



# National Transportation Safety Board

Washington, D.C. 20594  
Safety Recommendation

SP-20  
Log R-563

**Date:** November 18, 1986  
**In reply refer to:** R-86-43

Mr. William H. Dempsey  
President and Chief Executive Officer  
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About 1:33 p.m., c.d.t., on June 9, 1985, St. Louis Southwestern Railway Company (Cotton Belt) freight train Extra 4835 North derailed while passing over a ballast-deck pile trestle located about 3.3 miles southwest of Pine Bluff, Arkansas. Eighteen of the 42 derailed cars were loaded tank cars, and 14 of these cars contained regulated hazardous or toxic chemical commodities; 4 others contained non-regulated flammable petroleum and liquid plastics products. Fire broke out in the wreckage, and smoke and toxic gasses were released into the atmosphere. Two tank cars which were subjected to intense thermal exposure exploded but did not rocket. More than 2,800 persons were evacuated from within a 1-mile radius of the derailment site. Property damage was reported to be more than \$4 million. <sup>1/</sup>

According to the fireman of Extra 4835 North, he observed a lateral "kink" in the main track at a point 30 to 40 feet north of the south end of Bridge 272.14 when the train's head end was 75 to 100 yards south of the kink. He estimated that both rails were 10 to 12 inches out of normal alignment to the left (west), and that the kink was 2 to 2 1/2 feet long. As the locomotive units of Extra 4835 North passed over the kink, they rocked laterally but did not derail. The first 25 cars in the train also passed safely over the kink. However, when the locomotive was about 1/4-mile north of Bridge 272.14 and moving at about 41 mph, the train brakes went into emergency and cars began derailling at the bridge. The 26th through the 56th cars from the train's head end derailed at and immediately south of the bridge. As a result of the derailment, the west rail was turned over north of Bridge 272.14, and this caused the derailment of the 15th through the 25th head cars which had passed safely over the kink in the track. These 11 cars included 8 loaded tank cars, all but 2 of which were placarded and contained hazardous chemical commodities. None of these tank cars was punctured or ruptured, and although a tank car lost some of its cargo of hydrogen peroxide solution through a dome leak, there was no outbreak of fire with any of these cars.

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<sup>1/</sup> For more detailed information read Railroad Accident Report—"Derailment of St. Louis Southwestern Railway Company (Cotton Belt) Freight Train Extra 4835 North and Release of Hazardous Materials near Pine Bluff, Arkansas, June 9, 1985" (NTSB/RAR-86/04).

However, fire broke out immediately in the wreckage of the 31 cars at the south of the bridge. Two tank cars containing butyl acrylate, a combustible liquid, were ruptured and their contents ignited. Burning liquid engulfed many derailed cars including an insulated tank car loaded with liquid synthetic plastic and an insulated tank car that contained ethylene oxide, a flammable liquid. Two derailed tank cars containing vinyl chloride, a flammable gas, and two tank cars containing hydrogen fluoride anhydrous, a dangerous corrosive chemical, were located on the perimeter of the fire area. However, the vinyl chloride cars and the hydrogen fluoride car nearest the fire were jacket insulated and were not ruptured or punctured in the derailment.

Initially, the fire in the wreckage was fueled by liquid butyl acrylate released from two ruptured tank cars, but it rapidly spread to pelletized synthetic plastic (polyethylene and polypropylene) that was spilled from four covered hopper cars, two of which were on top of the apparently still-intact tank car containing ethylene oxide. Intense fire impinging on the ethylene oxide car caused it to explode at about 6:40 a.m. on June 10, about 17 hours after the accident occurred. Although a fireball resulted, the car did not rocket, probably because it was still under the covered hopper cars. A torch fire burned a large hole in one of the derailed tank cars containing liquid synthetic plastic (polymethylene polyphylisocyanate). Ultimately, the contents of the car was consumed by fire which, in turn, impinged on a second tank car loaded with the same commodity. This car exploded about 4:30 a.m. on June 11, but it did not rocket.

Burning plastic liquid pooled around the two tank cars containing vinyl chloride, but unmanned fire department master stream devices were used to play water on these jacketed fiber glass and rock wool-insulated tank cars to prevent overheating and consequent venting of the contents. Elsewhere, the fire was allowed to burn itself out.

All 18 loaded tank cars that derailed were equipped with top-and-bottom shelf couplers, and 13 tank cars had thermal insulation. Both derailed flammable gas cars (vinyl chloride) had jacketed fiber glass and rock wool-insulation that afforded effective thermal protection. One of these cars received a coupler strike in the side from a covered hopper car; the other vinyl chloride car had significant impact damage, mostly from strikes by wheelsets. These impacts were absorbed by the jackets and insulation material, and the shells and heads of the cars were not breached. As far as could be determined, none of the derailed tank cars sustained coupler-inflicted head punctures.

This was the second major train derailment resulting in the release of hazardous commodities on the Pine Bluff sub-division in recent years. On March 29, 1978 a Cotton Belt "K" train enroute from Shreveport to Pine Bluff turned over a rail in a curve at Lewisville, Arkansas and derailed the 4 locomotive units and 43 cars. <sup>2/</sup> The head of a non-insulated tank car carrying vinyl chloride was punctured, the chemical ignited, and buildings within 1,500 feet of the car were destroyed or damaged. About 1,700 persons were evacuated and property damaged exceeded \$2 million.

As a result of a 43-car derailment of an Illinois Central Gulf Railroad freight train at Livingston, Louisiana on September 28, 1982, <sup>3/</sup> 20 of 34 derailed tank cars containing hazardous commodities were punctured or breached. Fires broke out which ultimately resulted in thermally-induced explosions of two tank cars that had not been breached in

<sup>2/</sup> Railroad Accident Report—"St. Louis Southwestern Railway Freight Train Derailment and Rupture of Vinyl Chloride Tank Car, Lewisville, Arkansas, March 29, 1978" (NTSB/RAR-78-8).

<sup>3/</sup> Railroad Accident Report--"Derailment of Illinois Central Gulf Railroad Freight Train Extra 9629 East (GS-2-28) and Release of Hazardous Materials at Livingston, Louisiana, September 28, 1982" (NTSB/RAR-83/05).

the derailment. About 3,000 persons living within 5 miles of the derailment site were evacuated for up 2 weeks. A main highway was blocked and all business activity in the city was interrupted during that period. Many residential and commercial buildings were destroyed or severely damaged. More than 200,000 gallons of toxic chemicals were absorbed into the ground requiring massive excavation and long-distance haulage to dump sites. The damage exceeded \$50 million.

Although the Pine Bluff accident resulted in the ignition of chemical products in tank cars and, ultimately thermal abuse that caused the explosion of two tank cars, the releases of vinyl chloride that occurred at the Lewisville and Livingston accidents were avoided because the tank cars containing this commodity were of an improved design. The vinyl chloride cars at Pine Bluff sustained considerable damage, but unlike the vinyl chloride car at Lewisville, they did not receive coupler strikes in the heads because they were equipped with top-and-bottom shelf couplers.

In the Livingston accident, many tank cars equipped with conventional Type E couplers diverted widely from the track. As a result, they became extremely vulnerable to strikes by other cars. Virtually every one of these cars was breached and lost its chemical lading. The Safety Board noted in its report that this probably would have been avoided had the cars been equipped with shelf couplers. Inasmuch as all the tank cars derailed in the Pine Bluff accident were thus equipped, there was minimal lateral divergence of these cars and most remained in line with and close to the track. As a result, most of the tank cars sustained no rupturing strikes from sills and wheelsets of other cars. Those tank cars which were destroyed were crushed by following "jumbo" covered hoppers equipped with standard Type E couplers.

Although the Livingston and Pine Bluff derailments involved about the same number of derailed cars and occurred at about the same speed, the Pine Bluff accident was by far the less catastrophic. The Safety Board believes that the top-and-bottom or double shelf couplers on the Pine Bluff tank cars were largely responsible for this, and that if all freight cars were equipped with some type of shelf couplers the potential for catastrophic derailments would be greatly reduced.

Early in 1980, the Coupler and Draft Gear Committee of the Association of American Railroads (AAR) was asked to make the bottom-shelf E coupler an AAR standard and requirement on all new and rebuilt freight cars other than tank cars. The rationale given was that a shelf coupler retained the mated coupler in the event it failed and prevented the failed coupler from falling to the track and causing a derailment. <sup>4/</sup> The shelf coupler was included in the AAR Manual of Standards and Recommended Practices effective July 1, 1980, but it was not then required to be installed on new and rebuilt cars. Subsequently, the Coupler and Draft Gear Committee recognized the value of the shelf coupler in preventing uncoupling and lateral divergence of derailed cars, and recommended that it be required on new and rebuilt cars. Through a special letter ballot, the AAR membership overwhelmingly approved <sup>5/</sup> the adoption of the new and rebuilt car requirement, and the AAR's Manual of Standards and Recommended Practices has required bottom-shelf E couplers on all new and rebuilt freight cars, other than tank cars, since July 1, 1982. A 1981 proposal to permit substitution of bottom shelf couplers for conventional couplers in field repairs <sup>6/</sup> was not

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<sup>4/</sup> AAR Mechanical Division, Coupler and Draft Gear Committee Circular D.V.-1960, May 26, 1980, page 12.

<sup>5/</sup> AAR gives the vote as 1,106,212 for and 166,217 against the proposal.

<sup>6/</sup> AAR Mechanical Division Coupler and Draft Gear Circular D.V.-1981, May 26, 1981, "Rule 16 Proposed Correct Repair Chart," pages 71-73.

adopted, but is still under consideration by the AAR. At present, there is no cost differential between newly manufactured Type E and bottom-shelf E couplers.

Although the bottom-shelf coupler is not totally effective in preventing vertical coupler misalignment unless it is coupled to another shelf coupler, proliferation of shelf couplers in the freight car fleet will gradually reduce the incidence of uncoupling of cars in derailments over a period of many years. Given the average service life of freight cars, at least 30 years will pass before the freight car fleet will be completely equipped with shelf couplers unless the AAR permits the proposed substitution of this improved design for conventional couplers in field repairs. In light of the proven value of shelf couplers in preventing derailments, as well as mitigating the serious consequences of those derailments that do occur, the Safety Board urges the AAR to immediately require their substitution for conventional couplers in field repair work in addition to requiring their use on new and rebuilt cars.

Therefore, the National Transportation Safety Board recommends that the Association of American Railroads:

Require that when it is necessary to replace couplers on all freight cars other than tank cars during the course of field repair work, the replacement couplers be of the bottom-shelf type. (Class II, Priority Action) (R-86-43)

Also as a result of its investigation, the Safety Board issued Safety Recommendations R-86-41 and -42 to the St. Louis Southwestern Railway Company.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER and NALL, Members, concurred in this recommendation.

  
By: Jim Burnett  
Chairman