

INTERSTATE COMMERCE COMMISSION
WASHINGTON

REPORT NO. 3600
BOSTON AND MAINE RAILROAD
IN RE ACCIDENT
AT NASHUA, N. H., ON
NOVEMBER 12, 1964

SUMMARY

Date:	November 12, 1954
Railroad	Boston and Maine
Location:	Nashua, N. H.
Kind of accident.	Derailment
Train involved.	Passenger
Train number:	302
Engine number.	Diesel-electric units 3818 and 3820
Consist.	8 cars
Speed.	70 m. p. h.
Operation.	Timetable, train orders, and automatic block-signal system
Tracks.	Double; 6°35' curve, level
Weather:	Clear
Time.	5:52 a. m.
Casualties:	1 killed, 53 injured
Cause:	Excessive speed on curve

INTERSTATE COMMERCE COMMISSION

REPORT NO. 3600

IN THE MATTER OF MAKING ACCIDENT INVESTIGATION REPORTS
UNDER THE ACCIDENT REPORTS ACT OF MAY 6, 1910.

BOSTON AND MAINE RAILROAD

December 27, 1954

Accident at Nashua, N. H., on November 12, 1954, caused by
excessive speed on a curve.

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REPORT OF THE COMMISSION

CLARKE, Commissioner:

On November 12, 1954, there was a derailment of a passenger train on the Boston and Maine Railroad at Nashua, N. H., which resulted in the death of 1 passenger, and the injury of 35 passengers, 5 railway mail clerks, 2 Pullman Company employees, 2 buffet-sleeping car employees, 1 railway express messenger, 4 train-service employees, and 4 employees not on duty. This accident was investigated in conjunction with representatives of the New Hampshire Public Utilities Commission.

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Under authority of section 17 (2) of the Interstate Commerce Act the above-entitled proceeding was referred by the Commission to Commissioner Clarke for consideration and disposition.

Former site of water column

Speed-restriction sign

3,040 ft.

2,050 ft. P.T.

P.C.

10 345 ft.

P.T. 429 ft.

4,185 ft. To 302

I.C. 300 ft. 307 ft.

P.T. 17 ft. P.C.

603 ft. 231 ft.

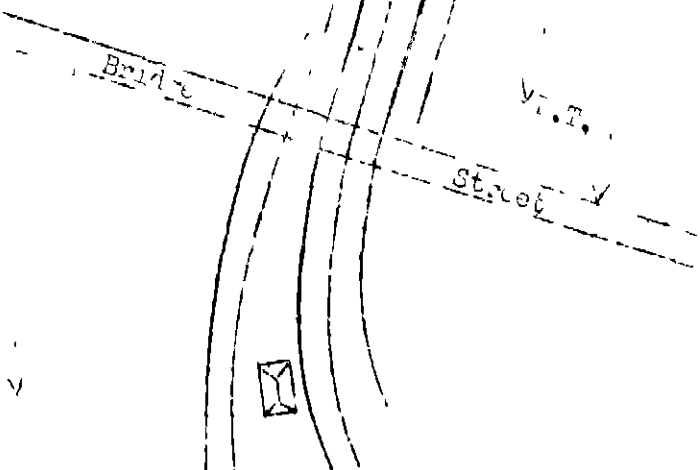
603 ft. 423 ft.

Point of accident

To South Lowell, Mass.

Nashua Union St.

White River Junction, Vt.	4.62 mi.
Lebanon, N.H.	13.43 mi.
Canaan	32.88 mi.
Franklin	18.67 mi.
Concord	2.02 mi.
Row	15.62 mi.
Manchester	1.74 mi.
South Manchester	13.16 mi.
Tie Plant	1.82 mi.
Nashua Union Sta., N.H. (Point of accident)	15.64 mi.
South Lowell, Mass.	



Report No. 3600
Boston and Maine Railroad
Nashua, N.H.
November 12, 1954

Location of Accident and Method of Operation

This accident occurred on that part of the New Hampshire Division extending between Concord, N. H., and South Lowell, Mass., 50.0 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 timetable, train orders, and an automatic block-signal system. The main tracks from west to east are designated as southward main track and northward main track. At Nashua Union Station, 34.36 miles south of Concord, auxiliary tracks parallel the southward main track on the west, and a siding and an auxiliary track, from west to east in the order named, parallel the northward main track on the east. A three-track through-truss bridge, 117 feet in length, spans the Nashua River at a point 1,279 feet north of the station. The accident occurred on the southward main track at a point 281 feet south of the south end of the bridge. From the north on the southward main track there are, in succession, a tangent 2,050 feet, a 1° curve to the left 345 feet, a tangent 429 feet, a 3°08' curve to the right 309 feet, a tangent 117 feet over the bridge, and a compound curve to the right, having a maximum curvature of 6°35', 281 feet to the point of accident and 423 feet southward. The grade in the vicinity of the point of accident is practically level.

The track structure of the southward main track consists of 112-pound rail, 39 feet in length, laid new in 1944 on an average of 22 treated ties to the rail length. It is fully tieplated with double-shoulder canted tieplates, spiked with two rail-holding and two plate-holding spikes per tieplate, and is provided with 4-hole 24-inch joint bars and an average of 8 rail anchors per rail. It is ballasted with trap rock to a depth of 6 to 8 inches below the bottoms of the ties. In the immediate vicinity of the point of derailment the gage varied between 4 feet 8-9/16 inches and 4 feet 8-3/4 inches. The superelevation at the point of derailment was 2-1/8 inches. At the northernmost point where marks of derailment were found the curvature was 6°20'.

A diamond-shape speed restriction sign 26 inches long and 20 inches high, which bears the numerals "30" in 8-inch black figures on a yellow background, is located 3,040 feet north of the point of accident. Reflector buttons are provided in the numerals. This sign is approximately 7 feet above ground level and is mounted on a post about 25 feet west of the center-line of the southward main track.

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

110. * * *

Speed restrictions shown in time-table, bulletin orders, by wayside signs, or by other means, must be strictly observed.

The maximum authorized speed for the train involved was 70 miles per hour, but it was restricted to 30 miles per hour on the curve on which the accident occurred.

Description of Accident

No. 302, a south-bound first-class passenger train, consisted of Diesel-electric units 3818 and 3820, coupled in multiple-unit control, one baggage-mail car, one baggage car, one milk-tank car, one baggage car, two coaches, one sleeping car, and one buffet-sleeping car, in the order named. All cars were of conventional all-steel construction except the fifth car, which was of lightweight steel construction. This train passed Tie Plant, 1.74 miles north of the point of accident, at 5:50 a. m., 6 minutes late, according to the dispatcher's record of the movement of trains, and while it was moving at a speed of 70 miles per hour the locomotive and all cars of the train were derailed at a point 998 feet north of Nashua Union Station.

Separations occurred between the Diesel-electric units and between all units of the train except the fifth and sixth cars. The first unit stopped upright with the front end several feet west of the southward main track and approximately 825 feet south of the point of derailment. The rear end of this unit stopped on the southward main track, which curves to the left at this point. The second Diesel-electric unit stopped on its left side across the adjacent tracks. The front end of this unit was on the southward main track about 40 feet to the rear of the first unit, and the rear end was about 45 feet east of the southward main track. This unit and the first four cars were off their trucks. The first to the seventh cars, inclusive, overturned. The first car stopped upside down on the auxiliary track east of the siding. The second and fourth cars stopped on their east sides in diagonal positions across the northward main track and the siding. The third car stopped on its west side, to the east of the southward main track, in the angle formed by the second and fourth cars. The fifth, sixth, and seventh cars stopped on their east sides on the northward main track. The rear car stopped approximately in line with the southward main track

with the rear end 85 feet south of the point of derailment. It leaned toward the east at an angle of approximately 15 degrees. The first Diesel-electric unit and the rear car were somewhat damaged. The second Diesel-electric unit and the other derailed cars were badly damaged. A baggage car on the siding and two freight cars on an adjacent auxiliary track east of the siding were struck and damaged by derailed equipment of No. 302.

Diesel-electric unit 3818 was the first unit of the locomotive. It is of the 0-6-6-0 type and is provided with a control compartment at the front end. The unit is 71 feet 1-1/4 inches in length over the pulling faces of the couplers. The trucks are of the swing-motion type. The wheelbase of each truck is 14 feet 1 inch, and the centers of the trucks are spaced 43 feet apart. The specified diameter of the wheels is 36 inches. The total weight of the unit is 322,436 pounds. The brake equipment is of the 24-RL type, with DS-24-H automatic brake valve and S-40-F independent brake valve. A safety control feature actuated by a foot pedal is provided. The regulatory devices are adjusted to maintain main-reservoir pressure of 130 pounds and brake-pipe pressure of 110 pounds. The center of gravity of the unit is 60-1/2 inches above the level of the tops of the rails. Diesel-electric unit 3820, the rear unit of the locomotive, is similar in design and construction. The theoretical equilibrium, safe, and overturning speeds for these units moving on a 6°20' curve having 2-1/8 inches superelevation are, respectively, 22, 45, and 75 miles per hour.

The first two cars of the train were equipped with PC type control valves, and the other cars were equipped with UC type control valves. One of the two tanks on the milk car was loaded. The centers of gravity of the cars varied between a minimum of 55 inches and a maximum of 60 inches above the level of the tops of the rails. The theoretical equilibrium speed for this equipment was 22 miles per hour at the point where track curvature was 6°20' and the superelevation was 2-1/8 inches. Safe speeds for the equipment varied between 43 and 47 miles per hour, and overturning speeds were estimated at from 75 to 80 miles per hour.

The engineer, the fireman, the conductor, the flagman, the front brakeman, and the train baggageman were injured.

The weather was clear at the time of the accident, which occurred about 5:52 a. m.

Discussion

As No. 302 was approaching the point where the accident occurred the speed was about 70 miles per hour, as indicated by the tape of the speed-recording device. The engineer and the fireman were maintaining a lookout ahead from the control compartment at the front of the locomotive. The conductor, the front brakeman, and the baggageman were in the baggage car, the fourth car of the train, and the flagman was in the rear car. The engineer said that he placed the brake valve in first service position when the locomotive was in the vicinity of a concrete base at the former location of a water column 5,183 feet north of the station, the usual point at which he began to reduce train speed to comply with the speed restriction on the curve south of the bridge and to make the stop at Nashua Union Station. He said that soon after he placed the brake valve in first service position the gauge indicated that a brake-pipe reduction of about 9 pounds had been effected, but there was no reduction in the speed of the train. He then made a service brake-pipe reduction of about 10 pounds, and when this failed to reduce the speed he again placed the brake valve in service position. He estimated that there was an interval of about 4 or 5 seconds between the first and second reductions, and the third reduction was made about 3 seconds after the brake-valve exhaust caused by the second reduction had ceased. He did not think that the exhaust from the brake valve was normal. He said that about this time he began to sound the whistle signal for Bridge Street crossing, located 839 feet south of the bridge, but then became concerned because the brakes were ineffective, and he did not complete the signal. He said that he moved the brake valve to emergency position when the locomotive was entering the bridge and that about the same time the fireman called a warning. He thought that the emergency brake application was effective in reducing the speed of the train considerably before the locomotive became derailed. The fireman said that he and the engineer called all signal indications en route and that the grade-crossing whistle signal was sounded for a crossing in the vicinity of Tie Plant. He thought the engineer made the initial brake-pipe reduction before the locomotive passed the speed-restriction sign. When the speed was not reduced he became concerned and called a warning as the train was closely approaching the bridge. He said that the locomotive lurched violently toward the east as it entered the curve south of the bridge and then lurched violently in the opposite direction. He thought it became derailed before the speed was materially reduced by the emergency application of the brakes. The baggageman said that he felt a slight brake application which caused some retardation before the

baggage car became derailed and overturned. The other members of the train crew said that the train had been riding smoothly and they did not feel any brake application before the accident occurred.

An assistant maintenance foreman said that No. 302 passed him as he was walking adjacent to the track in the vicinity of the crossing-whistle sign for Bridge Street crossing, approximately 500 feet north of the bridge. He said that the locomotive whistle was not sounded in the vicinity of the sign and that he did not observe any indication of braking action on the wheels of the train as it passed. The crossing watchman at Bridge Street said that he did not hear the whistle sounded as the train approached and that the train approached at unusually high speed. He observed sparks flying from the wheels of the Diesel-electric units immediately before the derailment occurred, but he did not know whether the brakes were applied on the cars.

Examination of the track after the accident disclosed that the first mark on the track structure was a flange mark inside the east rail 281 feet south of the south end of the bridge. The east rail on the curve was canted outward beginning at a point about 320 feet south of the bridge. The rail at this point was bent, and the general derailment occurred approximately 75 feet southward. Apparently the train entered the curve at approximately overturning speed, and the sequence in which the equipment became derailed could not be determined. The southward main track was destroyed throughout a distance of approximately 490 feet, and the northward main track and adjacent auxiliary tracks in the immediate vicinity were damaged. The marks on the track structure north of the point of general derailment apparently were made by following car equipment.

Examination of the equipment of No. 302 after the accident occurred disclosed that all angle cocks in the train, with the exception of the angle cock from the front end of the third car, which was broken off and could not be located, were in proper position for control of the brakes from the engineer's brake valve. No slid-flat spots or other indications of heavy braking were found on the wheels. Before any of the derailed equipment was moved the brake pipes of the locomotive units and the cars were tested for obstructions. Where the brake pipes were broken, each of the separated portions was tested. Compressed air at a pressure of approximately 80 pounds per square inch was used in these tests, and no obstruction to the normal flow of air was found in any of the brake pipes, air hose, or fittings. All air hose and

fittings, with the exception of the angle cock from the front end of the third car, were tested for internal defects or obstructions at the shops in Billerica, Mass., on November 26, 1954. No defective condition was found.

The brake control apparatus of Diesel-electric unit 3818 was tested after this unit was moved to the shops at Billerica. In these tests the piping was so arranged that the main reservoir of the unit could be fully charged and breaks were plugged to permit the making of tests that would indicate the pressure developed, during brake-pipe reductions, in the two brake cylinders which remained intact after the accident. With the air-brake system properly charged, movement of the engineer's brake valve to first service position effected an initial brake-pipe reduction of approximately 8 pounds, after which brake-pipe pressure continued to reduce at the normal restricted rate. Brake-cylinder pressure began to build up after equalizing-reservoir and brake-pipe pressures had been reduced approximately 7 pounds. Brake-cylinder pressure of 54 pounds was obtained with a service brake-pipe reduction of 20 pounds. During these tests the brake valve functioned properly in all positions.

The investigation disclosed that on the day of the accident train No. 302 was assembled at White River Jet., Vt., 103.76 miles north of the point of accident. A terminal test of the air brakes was made after the locomotive was coupled to the train. The car inspectors who inspected the train took no exception to the condition of any of the equipment. During this inspection the engineer made a brake-pipe leakage test and he took no exception to the rate of leakage in the train. The train departed from this point at 3:25 a. m., 5 minutes late. A running test of the brakes was made immediately after departure from this terminal, and stops were made at Lebanon, Franklin, Concord, Bow, and Manchester, N. H., located, respectively, 94.14, 52.83, 34.16, 32.14, and 16.52 miles north of the point of accident. In each instance the brakes functioned properly to control the speed of the train. This train departed from Manchester approximately 15 minutes before the accident occurred. The temperature at Canaan, N. H., 85.71 miles north of the point of accident, as reported to the train dispatcher at 12 01 a. m., was 32 degrees and it was 42 degrees at that point at 6 a. m. The minimum temperatures at other reporting points in this territory at the same hours were, respectively, 36 degrees and 37 degrees.

Examination of the tape of the speed-recording device disclosed that between Manchester and South Manchester, a distance of 1.74 miles, the speed of the train was first increased to 54 miles per hour and then reduced to about 28 miles per hour in compliance with a speed restriction at the latter point. The speed was then increased within a distance of approximately 4 miles to a maximum of 73 miles per hour, after which there was deceleration to about 70 miles per hour. Throughout a distance of approximately 10 miles immediately north of the point of accident an indicated speed of about 70 miles per hour was maintained and there was no appreciable reduction in the speed of the train before it entered the curve on which the accident occurred.

No conditions were found in any of the inspections or tests which would have caused the brakes of any of the equipment of this train to become inoperative. The brakes of the train were last used at South Manchester and they functioned properly to control the speed of the train. Under these circumstances, it appears that the speed of the train would have been properly controlled at the point of accident if braking action had been initiated a reasonable distance before reaching the point at which the speed restriction applied.

Cause

This accident was caused by excessive speed on a curve.

Dated at Washington, D. C., this twenty-seventh day of December, 1954.

By the Commission, Commissioner Clarke.

(SEAL)

GEORGE W. LAIRD,
Secretary.