



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: March 21, 2002

In reply refer to: R-02-6

Class I and passenger railroads (except the Burlington Northern and Santa Fe Railway)
(see distribution list)

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 lack of ultrasonic or other appropriate inspection of replacement rail, either before or after installation, to identify any internal defects. The recommendation is derived from the Safety Board's investigation of the derailment of National Railroad Passenger Corporation (Amtrak) train No. 5-17 on the Burlington Northern and Santa Fe Railway (BNSF) Creston Subdivision, near Nodaway, Iowa, on March 17, 2001, 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 three safety recommendations, one of which is addressed to class I and passenger railroads, including your company. 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.

On March 17, 2001, about 11:40 p.m. central standard time, westbound Amtrak train No. 5-17, the *California Zephyr*, en route from Chicago, Illinois, to Oakland, California, derailed near Nodaway, Iowa. Amtrak train No. 5-17 consisted of 2 locomotive units and 16 cars. All but the last five cars derailed. No fire or hazardous materials were involved in the accident. The train crew consisted of an engineer and 2 conductors with 13 on-board service personnel. In addition, 241 passengers were on the train. As a result of the derailment, 78 people were injured, including 1 fatal injury.

¹ For additional information, see Railroad Accident Brief—*Derailed of Amtrak Train No. 5-17 on Burlington Northern and Santa Fe Railway Track near Nodaway, Iowa, March 17, 2001* (NTSB/RAB-02/01).

The National Transportation Safety Board determines that the probable cause of the derailment of Amtrak train No. 5-17 was the failure of the rail beneath the train, due to undetected internal defects. Contributing to the accident was the BNSF's lack of a comprehensive method for ensuring that replacement rail is free from internal defects.

Amtrak train No. 5-17 had originated at Chicago, Illinois, at 3:35 p.m. on March 17, 2001, and was destined for Oakland, California. The train crew had originated at Chicago. The engineer on duty at the time of the accident had relieved the original engineer at Ottumwa, Iowa, milepost (MP) 280, about 9:00 p.m.

As the train progressed on its assigned route, the engineer found that the horn/whistle on the lead locomotive failed near Murray, Iowa, MP 370, around 10:21 p.m. He advised the dispatcher for the district of the problem and discussed the failure with the conductor. They decided that the conductor would ride in the second locomotive and activate the horn/whistle on the second locomotive when the train approached and passed through grade crossings. They used this procedure until, at Corning, Iowa, MP 414, the train entered a different train dispatcher's district. The new train dispatcher, upon learning of the malfunctioning horn/whistle, instructed the crew to reduce the speed of the train at the grade crossings rather than using the horn/whistle on the second unit. The conductor of train No. 5-17 came forward and rode in the lead locomotive with the engineer to assist him in observing the crossings. The engineer stated (and event recorder information confirmed) that he began reducing the train's speed at grade crossings. At MP 418.94, the train speed had been 16 mph while passing through a grade crossing. The engineer was accelerating the train during the approach to the accident site (MP 419.92). The event recorder indicated that, at MP 419.90, the train was traveling at 52 mph.

The engineer stated that near MP 419.90 he felt a "tugging" sensation in connection with the train's progress and heard a "grinding, screeching noise," so he made an emergency brake application about 11:40 p.m. When the locomotives came to a stop, the engineer and conductor looked back and realized that the train's cars had uncoupled from the locomotives, and most cars had derailed. The cars were about 1/8 mile behind the stopped locomotives. The engineer radioed the dispatcher and asked him to contact emergency responders. The conductor walked back and surveyed the damage. After reaching the cars, the conductor radioed the engineer and said, "...the wreck look[s] real bad." The conductor found the assistant conductor, and they cared for the passengers. Soon thereafter, local emergency medical service personnel began to arrive and immediately started to evacuate the injured from the train. The emergency response effort was completed by 4:00 a.m., March 18.

A broken rail was discovered at the point of derailment. The broken pieces of rail were reassembled at the scene, and it was determined that they came from a 15-foot, 6-inch section of rail that had been installed as replacement rail at this location in February 2001. The replacement had been made because, during a routine scan of the existing rail on February 13, 2001, the BNSF discovered internal defects near MP 419.92. A short section of the continuous welded rail that contained the defects was removed, and a piece of replacement rail was inserted. This rail, referred to as a "plug," was used to replace the defective rail segment. The plug rail did not receive an ultrasonic inspection before or after installation.

After the March 17, 2001, accident, portions of the broken plug rail were sent to the Safety Board laboratory for further analysis. The analysis indicated that the rail had multiple internal defects. Specifically, the laboratory found that the rail failed due to fatigue initiating from cracks associated with the precipitation of internal hydrogen. Cracks associated with the precipitation of internal hydrogen occur in steels due to excessive hydrogen content produced during processing. Therefore, the Safety Board concludes that in February 2001, the BNSF replaced an identified defective rail with a segment of replacement rail that contained undetected multiple internal defects.

Aside from the horn/whistle malfunction, nothing about Amtrak train No. 5-17's operation as it approached the accident site was unusual. The train was traveling at an appropriate speed for the conditions, and the engineer was operating the train in accordance with BNSF rules and existing signal indications. The "tugging" sensation that the engineer told investigators he felt just before the accident is a typical indicator of a train experiencing a track failure. When the track was examined after the accident, it was found that a rail was broken at the point at which the defective replacement plug rail had been inserted in February 2001. Therefore, the Safety Board concludes that Amtrak train No. 5-17 derailed due to a failure in the plug rail that had been used to replace a defective piece of rail at the accident location.

Typically, replacement rail is rail that has been removed from other track locations for reuse. It is usually visually inspected for obvious surface damage, defects, and excessive wear before installation. Title 49 *Code of Federal Regulations* (CFR) 213.113 provides guidelines that railroads use for replacing defective rail. The regulations, however, focus on operational concerns regarding the defective rail; they do not address how replacement rail should be selected or screened for defects.

Because many internal imperfections cannot be detected through visual inspection, ultrasonically scanning a rail for internal defects is the best means of determining whether a piece of rail is sound and unflawed. No Federal regulations require railroads to verify the quality of the rails used to replace defective rails, and replacement rails are not typically scanned for internal defects before they are used to replace rails that have been identified as defective. Consequently, when they are installed, the replacement rails may actually have internal flaws that have not been discovered, as was the case with the Nodaway plug rail. The Safety Board therefore concludes that using rails that have not been ultrasonically scanned for internal defects before they are installed as replacements for known defective rails may allow the flawed rails to be replaced by other flawed rails.

The Safety Board is not aware of any class I railroad (other than the BNSF since the Nodaway accident) with a procedure for checking the internal quality of rail being used to replace known defective rail. Most railroads rely on the fact that all existing rail must be ultrasonically scanned while in place on the track, in accordance with the requirements at 49 CFR 213.237. Therefore, if a piece of rail has been removed from a track location and stored for future use as replacement rail, a railroad may assume that the replacement rail was scanned while in its previous location and that it passed that inspection. However, this was the process used for the plug rail that failed in the Nodaway accident, and that rail segment was, in fact, defective.

Scanning, performed in accordance with requirements at 49 CFR 213.237, is only required to be conducted “at least once every 40 million gross tons (mgt) or once a year, whichever interval is shorter” for class 4 track. In effect, this means that it could take as long as a year for a railroad to scan any given section of rail to detect internal flaws. Although the BNSF exceeds the regulatory criteria and scans such track for internal defects once every 30 days, this still means that, even on the BNSF, defective replacement rail could be in place for as long as a month while rail traffic continues to travel over it. The failure of the Nodaway replacement rail took place within about a month of its being installed at MP 419.92, and the BNSF had not yet routinely scanned this section of rail for internal flaws. Other railroads that do not exceed the regulatory criteria at 49 CFR 213.237 and may take up to a year to scan their trackage are at even greater risk than the BNSF for accidents caused by the failure of defective replacement rails. The Safety Board concludes that relying on scanning schedules as are required under 49 CFR 213.237 to ensure the safety of replacement rail does not provide sufficient protection against the possibility of a replacement rail being internally defective.

On the basis of the Nodaway accident investigation, the Safety Board is recommending that the Federal Railroad Administration require railroads to conduct ultrasonic or other appropriate inspections to ensure that rail used to replace defective segments of existing rail is free from internal defects. The Safety Board would like railroads to act on this important matter without delay.

Therefore, the National Transportation Safety Board makes the following safety recommendation to class I and passenger railroads (except the Burlington Northern and Santa Fe Railway):

Conduct ultrasonic or other appropriate inspections on all rail used to replace defective segments of existing rail to ensure that the replacement rail is free from internal defects. (R-02-6)

The Safety Board also issued safety recommendations to the Federal Railroad Administration and to the Burlington Northern Santa Fe Corporation. In your response to the recommendation in this letter, please refer to Safety Recommendation R-02-6. If you need additional information, you may call (202) 314-6607.

Chairman BLAKEY, Vice Chairman CARMODY, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in this recommendation.

By: Marion C. Blakey
Chairman

**Class I* and Passenger Railroads (except the Burlington Northern and Santa Fe Railway)
Distribution List**

Mr. David R. Goode
Chairman, President, and Chief Executive
Officer
Norfolk Southern Corporation
3 Commercial Place
Norfolk, Virginia 23510-2191

Mr. Paul Tellier
President and Chief Executive Officer
Canadian National Railway
935 de La Gauchetiere Street, W.
16th Floor
H3B 2M9
Montreal, Quebec, Canada

Mr. A. R. Carpenter
President and Chief Executive Officer
CSX Transportation Inc.
500 Water Street, J-100
Jacksonville, Florida 32202

Mr. Robert J. Ritchie
President and Chief Executive Officer
Canadian Pacific Railway
401 9th Avenue, S.W., Suite 2000
Gulf Canada Square
Calgary, AB T2P 4Z4 Canada

Mr. Landon H. Rowland
President and Chief Executive Officer
The Kansas City Southern Railway
Company
Stilwell Financial, Inc.
920 Main Street, 21st Floor
Kansas City, Missouri 64105

Mr. Richard K. Davidson
Chief Executive Officer
Union Pacific Corporation
1416 Dodge Street
Omaha, Nebraska 68179

Mr. George Warrington
President and Chief Executive Officer
National Railroad Passenger Corporation
60 Massachusetts Avenue, N.E.
Washington, D.C. 20002

Ms. Anna Barry
Director of Railroad Operations
Massachusetts Bay Transportation Authority
10 Park Plaza
Boston, Massachusetts 02116

Mr. Gerald R. Hanas
General Manager
Northern Indiana Commuter Transport
District
33 East U.S. Highway 12
Chersterton, Indiana 46304

Mr. George L. Hardwidge
Chief Trans. Officer
Chicago Commuter Rail Service Board
547 West Jackson Blvd.
Chicago, Illinois 60661

* The Safety Board is issuing the individual Safety Recommendation R-02-7 concerning replacement rail inspections to the Burlington Northern and Santa Fe Railway Class I railroad, through its parent company, the Burlington Northern Santa Fe Corporation. Consequently, the Safety Board is not including the Burlington Northern and Santa Fe Railway in the distribution list for Safety Recommendation R-02-6.

Ms. Bonnie J. Duhr-Murphy
 Director
 Dallas Area Rapid Transit/Trinity Rail
 Express
 4801 Rock Island Road
 Irving, Texas 75060

Mr. David Solow
 Chief Executive Officer
 Southern California Regional Rail Authority
 700 South Flower Street
 Suite 2600
 Los Angeles, California 90017-4101

Mr. Kenneth Bauer
 President
 Long Island Railroad Company
 Jamaica Station
 Jamaica, New York 11435

Mr. George Walker
 Vice President, Operations
 Metro North Railroad
 347 Madison Avenue
 New York, New York 10017

Mr. William Knapp
 Vice President and General Manager
 New Jersey Transit Rail Operations, Inc.
 One Hudson Place
 Hoboken, New Jersey 07030

Mr. Thomas Lichterman
 Director, Transportation Services
 San Diego Northern Railway
 810 Mission Avenue
 Oceanside, California 92054

Ms. Faye Moore
 General Manager
 Southeastern Pennsylvania Transportation
 Authority
 1234 Market Street
 Philadelphia, Pennsylvania 19107

Mr. Joseph Giulietti
 Executive Director
 Tri-County Commuter Rail Authority
 800 NW 33rd Street, Suite 100
 Pompano Beach, Florida 33064

Mr. Michael Scanlon
 Chief Executive Officer
 Peninsula Corridor Joint Powers Board
 1250 San Carlos Avenue
 San Carlos, California 94070-1306

Ms. Kathryn D. Waters
 Manager and Chief Operating Officer
 Mass Transit Administration/MARC Train
 Service
 5 Amtrak Way
 BWI Airport, Maryland 21240-8718

Mr. Pete Sklannik, Jr.
 Chief Operating Officer
 Virginia Railway Express
 1500 King Street, Suite 202
 Alexandria, Virginia 22314-2730