



National Transportation Safety Board

Washington, D. C. 20594

Safety Recommendation

Date: January 14, 1992

In Reply Refer To: R-91-67 through -70

Mr. Gerald Grinstein
President
Burlington Northern Railroad, Company
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Forth Worth, Texas 76102

About 1:26 p.m. central daylight time on April 23, 1990, eastbound National Railroad Passenger Corporation (Amtrak) train No. 6, the California Zephyr, derailed at Batavia, Iowa, while operating on the Burlington Northern Railroad (BN). One passenger received serious injuries; 10 crew members and 75 passengers received minor injuries. Damage from the derailment was estimated \$1,835,000.¹

Postaccident on-site evidence indicated that a train No. 6 passed through Batavia, the track on the eastbound mainline buckled underneath the train beyond the frog, derailing the last eight cars. Physical indicators of a track buckle included the distance the mainline tracks shifted, the face gouging of the rail, the ambient weather conditions, and the location of the track near anchor points.

Track buckling results from heat expansion in the rail beyond the ability of the track structure to restrain the longitudinal forces. Studies conducted by the Association of American Railroads show that improper temperature control of continuous welded rail (CWR) during installation is the major cause of track buckling. Safety Board investigators reviewed the procedures that the BN's Holland welding gang followed while they installed CWR in the accident area and the quality review measures of BN supervisors and found several practices to be inadequate or improper.

The Safety Board's audit of BN's *Daily Report for Holland In Track Welding Gang No. 41* shows that gang No. 41 worked 62 days on BN's second subdivision eastbound mainline, including Batavia. Excluding rain days (nonworking days), the records show that the welding gang recorded rail temperatures on 48 of the 62 days.

¹For more detailed information, read Railroad Accident Report--"Derailment of Amtrak Train No.6 on the Burlington Northern Railroad at Batavia, Iowa April 23, 1990" (NTSB/RAR-91/05).

Of the 48 days on which they recorded temperatures, records show that on 32 days the rail temperatures were not at or above the required neutral rail temperature for the zone. On October 17-19, the gang recorded no temperatures above 49° F. According to testimony, these ambient temperatures were the rail laying (anchoring) temperatures. When BN increased the minimum rail laying temperature to 95° F, the disparity between the actual laying temperature and the specified minimum rail laying temperature also increased.

Although gang No. 41 had a rail heater on-site when they were in the Batavia area, they integrated the rail heater late into the production line, during their last 2 weeks of work. In addition, the inexperience of the new operator raises concerns as to the quality of work performed. The new rail heater operator testified he took rail temperatures and reported the rail temperature to his direct supervisor, the foreman. However, record keeping also became lax when rail temperatures were no longer recorded, just "adjusted to 95° F, plus or minus 5 degrees." Most importantly, the gang did not use match marks to ensure that the rail had been thoroughly and properly heated, or any other procedures, such as vibrating the rail, to ensure that the rail had free movement as it expanded.

The lack of recommended temperature control procedures was most evident at anchor points. The gang's general foreman testified that he determined gap distance at anchor points based on his experience as opposed to taking cold rail temperatures. This made correct determination of proper temperature differential and rail expansion gap improbable. The Safety Board believes that such a practice, where fractions of an inch in rail length can cause tons of excessive longitudinal rail force, is not sufficient to ensure a safe track structure.

In the course of our investigation, the Safety Board determined that the BN form used by the Holland gang to record rail temperatures during installation is not explicit enough to ensure that users record accurate rail temperatures. All of the Holland welding gang supervisors involved in this accident testified that the column implies that rail-anchoring temperatures should be recorded at these specified times. However, the superintendent of maintenance and engineering stated that some 8 a.m. rail temperatures were recorded before anchoring actually began. This contradicts the understanding that the column is for recording anchoring temperatures. The Safety Board believes the BN Holland track welding form should be modified to specify anchoring temperatures to avoid misuse or misunderstanding of the form's purpose which is to document sample rail temperatures at specified anchoring times. The Safety Board encourages BN to monitor the implementation of the revised form to ensure that it is used correctly.

When we interviewed BN personnel regarding the type and amount of training that BN provides for installation of CWR and rail heating, the Safety Board received contradictory testimony which raised questions as to the adequacy of the rail heating training that gang No. 41 received for its Holland welding operation. According to the Director of Maintenance, he felt he personally addressed the subject sufficiently in his track buckling seminars. However, gang No. 41's general foreman did not recall any information pertaining to rail heating from the seminars he had attended. He stated rather that he used maintenance-of-way circulars as his information source. In addition, the investigation determined that the general foreman relied upon his experience to assess rail expansion. Consequently, the Safety Board concludes that the rail heating training presented in the track buckling seminars could not readily be applied in the Holland operation or was sufficiently meaningful to the general foreman and his subordinates.

The Safety Board also found that BN's maintenance of way (MOW) rules do not specifically address the Holland production line process in which CWR is both made and laid in the same operation. The MOW rules book primarily contains instructions for more traditional maintenance and ribbon rail operations. Holland welding operation supervisors were generally left to interpret and interpolate the MOW instructions as best they could to fit their unique operation.

Although a person who installs CWR in-field can estimate rail length expansion using the matrix tables, the process is awkward. The tables list rail in conventional 39-foot or 1/4-mile lengths rather than in shorter lengths that would be more flexible and useful for the constantly moving Holland process. Another table lists rail lengths in increments of 400 feet which are generally too long to be of practical use in the Holland operation, particularly near anchor points. The Safety Board concludes that the MOW rules book for use by in-track welding operations is too generic and awkward to be effective. Therefore, the Safety Board believes BN should simplify and enlarge the thermal expansion tables in the MOW rules book to facilitate use and understanding by the Holland operation.

Safety Board investigators also determined that the standard practice circulars of BN's MOW rules book, including the appendixes, need to be updated and reorganized into a comprehensive set of instructions. In several instances, instructions applicable to a variety of operations are addressed in only one category. For example, BN supervisors testified that they recognized the importance of adjusting CWR after performing out-of-face operations such as surfacing. However, the MOW rules book does not mention any requirements for adjusting the rail after performing such work until Appendix A of Standard Practice Circular 1 under the subsection for concrete tie installation. Moreover, these guidelines for adjusting the rail do not specifically refer to CWR. The relevancy is implied because concrete ties are traditionally used for heavier rail which CWR is considered. Many rules in the circulars only address warm weather operations. These guidelines should also discuss the importance of temperature differential and the effects of cold weather operations.

Despite inadequate training and MOW instructions for in-field installation of CWR, the Safety Board found that most of the problems associated with the Batavia derailment stemmed from BN's supervisors placing greater emphasis on the quantity of rail laid rather than the quality of installation. In the field, first-line supervisors did not insist on quality control measures that might interrupt the gang's progress. For example, the welding gang No. 41 consistently failed to record actual rail anchoring temperatures and rarely used match marks to determine actual neutral rail temperature. Information from interviews and depositions showed that mid-level supervisors visited gang No. 41 too infrequently to ensure that the gang maintained proper temperature control or to ensure that the gang members had a complete understanding of proper procedures.

BN's upper-level supervision should have recognized from the daily reports that they received from the field that the Holland gang was laying rail at less than the specified (neutral) rail temperature and taken steps to correct the problem.

Even if all levels of management overlooked the potential problems in the initial installation, the track supervisors could have rectified the situation by requiring that the track be adjusted/destressed after surfacing. Supervision failed to assure that the track in the Batavia area was adjusted after surfacing operations and

before warm weather arrived. The Safety Board believes that if BN supervisors had taken steps to ensure that the track in the Batavia area was adjusted after surfacing, the track buckle might have been averted despite the improper procedures of gang No. 41.

Therefore, the National Transportation Safety Board recommends that the Burlington Northern Railroad Company:

Establish supervisory oversight procedures to ensure compliance with existing Burlington and Northern maintenance-of-way standards for all continuous welded rail operations. (Class II, Priority Action) (R-91-67)

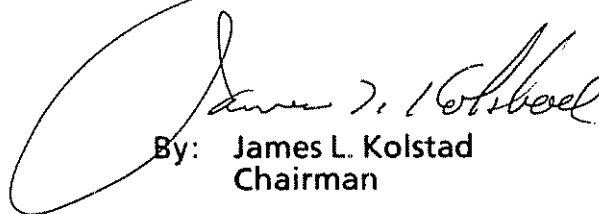
Revise the Holland track welding form to specify that only actual rail anchoring temperatures be recorded. (Class II, Priority Action) (R-91-68)

Revise the Maintenance of Way Rules book to make it applicable for the Holland welding operation by simplifying and expanding the thermal expansion (contraction) tables to facilitate use and understanding. (Class II, Priority Action) (R-91-69)

Revise the Burlington and Northern annual track buckling seminar to specifically address in-track welding procedures. (Class II, Priority Action) (R-91-70)

Also, the Safety Board issued Safety Recommendations R-91-65 and -66 to the Federal Railroad Administration; R-91-71 and -72 to the National Railroad Passenger Corporation (Amtrak); and R-91-73 to the Association of American Railroads.

KOLSTAD, Chairman, COUGHLIN, Vice Chairman, and LAUBER, HART and HAMMERSCHMIDT, Members, concurred in these recommendations.



By: James L. Kolstad
Chairman