DEPARTMENT OF THE ENVIRONMENT

RAILWAY ACCIDENT

Report on the Derailment and consequent Collision that occurred on 4th July 1971 at Surbiton

IN THE

SOUTHERN REGION

BRITISH RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE

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1972

RAILWAY INSPECTORATE,
DEPARTMENT OF THE ENVIRONMENT,
2 MARSHAM STREET,
LONDON, S.W.1.
12th May 1972.

SIR,

I have the honour to report for the information of the Secretary of State in accordance with the Order dated 6th July 1971, the result of my Inquiry into the derailment of an engineer's ballast train and consequent collision with an electric multiple-unit passenger train at about 10.05 on 4th July at Surbiton in the Southern Region, British Railways.

The 08.25 Clapham Yard to Farnham ballast train consisting of 45 engineer's wagons with a brake van at each end and hauled by two Class 73 electro-diesel locomotives, was running at slow speed on the Down Slow line approaching Surbiton Station when the 24th wagon, having previously become buffer locked with the wagon ahead of it, became derailed at facing points. The wagon struck the ramp of the Down Slow line platform and its door springs rode along the platform coping until, about half way along it, the wagon following it also became derailed and both vehicles swung foul of the Down Fast line. The 09.50 Waterloo to Portsmouth Harbour electric passenger train which was closely following at about 72 mph on the fast line struck the derailed wagons and itself became derailed. One of the derailed wagons was thrown to its left and struck and destroyed a point machine causing the facing points to be reversed and directing the following wagons into the side of the passing passenger train.

The leading car of the passenger train continued derailed for some 580 feet until its bogies struck and badly damaged a rail-over-road bridge girder and the car then turned onto its offside and travelled a further 500 feet before coming to rest in front of Surbiton signalbox. One of its bogies directed to the left by a cross-over struck the leading end of the ballast train which resulted in the brakevan and first two wagons turning onto their sides, the derailment of three other wagons, and damage to the rearmost locomotive. The passenger train became divided behind the leading car and also between the fourth and fifth cars and all except the third car were derailed. The ballast train also became divided, the front portion consisting of the brakevan and 23 wagons being separated by some 280 feet from the remaining 21 wagons and the rear brakevan, the latter coming to rest two-thirds of the way along the platform.

The emergency services were called immediately and arrived promptly and ten passengers and the driver, all from the leading car, were taken to hospital but only three passengers were detained. The Down Slow line was cleared for traffic by 14.10 on 5th July, but the Down Fast line was not cleared until 09.45 on 7th July, temporary speed restrictions being imposed on both lines. The weather was warm and clear.

DESCRIPTION

The Site and Signalling

1. Surbiton Station lies on the Waterloo to Bournemouth main line some 8 miles south-west of Clapham Junction. The lines are electrified on the third rail system at 750 volts. The Down Slow and Fast lines lie to the east of the Up Fast and Slow lines as shown in the diagram at the end of this report. About 490 feet before the London end of Surbiton Station platforms, facing points No. 248 lead from the Down Slow to the Down Platform Loop line, which loop rejoins the Down Slow line at points No. 244 some 430 feet beyond the country end of the 860 foot long platform. There are also crossovers from the Down Fast to Down Slow line and Down Slow to Down Fast line parallel to the two connections. Some 230 yards beyond the platforms the lines cross the Brighton Road over a through-girder bridge, and between this bridge and the signalbox there is a trailing crossover from the Up Fast to the Down Slow with a diamond crossing in the Down Fast line.

2. The signalling is track circuit block with four-aspect colour-light signals controlled from Surbiton signalbox, which is situated on the Down side of the lines some 370 yards beyond the country end of the platforms. The first signal on the Down Slow line controlled from Surbiton signalbox is signal No. S4 which protects points No. 248 and carries a junction indicator reading to the Down Platform loop. The lines on the approach to this signal curve to the left in a cutting and signal No. S4 is preceded by a repeating signal No. 4R. The previous 4 signals are all automatic and lead from New Malden Station whence track circuits are indicated in Surbiton signalbox.

The Track

3. The turn-outs and crossovers already mentioned were laid in new material when the signalling was introduced in 1969. The 2 miles of track in the Down Slow line from New Malden was formed of standard 109 lb flat bottom jointed rail on BR baseplates laid in 1964, except for a length of some 700 yards on the approach to and through Berrylands Station which was laid in 113 lb continuously welded rail on concrete sleepers in 1970. The length of jointed track immediately preceding Surbiton Station was last tamped in June 1971 and was in excellent condition. The maximum permissible line speed was 90 mph. The clearance

between the Down Slow and Down Fast lines varied between 6 feet 4 inches and 7 feet through the station and that between the Down and Up Fast lines was over 9 feet in the station reducing to about 6 feet 6 inches at the overbridge.

4. The ballast train began its journey from No. 1 Siding at Clapham Junction which lies beside the Up Main line on the London side of the station as shown in figure 2. No. 3 Siding lies on the west side of No. 1 Siding and both pass through carriage washing machines at about their mid points. From the south No. 1 Siding is straight for the first 50 yards and curves left and then right before passing through the machines. To the north of it the siding first curves right-handed at a radius of 13·8 chains (900 ft) from facing points which are clipped and padlocked reversed, and then left-handed at 11·8 chains (780 ft) to continue beside the Up Main line. The points lead to a spur known as No. 2 Siding. The gauge at the point of inflexion between the two latter curves (measured subsequent to the accident) was 4 ft $9\frac{3}{8}$ ins, and the point of inflexion is about 755 feet from the siding exit ground shunting signal No. WE 40 at its northern end. The siding is some 1,160 feet long overall between the two exit shunting signals Nos. WE 40 and WF 9 at its southern end.

The Trains

5. The ballast train consisted of twelve 13-ton open wagons forming the fitted head, followed by five 20-ton Grampus wagons and a further twenty-eight wagons consisting of one 10-ton, two 12-ton, eighteen 13-ton and seven 20-ton wagons. There was a brakevan at each end of the train which was hauled by two Class 73 electro-diesel locomotives Nos. E 6025 (leading) and E 6033 working in multiple. The train carried 371 tons of ballast in 34 wagons, five of which were lightly laden; the remaining eleven wagons were empty. Its total length was 1,118 feet and it weighed nominally 846 tons, of which 151 tons was the weight of the two locomotives, and its maximum permitted speed was 45 mph.

6. The 8-car passenger train was formed of two outer suburban multiple-units classified 4 VEP, No. 7714 leading and No. 7806 trailing. Each unit consisted of a Driving Trailer Semi-Open Composite at each end, with a Trailer Open Second and a Motor Open Brake Second between them, and each was gangwayed throughout. The leading car of the train, No. 76256, contained a cross passage behind the driver's compartment with two inward opening doors followed by an open second class compartment with 38 seats having four doors on each side. To its rear were four first-class compartments each having a door on the offside of the train, with a corridor with two doors on the nearside. The train was 530 feet overall and weighed 299 tons, and its maximum permitted speed was 90 mph.

The Damage Caused

7. The leading car of the passenger train was severely damaged. The impact with the ballast wagon destroyed the nearside half of the driver's cab and it was probably the second derailed wagon which stove in the rearmost nearside door. The bogies and all the underfloor equipment were also ripped away. Although the car came to rest on its offside only one, the leading offside window in the passenger compartment, was broken, all glass in this relatively new stock being toughened to British Standard 857. The remaining cars were scarred down their near sides, and all were derailed except for the third and the leading axle of the fifth car. There was considerable underfloor damage throughout the train but only slight interior damage.

8. The leading locomotive of the ballast train was slightly damaged on its offside but the second locomotive was badly damaged at its rear by impact with the leading brakevan. This van, and the first four wagons of the fitted head were derailed following impact with the bogies of the leading car of the passenger train.

9. The 24th, 25th and 26th wagons in the train were also derailed. The 24th, an unladen 20-ton Grampus wagon No. LDB 984371, was badly damaged. The nearside door springs were bent and ground away and there was stone dust on the axle boxes and springs from the platform coping stones. The wagon doors were ripped off in the collision. There were deep marks on the rear buffer stems of the 23rd wagon, fully laden 13-ton open wagon No. DB 459910, and similar marks on the buffers of the 24th wagon, which could only have been made if the latter wagon had been riding buffer locked on top of the former for a considerable distance with their buffers in the '10 or 11 o'clock' position.

10. The 25th wagon, 20-ton Grampus No. DB 985600, bore the blue paint of the passenger train on its offside showing that it had probably been the first to be struck by the leading car of that train. The 26th, a 13-ton open wagon was also damaged at its leading end where it had hit the passenger train having been directed through the facing crossover No. 245. This wagon was derailed on the crossover but the remainder of the train stayed on the line.

11. The Down Fast line became slewed, some 6 inches towards the Up Fast line at the point of impact between the two trains about 60 feet south of the platform ends. 300 yards of track had to be relayed including 420 damaged sleepers and two sets of points with their machines, and 5 sets of point connections had to be renewed. 330 yards of conductor rail required renewal and a further 400 yards were displaced. The top flange of the Down Fast line offside girder of bridge No. 46 also had to be rebuilt.

12. The ballast train had been loaded with spent ballast at St. Margarets Station on the night prior to the accident and *Area Inspector A. G. Moody* was the Movement Department's Supervisor on site. He described to me how the train was loaded by three machines working on the neighbouring line. He told me that he pointed out to the guard that a wagon which was about 4th from the London end of the train was fully loaded, which he could tell from the state of the springs, but in his opinion it was not too heavy to run. He said that he knew some wagons were empty and some only partly laden when the train departed but this was not unusual. He confirmed that it was the task of the supervisor from the Chief Civil Engineer's Department, and of the guard jointly to check that wagons were not overloaded and that the guard seemed to be fully alert to his responsibilities.

13. *Guard B. Young* took over the train at 01.00 on 4th July at Woking and travelled with it to St. Margarets. He told me that he was given a completed train preparation form by the guard from whom he took the train over at Woking, and that he entered on it the load of each wagon as loading proceeded. When in his opinion the load totalled 849 tons, the maximum allowed being 856 tons, he told Inspector Moody and loading ceased immediately. He estimated the load by calculating a heavily loaded wagon as 20 tons and medium loaded wagons as 16 tons, although some of them were only 13-ton wagons. When I asked him where the train preparation form was he said it had been lost.

14. Young told me that while walking along the train he had noticed that ballast, which was being loaded into one wagon about the 7th from the country end of the train, was falling straight through onto the rails. The hole in the floor was covered over and loading continued. He said he did not notice if the wagon was carded for repairs, nor did he notice any wagons too heavily laden. He said that the train left St. Margarets shortly before 08.00 and they had an uneventful journey to Clapham Junction where they stopped in No. 3 platform and where he handed over to a relieving guard.

15. *Passed Secondman G. C. Peck* drove the train with electro-diesel locomotive No. 6025 from St. Margarets to Clapham Junction. He told me that the guard gave him a 'Driver's slip' showing that the train weighed 849 tons and had a fitted head of 12 wagons not including the through-piped brakevan. He had no difficulty in controlling the train with the single electro-diesel locomotive, and they had an uneventful journey to Clapham Junction. After about 20 minutes they pulled forward onto the Up Windsor line, and then set back into the yard. Before leaving his locomotive he said he shut it down and left the brake selector switch in the vacuum position and the 'fitted/unfitted' switch in the 'fitted' position.

16. *Driver L. C. Willmott* worked electro-diesel locomotive No. 6033 light from Woking to Clapham Junction where he and his secondman coupled it to locomotive No. 6025 on the head of the train. He then changed into the country end of locomotive No. 6025 and later hauled the train out of the yard into No. 1 siding. He told me that he drove from the left-hand side of the cab facing south so that he was facing the brakevan, and that his secondman and the shunter who accompanied them were on the right-hand side of the same cab looking out for the exit signal No. WE 40. When they arrived at the exit, the signal was already cleared and the shunter got down to apply the London end van's brake and to uncouple the locomotives. They then left the siding and ran round to the country end of the train where the shunter handsignalled him back and coupled up. He told me that he stopped his locomotives short of the train and they then set back very gently onto it. I asked him if a brake test had been carried out prior to their departure, but he told me that there had been some uncertainty whether the brake release strings had been pulled on the London-end wagons which had previously formed the fitted head, and that by the time they had checked this the signal was cleared for their departure and the test was overlooked. He had however destroyed and re-created his vacuum brake which satisfied him that the brake was continuous.

17. Driver Willmott told me that they pulled out of the siding over the main lines onto the Down Local line under diesel power and he changed smoothly to electric traction south of Clapham Junction. He said that he accelerated very smoothly and he thought they were doing about 30 mph on passing through Earlsfield and not more than 40 mph approaching New Malden. He thought the New Malden starting signal (No. 32) was showing a double yellow aspect which cleared to green as he approached it and that the next few signals were showing the same, but he was on a rising gradient and did not have to use his brake. He thought he passed through Berrylands at about 30 mph and when he came to signal No. WA 76 some 1,000 yards before Surbiton station it was showing a single yellow aspect which cleared to double-yellow as he approached. He therefore applied the locomotive air brake to buffer up his train and he estimated his speed was some 20 mph when he passed the repeating signal No. 4R which was Off. Signal No. S4 protecting No. 248 points on the approach to the station was showing a single yellow aspect as it came into view but, shortly after passing it, he saw the platform starting signal No. S10 at yellow. He applied a small amount of power, and when it cleared to a double yellow aspect he applied a little more power. As he approached Surbiton signalbox he saw the signalmen, who were in the corner of the box looking in the London direction, raise their hands and on looking back himself he saw a huge cloud of dust. He brought his locomotives to a stand outside the signalbox and went straight up to the signalbox to make sure the lines were protected. When he was assured that they were he went down to the leading car of the passenger train to help the passengers and driver.

18. I asked him if when driving two locomotives hauling such a train he had any feel of the train behind him, and he replied "on those engines you have got very little feel of the train at all. It is almost a sense rather

than a feel". He also said that on passing over gaps in the conductor rail at speed there was hardly any indication at all, but at slow speed there could be quite a jolt and he always reduced power before approaching a gap. He said that he had not had to do so between Clapham Junction and Surbiton on the day in question.

19. *Secondman D. C. Osman* confirmed his driver's evidence and told me that the only time Driver Willmott braked was when they were approaching signal No. WA 76 which was showing a yellow aspect. He said that with two locomotives there was no sensation of the train and he could not tell if the guard was using his brake or not. He also saw signal No. WA 10 clear to a double yellow aspect when they were about halfway down the platform.

20. *Guard S. N. Ahmed* took over the train in platform No. 3 at Clapham Junction, and was in the rear (country end) brakevan when they drew forward and set back into the yard. He told me that he did not take over a train preparation form, but there was a duplicate driver's slip which he amended in red to show that the brake force (including the two locomotives) was 109 tons. He told me that when they drew forward into No. 1 siding he gently applied his van's brake to take up the slack to indicate to the driver that he was within the siding, and then gave the hand signal to stop. He then fully applied the hand brake. He told me that he waited until the locomotives had run round and then got out of his van to watch the shunter coupling them onto the train. Having given the driver the driver's slip he walked back along Nos. 3 and 2 sidings next to No. 1 siding and on passing through the carriage washing machine he changed an Instanter coupling from the long to the short position. He told me that he did not notice any wagons buffer locked, but he did not make a thorough check of his train at this stage. On arriving at the rear van he released its brake ready for their departure.

21. He thought that they were travelling at a good 40 mph on their journey to New Malden and he saw several signals showing green aspects, but thereafter because of the length of the train and curves in the lines he did not see any signal aspects. He described the ride in the brakevan as 'very rough' but he did not notice any wagons in the train hunting badly, possibly because those nearest him were loaded and more stable. He applied some brake in the area of New Malden and released it when he felt the locomotives pulling away again but it was still slightly applied when they went through Berrylands. As he came into view of Surbiton platform he saw dust coming from the middle of his train and a member of the platform staff signalling to him to brake, which he did, and his van came to a stand some two thirds of the way along the platform. When he went forward to see the derailment he was told that the platform staff had protected the rear of his train by putting down detonators.

22. *Leading Railman C. V. Tate* was the shunter who coupled the locomotives onto the ballast train in Clapham Yard. He told me that he travelled in the London-end brakevan as the train was hauled into No. 1 siding. When they came to a stand in the siding he applied the handbrake in the brakevan before uncoupling the locomotives, and then travelled with the driver and secondman in the country-end cab while they ran round the train. He then handsignalled the locomotives back onto the country end of the train and coupled up; the locomotives came onto the train very gently and there was no shock at all. He said that he did not get into the country-end brakevan because the guard was with him. Finally he rode on the locomotive as far as the siding exit signal and then left the train to walk back to the yard and did not watch the train pass.

23. *Motive Power Supervisor W. Stone* was standing at the door of his office at the northern exit of Clapham Junction Yard when the ballast train was drawn out towards No. 1 siding. In a written statement he said that he watched the train depart and there was definitely no buffer locked wagon in it then, but when the train finally departed from the siding it was too far away for him to see it.

24. *Signalman A. Lucas* came on duty at the London end of Surbiton panel at 06.00 on Sunday 4th July. Shortly before the accident the 09.42 Waterloo to Bournemouth passenger train had arrived on the Down Fast line and had crossed over onto the Down Slow line and stopped at the platform. While it was still in the platform the ballast train was indicated on his track circuit diagram as approaching signal No. WA 14. At this time signal No. S4 was showing a red aspect (so that signals Nos. WA 72 and WA 68 would be showing double yellow aspects). The 09.42 train then departed under green signals down the Slow line and he set the route for the ballast train from No. S4 to No. S10 signal (so that No. S4 signal would be showing a yellow aspect, and Nos. WA 76 and WA 72 double yellow aspects). He thought the ballast train was then approaching No. WA 76 and he had the impression that it was travelling quite slowly. At this time the 09.50 Waterloo to Portsmouth train was approaching Berrylands on the Down Fast line. The only train on the Up Fast and Slow lines from Weybridge, on which all the signals were set to work automatically, was a train in the Up Slow platform which departed at about this time.

25. As the 09.42 train left the platform, he selected the route behind it for the ballast train from signal No. S10 to No. WA 80 on the Down Slow line at which time he heard the traction current circuit breakers in the hut adjacent to the signalbox blow out. He told me that the sound was like a muffled rifle shot; generally the breakers were reset by Raynes Park electrical control, but on this occasion they blew out a second time and he knew there was trouble. The telephone then rang from the Down platform and he was told that a wagon door was open and that he should stop the ballast train, and almost immediately there was another similar call from the Up platform. He went to the window and seeing that the ballast train was travelling quite slowly he held up his hands to stop it. As he did so he saw the leading car of the passenger train strike something on the ballast train at about the trailing ends of crossover No. 245 and derail towards the Up Fast

line, and as each car passed that point it too derailed. Before going about his duties he saw the leading car rear up just clear of the underside of a signal gantry and then turn over onto its side, and as its bogies hit the diamond crossing of No. 242 crossover he saw them being directed under the leading end of the ballast train which was also becoming derailed. He told me that he immediately sent the Obstruction Danger signal to New Malden on the emergency block bell and called the emergency services. The passenger train had caused the signals on the Up Fast line to be replaced to Danger, but he also protected both the Up Fast and Slow lines.

26. *Railman I. J. Shepherd* was standing on the Down Platform when the ballast train was passing through. He told me that he saw a wagon rear up somewhere near points No. 248, and he then saw the front end of a wagon hit the end of the platform ramp. He told me that as the train went by he saw one wagon pass him tipped towards him so that he could see inside it, and he thought that two wagons were derailed at that time. He immediately telephoned the signalbox.

27. *Driver W. J. Tweedie* who was the driver of the 09.50 Waterloo–Portsmouth train told me that he was approaching Surbiton under clear signals at about 72 mph when he saw a cloud of dust coming from the middle of the ballast train ahead of him on the adjoining line. He shut off power and began to sound his horn when suddenly the dust cleared and he saw the rear end of a wagon canted across his line. He took his hand off the dead man's handle and moved away from the window into the middle of the driver's compartment. He felt a bang and remembered nothing more until his train came to a stand and he realised his car was on its side. He told me that he was bruised and his legs were cut but he remembered to ask the driver who got him out of his cab if the lines were protected, and was told that they were.

28. *Signal and Telecommunications Supervisor G. C. Elliott* inspected points No. 248 immediately after the accident. He told me he found them set normal and they were not in any way damaged. He tested them mechanically and electrically and could find nothing wrong with them. He also 'dropped' the track-circuit over the points and proved that the points could not then be moved. He found no loose ballast on the points and he saw nothing that could have caused a derailment.

29. *Mr. A. L. Headech* of the British Railways Board Research Department, Derby, in a written report described the marks he had found at the point of initial derailment near No. 248 points. The first mark of derailment was that of a wheel flange climbing over the left hand switch blade 4 feet beyond the tip of the blade, and another 17 feet beyond the tip of the right hand blade, by which point one axle had taken the divergent route to the Down Loop line. At about 100 feet from the tip of the right hand switch blade, where the switch rail is 19 inches from the stock rail he found rolling marks on the stock rail head which he thought had been made by the trailing wheel of a wagon, the leading axle of which had taken the wrong line. There were then signs that the point of contact of the right hand wheel transferred to the outside of the rail, indicating that the wagon was overturning to the offside, and the trailing wheelset having no lateral restraint to the left, derailed. Shortly afterwards the leading right wheel flange climbed over the rail and the wagon became totally derailed on the left hand side. The wagon was steered further to the left by the convergence of No. 247 crossover, and there were clear signs of this wagon striking and damaging the platform ramp, and of a further wagon, probably that following, derailing towards the offside and displacing the conductor rail. He also told me that the track alignment was good, although at the point of derailment the gauge, which was generally on the narrow side was $\frac{5}{16}$ inches less than the nominal 4 feet 8½ inches. Mr. Headech also described to me a continuous mark on the running edge of the left hand rail just below the head of the rail approaching points No. 248, which in his opinion had been caused by an unusual flange contact.

Subsequent Investigations

30. According to the signalbox register of Clapham Junction 'A' signalbox, the ballast train left Siding No. 1 at 09.47. It passed Wimbledon 'A' signalbox at 09.54 having averaged a little over 30 mph between the two signalboxes. The Raynes Park control recorded the power as being cut off at 10.05. The train therefore averaged 27 to 28 mph for the 8¼ miles and there is no evidence that it was travelling in excess of its permitted speed.

31. The undamaged wagons in the ballast train were weighed after the accident and eight wagons were found to be overloaded. In particular the 14th wagon of 20-ton maximum load was 6 tons 15 cwt overloaded, and the 22nd wagon of 13 tons maximum load was 7 tons 9 cwt overloaded and the springs were heavily on their stops. I examined the train after the accident and noted that some of the lightly laden wagons had been loaded in one corner or at one end only. As an example the 38th wagon, of 13 tons maximum load, although only carrying 9 tons 8 cwt was loaded at one end so that the springs on that end were riding on their stops.

32. Wagons often become buffer locked due to traction and braking shocks and I therefore considered the likelihood of the buffer locking having been caused by a sudden loss of traction current. There are several gaps in the conductor rail between Clapham Junction and Surbiton. At Wimbledon Station the gap is 110 feet, at Raynes Park 50 feet, over the Kingston By-pass bridge it is 83 feet, and at New Malden Junction it is 60 feet. The remainder were less than the 36½ feet span of the shoes on a single Class 73 locomotive. The span of the shoes of two locomotives is 89½ feet and so total loss of power only occurred for a very short time at one point, and I do not consider it could have caused the buffer lock.

33. The Railway Officers also carefully examined the left hand rail over the route the train followed, to find the point at which the flange mark Mr. Headech had described began. Although it was generally intermittent it was very marked on the London side of Surbiton station, but some evidence of it was also found in No. 1 siding at Clapham Junction. They also had a section of rail on an extensively used line painted, and on re-examination 48 hours later no similar mark could be found. It seems likely therefore that the mark was caused by one of the wheels of the ballast train.

34. The 23rd and 24th wagons, which were buffer locked, have been carefully examined. The 23rd, No. DB 459910, had last been overhauled at Deal on 5th February 1970 and the 24th, No. DB 984371, at Hoo on 9th December 1970. The axle guards at three of the wheels of the 23rd wagon were worn slightly in excess of the maximum allowed $\frac{1}{2}$ inch axlebox to guard clearance, but those on the 24th wagon were within tolerance. There was slight hollow wear on the wheels of both wagons (amounting to $\frac{1}{16}$ inch on the 24th wagon) but nothing was found which would have caused it to derail.

35. Both wagons were fitted with spring mounted buffers of 13 inches diameter on spindles of 3 inches diameter. The total distance that the buffers of the 24th wagon, an unladen 20-ton 'Grampus' wagon, could be raised without the nearest wheels lifting clear of the rail was some $6\frac{3}{4}$ inches. The buffers of the 23rd wagon, a fully laden 13-ton Medium Open wagon, were riding some 2 inches below those of the 24th, and to this can be added a further $\frac{1}{4}$ inch due to its carrying part of the weight of the following wagon when buffer locked. Riding as they were in the '10 o'clock' position, the buffers of the 24th wagon would have been lifted only some $3\frac{1}{4}$ inches, and its leading wheels would have been on the rails when running buffer locked.

36. To determine the likelihood of the two wagons becoming buffer locked in No. 1 siding at Clapham Junction I asked the Railway Officers to measure carefully the track where the buffer lock might have occurred, and to carry out certain tests on the two wagons involved. It is possible that the driver first applied his brakes when the leading locomotive was some 150 feet from the siding exit signal at which time the two wagons would have been negotiating the reverse curves of some 900 and 780 feet radii as shown in figure 2. The track on either side of the point of inflexion between these curves was from $\frac{3}{8}$ inch to $\frac{3}{4}$ inch wide to gauge.

37. The 23rd wagon was tested on track of 4 feet $8\frac{1}{2}$ inch gauge by hauling the buffers on its diagonally opposite corners first to one side and then to the other until the flanges of its wheels were against the rails and all axlebox, spring, and buffer lateral clearances had been taken up. The total movement was about 3 inches, but using a little force (a $\frac{1}{2}$ ton pull-lift jack was used) the movement could easily be increased to over $3\frac{1}{2}$ inches as parts of the suspension deflected.

38. The 24th wagon was too damaged for such a test, but from measurements of the wear at the wheel flanges and the clearances between the axlebox bearings and journals, the axlebox guards and guardways, the spring buckles and their seats, and finally the lateral buffer movements I estimate the total lateral movement of this wagon's buffers could have been some $2\frac{3}{4}$ inches.

39. Gauge widening could have allowed the ends of the buffer locked wagons to move laterally a further $1\frac{1}{4}$ and $1\frac{3}{8}$ inches; and had the buffer locking occurred when the wagons were on either side of the point of inflexion the relative lateral displacement between them could have been a further $1\frac{3}{8}$ inches. Thus their total lateral displacement could have been some 7 inches, and over 8 inches with only a little force applied.

40. As the train was being hauled back into the siding the 24th wagon was preceding the 23rd. Had it lifted some 6 inches, and had the buffers of the 23rd wagon been depressed a further $2\frac{1}{4}$ inches or the suspensions of the two wagons been further deflected under the buffering forces, a buffer lock at the '10 o'clock' position could then have occurred without the wheels of the 24th wagon leaving the rails; and I think that something like this must have occurred.

Conclusions and Recommendations

41. The accident occurred because the buffers of an unladen wagon marshalled 24th in the ballast train became buffer locked over those of a laden wagon ahead of it and the wagon subsequently derailed at facing points approaching Surbiton station. It is not possible to be certain where this buffer lock occurred, but from the depth of the marks on the buffers and from the unusual mark on the rail it seems most likely that it happened at low speed as the locomotives were first braked after the train had been hauled back into No. 1 siding at Clapham Junction, and possibly when the two wagons were astride reverse curves in that siding.

42. If, as I believe, the buffer lock occurred in No. 1 siding, it might have been prevented had Guard Ahmed applied more handbrake as the train was being hauled into the siding. Subsequently he also failed to make out a proper train preparation form although the locomotives had changed ends and a new set of wagons formed the fitted head of the train, and also failed to carry out a brake continuity test before the train left the siding. These facts confirm my view that he was not fully carrying out his duties.

43. He admitted that he did not particularly look for buffer locking as he walked back beside his train along No. 3 siding, but had he done so it seems likely that he would have noticed the two wagons locked together. When unfitted trains are brought to a stand in sidings, and particularly when such trains contain

empty wagons between heavily laden ones, guards should when possible, and certainly when they have to change ends, check for buffer locking.

44. For a number of years, faulty and broken springs have been responsible for over half the derailments caused by wagon faults, and wagon overloading probably contributed. The civil engineer's supervisors have a special responsibility when wagons are being loaded to ensure that they are not overloaded, especially when several excavators are being used during the night at different points; following the accident the Chief Civil Engineer reminded those concerned in his department of this responsibility. Guard Young however should have noted that the springs of several wagons were heavily on their stops indicating overloading, although the prime responsibility must rest with the civil engineers.

I have the honour to be,

Sir,

Your obedient Servant,

A. G. TOWNSEND-ROSE,
Lieutenant Colonel.

The Permanent Secretary,
Department of the Environment.

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DERAILMENT AND COLLISION AT SURBITON ON 4TH JULY 1971.

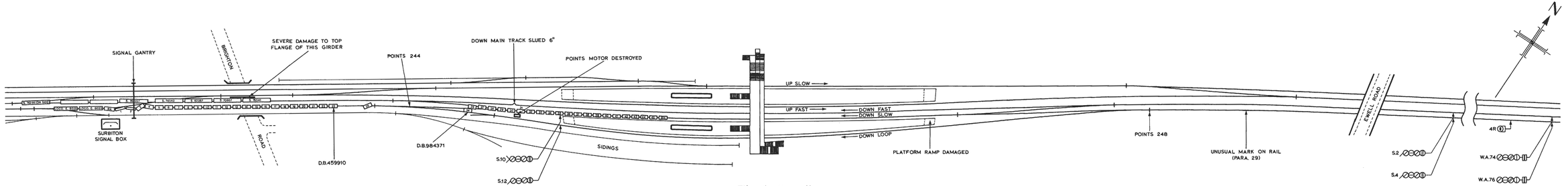
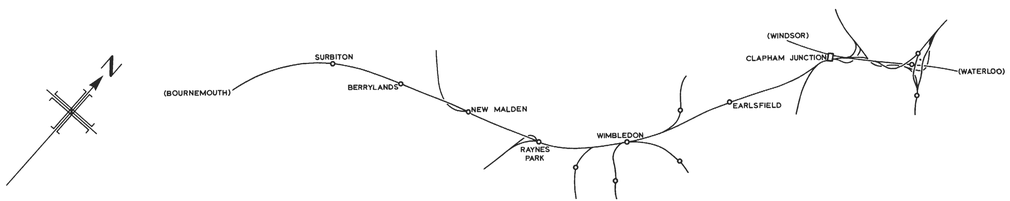


Fig. 1 Surbiton
Scale:- 100' to 1"



Location Map
Scale:- 1" to 1mile

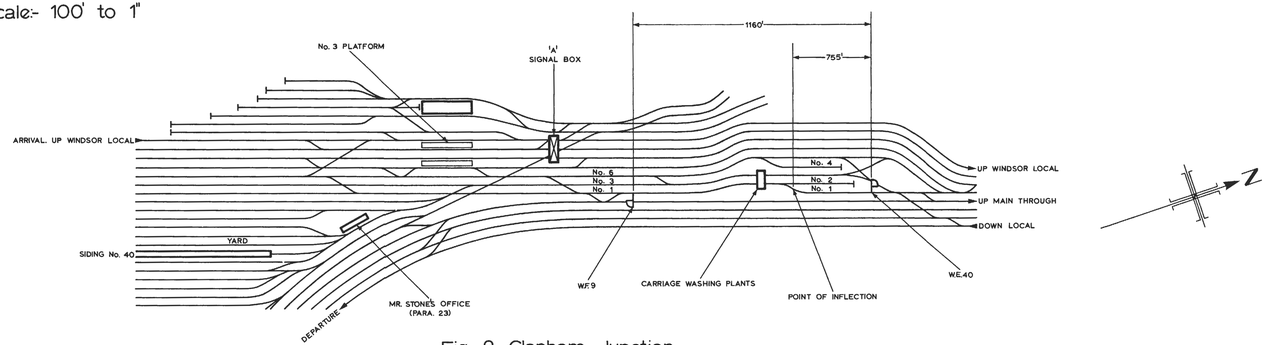


Fig. 2 Clapham Junction
(Not to Scale)