National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: March 2, 2012

In reply refer to: R-12-9

Mr. Edward R. Hamberger
President and CEO
Association of American Railroads
425 Third Street, SW
Washington, D.C. 20024

The National Transportation Safety Board (NTSB) 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 you to take action on the safety recommendation in this letter. The NTSB is vitally interested in this recommendation because it is designed to prevent accidents and save lives.

This recommendation addresses the vulnerability of DOT-111 tank car shells and fittings to damage and subsequent release of lading during derailments. The recommendation is derived from the NTSB's investigation of the June 19, 2009, derailment of a Canadian National Railroad Company (CN) freight train in Cherry Valley, Illinois, and is consistent with the evidence we found and the analysis we performed. As a result of this investigation, the NTSB has issued 15 safety recommendations, 1 of which is addressed to the Association of American Railroads (AAR). Information supporting this recommendation is discussed below. The NTSB would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation.

About 8:36 p.m., central daylight time, on Friday, June 19, 2009, eastbound CN freight train U70691-18, traveling at 36 mph, derailed at a highway/rail grade crossing in Cherry Valley, Illinois. The train consisted of 2 locomotives and 114 cars, 19 of which derailed. All of the derailed cars were tank cars carrying denatured fuel ethanol, a flammable liquid. Thirteen of the derailed tank cars were breached or lost product and caught fire. At the time of the derailment, several motor vehicles were stopped on either side of the grade crossing waiting for the train to pass. As a result of the fire that erupted after the derailment, a passenger in one of the stopped cars was fatally injured, two passengers in the same car received serious injuries, and five occupants of other cars waiting at the highway/rail crossing were injured. Two responding firefighters also sustained minor injuries. The release of ethanol and the resulting fire prompted a

mandatory evacuation of about 600 residences within a 1/2-mile radius of the accident site. Monetary damages were estimated to total $7.9 million.[1]

The NTSB determined that the probable cause of the accident was the washout of the track structure that was discovered about 1 hour before the train's arrival, and CN's failure to notify the train crew of the known washout in time to stop the train because of the inadequacy of the CN's emergency communication procedures. Contributing to the accident was the CN's failure to work with Winnebago County to develop a comprehensive storm water management design to address the previous washouts in 2006 and 2007. Contributing to the severity of the accident was the CN's failure to issue the flash flood warning to the train crew and the inadequate design of the DOT-111 tank cars, which made the cars subject to damage and catastrophic loss of hazardous materials during the derailment.

One of the derailed tank cars in this accident had a large breach that occurred as the draft sill was loaded downward relative to the tank. The draft sill is attached to pads that are attached to the tank car. The pads should help protect the tank from fracture caused by loads applied to the draft sill. The strength of the welds attaching the draft sill to the pad should be no more than 85 percent of the strength of the welds attaching the pad to the tank. Thus, it is expected that the draft sill should separate from the pad before the pad separates from the tank. However, in the case of this particular tank car, the front sill pad fractured from the tank and remained attached to the draft sill.

The fracture of the front sill pad occurred at its edges within the fillet welds where it was attached to the tank. Overall deformation and fracture patterns indicated fracture initiated at the front edge of the front sill pad due to downward loading of the head brace relative to the tank. Fractures at the edges of the front sill pad all showed ductile overstress features with no evidence of preexisting damage such as weld defects or fatigue cracks.

As the draft sill deformed further downward during the accident sequence, the front sill pad separated completely from the tank, but the body bolster pad remained attached to the tank, and the draft sill remained attached to the body bolster pad. As a result, the downward deformation of the draft sill led to a circumferential rupture of the tank shell adjacent to the front edge of the body bolster pad.

AAR standards require that the pads extend at least 1 inch transversely on either side of the draft sill attachment and must extend some distance from the head brace in the longitudinal direction as defined by a formula. However, there is no other requirement for distance that the pads extend in the longitudinal direction. In the tank cars involved in this accident, transverse portions of the draft sill attachment above the center plate were welded to the body bolster pad adjacent to the edge of the bolster pad where the pad was welded to the tank. This area also corresponded to the tank circumferential fracture location. While separation of the front sill pad

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[1] See *Derailment of Canadian National Railway Company Freight Train U70691-18 With Subsequent Hazardous Materials Release and Fire, Cherry Valley, Illinois, June 19, 2009*, Railroad Accident Report NTSB/RAR-12/01 (Washington, DC: National Transportation Safety Board, 2012) on the NTSB website at <http://www.ntsb.gov>.

made tank failure more likely, the proximity of the attachment welds for the pads and the draft sill in this area provided a location where draft sill loads could be transferred directly to the tank wall rather than going first through the pads.

According to AAR standards for other substantial attachments such as brackets (AAR MSRP C-III Appendix E 15.2.4), the distance between a bracket and the edge of the pad shall not be less than three times the thickness of the pad in any direction. However, there is no similar requirement for draft sills in the longitudinal direction except between the head brace and the front edge of the front sill pad. The NTSB concluded that tank car design standards for the attachments of draft sills to sill pads and of sill pads to the tanks are insufficient to protect the integrity of the tanks in accidents in which the draft sills are subjected to significant downward deformation. The NTSB believes that the requirements for draft sills should be reviewed to ensure that appropriate distances are maintained between the draft sill/pad attachment welds and the pad/tank welds in all directions throughout the entire length of the draft sill attachment.

Therefore, the National Transportation Safety Board makes the following safety recommendation to the Association of American Railroads:

> Review the design requirements in the Association of American Railroads *Manual of Standards and Recommended Practices* C-III, "Specifications for Tank Cars for Attaching Center Sills or Draft Sills," and revise those requirements as needed to ensure that appropriate distances between the welds attaching the draft sill to the reinforcement pads and the welds attaching the reinforcement pads to the tank are maintained in all directions in accidents, including the longitudinal direction. (R-12-9)

The NTSB also issued safety recommendations to the U.S. Department of Transportation, to the Federal Railroad Administration, to the Pipeline and Hazardous Materials Safety Administration, to the American Association of State Highway and Transportation Officials, to the National Association of Country Engineers, to the American Public Works Association, to the Institute of Transportation Engineers, to the National League of Cities, to the National Association of Counties, to the Association of State Dam Safety Officials, to the National Association of Towns and Townships, to the U.S. Conference of Mayors, and to the Canadian National Railway Company. The NTSB also reiterated previously issued safety recommendations to the Federal Railroad Administration and the Pipeline and Hazardous Materials Safety Administration.

In response to the recommendation in this letter, please refer to Safety Recommendation R-12-9. We encourage you to submit updates electronically at the following e-mail address: correspondence@ntsb.gov. If a response includes attachments that exceed 5 megabytes, please e-mail us at the same address for instructions. To avoid confusion, please do not submit both an electronic copy and a hard copy of the same response.

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred in this recommendation.

[Original Signed]

By: Deborah A.P. Hersman
Chairman