle of the leading car in draft A, NATX 75141, was open and had fresh impact marks matching the marks on car GATX 56715. The coupling mechanism on car NATX 75141 was not operating properly. It was disassembled and examined. Tank car NATX 75141 was equipped with a type SF70 coupler, but it had a type E-30 knuckle thrower instead of a type F-31 which is normally required. It was re-assembled with a type F-31 knuckle thrower, and it operated normally.

Railway company maintenance programs do not include cars that are leased to private companies and used on other rail systems, or cars owned by other railways. Railways maintain only their own cars or cars they maintain under contract. However, since railways are responsible for the condition of all cars running on their tracks, they must often perform maintenance to ensure safe operation. For this purpose, the Association of American Railroads (AAR) has established rules for repair cost recovery and work standards. These rules are set out in the *Office Manual* and the *Field Manual of the AAR Interchange Rules*. Work must be done in AAR-certified shops to AAR specifications. In exceptional cases, a repair can deviate from AAR specifications if the car owner consents.

The cost of the repairs to the knuckle thrower of car NATX 75141 was never claimed from the owner—NATX. The car records contain no indication as to the date or location of the work or which company did it.

1.15 Condition of Stop Blocks

The examination of several stop blocks revealed old cracks and ovalized attachment bolt holes. There was also surface corrosion in the area of the attachments, and the cross-section of the attachment bolts was diminished.

Under Transport Canada's *Railway Track Safety Rules* and CN's Standard Practice Circulars, switching tracks must be inspected once a month; however, there are no requirements regarding the inspection or maintenance of stop blocks. CN's records contained no information regarding the inspection of stop blocks.

1.16 Internal Supervision and Control

The crew was working under the supervision of a train master in Brockville, Ontario. According to CN's General Operating Instructions, one of the duties of supervisors is to:

> Ensure that safe work methods, standards and procedures are followed by all employees working under their supervision. . . .

CN's records indicate that there was a non-compliance to Rule 112 in 1995 in the Cornwall area; however, there is no recent record of control inspections by supervisors to check compliance with the rules and procedures for rolling stock securement and coupling.

1.17 Class 111A Tank Cars

Class 111A tank cars, built to DOT-111A specifications in the United States or TC or CTC-111A specifications in Canada, are used to transport flammable liquids, acids and other corrosives. These cars are commonly referred to as non-pressure tank cars. They normally have no head shields or protective housing to protect top fittings from impact damage. The tank shells are often the minimum specified thickness of 7/16 inch. Class 112 and 114 cars, on the other hand, have head shields and thicker tank shells.

Data collected by the TSB on accidents suggest that over 60 per cent of releases of products from Class 111A tank cars were through damaged top fittings; over 25 per cent were due to car structural failure, mainly from punctures in the head or shell; and about 10 per cent of releases were through damaged bottom fittings.

Given that Class 111A tank cars are more likely to release their content in an accident, the Board has been concerned about the use of these cars to carry certain dangerous goods, particularly those that present a high inhalation toxicity. The Board felt that the risks could be minimized by reducing the probability of a product release through design improvements for protecting the cars or by limiting the types of products they can carry (TSB report No. R94C0137).

1.18 Application of Circular DG-1

The tracks in yard CB are used to store cars for varying periods of time, depending on the customer's requirements. The rules for handling and storing cars containing dangerous goods were revoked by Transport Canada in 1995 and replaced with the Railway Association of Canada *Circular DG-1* on the safe handling and storage of dangerous goods cars delayed in transit on railway property.

The circular states that, beginning on the fifth day of securement, dangerous goods cars must be inspected for product leaks every 24 or 48 hours. Inspection results must be recorded and kept for two months after the cars leave.

CN records contained no documents indicating that this procedure was followed.

1.19 Emergency Response

The evacuation, product confinement and transshipment to tank trucks, and clean-up and recovery of contaminated soil were carried out in a timely and effective manner.

2.0 Analysis

2.1 Introduction

Safety action taken by the industry and Transport Canada after the Edson accident had a significant impact since the number of runaway occurrences decreased in 1997. The number of occurrences subsequently increased by about 50 per cent in 1998. In 1999, the number again returned to a level similar to that observed in 1997. However, this accident shows that further action is required in areas where strict compliance with the rules by employees is the only way to ensure the health and safety of employees and residents along railway rights-of-way.

The analysis will focus on compliance with the procedures for the coupling and securement of cars, on the inspection and maintenance of stop blocks, and on the transportation and storage of dangerous goods in urban areas.

2.2 Car Switching and Securement

The crew members were qualified and experienced to perform their duties in accordance with company requirements. They were familiar with the area and were performing routine operations. CN guidelines for car securement and coupling were specific but employees were not following them. As a result, the procedures in place were inconsistent with those set down by the company, and there was no monitoring and control program in place in the area to prevent employees from using procedures that were inconsistent with company instructions. When performing their operations, the crew members did not comply with CROR rules and associated special instructions for the securement and coupling of rolling stock (Rules 112, 113 and 115). Further, since the track was slightly inclined and had end stop blocks, the crew members considered the risk of a runaway to be low; consequently, the practices followed were considered satisfactory and less binding.

The cars in draft B had been parked in two separate cuts; however, the hand brake was applied on only one car in spite of CN instructions that two hand brakes must be applied on each cut of cars. While performing switching operations, the crew members were in positions from which they could see neither the end of the draft they were pushing nor the cars that were already standing. Without a crew member to control the movement, it was very difficult to avoid contact between the drafts because, in theory, there was only 16 feet between draft A and draft B. The fresh impact marks on the coupler knuckles of the end cars of each draft show that there was contact between the drafts. Under normal conditions, contact between the drafts would have triggered the coupling mechanism and coupled the two drafts together. However, since the wrong coupling equipment had been installed on car NATX 75141 while it was in repair, coupling did not occur. The first three cars of draft B, which were not secured by hand brakes, started to roll and struck the rest of the draft. On impact, the other three cars started to run away because the one hand brake that was applied was insufficient to hold them.

2.3 Coupling Mechanism

It could not be determined where or when the repair was done to the coupler of car NATX 75141. Since the repairs were not recorded in the car records and the repair costs were not claimed from the company, a type E-30 knuckle thrower may have been intentionally installed instead of a type F-31. This might be because the consequences of installing the wrong part may not have been fully appreciated, but it is also possible that the repairs were done on a temporary basis on the main track in an emergency situation, and that subsequent corrective action was never taken. This is probably an isolated case, since the AAR rules for recovering the cost of repairs to cars owned by other companies do not encourage this type of situation.

2.4 Condition of Stop Blocks

Stop blocks are installed on dead-end tracks to prevent cars from derailing off the end of the track. However, the stop block on track CB17 could not serve its purpose even in a low-speed impact. The observed old cracks and ovalized bolt holes show that the stop blocks in yard CB had previously been put to the test and had stopped movements. However, they were not being maintained and had deteriorated to the point where they could not perform the function for which they were designed. CN records contain no information regarding stop block inspections; moreover, neither Transport Canada's *Railway Track Safety Rules* nor CN's Standard Practice Circulars contain any provisions pertaining to the inspection or maintenance of stop blocks. With no inspection and maintenance program, these devices, which play a key role in the safety of operations, can become unserviceable, thereby increasing the risk to the public.

2.5 Class 111A Tank Cars

Even though the tank cars in draft B struck the stop block at very low speed, the tank did not withstand the impact and it was punctured. In general, Class 111A tank cars do not have sufficient protection against loss of contents, even in minor impacts due to the thinness of the tank shell and the absence of a head shield.

2.6 Storage of Dangerous Goods

Circular DG-1 states that cars carrying dangerous goods must be inspected for product leaks every 24 or 48 hours. However, there were no documents in Cornwall Yard indicating whether this procedure was followed for regulated dangerous goods. Some of the tank cars involved in this occurrence had been standing on track CB17 for one month but were never inspected during that time, nor were they expected to be inspected. These cars contained a dangerous good that is not regulated in Canada; therefore, their storage is not subject to *Circular DG-1*, even though their contents were flammable and presented risks to local residents.

Leaks or releases of dangerous goods (regulated or not) can put the safety of persons and the environment at risk. The risks are even greater when rail cars are stored on switching tracks in an urban area. Therefore, it is imperative that the existing safety rules be enforced, particularly *Circular DG-1*.

2.7 Response and Site Clean-up

Product confinement, control and site clean-up were carried out in a timely and effective manner. Action taken to secure the site and ensure the safety of the public and the personnel involved in the confinement and site clean-up were appropriate and well executed.

3.0 Conclusions

3.1 Findings as to Causes and Contributing Factors

1. Theoretically, there was only 16 feet to manoeuvre between draft A and draft B. It was difficult to avoid contact between the drafts without a crew member controlling the movement.

2. Contact between the drafts should have triggered the coupling mechanism and coupled the drafts together, but coupling did not occur because tank car NATX 75141 was equipped with a knuckle thrower which did not meet Association of American Railroads (AAR) specifications.

3. The cars in draft B ran away because the one hand brake that had been applied was insufficient to secure them.

4. Canadian National (CN) guidelines on car securement and coupling were specific but were not followed. The employees did not follow the Canadian Rail Operating Rules (CROR) and associated special instructions pertaining to the securement and coupling of rolling stock (Rules 112, 113 and 115).

5. There was no monitoring and control program in place in the area to prevent employees from using procedures that were inconsistent with company instructions.

6. The risk of runaways in yard CB were considered to be low because the tracks were slightly inclined and were fitted with end stop blocks. However, the end stop blocks were deteriorated to the point where they could not perform the function for which they had been designed.

7. In general, Class 111A tank cars do not have sufficient protection against punctures, even in a low-speed impact due to the thinness of the tank shell and the absence of a head shield.

3.2 Other Findings

1. There is no indication that the requirements in *Circular DG-1* were complied with in Cornwall Yard, and as a result, the storage of cars loaded with both regulated and non-regulated dangerous goods in an urban area put the community and the environment at risk in the event of a release.

2. Confinement and control of the dangerous good and the clean-up and control of the derailment site were performed with professionalism.

3. With no inspection and maintenance program, equipment that plays a key role in the safety of operations can become unserviceable, thereby increasing the risk to the public.

4.0 Safety Action

4.1 Action Taken

In September 1999, Canadian National (CN) issued new instructions for the Wesco spur in Cornwall. The instructions require that all rolling stock be grouped and secured with the appropriate number of hand brakes as required under special instructions to Rule 112. Also, cars must rest against the stop blocks on tracks so equipped. A full stop must be made 6 to 12 feet from any coupling. The same instructions apply to tracks with crescent stops, except that rolling stock must be left standing 6 to 12 feet from the crescent stop. In October 1999, CN implemented the above instructions on several spur tracks and industrial tracks in the Kingston Subdivision.

CN has retrofitted the stop blocks and modified the track layout in yard CB at Cornwall. Tracks CB19 and CB20 were removed and the remaining tracks were shortened by 500 feet, thus distancing the storage area from nearby businesses.

Efforts are being made by Transport Canada, through the Association of American Railroads Tank Car Committee, to change the design of new Class 111 tank cars and to increase the top fitting protection level of the most vulnerable non-pressure tank cars in the North American fleet. Also, a full head shield will be a future requirement for new Class 111A aluminum and nickel tank cars carrying dangerous goods.

4.2 Safety Concern

The Board recognizes the effort by CN to mitigate the risks identified with rolling stock securement and switching practices in the Cornwall area. The Board also acknowledges that the measures were extended to several spur tracks and industrial tracks in the Kingston Subdivision. However, the Board notes that neither CN nor Transport Canada has assessed whether the weaknesses in safety defences that contributed to this accident exist elsewhere. Therefore, the Board is concerned that the risks associated with rolling stock securement and switching practices have not been fully assessed.

The Board notes that CN has improved the stop blocks in the Cornwall area. However, there is no indication that the industry is taking any further safety action. The Board is concerned that the absence of railway or regulatory standards governing the inspection and maintenance of stop blocks can lead to inadequate inspection and maintenance programs. Without maintenance, the equipment that plays a key role in the safety of operations cannot perform the function for which it had been designed, thereby increasing the risk to the public.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 30 May 2001.