

INTERSTATE COMMERCE COMMISSION

Ex Parte No. 187

ACCIDENT NEAR DILLON, S. C.,

Submitted April 24, 1953Decided June 5, 1953

Accident near Dillon, S. C., on April 20, 1953, caused by an open switch.

Charles Cook Howell for the Atlantic Coast Line Railroad Company.

REPORT OF THE COMMISSION

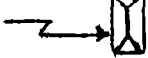
DIVISION 3, COMMISSIONERS PATTERSON, JOHNSON, AND KNUDSON

PATTERSON, Commissioner:

This is an investigation by the Commission on its own motion with respect to the facts, conditions, and circumstances connected with an accident which occurred on the Atlantic Coast Line Railroad near Dillon, S. C., on April 20, 1953. Said investigation and an investigation by the Public Service Commission of South Carolina were heard on a common record. Hearing was had at Rocky Mount, N. C., on April 24, 1953. The accident was a derailment of a passenger train and resulted in the death of 1 passenger, 1 train-service employee, and 2 dining car and chair car employees, and the injury of 115 passengers, 2 train-service employees, and 23 dining car and chair car employees.

To Rocky Mount ↑

Dillon



3,775 ft.

Interlocking station



North siding-switch

○	Rocky Mount, N. C.	142.8 mi.
○	Dillon	0.6 mi.
X	Maple (point of accident)	27.7 mi.
○	F.Y.	2.2 mi.
○	Florence, S. C.	

Tangent

Southward main
Northward main

1.76 mi.

Siding

South siding-switch
Point of accident

460 ft.

Sig. 4R

To Florence ↓

Tangent

No. 2

2.36 mi.

Sig. 2670

Ex Parte No. 187
Atlantic Coast Line Railroad
Near Dillon, S. C.
April 20, 1953

Location of Accident and Method of Operation

This accident occurred on that part of the Northern Division extending between Florence, S. C., and Rocky Mount, N. C., 173.3 miles. In the vicinity of the point of accident this is a double-track line, over which trains moving with the current of traffic are operated by signal indications supplemented by an automatic intermittent inductive train-stop system. At Maple, S. C., 29.9 miles north of Florence, a siding 1.76 miles in length parallels the northward main track on the east. The north siding-switch is 3,775 feet south of the station at Dillon. Each switch of the siding is within interlocking limits. The accident occurred on the northward main track at the south siding-switch. The main tracks are tangent throughout a distance of several miles immediately south of the point of accident and a considerable distance northward. The grade for north-bound trains varies between 0.21 percent descending and 0.44 percent ascending throughout a distance of several miles immediately south of the point of accident. It is 0.05 percent ascending at that point.

In the vicinity of the point of accident the structure of the northward main track consists of 131-pound rails, 30 feet in length, laid new in 1946 on an average of 24 ties to the rail length. It is fully tieplated with double-shoulder tieplates and is spiked with two rail-holding spikes and two anchor spikes per tieplate. It is provided with 6-hole 56-inch leadirce joint bars and an average of 10 rail anchors per rail. It is ballasted with crushed granite to a depth of 15 inches below the bottoms of the ties. The turnout at the south end of the siding is constructed with 30-foot reinforced switch rails, 131-pound rails, adjustable rail braces, a No. 16 rail bound manganese steel frog, and 11-foot guard rails. The switch points are secured by four insulated tie bars and one head rod with locking rod arrangement. The heel of each switch rail is secured by four 1-inch by 12-inch bolts, which pass through the stock rail, the heel block, and the switch rail. This switch, which is designated as switch 3, is operated by an electro-pneumatic, dual-control switch machine.

Automatic signal 2670, governing north-bound movements on the northward main track, and semi-automatic signal 4R, governing north-bound movements on the northward main track and from the northward main track to the siding, are located, respectively, 2.36 miles and 460 feet south of the point of accident. These signals are of the searchlight type. Signal 2670 is approach lighted, and signal 4R is continuously lighted. Aspects applicable to this investigation and the corresponding indications and names are as follows:

<u>Signal</u>	<u>Aspect</u>	<u>Indication</u>	<u>Name</u>
2670	Green	Proceed.	Clear.
	Yellow	Proceed preparing to stop at next signal. Train exceeding medium speed must at once reduce to that speed.	Approach.
4R	Green-over-red	Proceed.	Clear.
	Red-over-yellow	Proceed at restricted speed.	Restricting.

The controlling circuits are so arranged that when the signal north of signal 4R indicates Approach or Proceed, the blocks of signals 2670 and 4R are clear, and the route is lined for north-bound movement on the northward main track, signals 2670 and 4R each indicate Proceed. When the route is lined for movement from the northward main track to the siding, signal 2670 indicates Approach and signal 4R indicates Restricting.

The interlocking at the south siding-switch, which includes the south siding-switch and a trailing-point crossover connecting the main tracks, is remotely controlled from an interlocking station near the north siding-switch. It was placed in service during December, 1951. Approach, indication and electric switch lockin are provided. The interlocking machine is equipped with visual indicators which indicate track occupancy of the approach circuits and of the routes of the interlocking, the position of controlled switches, provided the switches are locked in that position, and whether controlled signals display an aspect to proceed or to stop.

This carrier's operating rules read in part as follows:

DEFINITIONS

Restricted Speed.--Proceed prepared to stop short of train, obstruction, or switch not properly lined and to look out for broken rail, but not exceeding 20 miles an hour.

Medium Speed.--A speed not exceeding 30 miles an hour.

The maximum authorized speed for passenger trains is 90 miles per hour.

Description of Accident

No. 2, a north-bound first-class passenger train designated as the East Coast Champion, consisted of Diesel-electric units 552, 542, and 501, coupled in multiple-unit control, one baggage-dormitory car, five coaches, one tavern-lounge car, two dining cars, seven coaches, and one tavern-observation car, in the order named. All cars were of lightweight stainless steel construction, and all were equipped with tightlock couplers. This train departed from Florence at 10:48 p. m., on time, passed F.Y., 2.2 miles north of Florence, at 10:52 p. m., on time, passed signals 2670 and 4R, each of which indicated Proceed, and while moving at a speed of about 90 miles per hour the Diesel-electric units and the first to the fifteenth cars, inclusive, were derailed at the south siding-switch at Maple.

The second and third Diesel-electric units, the seventh and eighth cars, and the thirteenth to the seventeenth cars, inclusive, remained coupled. Couplers were broken and separations occurred between all other units of the train. The first Diesel-electric unit rolled over at least once and then stopped in an upright position. The rear end was 368 feet north of the point of accident and 40 feet east of the northward main track, and the front end was toward the south-east at an angle of about 25 degrees to the track. The second and third units stopped approximately upright, between the northward main track and the siding and parallel to them. The front of the second unit was 952 feet north of the point of accident. The first 12 cars stopped in various positions on or near the tracks between points 464 feet and 844 feet north of the point of accident. The rear five cars remained upright and approximately in line with the siding. The front of the thirteenth car was 426 feet north of the point of accident. The fuel tank of the first Diesel-electric unit was punctured, the escaping fuel became ignited, and this unit was badly damaged by fire. The second and third units were considerably damaged. The first four cars were badly damaged, the fifth to the twelfth cars, inclusive, were damaged somewhat less and the other derailed cars were slightly damaged.

The fireman was killed. The engineer and the train baggageman were injured.

The weather was clear at the time of the accident, which occurred at 11:16 p. m.

Discussion

As No. 2 was approaching the point where the accident occurred the speed was about 90 miles per hour. The headlight was lighted brightly. Signals 2670 and 4R each indicated Proceed. Because of the speed at which the train was moving, the engineer was not certain of the exact point at which the derailment occurred. He did not see the position of the switch points at the south siding-switch as the train approached the switch. When the train stopped, the flagman immediately proceeded southward to provide protection. After he passed signal 4R he observed that the signal indicated Stop.

When No. 2 stopped, the sixteenth and seventeenth cars, which were not derailed, were standing on the siding and the turnout at the south end of the siding. The rear wheels of the seventeenth car were 16 feet north of the switch points. The switch was lined for entry to the siding. The switch was not locked, and apparently it had not been locked when the front end of No. 2 passed over it. Neither the switch rods nor the mechanism of the switch machine bore indications that the switch points had been forced in either direction while the mechanism was locked in either normal or reverse position. Examination of the track structure throughout a considerable distance immediately south of the switch disclosed no indications of dragging equipment. Examination of the locomotive and cars of No. 2 disclosed no defective condition which could have contributed to the cause of the accident.

After the accident occurred it was found that there was a gap of about 1/8 inch between the west switch point and the stock rail. A small piece was broken out of the top of the switch point. The top of the point was bent slightly toward the stock rail. Marks on the switch point indicate that the flanges of one or more wheels crossed the top of the point and dropped between the switch rail and the stock rail. Scraping marks were found on the back side of each switch rail. The west closure rail was displaced to the west from 1/4 inch to 2-1/2 inches between the switch rail and the frog. All heel-block bolts at the heel of the east switch rail had been broken in tension, and the heel of the switch rail had been displaced to the west. The top of the receiving end of the east closure rail had been struck several severe blows and was bent downward approximately 2-1/2 inches. The tie under this end of the rail was broken. The frog bore marks which indicated that flanges or other parts of equipment had come in contact with the top surface and the point. The east guard rail had been torn out. North of the frog, there were flange

marks on the ties of both the main track and the siding. Both the main track and the siding were destroyed between a point 20 feet north of the frog and the point at which the Diesel-electric units of No. 2 stopped.

The tread of the right front wheel of the front truck of the first Diesel-electric unit bore a mark obviously caused by striking the end of a rail a severe blow. It appears that this was the first wheel to strike the end of the closure rail after the heel of the switch rail was displaced. Apparently when the front truck of the first Diesel-electric unit passed the switch the east switch point was open sufficiently to permit the flanges of the right wheels to pass between the switch point and the stock rail. These wheels dropped between the switch rail and the stock rail. Sufficient pressure was exerted against the back side of the east switch rail to break the heel-block bolts and displace the heel of the switch rail to the west. The absence of flange marks between the heel of the switch rail and the frog indicates that the derailed wheels were rerailed at the receiving end of the closure rail and the wheels of the rear truck were deflected toward the siding at the switch points. The general derailment occurred immediately north of the frog.

No. 88, a north-bound passenger train, passed Maple on the northward main track about 35 minutes before the accident occurred. After No. 88 passed, the operator lined the route for Extra 307 North, a north-bound freight train, to enter the siding at the south siding-switch. The control panel in the interlocking station indicated that the switch and signal functioned properly. As Extra 307 North approached the siding, signal 2670 indicated Approach and signal 4R indicated Restricting, the proper indications for the movement. This train, consisting of two Diesel-electric units, 86 cars, and a caboose, passed the south siding-switch at 11:06 p. m. and stopped near the north end of the siding. None of the members of the crew noticed any unusual condition as the train passed the switch. After this train cleared the interlocking limits at the south siding-switch, the operator operated the controlling lever to line the switch to normal position. When the control panel indicated that the switch had moved to normal position and was locked in that position, the operator operated the lever to cause signal 4R to indicate Proceed for the movement of No. 2. The control panel then indicated that the signal was displaying an aspect to proceed. After the derailment occurred the panel board showed that signal 4R indicated Stop, but it continued to indicate that switch 3 was locked in normal position.

The signal maintainer arrived at the interlocking station soon after the accident occurred and observed that the panel board indicated switch 3 in normal position. He then proceeded to the south siding-switch and observed that the switch was lined for movement to the siding and was unlocked. He remained in the vicinity of the south siding-switch the remainder of the night. However, he did not test or adjust any of the signal apparatus and did not observe the position of any of the relays. The supervisor of signal construction arrived at Dillon about 2:30 p. m., April 21. He observed that the control relays for the operation of switch 3 had last been coded to the normal position and that other relays were demagnetized. The code line was broken in the accident. None of the control circuits was grounded and the operating characteristics of the control relays were within the limits in which they were designed to operate. The train-stop inductors at signals 4R and 2670 were tested and functioned properly after the accident. Operating tests were made over all routes of the interlocking and during all tests the interlocking functioned properly.

The electro-pneumatic switch and lock movement and control valves in service in switch 3 at the time of the derailment were removed from service and examined to determine if any part was worn or out of adjustment and tests were made on the electro-pneumatic valves to determine if they were adjusted in accordance with the manufacturer's specifications. The switch movement was found in good adjustment with very little wear and there was no indication that the switch might have been forced from normal to reverse position while the switch was locked normal. The switch valve was found to meet the manufacturer's specifications, and valve parts were in good condition except that the air strainer through which air enters the main air-chamber of the valve was found coated with considerable rust at one end on the air chamber side of the strainer, that is, on the side of the strainer to permit it to be carried to the valve parts in the air stream. This rust appeared to have been caused by water from the air line lying in the bottom of the air chamber resting.

The evidence shows that signal 4R and signal 2670, its approach signal, both indicated Proceed and that switch 3 was in normal position and locked for the movement of No. 8. The engineer testified that signal 4R displayed a green-over-red aspect, which indicated Proceed, when his engine passed it. The interlocking circuits are so designed that signal 4R cannot display such an aspect unless switch 3 is in normal

position and locked. With switch 3 in any position and unlocked, signal 4R can only display a red-over-red aspect, which indicates Stop. Tests made after the accident disclosed that the circuits were installed in accordance with the plans. No defective condition of any relay entering into the control of either signal 4R or switch 3 and no crosses or grounds in their control circuits that could have caused signal 4R to display a false-proceed aspect was found. The circuits are so arranged that the control panel lights, which indicate the position of the switch, show a green light when the switch is locked normal and an amber light when the switch is locked reversed, but if the switch is unlocked both lights are extinguished. As the switch was found unlocked and in reverse position immediately after the accident with no evidence that it had been forced open and the control panel indicated that it was locked normal, it would appear that it became unlocked and the points moved from normal toward the reverse position after No. 2 passed signal 4R. It requires several seconds for an indication code to be transmitted from the field station to the control station and apparently the code line was broken in the accident before the code to indicate that switch 3 was not locked in normal position could be transmitted from the field station. Tests made after the accident with the switch machine and the electro-pneumatic valves controlling it showed that both were in good condition and functioning properly. With the exception of the moisture, rust and scale in the control valve, nothing was found that might have caused or have contributed to cause the switch to become unlocked and moved from the normal position when it should have remained locked in the normal position.

We find that this accident was caused by the movement of train No. 2 at high speed over an interlocked switch, the points of which were unlocked and not in proper position, the reason for which cannot be definitely determined at this time.

By the Commission, Division 3.

(SEAL)

GEORGE W. LAIRD,
Acting Secretary.