Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

# RAILWAY INVESTIGATION REPORT

# R00T0324

## MAIN TRACK DERAILMENT

## CANADIAN NATIONAL

## TRAIN NO. M-309-21-09

## MILE 214.07, KINGSTON SUBDIVISION

## MARYSVILLE, ONTARIO

## 10 DECEMBER 2000

Canada

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 Investigation Report

# Main-Track Derailment

# Canadian National
# Train M-309-21-09
# Mile 214.07, Kingston Subdivision
# Marysville, Ontario
# 10 December 2000

# Report Number R00T0324

## *Summary*

On 10 December 2000 at 0624 eastern standard time, westward Canadian National train M-309-21-09, proceeding on the south main track of the Kingston Subdivision at a speed of 49 mph, derailed two cars at Mile 214.07, near Marysville, Ontario. One of the derailed cars, a bulkhead flatcar loaded with lumber, lost its load, blocking the adjacent north main track. There were no injuries.

*Ce rapport est également disponible en français.*

# *Other Factual Information*

Canadian National (CN) train M-309-21-09 (the train), powered by 2 locomotives, consisted of 51 loaded cars and 44 empty cars. It was approximately 6600 feet long and weighed about 8300 tons. The train was restricted to a speed of 50 mph due to the presence of empty gondola cars in the consist (empty gondola cars are prone to truck hunting at speeds above 50 mph). The locomotive event recorder data showed that the train was proceeding at 49 mph, with the throttle in idle, and the air brakes released when it experienced a train-initiated emergency brake application.

The train had departed the Joffre Terminal at Charny, Quebec, and was destined for Toronto, Ontario. On 10 December 2000 at 0624 eastern standard time (EST),[1] as the train negotiated a one-degree right-hand curve (in the direction of travel) with a three-inch superelevation (banking) at Mile 214.07, it experienced a train-initiated emergency brake application, bringing the train to a stop. After conducting the necessary emergency procedures, the crew determined that two cars, the 94th (DWC 605462, a bulkhead flatcar measuring 52 feet 6 inches that had been loaded with rough cut construction grade [grades 3 and 4] lumber), and the 95th (ACFX 75842, a residue tank car of clays) had derailed.

The bulkhead flatcar, DWC 605462, had turned 180 degrees and came to rest in the south ditch. The tank car remained coupled to the rear of the train and was pushed approximately 300 feet (91.6 m) westward with the leading truck derailed foul of the north main track. The load of lumber had fallen onto the north main track just past the exit point of the curve. The ballast and ties were heavily gouged next to the gauge side of the south rail at this point. DWC 605462 was observed to still have stub stakes in place on what had been the south side of the car deck before the derailment. These remaining stakes were not secured with nails. Wood guard rails required to be nailed to the car deck on each side of the load were missing. Several pieces of guard rail, with nails not driven home, were located on the right-of-way in the vicinity of Mile 210.00. The north side stakes were not found.

In the area of Mile 214.07, the subdivision is double main track. The authorized maximum speed is 100 mph for passenger trains and 60 mph for freight trains. Train movements are controlled by the Centralized Traffic Control System, authorized by the Canadian Rail Operating Rules. This portion of the subdivision is supervised by a rail traffic controller in Toronto, Ontario. A hot box and dragging equipment detector is located at Mile 209.0, and the train passed this location without any indication of an equipment malfunction.

Lengths of steel banding straps, used to secure the load, were recovered from the pile of lumber. Some pieces appeared to have slipped through their securement clips and one sample showed areas of heavy abrasion and scratching consistent with having been dragged along the ballast for a considerable time.

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1 All times are EST (Coordinated Universal Time [UTC] minus five hours) unless otherwise stated.

Lumber shipped in this manner is first arranged in bundles secured by plastic banding straps. The bundles are then arranged in a staggered fashion on the rail car and secured together with steel banding. Lumber guard rails are nailed the full length of the car deck on each edge of the load. Side stakes are fixed into pockets on the edge of the deck. All aspects of bulk lumber loading are outlined in the Association of American Railroads (AAR) *Open Top Loading Rules*. The manner of loading could not be assessed as the complete load had fallen from the car. However, a car which was loaded at the same location as the subject car and marshalled on the same train was given a thorough inspection in Toronto by a representative of the Railway Association of Canada (RAC).

The RAC representative observed that the steel banding straps had dug into the wood at the corners of various locations, causing the straps to become loose due to the softness of the lumber. Corner protectors, which can prevent damage to the load, are added at the option of the shipper and are not typically used on grades 3 or 4 lumber. These grades have a high moisture content and are easy to crush. It was also observed that, to a lesser extent, the plastic banding had dug into the corners of the wood bundles and become loose.

The AAR requires side stakes to extend from the bottom of the stake pocket on the side of the car to 25.5 cm (10 inches) above the floor and be secured to the stake pocket with a nail. The stub stakes met the required height but did not have the securement nails. The AAR also stipulates that there must be one guard rail on each side of the load and that the guard rails must be secured by nailing to the car floor bearing pieces. On the inspected car, the nails were not hammered all the way into the car floor bearing pieces as required.

DWC 605462 was loaded in New Richmond, Quebec, at the Chemin de fer Baie des Chaleurs (CFBC) loading facility. The sawmill produces rough cut board lumber of different categories for various customers throughout North America. The sawmill may ship anywhere from 250 to 500 car loads per year by rail. The sawmill is about 25 km from the rail facility, and lumber is shipped by truck to New Richmond.

The sawmill supplies AAR-approved bands and banding securement tools (sealers) for the securement of wood on the rail cars. The trucking firm is responsible for ensuring the supplied tools are maintained in good condition and the rail cars are properly loaded. The sawmill operator and the trucking firm employees have attended training and information sessions on the AAR open top loading and lumber packaging standards, given by RAC representatives on at least two occasions since 1998. The sealers in use appeared capable of crimping the seals in the appropriate fashion.

The tools and the strapping used at the sawmill for packaging the lumber were AAR approved. The lumber bundles were prepared for shipment in accordance with recommended packaging procedures. The trucking firm had been performing the trans-shipping from truck to rail car for the mill and other local customers since 1995, and handles up to 700 rail car loads per year.

DWC 605462 was released by the shipper for pickup at 1638 on 07 December 2000. The car was picked up by the CFBC on 08 December 2000. The car was then taken to Matapédia, Quebec, and interchanged to the Chemin de fer de la Matapédia et du Golfe, arriving in Rivière-du-Loup, Quebec, for interchange with CN on 09 December 2000. During this process, the car was subject to two Schedule A safety inspections[2] by train crews with no exceptions noted. The car again passed a Schedule A safety inspection by the receiving CN train crew before being taken to the CN Joffre Yard in Charny. The car then passed a safety inspection by certified car inspectors before being marshalled on train M-309-21-09 at 2030 on 09 December 2000.

The steel banding recovered from the derailment location, samples of banding crimped by the trucking contractor using the same sealers that were used in loading the car, crimped samples from two other operators, and unused banding and seal joints were forwarded to the TSB Engineering Laboratory for examination and testing (Report LP 135/00). It was determined that:

- The seals joining the straps recovered from the derailment site had either slipped or opened up. Examination of one notched joint on a strap from the derailment site showed that the straps had been mostly deformed, as opposed to being cut through, suggesting possible excessive wear of the jaws and punches on the sealer.

- Tensile tests showed that the majority of the comparison samples received from three different operators failed below the minimum required joint strength, indicating that the sealer was not achieving a proper notch and that wear of the sealer could be a factor.

- A visual inspection could not determine if the notches or crimps were satisfactory.

- The use of corner protectors or angle brackets would have reduced crushing of soft lumber products and reduced the possibility of loosening the straps.

- Tensile tests carried out on the straps showed that they met the breaking strength specification.

Examination of a sealer from one of the suppliers of the comparison banding led to the conclusion that the sealer used to secure the derailed load had jaws that were worn smooth. The manual for this tool states, “Should the cuts be shallow and poorly defined, check the jaws and the punches for wear.” Good maintenance practices would be to inspect the sealers regularly for

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2 A Schedule A safety inspection is a pre-departure inspection carried out by qualified train crew members at locations where certified car inspectors are not available. The inspection consists of a train air brake test to ensure that the air brakes properly apply and release and of either a walking or pull-by inspection of the train to ensure that it is free of operating defects, defective doors or missing safety appliances.

wear of the jaws and punches. Test samples from the sealer should be examined regularly to ensure that the joints meet specifications.

# *Analysis*

There were no train handling or equipment difficulties evident up to the time of the emergency brake application. Car DWC 605462 did not evoke concern from railway employees who inspected the car up until it departed Joffre Terminal for Toronto. The manner of loading and the condition of the load appeared safe at these times. However, as evidenced by the roadbed and tie marking at the area of the load loss, it is apparent that the derailment and the security of the load are linked. The analysis will deal with the load of lumber as it moved along the Kingston Subdivision and negotiated the curve at Mile 214.07.

Curves on this subdivision are designed for high speed, and a one-degree curve with a three-inch superelevation, such as the one at Mile 214.07, has a balance speed of 65.46 mph (the force of gravity to the inside of a curve will be balanced by the centrifugal [lateral] force to the outside of a curve). The operation of a train at any speed less than this, such as a maximum of 50 mph in this case, while not unsafe, results in a greater force being experienced to the inside of a curve. This force would be particularly strong on a bulkhead flatcar loaded with lumber as the centre of gravity would be quite high. Therefore, it is likely that the load had been encountering lateral forces, shifting the load from one side of the car to the other, all along the subdivision. These forces caused the banding to dig into the corners of the lumber, gradually lessening the degree of securement and allowing even greater movement as the trip progressed.

One strip of banding may have broken many miles before the derailment as one of the recovered pieces of banding had been dragged for a period of time. At about Mile 210.0, the load had probably shifted enough to knock the north side guard rails off and more banding may have broken at this time. The already unstable load would have moved again in the curve at Mile 214.07. Just before the lumber began to fall off, the unbalanced load caused one or more wheels on the south side of the car to lift and derail to the south, destabilizing the trailing car which also derailed. Upon striking the roadbed, the remaining banding broke, allowing the lumber to scatter over the tracks.

While the loading condition of DWC 605462 could not be assessed, two exceptions were noted to the AAR loading requirements on the sister car. These exceptions, including the side stakes not being nailed in place and the nails on the guard rails not being hammered home, would not have resulted in the load shift of DWC 605462. Crushing of the corners of the lumber and the resultant loosening of the banding, which in turn allowed more shifting and increasingly severe crushing and even more loosening, are considered to have played a very important role in the load shift. Corner protection that is not prone to crushing and that would spread out the load would aid the safe loading of construction grade lumber on flatcars.

The seals supplied by the shipper and two other operators appeared to be capable of securing the bands in a proper fashion, but as TSB testing has shown, they did not meet the required AAR tensile strength. It was shown that, even though the sealers appeared to be in good

condition, they were not achieving a proper notch; wear of the sealer could be a factor. During the transportation of this type of load, it is imperative that the band securement be strong enough to restrain movement and it is essential that sealers perform to specification.
AAR methodologies with respect to approved tools and seals do not maintain the expected level of safety.

## *Findings as to Causes and Contributing Factors*

1. As the train speed was much lower than the balance speed, the load experienced lateral forces in each curve, causing the banding around the load of lumber on car DWC 605462 to dig into the corners of the lumber, gradually lessening the degree of securement and allowing even greater movement as the trip progressed.

2. Travelling in an unstable state, the lumber shifted in the curve at Mile 214.07 and the unbalanced load caused one or more wheels on the car to lift and derail to the south, destabilizing the trailing car which also derailed.

## *Other Findings*

1. Corner protection not prone to crushing would spread out the load, thereby aiding the safe loading of construction grade lumber on flatcars.

2. American Association of Railroads methodologies with respect to approved tools and seals do not maintain the expected level of safety.

## *Safety Action*

The American Association of Railroads (AAR) will be issuing new recommended practices for annual tool and seal inspections, which will be included in its revisions to the *General Rules Governing the Loading of Commodities on Open Top Cars* in March 2003.

Canadian National (CN) loading staff and open load inspectors have been notified regarding irregularities noted in bulk flathead cars loaded with lumber.

CN inspectors were advised to ensure that, when inspecting trains made-up with bulkhead flatcars loaded with lumber, the cars are loaded in accordance with the prevailing AAR General Rules.

CN's mechanical supervisors and inspectors are being given refresher training courses on the *AAR General Rules Governing the Loading of Commodities on Open Top Cars*.

During Comprehensive Safety Audits, Transport Canada inspectors will ensure that bulkhead flat cars carrying lumber are loaded in accordance with prevailing AAR General Rules.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 17 December 2002.*