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**NATIONAL TRANSPORTATION SAFETY BOARD**  
WASHINGTON, D.C.

ISSUED: November 13, 1985

Forwarded to:

Ms. M. Cynthia Douglass  
Administrator  
Research and Special Programs  
Administration  
U.S. Department of Transportation  
Washington, D.C. 20590

SAFETY RECOMMENDATION(S)

R-85-105

About 7:15 a.m., on February 23, 1985, Seaboard System Railroad (SBD) train No. F-690 derailed at Jackson, South Carolina, while traveling about 53 mph. The train struck a cushion unit that had dropped from a cushion-underframe boxcar in a train which had passed through Jackson about 5 hours earlier. Eight of the 27 derailed cars were tank cars laden with cyclohexane. The tank cars did not have head shield protection. Cyclohexane was released through tank head penetrations and was ignited immediately. Although no fatalities or injuries resulted from the accident, damage was estimated at \$1,293,133, and residences within a 1-mile radius of the accident site were evacuated. <sup>1/</sup>

As the cars of train No. F-690 derailed, they began to jackknife and disperse laterally. Although the tank cars carrying cyclohexane were equipped with type-"F" top-and-bottom shelf couplers, it is evident that these were not sufficient protection alone in this high-speed derailment; the tank heads of five of the eight tank cars were penetrated. Had these cars been equipped with head shields, it is likely that the penetrations and subsequent releases of hazardous materials from those penetrations would not have occurred. While head shields would not have prevented penetrations on other portions of the tank cars, product loss would have been substantially minimized, easing the efforts of emergency response personnel, and the threat to life and property would have been minimized.

<sup>1/</sup> For more detailed information read Railroad Accident Report--"Derailment of Seaboard System Railroad Train No. F-690 with Hazardous Material Release, Jackson, South Carolina, February 23, 1985; and Collision of Seaboard System Railroad Train No. F-481 with Standing Cars, Robbins, South Carolina, February 25, 1985" (NTSB/RAR-85/12).

The Safety Board's position regarding the demonstrated need for additional protective systems on tank cars carrying high-risk hazardous commodities has been corroborated in numerous accident investigations. 2/ As a result of a Safety Board hearing held on April 4-6, 1978, 3/ the Board recommended expedited rulemaking actions (Safety Recommendations R-78-19 and R-78-20) to require installation of head shields and shelf couplers on U.S. Department of Transportation (DOT) specification 112A and 114A cars. Those tank cars since equipped with both head shields and shelf couplers which have been involved in derailments have demonstrated the effectiveness of those protective systems. 4/

2/ Railroad Accident Reports--"Pennsylvania Railroad Train PR-11A, Extra 2210 West and Train SW-6, Extra 2217 East, Derailment and Collision, Dunreith, Indiana, January 1, 1968" (NTSB/RAR-68/03); "Southern Railway Company Train 154, Derailment with Fire and Explosion, Laurel, Mississippi, January 25, 1969" (NTSB/RAR-69/01); "Illinois Central Railroad Company Train Second 76 Derailment at Glendora, Mississippi, September 11, 1969" (NTSB/RAR-70/02); "Derailment of Toledo, Peoria and Western R.R. Co. Train No. 20 with Resultant Fire and Tank Car Ruptures, Crescent City, Illinois, June 21, 1970" (NTSB/RAR-72/2); "Hazardous Materials Railroad Accident in the Alton and Southern Gateway Yard in East St. Louis, Illinois, January 22, 1972" (NTSB/RAR-73/1); "Hazardous Materials Accident in the Railroad Yard of the Norfolk and Western Ry. at Decatur, Illinois, July 19, 1974" (NTSB/RAR-75/4); "Hazardous Materials Accident at the Southern Pacific Transp. Co. Englewood Yard at Houston, Texas, September 21, 1974" (NTSB/RAR-75/7); "Derailment of Tank Cars with Subsequent Fire and Explosion on Chicago, Rock Island and Pacific R.R. Co., Des Moines, Iowa, September 1, 1975" (NTSB/RAR-76/8); "Chicago and Northwestern Transp. Co. Freight Train Derailment and Collision, Glen Ellyn, Illinois, May 16, 1976" (NTSB/RAR-77/2); "Derailment of a Burlington Northern Freight Train at Belt, Montana, November 26, 1976" (NTSB/RAR-77/7); "Louisville and Nashville R.R. Co. Freight Train Derailment and Puncture of Anhydrous Ammonia Tank Cars at Pensacola, Florida, November 9, 1977" (NTSB/RAR-78/4); "Collision of a Louisiana & Arkansas Ry. Freight Train with a Tractor-Semitrailer at Goldonna, Louisiana, December 28, 1977" (NTSB/RAR-78/1); "St. Louis Southwestern Ry. Co. Freight Train Derailment and Rupture of Vinyl Chloride Tank Car, Lewisville, Arkansas, March 29, 1978" (NTSB/RAR-78/8); "Derailment of Seaboard Coast Line RR. Train No. 120 at Colonial Heights, Virginia, May 31, 1982" (NTSB/RAR-83/04); "Derailment of Illinois Central Gulf RR. Freight Train Extra 9629 East (GS-2-28) and Release of Hazardous Materials at Livingston, Louisiana, September 28, 1982" (NTSB/RAR-83/05); "Denver and Rio Grande Western RR. Co. Train Yard Accident Involving Punctured Tank Car, Nitric Acid and Vapor Cloud and Evacuation, Denver, Colorado, April 3, 1983" (NTSB/RAR-85/10).

3/ Safety Effectiveness Evaluation--"Analysis of Proceedings of the National Transportation Safety Board into Derailments and Hazardous Materials, April 4-6, 1978" (NTSB/SEE-78/2).

4/ Railroad Accident Reports--"Louisville & Nashville RR. Co. Freight Train Derailment with Hazardous Materials Tank Cars, Crestview Florida, April 8, 1979" (NTSB/RAR-79/11); "Louisville and Nashville RR. Co. Freight Train Derailment, Molino, Florida, November 11, 1979" (NTSB/ATL-80-FR/008); "Illinois Central Gulf RR. Co. Freight Train Derailment and Hazardous Materials Release and Evacuation, Muldraugh, Kentucky, July 26, 1980" (NTSB/RAR-81/1); Special Investigation Report--"The Accident Performance of Tank Car Safeguards" (NTSB/HZM-80/1).

On April 14, 1983, the Federal Railroad Administration and the Materials Transportation Bureau (MTB) of the DOT's Research and Special Programs Administration (RSPA) issued a Notice of Proposed Rulemaking (NPRM), 5/ which, as summarized by the MTB:

would require that specifically identified hazardous materials being transported in existing large capacity specification 105 and 111 tank cars have the same added tank head and thermal safety systems that now are required on newly built specification 105 tank cars (HM-174) and on all specifications 112 and 114 tank cars (HM-144) when carrying those same commodities.

"Large capacity" is defined in the NPRM as exceeding 18,500 gallons; the specifically identified hazardous materials are flammable gases, anhydrous ammonia, and some shipments of ethylene oxide. In comments to the NPRM, the Safety Board stated:

The Safety Board supports adoption of this proposal even though it limits the protective requirements to tank cars with capacity of more than 18,500 gallons that transport flammable gases, ethylene oxide, and anhydrous ammonia only. We believe that the proposed rule should be broader in scope and should require adequate protection for tank cars carrying other hazardous materials besides flammable gases, ethylene oxide, and anhydrous ammonia.

Also in comments to the MTB, the Safety Board urged the MTB "to seek information about the extent of endangerment resulting from releases of hazardous materials, including the radius of the area in which accidental releases pose risks to persons and property, the elapsed time involved, and the ultimate harmful effects to exposed persons and property." Since the MTB had decided not to evaluate the need for added protective systems for tank cars based on acceptable risk hazard classification per given hazardous commodities, the Safety Board also stated in comments to the NPRM that as an initial effort to enhance the safety of transporting hazardous materials, those materials with a required evacuation radius of one-half mile or more should be transported in head-shielded tank cars.

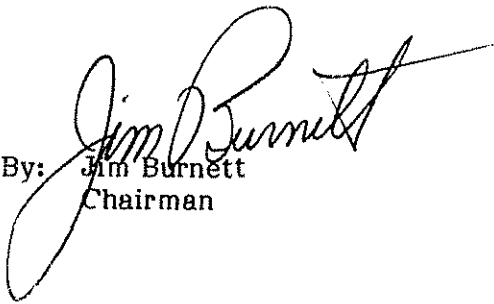
Upon announcement of the final rules resulting from the NPRM on April 30, 1983, the DOT stated, "While we are completing the rulemaking process for flammable gas tank cars, the Department plans to continue to review its safety rules governing rail tank cars used for other hazardous cargoes. . . . These cargoes move in smaller amounts and less frequently than flammable gases, but they nevertheless represent a real and substantial risk in accident situations." However, the Safety Board is not aware of any such ongoing review having been initiated within the DOT to provide needed additional safeguards for tank cars carrying hazardous materials other than flammable gases, ethylene oxide, or anhydrous ammonia, or to provide needed additional protection for tank cars carrying less than 18,500 gallons of hazardous materials. From the standpoint of safety, there is no demonstrated practical difference whether a breached tank car is releasing slightly less or slightly more than 18,500 gallons of high-risk hazardous material. The Safety Board strongly believes that these unacceptable risks which are now levied on the general public and emergency responders, as well as railroad employees, due to inadequately safeguarded tank cars laden with high-risk hazardous materials must be alleviated before further catastrophic accidents occur.

5/ RSPA, 49 CFR Parts 173 and 179, Docket No. HM-175; Notice No. 83-11, Specifications for Railroad Tank Cars Used to Transport Hazardous Materials.

Therefore, the National Transportation Safety Board recommends that the Research and Special Programs Administration:

Require that all tank car shipments of hazardous materials with an isolation radius of one-half mile or more, as recommended by the U.S. Department of Transportation Emergency Response Guidebook, be transported in tank cars equipped with head shield or full tank head protection. (Class II, Priority Action) (R-85-105)

BURNETT, Chairman, GOLDMAN, Vice Chairman, and BURSLEY, Member, concurred in this recommendation.

By:   
Jim Burnett  
Chairman