National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: March 15, 2004

In reply refer to: R-04-8

Mr. Robert J. Ritchie
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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 Canadian Pacific Railway's (CPR's) programs and practices for the inspection and maintenance of joint bars in its continuous welded rail (CWR). The recommendation is derived from the Safety Board's investigation of the January 18, 2002, derailment of CPR freight train 292-16 and the subsequent release of anhydrous ammonia near Minot, North Dakota, and is consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued eight safety recommendations, one of which is addressed to the CPR. 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.

At approximately 1:37 a.m. on January 18, 2002, eastbound CPR freight train 292-16, traveling about 41 mph, derailed 31 of its 112 cars about 1/2 mile west of the city limits of Minot, North Dakota. Five tank cars carrying anhydrous ammonia, a liquefied compressed gas, catastrophically ruptured, and a vapor plume covered the derailment site and surrounding area. The conductor and engineer were taken to the hospital for observation after they complained of breathing difficulties. About 11,600 people occupied the area affected by the vapor plume. One resident was fatally injured, and 60 to 65 residents of the neighborhood nearest the derailment site were rescued. As a result of the accident, 11 people sustained serious injuries, and 322

people, including the 2 train crewmembers, sustained minor injuries. Damages exceeded $2 million, and more than $8 million has been spent for environmental remediation.[1]

The National Transportation Safety Board determined that the probable cause of the derailment of CPR train 292-16 was an ineffective CPR inspection and maintenance program that did not identify and replace cracked joint bars before they completely fractured and led to the breaking of the rail at the joint. Contributing to the severity of the accident was the catastrophic failure of five tank cars and the instantaneous release of about 146,700 gallons of anhydrous ammonia.

According to CPR maintenance-of-way employees, most inspections of joint bars were visual inspections made from a moving Hy-Rail vehicle. They would also listen for telltale sounds to indicate a loose joint. But neither of these methods is as accurate at detecting defects in the joint bars as a visual inspection from the ground. The sound as the vehicle traverses a joint is both nonspecific and subjective. Inspectors simply cannot "hear" the presence of small hairline cracks at a rail joint location. A wide gap at the rail ends may be detected as a "thud," but these gaps are more closely associated with "pull-aparts."

Visual inspection from a moving vehicle is inadequate because, for example, a track inspector checking the accident location from a vehicle traveling west to east would be able to see only the tops of the joint bars on the north rail, and the outside joint bar on the south rail would not be visible at all. Even those joint bars that can be partially seen by an inspector may have small fractures or fatigue cracks that are extremely difficult, if not impossible, to see from a moving vehicle. Instead, to adequately visually inspect joint bars, an inspector must dismount the vehicle and conduct an up-close, on-the-ground inspection of both the field and gage side bars for small hairline cracks. The joint bar fatigue cracks that eventually fractured and led to the Minot derailment were externally visible over a length of 1.9 inch on the gage-side bar and 0.8 inch on the field-side bar. An on-the-ground, visual inspection of this joint bar would almost certainly have detected the larger crack, which should have led to replacement of the joint bar before it failed and caused a derailment. A secondary benefit of on-the-ground rail joint inspection in CWR territory is that the inspector could assess the rail joint gap as well as look for evidence of bent or loose bolts.

At the time of the accident, the CPR's inspection program required an on-the-ground inspection of joint bars only once per year. Given the increase both in tonnage and in the number of joints on the accident subdivision and the minimal amount of specific guidance provided for joint bar inspection, the Safety Board concluded that CPR inspection procedures before the accident were inadequate to properly inspect and maintain joints within CWR, and those inadequate procedures allowed undetected cracking in the joint bars at the accident location to grow to a critical size.

The Safety Board notes that since the accident, CPR has instituted a rail joint bar inspection policy that requires that maintenance workers perform on-the-ground visual joint bar inspections semiannually (spring and fall) and that the results be documented and forwarded to

[1] For additional information, see National Transportation Safety Board, *Derailment of Canadian Pacific Railway Freight Train 292-16 and Subsequent Release of Anhydrous Ammonia Near Minot, North Dakota, January 18, 2002*, Railroad Accident Report NTSB/RAR-04/01 (Washington, D.C.: NTSB, 2004).

the local supervisor and division headquarters for data collection and trend analysis. In addition, CPR officials have told the Safety Board that the railroad has reinstituted ultrasonic rail joint testing on tracks from the Twin Cities area west to Portal, North Dakota. Guidelines state that the ultrasonic inspections will be performed semiannually, and the results will be forwarded to the local supervisor and to division headquarters.

The Safety Board determined that effective CPR track maintenance was complicated by the fact that the Standard Practice Circulars (SPCs) that were used to standardize the procedures used by the maintenance-of-way employees were confusing. Because the SPCs contained imbedded references to other, sometimes contradictory, SPCs, an employee could easily be confused and unable to apply the proper procedure. One SPC specifically states that the anchor pattern should be "every other tie," while a conflicting SPC instructs the employee to anchor at "every tie for 195 feet."

CPR had trained its track employees on the SPCs, including 1 day of rollout training to introduce the SPCs. However, responses at the public hearing to questions about the training indicated that at least one employee could not recall the particulars of training presented just 2 months before and that one employee used a combination of the CPR's and the old Soo Line's methods for track maintenance.

Federal Railroad Administration (FRA) regulations (49 *Code of Federal Regulations* 213.119, "CWR, general," effective September 28, 1998) required railroads to submit, by March 22, 1999, a maintenance program covering CWR. The FRA was to review the railroads' CWR programs to determine if they contained adequate written procedures to address the regulatory requirements regarding CWR installation, adjustments, maintenance, and inspection and that they included a training program for the people responsible for implementing those procedures. The regulatory requirements generally address rail anchoring and the practices to eliminate rail pull-aparts and buckled track.

Four SPCs specifically addressed CWR, and it was these four that CPR submitted to the FRA as documentation for its CWR program:

SPC 6 - Prevention of Track Buckling

SPC 12 - Laying Continuous Welded Rail

SPC 28 - Track Maintenance of Continuous Welded Rail

SPC 40 - Gauge Restraint Measurement System

SPC 12 references at least eight SPCs that CPR did not provide to the FRA as part of its CWR program.[2] SPC 28 refers to at least five SPCs not provided to the FRA. FRA preamble language explaining the CWR regulation states that a railroad's CWR program "procedures should be clear, concise, and easy to understand by maintenance-of-way employees." CPR provided the Safety Board with a revised draft of its CWR program in January 2004 that CPR

[2] SPC 7–Ballast, SPC 8–Ties, SPC 9–Rail, SPC 10–Laying Bolted Rail, SPC 13–Thermite Welding, SPC 14–Joints and Bolts, SPC 17–Gage of Track, SPC 18–Spiking.

representatives said was intended to provide more clear and concise instructions. CPR advised the Safety Board that it plans to file the revised CWR program with the FRA.

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

> Finalize and submit to the Federal Railroad Administration your revised continuous welded rail maintenance program and ensure that all maintenance employees are trained in the requirements of the new program. (R-04-8)

The Safety Board also issued safety recommendations to the Federal Railroad Administration. In your response to the recommendation in this letter, please refer to R-04-8. If you need additional information, you may call (202) 314-6177.

Chairman ENGLEMAN CONNERS, Vice Chairman ROSENKER, and Members CARMODY and HEALING concurred in this recommendation. Member GOGLIA did not participate.

Original Signed

By: Ellen Engleman Conners
Chairman