



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: August 25, 2005

In reply refer to: R-05-07

Mr. E. Hunter Harrison
President and Chief Executive Officer
Canadian National Railway Company
455 N. City Front Plaza Drive
Chicago, Illinois 60611

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendation in this letter. The Safety Board is vitally interested in this recommendation because it is designed to prevent accidents and save lives.

This recommendation addresses the Canadian National Railway Company's (CN's) continuous welded rail (CWR) maintenance and inspection procedures and standards. The recommendation is derived from the Safety Board's investigation of the April 6, 2004, derailment of National Railroad Passenger Corporation (Amtrak) train No. 58 (*City of New Orleans*) on CN railroad track near Flora, Mississippi, and is consistent with the evidence we found and the analysis we performed.¹ As a result of this investigation, the Safety Board has issued four safety recommendations, one of which is addressed to CN. Information supporting this recommendation is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation.

About 6:33 p.m. central daylight time on April 6, 2004, northbound Amtrak train No. 58 (*City of New Orleans*) derailed on CN railroad track near Flora, Mississippi. The entire train, consisting of one locomotive, one baggage car, and eight passenger cars, derailed near milepost 196.5 while traveling about 78 mph. The train was carrying 61 passengers and 12 Amtrak employees. The derailment resulted in 1 fatality, 3 serious injuries, and 43 minor injuries. The equipment costs associated with the accident totaled about \$7 million.

¹ For additional information, see National Transportation Safety Board, *Derailed of Amtrak Train No. 58, City of New Orleans, Near Flora, Mississippi, April 6, 2004*, Railroad Accident Report NTSB/RAR-05/02 (Washington, DC: NTSB, 2005).

The National Transportation Safety Board determined that the probable cause of this accident was the failure of CN to properly maintain and inspect its track, resulting in a rail shift and the subsequent derailment of the train, and the Federal Railroad Administration's (FRA's) ineffective oversight to ensure the proper maintenance of the track by the railroad.

Since the beginning of 2004, the area near the point of derailment (milepost 196.5) had several track maintenance procedures performed. On January 29, 2004, welders cut out a 12-foot 11 1/2-inch portion of the east rail with a crushed rail head. When the piece of rail was cut out, the remaining rail pulled apart, and the replacement rail plug had to be 2 1/2 inches longer to fill the opening. The replacement rail plug was 13 feet 2 inches long. At that time, the rail plug was bolted rather than welded into place.

On the day of the accident, April 6, the air temperature was approximately 80° Fahrenheit (F) with broken clouds. Three days later, a similar day with a temperature of 82.9° F and a few clouds, the rail temperature was measured to be 114° F. Rail temperatures can be much greater than the ambient temperature depending on the amount of radiant heating by the sun. The rail plug was inserted at a temperature of 60° F in January. The standard neutral rail temperature for the surrounding rail should have been the same as the preferred rail laying temperature of 105° F. When the plug was inserted at the lower temperature and fitted against the existing rail, it changed the neutral rail temperature of the existing rail to well below the original neutral rail temperature. When the weather changed, the entire rail, including the rail insert with the lower neutral temperature and the rail on both sides of the insert, heated up and expanded, creating internal compression forces in both the existing rail and the new plug, which was tight against the existing rail.

Three critical components of the track structure that help secure the rail and counter the forces during an increase in temperature that causes the rail to expand are the number and pattern of effective anchors applied tightly against the sides of the crossties, the effectiveness of the ties to hold the spikes to prevent the rail from lifting from the compressive forces, and the presence of ballast tamped around the tie and applied to the shoulders to prevent the ties from moving.

Approximately 50 percent of the anchors were ineffective. There were split ties and ties in marginal condition with reduced spike-holding ability. Even though several locations had fouled ballast, there appeared to be enough shoulder ballast to prevent the track from moving laterally. The ineffective anchoring and the marginal tie condition were the weakest of the three rail restraints.

When the rail expanded in the heat and tried to "run" longitudinally, it moved northward away from the Big Black River Bridge. Exacerbating that movement was the speed reduction through the derailment site between March 6 and March 24, 2004. As a train approached the speed reduction from either direction, the train brakes were applied. Because of the frictional forces between the wheels and the rail during deceleration, the rail was pushed ahead of the train. At the bridge the rail was anchored solidly with elastic clips, and the rail could not move longitudinally in that area. However, because the rail was not anchored effectively in the area away from the bridge, its ability to move longitudinally increased the compressive forces within the rail between the bridge structures. With the adequate shoulder

support from the ballast preventing the track structure's lateral movement between the bridges, the east rail could only move upward to relieve the forces within it. The east rail started to bow, and the spikes were lifted out of the ties because the ties were split and could not hold the spikes effectively. The rail is designed to rest in a metal tie plate with raised portions against the outside and inside of the rail that help prevent lateral movement when secured to ties imbedded in well-tamped ballast. Once the rail bowed high enough to clear the raised portions on the tie plates, the rail moved more easily outward. At milepost 196.5, the east rail moved enough laterally to widen the gage of the rail and allow the wheels of train No. 58 to drop between the rails. The west rail remained intact, resting on the tie plates, and appeared to be moderately secure. The Safety Board concluded that the inadequately restrained east rail lifted out of the tie plates because of expansion caused by warm temperatures resulting in the rail shifting and the gage widening, causing the wheels of the train to drop between the rails.

On March 6, 2004, the track inspector made repairs at the location of the rail insert. He remembered seeing that some of the anchors were missing but since he did not see any rail movement (longitudinally) he considered their absence to be inconsequential. A few days later, the track foreman put some new ties under the rail plug. The foreman recalled that the rail anchors that were removed from the old ties were put on the new ties. Postaccident examination showed that anchors were not applied box style on every other tie of the new ties as required by the CWR program. Following these 2 separate days of work by the track inspector and the track foreman, the track supervisor visited the site to evaluate the work performed by them and the welder. He told investigators that the work was satisfactory but noted that a couple of anchors had been left off.

Between January and March 2004, four maintenance employees (welder, track inspector, track foreman, and track supervisor) had been at or near milepost 196.5 on four different occasions, and all four employees said they had examined the condition of the anchors. However, even though CN's standard for anchors in CWR was full box anchoring on every other tie, none of the four employees adjusted or added anchors although half of the anchors were missing or not against the sides of the ties. Further, CN did not have an adequate system to alert key personnel of critical maintenance activities, such as followup rail adjustments before the onset of warm weather. The Safety Board concluded that although CN had written instructions for maintaining CWR and preventing track buckling, track employees at multiple levels did not follow or ensure adherence to these instructions. The Safety Board also concludes that had the employees who maintained the track at the accident site followed the written procedures the rail shift condition likely would not have occurred.

Therefore, the National Transportation Safety Board makes the following safety recommendation to the Canadian National Railway Company:

Establish an audit program to verify that employees follow the current written track maintenance and inspection procedures, including rail anchoring requirements and specifically maintaining the preferred rail laying temperature.
(R-05-07)

The Safety Board also issued safety recommendations to the Federal Railroad Administration and Amtrak. In your response to the recommendation in this letter, please refer to Safety Recommendation R-05-07. If you need additional information, you may call (202) 314-6177.

Acting Chairman ROSENKER and Members ENGLEMAN CONNORS and HEALING concurred in this recommendation. Member HERSMAN disapproved. (For further information, see Member HERSMAN's dissenting opinion in the published report referenced on page 1 of this letter.)

By: Mark V. Rosenker
Acting Chairman