



National Transportation Safety Board

Washington, D.C. 20594
 Safety Recommendation

Date: November 18, 1986
In reply refer to: R-86-41 and -42

Mr. D. K. McNear
 Chairman of the Board
 and President
 St. Louis Southwestern Railway Company
 One Market Place
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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. ^{1/}

At a point about 5 miles south of Pine Bluff and 1.9 miles south of Bridge 272.14, Extra 4835 North began descending a 1.7-mile grade with an average falling gradient of 0.74 percent northbound. At the time the train was moving at 54 mph and the throttle was in the eighth (full throttle) position with the brakes released. After the locomotive started down the grade, the fireman initiated a minimum 6-pound reduction of train brakepipe pressure to apply the train brakes to prevent acceleration and slack action within the train. He followed this by making progressive one-position throttle reductions for the same purpose. When the locomotive nearly reached the bottom of the grade, the fireman increased the brakepipe pressure reduction to 10 to 13 pounds. By this time he had already reduced locomotive power to the fourth (half-throttle) position. As a result the train was traveling 49 mph when the locomotive reached the bottom of the grade.

According to the fireman, 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. The fireman made a full-service application of the train brakes when he saw the kink, and he used the radio to alert the conductor that the train would be passing over the irregularity in the track.

^{1/} 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).

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.

The accident occurred in a 0.8-mile section of track between mileposts 271.5 and 272.3 that was constructed of 112-pound continuous welded rail (CWR) laid in 1967. This rail had been in use as jointed rail for about 20 years prior to that time. Before being installed at the accident site, the rail had been end-cropped and plant welded. It was programmed for replacement with 136-pound CWR in August 1985, and the new rail was already on the right-of-way for this purpose. There were sections of 136-pound CWR on both sides of the 112-pound section; the section to the south was laid in 1981, and that to the north in 1974.

In the undamaged section of tangent track south of the derailment area, there appeared to be no set spiking pattern, although most tieplates had two rail-holding spikes. Some tieplates had one or two plate-holding spikes, but many had none. Two tieplates were missing in the 400 feet of track immediately south of the derailment area. In this section ties were spaced on 19-inch centers, and there were 47 rail anchors to retard northward rail movement per 100 ties; 25 were applied to the west rail and 22 were applied to the east rail. About 40 percent of these anchors were not bearing against ties. Fresh rub marks made by spike heads on the base of the rail indicated the rails had moved 3 to 4 inches northward.

Cotton Belt standards at the time the 112-pound CWR was installed called for box anchoring every third tie, thus providing 33 anchors per 100 ties to retard movement in each direction on each rail. The standard in effect at the time of the accident required box anchoring of every second tie. The 136-pound CWR sections on each side of the 112-pound CWR section were anchored according to this latest standard. When the 112-pound CWR was replaced with 136-pound CWR, the current Cotton Belt standard of box anchoring every other tie to prevent longitudinal rail movement was to be employed. This probably would have solved the recurrent track irregularities in this section. However, in the meantime only temporary and inadequate stop-gap measures were employed.

Cotton Belt maintenance of way rules require that anchors will conform in number and distribution to the prescribed standard; that anchors must be set to bear against ties and, when necessary, anchors must be reset to maintain solid bearing to prevent rail movement. In addition, out-of-face raising of CWR track can only be done at the same or lower temperature than that prevailing at the time the rail was laid. Cotton Belt maintenance of way supervisors were unable to locate any record of the temperature at the time the 112-pound CWR section was laid in 1967. However, they did report that the section was included in a mechanized tie renewal program on September 29, 1983, and that an average of slightly more than one of every three ties was replaced at the time. According to National Weather Service records, temperatures at Pine Bluff on the day the ties were replaced ranged from a low of 54° F to a high of 83° F.

After the tie renewal program, the 112-pound CWR section was machine surfaced in February 1984 and again in February 1985. On May 7, 1985, a maintenance gang cut both rails near milepost 271.8 about 1/3 mile north of Bridge 272.14. A 4 1/2-inch section was removed from the east rail, and a 6 1/2-inch section was cut out of the west

rail. Before the cuts were made, the anchors were removed to destress the track for a distance of about 700 feet in both directions from the location of the cut. After the rails were allowed to expand and close the gaps, they were rejoined by field welding and the anchors were then reset to the every-other-tie box anchoring pattern with the anchors bearing properly against the ties. However, the approximately 1,940 feet of 112-pound CWR remaining to the south through Bridge 272.14 to the 136-pound CWR section beginning at Milepost 272.3 was not destressed at the time the rail cut was made. The number of anchors in this section was considerably less than what was called for under the old Cotton Belt standard of box anchoring every third tie. Moreover, as many as 40 percent of the anchors that were still in place were not bearing against ties as required. Hence, the rail in the 1,940-foot section was only somewhat restrained against movement and not nearly so much so as the sections of rail abutting to it on both ends.

The day after the cut was made near milepost 271.8, the district manager had the maintenance gang replace some ties in the track on Bridge 272.14 because he noticed the ties were rounded on the bottom and might be the cause of the misalignment problems at that location. Bridge 272.14 was a pile trestle of the ballast-deck type with a timber floor supporting a ballast section on which the track was laid. This bridge was 127 feet long, 16 feet high, and had been completely rebuilt in 1954.

On May 31, 1985, the district manager instructed the foreman of a surfacing gang to work on the track on Bridge 272.14. According to the foreman, the track was in proper alignment but there was a low spot about 15 feet long in the track. On inspection, the foreman found no evidence that the low spot was caused by ballast stone leaking through the bridge floor. The surfacing gang worked on the track early on the morning of June 4, 1985, when the temperature ranged from 82° to 85° F. A tamper was used to raise the west rail about 2 1/2 inches and the east rail about 1 inch at the low spot. According to the foreman, he tamped the lifted section three times to make certain the ballast was solid under the track. A ballast regulator was then used to dress the ballast. The work was completed by 9 a.m. when the foreman placed a 25 mph slow order on that section. No rail anchors were added or reset after the work was completed.

On June 5, 1985, the district manager inspected the track at Bridge 272.14 and found it properly aligned and level. The next day he had the slow order raised to 40 mph. At 9:30 a.m. on June 7 the track inspector assigned to the territory passed over the location on a motorcar while making his regular semi-weekly inspection. He reported that the alignment, surface, and ballast appeared to be "perfect, okay for maximum speed." On the strength of this report the slow order was removed that morning.

Relatively high midday temperatures were commonplace in the accident area in the late spring and early summer with the mercury typically rising rapidly after sunrise. The weather pattern during the 8 days preceding the accident was relatively static with temperatures rising from early morning lows in the low to mid-70's to highs in the 88° to 98° range by early afternoon. On the day of the accident, the temperature rose 21° to 22° between 5:40 a.m. and the time of the accident. It was a clear day, and the temperature of the rail normally would have been 35° to 50° higher than the ambient temperature. This could have resulted in as much as 8 1/2 to 11 inches of longitudinal rail movement in the relatively unrestrained 1,940-foot section of 112-pound CWR. Any misalignment in the section caused by rail movement would tend to occur at a point where the track had been recently disturbed and was not so firmly imbedded in the ballast.

The location on Bridge 272.14 where ties had been replaced on May 8 and where the track had been raised and tamped on June 4 was approximately 850 feet north of the south end of the 112-pound CWR section at milepost 272.3 and about 1,090 feet south of the southernmost point where anchors were reset following the rail cutting on May 7. The Safety Board believes that this location was highly vulnerable to misalignment caused by excessive stresses imposed by rail expansion and/or train movement, and that it was imperative that the rails be properly restrained by anchoring at the time the track was disturbed. This should have been obvious to the district maintenance of way manager, and he should have had the track anchored in accordance with the Cotton Belt's current standard after he ordered the track to be disturbed by raising it at Bridge 272.14.

From the time it left Shreveport, Extra 4835 North contained cars loaded with hazardous commodities; as such, it was classified as a "K" train and was restricted to a maximum speed of 55 mph. The weight of the train always exceeded 80 tons per car with operative brake and, as a result, its speed was further restricted by the timetable to a maximum of 45 mph. These speed restrictions were plainly set forth in the train manifest data furnished to the conductor and engineer at Shreveport. All the crewmembers acknowledged that they were aware they were restricted to 45 mph before they departed for Pine Bluff. Nevertheless, an event recorder on one of the locomotive units indicated that the train was operated at speeds in excess of those permitted by the timetable and a slow order for 27 of the 55 miles between Eagle Mills and the accident location at Bridge 272.14. On two occasions the train's speed reached an indicated 59 mph--14 mph faster than that permitted.

The excessive speed of Extra 4835 North while on the descending grade approaching the accident site would have necessitated an increase in the amount of braking force needed to dissipate the kinetic energy in order to slow the train to prescribed operating speed within a given distance. Also, increased braking was needed to overcome the train's tendency to accelerate on the descending grade due to gravity. The braking force applied to the train would exert longitudinal forces to the rails which would tend to push the rails ahead of the train.

As Extra 4835 North reached the bottom of the grade and entered the 112-pound CWR section, the rail was moving or running ahead of it. This was indicated by the marks made on the base of the rail as it moved northward under the spike heads. Although it was a clear day and the train was moving on straight track, the fireman did not see the lateral kink in the track until he was only 75 to 100 yards away from it. This was probably because the track did not go out of alignment until the train reached that point. The Safety Board believes that so great an irregularity in the track would have been easily seen from a much greater distance had it occurred earlier. Unable to absorb the added stress caused by the rails running ahead of the train, the track buckled out where it had been disturbed and the ballast was least able to hold it in line.

The fireman was operating Extra 4835 North under the direction and supervision of the engineer. Although the engineer had served a 30-day suspension in 1984 after the trainmaster on the Pine Bluff subdivision had radar-checked his 45-mph train at a speed of 58 mph, the discipline apparently failed to motivate him to be more responsive to speed restrictions.

According to the trainmaster headquartered at Camden, he routinely made surprise efficiency checks of trains enroute, and he had a radar gun for making speed checks. The trainmaster was required to make a specific number of efficiency checks and to render a monthly accounting of his checks to the division superintendent. However, he was given the freedom to decide what types of checks he made. According to the

trainmaster, he was only required to ride two local freight trains monthly. He did not often ride the through freight trains. The trainmaster nominally worked a daylight tour of duty and had every other weekend off. He did not have an assistant or a counterpart at night, and there was no one to assume his duties when he was off. According to the trainmaster, he was on vacation on the day of the accident.

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. 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. The Safety Board's investigation determined that the train was moving about 35 mph through a 10 mph restriction, and the Board held that the probable cause of the accident was the train crew's failure to comply with the speed restriction. 2/

Considering the financial and human impact of these accidents, the Safety Board finds it dismaying that railroads heavily involved in the transportation of hazardous commodities would not adopt the most stringent measures necessary to insure that their trains are operated in accordance with speed restrictions. This is particularly so in the case of the Cotton Belt, which is one of the principal haulers of tank cars loaded with hazardous commodities, and which had earlier experienced a serious accident involving them and train overspeed. In the intervening years, serious accidents of a similar nature elsewhere should have emphasized to Cotton Belt management the critical importance of train crew compliance with speed restrictions. The Cotton Belt must impart to its train service employees and line supervisors the understanding that violations will not be tolerated. Moreover, this understanding must be underwritten by a most comprehensive enforcement program. Proper regard for the public safety requires nothing less.

Therefore, the National Transportation Safety Board recommends that the St. Louis Southwestern Railway Company:

Uniformly maintain its main tracks in accordance with its current standard for the number and distribution of rail anchors to inhibit rail movement. (Class II, Priority Action) (R-86-41)

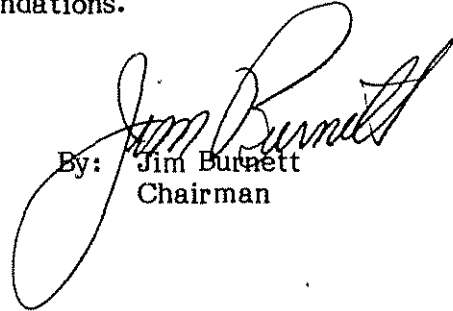
Provide intensive full-time supervisory oversight to its mainline train operations with particular emphasis placed on the enforcement of speed restrictions and operating rules. (Class II, Priority Action) (R-86-42)

Also as a result of its investigation, the Safety Board issued Safety Recommendation R-86-43 to the Association of American Railroads.

2/ 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).

The National Transportation Safety Board is an independent Federal agency with the statutory responsibility "...to promote transportation safety by conducting independent accident investigations and by formulating safety improvement recommendations" (Public Law 93-633). The Safety Board is vitally interested in any actions taken as a result of its safety recommendations and would appreciate a response from you regarding action taken or contemplated with respect to the recommendations in this letter. Please refer to Safety Recommendations R-86-41 and -42 in your reply.

BURNETT, Chairman, GOLDMAN, Vice Chairman, and LAUBER and NALL, Members, concurred in these recommendations.


By: Jim Burnett
Chairman