



# National Transportation Safety Board

Washington, D.C. 20594

## Safety Recommendation

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**Date:** August 27, 1999

**In reply refer to:** R-99-31 through -33

Honorable Jolene Molitoris  
Administrator  
Federal Railroad Administration  
Washington, D.C. 20590

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About 4:31 a.m. central daylight time on June 18, 1998, a westbound Northern Indiana Commuter Transportation District (NICTD) two-car passenger train struck the second semitrailer of a long combination vehicle that consisted of a tractor pulling two flatbed semitrailers loaded with steel coils at a highway-rail grade crossing near Portage, Indiana. When the vehicles collided, the second semitrailer broke away from the first semitrailer and was dragged by the front of the train, while the single chain securing a steel coil to the second semitrailer broke. The released steel coil, weighing about 19 tons, entered the train through the front bulkhead of the lead car and moved into the passenger compartment. Three fatalities and five minor injuries resulted from the accident. Damages were estimated to total \$886,000.<sup>1</sup>

The National Transportation Safety Board determined that the probable cause of the collision between NICTD train 102 and a long combination vehicle (truck) at the National Steel Corporation's Midwest Steel grade crossing was ineffective action by Federal, State, and private agencies to permanently resolve safety problems at the Midwest Steel grade crossing, which they knew to be a hazardous crossing.

The crossing area of the Midwest Steel compound grade crossing consisted of two sets of double tracks, one set owned by the Consolidated Rail Corporation (Conrail)<sup>2</sup> and one by NICTD, separated by 86 feet and 9 3/4 inches of paved asphalt (from the southernmost Conrail rail to the northernmost NICTD rail). A 58-foot space lay between the southernmost Conrail gate and the northernmost NICTD gate. Thus, the maximum storage area for the grade crossing was about 58 feet.

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<sup>1</sup> For additional information, read *Collision of Northern Indiana Commuter Transportation District Train 102 with a Tractor-Trailer, Portage, Indiana, June 18, 1998*, Railroad/Highway Accident Report NTSB/RAR-99/03 (Washington, D.C.: National Transportation Safety Board, 1999).

<sup>2</sup> At the time of the accident, Conrail operated the northern portion of the Midwest Steel crossing. As of June 1, 1999, the Conrail operation in this area was taken over by the Norfolk Southern Corporation.

The long combination vehicle involved in the accident was 82 feet long, 24 feet longer than the 58-foot storage distance. Nevertheless, nothing in law or practice prevented the 82-foot-long vehicle from using this crossing. Therefore, the Safety Board concluded that, as currently configured, the Midwest Steel grade-crossing storage area cannot safely accommodate all vehicles that are allowed to use it.

Since the Portage accident in late June 1998, several additional incidents and near-misses have taken place at the Midwest Steel grade crossing. The Safety Board understands that, even before this accident occurred, the National Steel Corporation, NICTD, the Indiana Department of Transportation, the Port of Indiana, and the Federal Railroad Administration had agreed that the safety issues raised by the crossing should be addressed. The Safety Board has long advocated total grade separation as the best means of ensuring grade-crossing safety.<sup>3</sup>

The Portage accident raised questions concerning railcar crashworthiness as well as grade-crossing safety. In its postaccident inspection of the railcar (NICTD car 11) through which the steel coil entered train 102, the Safety Board found problems concerning the welds of a collision post in the front bulkhead of the car. This collision post failed when the coil entered the car. According to 49 *Code of Federal Regulations* (CFR) 229.141 (a) (4), a collision post “shall have an ultimate shear value of not less than 300,000 pounds at a point even with the top of the underframe member to which it is attached.” The kinetic energy released by the impact of the coil upon its collision with the front bulkhead of car 11 was approximately 2.36 million foot pounds.

The collision post in car 11 was not designed to absorb the force of an object (such as the coil) weighing 38,030 pounds at the speed at which the collision occurred. Therefore, the Safety Board concluded that the structural elements of the NICTD railcar 11 collision post that failed were overwhelmed by the force of the collision, and the post could not have prevented penetration of the steel coil, given the train speed and the weight of the coil.

Nevertheless, the Safety Board is concerned about the lack of weld penetration and fusion and the unexplained fastener found in the collision post welds of this railcar. Although intrusion of the coil into the railcar was probably unavoidable in this accident, collision posts should always be installed to ensure optimum strength and effectiveness. The purpose of the collision posts provided within passenger cars is to prevent intrusion into the car body. Passengers and crew depend on the collision posts to provide protection in the event of an accident. The Safety Board therefore finds the existence of defective welds in the area of the collision posts disturbing. Although the weld quality did not affect the outcome of the Portage accident, the presence of defective welds can only serve to weaken the structure of the car. If adjacent welds had demonstrated the same deficiencies as those found by investigators, the strength of the collision post structure could have been significantly compromised.

The lack of joint penetration and lack of fusion found on the vertical inboard front weld would have resulted in a weld that was weaker than the 100-percent penetration (and fused) weld that was required. Because of the loading speed and the point of application in this accident, the

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<sup>3</sup> National Transportation Safety Board, *Safety at Passive Grade Crossings, Volume I: Analysis*, Safety Study NTSB/SS-98/02 (Washington, D.C.: National Transportation Safety Board, 1998), p. 64.

load path did not go through either the front or rear vertical inboard welds. However, many other possible accident scenarios exist in which the strength of the vertical inboard collision post welds would have been relied upon to prevent intrusion into the car. The Safety Board concluded that, under some circumstances, the full strength of the vertical inboard collision post welds may be necessary to protect passengers and crew.

Railroad passenger and transit cars are purchased through contracts that cite detailed technical specifications. The technical specifications typically dictate requirements intended to ensure the quality and performance of the vehicle, including workmanship standards. The NICTD specification is clear that “The contractor shall be responsible for the quality of the welding and brazing done by himself and his subcontractors.”<sup>4</sup> Nippon Sharyo indicated that it performed inspections in addition to those performed by NICTD and its representatives, but the welding defects noted in the vertical inboard collision post welds were apparently not found during these inspections. No records of the Nippon Sharyo weld inspections could be reviewed by the Safety Board, but based on the presence of these weld defects, the Safety Board concluded that Nippon Sharyo did not employ sufficient quality assurance procedures during the welding of the collision post structures.

The Safety Board considers that, because of Nippon Sharyo’s insufficient welding quality assurance procedures, deficiencies such as the lack of joint penetration, the lack of fusion, and the unexplained components found in the collision post welds of this car might also be found in other Nippon Sharyo railcars in the NICTD fleet. The Safety Board is also aware of another fleet of cars, virtually identical in design to the NICTD cars, that was also manufactured by Nippon Sharyo.<sup>5</sup> It is not known whether these cars contain weld defects in the collision posts, such as the lack of penetration and fusion noted here, or whether the same weld quality assurance procedures were used in both cases.

The Safety Board is aware of no Federal requirements for welding quality assurance in the attachment of collision posts. The FRA does require, however, that collision posts be constructed to a certain strength specification and that “the attachment of these members at bottom shall be sufficient to develop their full shear value.”<sup>6</sup> Because of the vital safety role played by the collision posts, the Safety Board considers that the attachment welds should be carefully inspected to ensure that they are of a sufficient quality to fulfill the design requirements of the car.

Therefore, the National Transportation Safety Board makes the following safety recommendations to the Federal Railroad Administration:

Work together with the Federal Highway Administration, the Indiana Department of Transportation, the National Steel Corporation, the Norfolk Southern

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<sup>4</sup> *Specification of Electric Multiple Unit Commuter Cars for Northern Indiana Commuter Transportation District*, Specification number SP90034, section S12.10(b), dated 1983.

<sup>5</sup> National Transportation Safety Board, *Collision and Derailment of Maryland Rail Commuter MARC Train 286 and National Railroad Passenger Corporation AMTRAK Train 29 near Silver Spring, Maryland, on February 16, 1996*, Railroad Accident Report NTSB/RAR-97/02 (Washington, D.C.: National Transportation Safety Board, 1997).

<sup>6</sup> 49 CFR 229.141.

Corporation, and the Northern Indiana Commuter Transportation District to make, within 2 years, permanent engineering changes to the Midwest Steel highway-rail grade crossing that will minimize or eliminate safety hazards at this crossing. (R-99-31)

Determine the extent of the weld quality assurance inadequacies demonstrated by Nippon Sharyo Ltd. in its collision post welds, and implement corrective action as necessary to ensure the strength of the collision posts. (R-99-32)

Require 100-percent nonvisual inspection of all collision post attachment welds made on multiple-unit locomotives and passenger cars during manufacture, and require that inspection records be retained for the life of the car. (R-99-33)

Also, the Safety Board issued safety recommendations to the U.S. Department of Transportation, the Federal Highway Administration, the Indiana Department of Transportation, the National Steel Corporation, the Norfolk Southern Corporation, and the Northern Indiana Commuter Transportation District.

Please refer to Safety Recommendations R-99-31 through -33 in your reply. If you need additional information, you may call (202) 314-6437.

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred in these recommendations.

By: Jim Hall  
Chairman