RAILROAD ACCIDENT INVESTIGATION ,

REPORT NO. 4188 .

MISSOURI PACIFIC RAILROAD COMPANY

ST. LOUIS-SAN FRANCISCO RAILWAY COMPANY

PAOLA, KANSAS

MAY 20, 1972

FEDERAL RAILROAD ADMINISTRATION

RAILROAD SAFETY BOARD,

Washington, D. C. 20590

Summary

Date:	May 20, 1972	
Railroads:	St.Louis-San Francisco	Missouri Pacific
Location:	Paola, Kansas	
Accident Type:	Side collision	
Trains:	Freight	Freight
Train Numbers:	Extra 915 South	Extra 787 West
Locomotive Numbers:	Diesel-electric units 915, 920	Diesel-electric units 787, 978, 970, 760
Consists:	97 cars, caboose	86 cars, caboose
Speeds:	Standing	30 m.p.h.
Operation:	Interlocking	
Tracks:	Single: 3°03' curve; level	Single; tangent; 0.53% descending grade westward
Weather:	Clear	
Time:	10:07 a.m.	
Casualties:	2 injured	
Cause:	Failure of engineer to operate the MP train in accordance with restrictive signal indications.	

Department of Transportation

Federal Railroad Administration

Office of Safety

Railroad Accident Investigation

Report No. 4188

Missouri Pacific Railroad Company

St. Louis-San Francisco Railway Company

May 20, 1972

Synopsis

On May 20, 1972, an MP freight train struck a SL-SF freight train at a railroad grade crossing within an automatic interlocking at Paola, Kansas. The collision resulted in injury to two members of the MP train crew.

The accident was caused by failure of the engineer to operate the MP train in accordance with restrictive signal indications.

Location and Method of Operation

The accident occurred on that part of the SL-SF extending southward from Kansas City, Mo. to Ft. Scott, Kansas, a distance of 98.6 miles, and on that part of the MP extending westward from Leeds Jct., Mo. to Osawatomie, Kansas, a distance of 49.7 miles. In the accident area, each railroad is a single-track line over which trains operate by signal indications of a traffic control system.

At Paola, Kansas, 42.9 miles south of Kansas City and 42.8 miles west of Leeds Jct., the SL-SF and MP main tracks cross at grade within the limits of an automatic interlocking. The crossing is 965 feet south of the SL-SF station and 2917 feet west of the MP station. The collision occurred within the Paola interlocking, where the SL-SF and MP main tracks cross at grade.

With respect to the SL-SF main track, the limits of the Paola interlocking are 140 feet north and 645 feet south of the MP crossing.

Tracks

From the north on the SL-SF main track there are, successively, a lengthy tangent and a compound curve to the left, having a maximum curvature of 3°30', 1260 feet to the collision point and 1199 feet southward. The SL-SF grade is practically level in the immediate area of the collision point.

From the east on the MP main track there are, successively, a series of tangents and curves followed by a tangent 648 feet in length, a 3°00' curve to the right 450 feet, a tangent 712 feet, a 3°30' curve to the left 859 feet, and a tangent 811 feet to the collision point and a considerable distance westward. The grade for westbound MP trains is, successively, heavily descending for approximately two miles, slightly descending about 3000 feet, slightly ascending 600 feet, and 0.53% descending about 900 feet to the collision point.

A SL-SF auxiliary track parallels the SL-SF main track on the east in the area of the Paola interlocking, as shown in Plate No. 1. It also crosses the MP main track at grade within the interlocking. It is known as the River Track south of the MP main track and as the Back Track north of the MP main track. The south switch of this auxiliary track is trailing point for southbound movements on the SL-SF main track and is 636 feet south of the southerly limit of the interlocking.

Signals

SL-SF

Supervisory controlled interlocking signal 114L, governing southbound SL-SF movements through the Paola interlocking, is 140 feet north of the collision point.

MP

Automatic signal 3237, controlled signal 3251, and automatic interlocking signal 3269, governing westbound MP movements through the Paola interlocking, are 3.1 miles, 1.7 miles and 252 feet east of the collision point, respectively. They are of the color-light type and are continuously lighted. The applicable signal aspects, and the corresponding indications and names are as follows:

Signal	Aspect	Indication	Name
3237	Yellow-over-yellow	Proceed, reducing to 50 m.p.h. before reaching next signal	Advance Approach
3251	Green	Proceed	Clear
	Yellow	Proceed immediately reducing to 40 m.p.h. if necessary, prepared to stop before reaching next signal	Approach
3251 3269	Red	Stop	Stop

Signals 3251 and 3269 normally display Stop aspects. The MP train dispatcher has control over signal 3251 due to it being utilized as a home signal governing westbound movements over a MKT grade crossing 4150 feet east of the collision point. The circuits are so arranged that if the MP dispatcher codes signal 3251 to display a Proceed aspect when the SL-SF main track is occupied within the Paola interlocking and the blocks of signals 3237 and 3251 are unoccupied, signals 3237, 3251 and 3269 display Advance-Approach, Approach and Stop aspects, respectively, for any approaching westbound MP train.

SL-SF and MP Operating Rules

SL-SF

Interlocking Limits: The tracks between opposing home signals of an interlocking

98. ...

Trains, engines or cars must not be permitted to stand across another railroad when practicable to avoid it.

669. Engine or cars must not be left standing between the home signals of an interlocking without permission of the operator.

MP

34(a). Keeping Lookout. - Engineers must, and other members of the crew on engine will, when practicable, keep a constant and vigilant lookout for signals or any condition that may affect the movement of their train or engine.

...

340. Proceeding From Stop Signal. - Trains or engines must not pass an interlocking signal indicating Stop. ...

Authorized Speed

The maximum authorized speed for MP movements through the Paola interlocking is 45 m.p.h.

Time and Weather

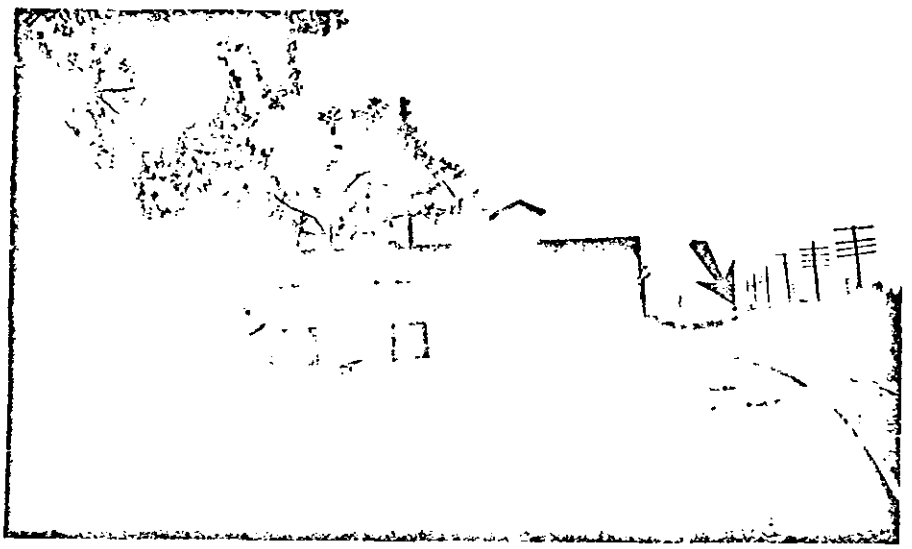
The collision took place at 10:07 a.m., in clear weather.

Sight Distance

The following relates to views from the right side of a cab at the leading end of a road-switcher type diesel-electric unit:

As a westbound MP train approaches signal 3251 within a distance of 3696 feet, the engineer has an unobstructed and continuous view of the aspect displayed by that signal.

Because of track curvature, trees and a building alongside the MP right-of-way, the engineer of a westbound MP train cannot see the aspect displayed by signal 3269 at a distance greater than about 991 feet.



View of signal 3269 (arrow) from a distance of about 600 feet. Collision point is 252 feet beyond the signal.

Circumstances Prior to Accident

SL-SF Train

Extra 915 South, a southbound SL-SF freight train, left Kansas City at 5:55 a.m. the day of the accident with instructions to pick up nine cars from the Back Track at Paola. Approximately 3 hours 30 minutes later, this train, consisting of 2 locomotive units, 88 cars and a caboose, approached Paola. The front end passed signal 114L, which displayed a Clear aspect, and entered the Paola interlocking at 9:24 a.m., as indicated by the tape of an interlocking recording device. After the locomotive moved over the railroad crossing within the interlocking and passed the southerly interlocking limit, the train stopped with its front end a few car lengths short of the south switch of the River Track and its middle portion occupying the interlocking. The rear portion extended northward beyond the northerly interlocking limit and blocked a rail-highway grade crossing located a short distance north of the SL-SF station. After the train

was separated at that crossing to permit highway traffic to cross the main track, the locomotive with the first three cars proceeded to the south switch of the River Track to pick up the nine cars from the Back Track as required. Shortly after 9:57 a.m., the locomotive with twelve cars returned to the SL-SF main track; recoupled to the front portion of its train, and pushed that portion back to a coupling, at the rail-highway grade crossing, with the rear portion. When this was accomplished, the locomotive began to recharge the air brake system of the reassembled train in preparation for departure from Paola. At that time, the train occupied the SL-SF main track throughout the interlocking, and the 33rd car was standing at the point where the SL-SF main track crosses the MP main track at grade within the interlocking. The engineer was in the cab of the first locomotive unit. The front brakeman was in the area of the 27th car, and the flagman was at the rail-highway grade crossing. The conductor was in or about the caboose.

No member of the crew had requested permission of the interlocking operator, i.e. SL-SF train dispatcher, for his train to occupy the interlocking while the nine cars were being picked up from the Back Track. According to one member of the crew, it was not an uncommon practice for a southbound SL-SF train to be left standing in the interlocking and across the MP main track while its locomotive picked up and/or set off cars at Paola.

MP Train

Extra 787 West, a westbound MP freight train, left Leeds Jct. at 8:10 a.m. the day of the accident. Upon departure from Kenneth, Kansas, 26.4 miles east of Paola, it consisted of road-switcher type diesel-electric units 787, 978, 970 and 760, 86 cars and a caboose (4576 tons). The first and fourth locomotive units were EMD SD-40 models; the second and third were GE U-30C models. This train passed Wagstaff, Kansas, 9.0 miles east of Paola at 9:52 a.m. Ten minutes later, it entered the westward approach circuit associated with the automatic interlocking at Paola. The engineer and front brakeman were in the cab at the front of the first locomotive unit; the conductor and flagman were in the caboose. They regularly worked together as a crew on the run involved. The crew members were regularly assigned on a relatively new interdivisional run and had previously made about fifteen roundtrips on that run. A road foreman of engines had accompanied the engineer on approximately seven roundtrips over the new portion of the run, which included the Paola interlocking area, and had familarized him with the physical characteristics and proper operational procedures in that territory.

MP Train Dispatcher

Some time shortly before or after the MP train passed Wagstaff, the MP dispatcher coded signal 3251 to display a Proceed aspect for that train. This action was taken approximately 28 minutes after SL-SF Extra 915 South entered the Paola interlocking and, under the existing circumstances, should have caused signal 3251 to display an Approach aspect for the MP train.

The Accident

SL-SF Extra 915 South

Soon after the SL-SF train was reassembled at the Paola interlocking, the conductor, flagman and front brakeman saw MP Extra 787 West nearing the interlocking at a speed which they estimated to be between 25 and 35 m.p.h. They promptly recognized the MP train could not stop short of a collision with their train at the railroad grade crossing within the interlocking and shortly thereafter, saw or heard the MP train collide with the 33rd car of their train at the crossing.

MP Extra 787 West

This train neared signal 3237 and a heavy descending grade while moving at a speed of approximately 50 m.p.h. and at that time the engineer informed the front brakeman he (engineer) would be replaced on the crew by another engineer within the next few days. He then began to inform the brakeman as to how a westbound train should be handled on the descending grade in approach to the Paola interlocking, so that the brakeman could transmit this information to the replacement engineer for his guidance when he came to work on the relatively new interdivisional run involved. To better hear the instructions and to understand their relationship to points along the railroad, the front brakeman left his seat in the locomotive cab and stood near the engineer during the approach of the train to the Paola interlocking.

Both the engineer and front brakeman saw that signal 3237 displayed an Advance-Approach aspect and called that aspect to each other, according to their statements. As the train passed signal 3237 and moved onto the descending grade with the locomotive under power, the engineer initiated a service application of the brakes to control the speed on the descending grade. Soon thereafter, the train neared signal 3251, which should have been displaying an Approach aspect under the existing circumstances. The front brakeman said the engineer instructed

him at that time to make certain he informed the forthcoming replacement engineer not to release a brake application on the descending grade unless signal 3251 was observed to be displaying a Clear aspect.

Although signal 3251 should have been displaying an Approach aspect, both the engineer and front brakeman said they observed that it displayed a Clear aspect for their train and called this aspect to each other. Soon after the locomotive passed signal 3251, the train neared the bottom of the descending grade while moving at a speed of approximately 25 m.p.h., and the engineer released the brake application with the locomotive still operating under power. The train then increased speed to about 35 m.p.h. as it neared signal 3269 and the Paola interlocking while moving on a restricted-view curve. The engineer and front brakeman saw that signal 3269 was displaying a Stop aspect when it came into view and, at the same time, saw that an SL-SF train was stopped across the MP main track at the railroad grade crossing within the interlocking. The engineer immediately initiated an emergency application of the train brakes. He and the front brakeman then hurriedly proceeded to the walkway at the east, or rear, end of the first locomotive unit, where they assumed a prone position and braced themselves for the impending collision. A few seconds later, when its speed had been reduced to approximately 30 m.p.h., MP Extra 787 West struck the 33rd car of the SL-SF train at 10:07 a.m.

Casualties

SL-SF Extra 915 South

No crew member of this train was injured.

MP Extra 787 West

The impact caused the engineer to be thrown from the rear of the first locomotive unit. He sustained a fractured vertebra, bruises and contusions. The front brakeman sustained minor abrasions and contusions.

Damages

SL-SF Extra 915 South

The 33rd car, an open-top hopper car loaded with 43 tons of coke, was struck on its east side by the MP train, at a point about 10 feet from its south end. The 31st through the 35th cars were derailed. The 33rd car was broken in two, and a broken-off portion was carried by the locomotive of the MP train to a point about 250 feet west of the crossing. The remaining derailed equipment stopped in various positions on or near the SL-SF main

track structure. Of the five derailed cars, two were destroyed, one substantially damaged, and two slightly damaged. According to the carrier's estimate total damage to SL-SF track, signals and equipment was $24,000.

MP Extra 787 West

All four diesel-electric units and the first six cars were derailed. The lead locomotive unit traveled about 250 feet after striking the SL-SF train and came to rest in an upright position across and virtually perpendicular to the MP main track. The following three locomotive units remained upright and stopped in various positions roughly in line with the main track and behind the lead locomotive unit. The derailed cars stopped in various positions on or near the MP main track at the collision point.

The four locomotive units were substantially damaged. Of the six derailed cars, two were destroyed, three substantially damaged, and one slightly damaged. According to the carrier's estimate total damage to MP track and equipment amounted to $127,900.

Post-Accident Examinations and Tests

MP Extra 787 West

Examination of the control compartment of the first locomotive unit revealed the independent brake valve to be in release position, the automatic brake valve was in emergency position, the selector lever in forward position and the throttle was in "off" position.

The brakes of the non-derailed cars were tested after the accident. The test revealed that eight of these cars had excessive piston travel and the brakes on two cars were inoperative due to being cut out.

Signals

Soon after the accident signal maintainers, officials of both carriers, and a representative of the Federal Railroad Administration conducted thorough tests of the signal circuits and interlocking apparatus involved. The tests did not disclose any condition that could contribute to a malfunction of the signal system. Extensive testing was performed on MP approach signal 3251 to discover any condition that would cause or permit signal 3251 to display a Clear aspect while the SL-SF interlocking was occupied and signal 3269 displayed a Stop aspect. No such condition was discovered.

Two test trains were run on separate days shortly after the accident. It was determined that controlled signal 3251 and home signal 3269 could be distinctly observed from 3696 and 991 feet, respectively, from a locomotive similar to the lead locomotive unit involved in the accident.

Conditions similar to those existing at the time of the accident, including cars in the SL-SF interlocking, were simulated with the test train approaching the accident site. On each occasion signals 3237, 3251 and home signal 3269 displayed Advance Approach, Approach and Stop aspects respectively.

Train Crews Hours of Service

SL-SF Extra 915 South

The train crew and engineer had been on duty 5 hours and 37 minutes and 5 hours and 47 minutes, respectively, after having been off duty over 20 hours.

MP Extra 787 West

All crew members had been on duty for 7 hours and 47 minutes after having been off duty over 24 hours.

Engineer and Front Brakeman MP Extra 787 West

Engineer

The engineer, age 59, was first employed by the carrier as a fireman in 1929, he was promoted to engineer in 1961. He received a deferred suspension in 1964 for his responsibility in a derailment, otherwise his personal record was clear. In June of 1971 his vision, color sense and hearing were tested.

Front Brakeman

The front brakeman, age 34, was first employed by the carrier as a brakeman in 1960. He was disciplined on 5 occasions for rule infractions throughout his career. He last had his vision, color sense and hearing checked in December of 1968.

Analysis of Accident

The cause of this accident hinges on whether MP signal 3251 displayed an Approach aspect indicating proceed, immediately reducing to 40 m.p.h. or slower if necessary, prepared to stop before reaching next signal, or a Clear aspect indicating proceed.

The event recorder tape at the Paola interlocking indicated the SL-SF main track, between the SL-SF home signals, was continuously occupied from 9:29 a.m. until the time of the accident at 10:07 a.m. The recorder also indicated interlocking signal 3269 continuously displayed a Stop aspect for the same period of time. Since extensive tests of the signal and interlocking system revealed that they functioned properly it is apparent that signal 3251 displayed an Approach aspect. Under these circumstances MP Extra 787 West was authorized to proceed prepared to stop before reaching interlocking signal 3269.

Statements made by the engineer and front brakeman of MP Extra 787 West as to the aspect displayed by signal 3251 apparently were erroneous, as the tests and examinations revealed the most favorable aspect that signal could have displayed under the circumstances was an Approach aspect. MP Extra 787 West was proceeding in the block of signal 3251 at an excessive rate of speed. When signal 3269 came into view displaying a Stop aspect the engineer applied the brakes in emergency. However, there was insufficient braking distance at that time for the train to stop short of signal 3269 or the SL-SF train standing in the interlocking.

The previously mentioned air brake defects were not a significant factor in the accident due to their minimal effect on the total braking capability of the train. The FRA has taken appropriate action with respect to this matter.

Findings

1. At the time of the accident SL-SF Extra 915 South was standing on the SL-SF main track, through the Paola interlocking, in accordance with rules of the carrier.

2. MP Extra 787 West was moving westward on the MP main track at a speed in excess of that authorized by signal indications.

3. As a result of excessive speed MP Extra 787 West was unable to stop short of Signal 3269 and SL-SF Extra 915 South when they came into view.

Dated at Washington, D. C. this 22nd
day of November, 1974
By the Federal Railroad Administration

Mac E. Rogers
Chairman
Railroad Safety Board

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