DEPARTMENT OF THE ENVIRONMENT

RAILWAY ACCIDENT

Report on the Collision that occurred on 16th December 1971 at Lenton South Junction, Nottingham

IN THE
LONDON MIDLAND REGION
BRITISH RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE
1973

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RAILWAY INSPECTORATE,
DEPARTMENT OF THE ENVIRONMENT,
2 MARSHAM STREET,
LONDON, S.W.1.
21*st September* 1972.

SIR,

I have the honour to report for the information of the Secretary of State, in accordance with the Order dated 16th December 1971, the result of my Inquiry into the collision between a parcels train and a freight train that occurred at about 06.15 on that day at Lenton South Junction, Nottingham, in the London Midland Region of British Railways.

A special freight train conveying coal from Bestwood Park to Derby was running off the Up North Curve line through Lenton South Junction onto the Up Main line under clear signals when it was struck head-on by the 01.30 parcels train from Liverpool to Nottingham, running on the Down Main line, which had passed at Danger the signal protecting the junction. Both trains were hauled by diesel locomotives, the coal train being double-headed.

I regret to report that three railwaymen lost their lives as a result of the collision. The Emergency Services were promptly called out, the Fire Brigade and Ambulance Service reaching the site by 06.31, but despite their efforts the driver of the coal train died in hospital after a 3½ hour struggle to release him from the wreckage. Both the driver and the guard of the parcels train were found to be dead when they were finally extricated some 8 hours after the collision.

Following on the Appointment dated 25th January 1972, I acted as Assessor to Her Majesty's Coroner for the City of Nottingham at the resumed Inquest on 17th February 1972 and my Report is attached as Appendix 1.

The locomotives of both trains were derailed and extensively damaged; 5 vehicles of the coal train and four of the parcels train were derailed, all four running lines being blocked.

The lines were cleared by use of the Toton steam cranes, the Up Goods line being made available by 19.45. The Up Main and Down Goods lines were made available at 04.21 and the Down Main line at 05.20 the following morning, subject to a temporary speed restriction of 15 miles/hr.

The collision occurred before dawn, in fine weather with good visibility.

DESCRIPTION

Site and Signalling

1. Lenton South Junction lies 1 mile 370 yards to the West of Nottingham (Midland) Station on the main line from St. Pancras to Nottingham via Trent, where the double track North Curve Goods line diverges from the Main line on the Down side to connect with the Nottingham–Mansfield line at Lenton North Junction, 600 yards distant. The Main line is four-tracked at this point, with Down and Up Goods lines flanking the Main lines. At the junction, which has recently been re-designed to eliminate diamond crossings in the fast lines, the Up and Down North Curve lines make a double junction with the Down Main and Down Goods lines respectively. Traffic off the Up North Curve line is required to run about 100 yards in the Up direction along the Down Main line in order to reach a ladder of crossovers by which it is diverted on to the Up Main or Up Goods line as required. The head-on collision occurred on this two-way section of the Down Main line.

2. The Main lines at the point of collision are on a gentle right-hand curve with a falling gradient of 1 in 475 in the Down direction. The track in the Down Main line consists of 60 ft lengths of 110A FB rail on timber sleepers and the line speed limit is 80 miles/hr. The North Curve is of 12½ chains radius and falls at a gradient of 1 in 224 for 300 yards from Lenton North Junction before rising at 1 in 1,456 as it approaches the Main line. It is maintained to goods line standards and the permanent speed restriction for trains off the North Curve through the connections on to the Up Main or Up Goods lines is 15 miles/hr.

3. All running lines in the area are worked on the Track Circuit Block system with multiple-aspect colour light signals. The signalling is controlled from a power signal box located at Trent, housing a route-relay interlocking installation. The relay room for the whole area is located in the signal box structure and all points and signals are controlled over a frequency division multiplex system using tuned reeds to ensure the integrity of the individual control and indication circuits.

4. The signalling is operated on the "Entrance-Exit" system in which the signalman does not operate the individual points and signals by levers or switches, but sets up "routes" for trains as necessary. Each individual route, when set up, allows a train to proceed from one signal to the next signal ahead and at the same time protects the train from any possible conflicting movements. No facilities are provided for the pre-selection of routes.

5. The method of operation is as follows. Alongside the position of each controlled signal on the panel diagram in the signal box is a button. The pressing of the button at the signal at the beginning of a route (the Entrance button) proves the electrical interlocking of other potentially conflicting routes and, in effect, searches out available destinations. When the button at the next signal is pressed (the Exit button), provided the route is available, a "call" is placed on the route and the route setting and locking procedure comes into operation automatically. For each route a list of requirements is laid down: which points are to be set and detected in the normal position, which in the reverse position, and which track circuits must be proved clear. When these requirements are satisfied, and the approach locking proved effective, the entrance signal clears to a proceed aspect, the actual aspect displayed depending on the aspect of the signal ahead. While a route is being set up, a chain of white lights becomes progressively illuminated, defining the route on the panel diagram. Where a continuous series of routes is being set up, the Exit button for one route acts as the Entrance button for the succeeding route.

6. Once a route is set up and the appropriate signal is cleared, the route is approach locked and cannot be disturbed until the approach locking is released. This can happen in one of two ways. Either, normally, by the passage of the signalled train over the route set up for it, in which case the approach locking is released by the sequential occupation and clearance of the track circuits along the route, the position of the train being indicated to the signalman by the substitution of red lights for the white route lights on the panel diagram, or by a timed release.

7. The alternative method of releasing the approach locking is used when, for any reason, a train does not proceed over a route as signalled. In such a case the signalman restores the signal at the beginning of the route to Red by pulling out the Entrance button; this action also has the effect of putting back the signals in rear to the appropriate caution aspects. The signalman must then wait for a period of 2 minutes, measured by an automatic timing device, during which time the route lights on the panel remain lit, the route is held locked and no conflicting routes can be set up. This period of delay is provided to prevent any danger arising when an approaching train is already too close to stop short of a signal replaced to Danger in front of it, by ensuring that the route beyond the signal is held.

8. Train description throughout the area controlled from Trent signal box is on the 4-digit system with miniature cathode ray tube displays located at each signal berth on the panel diagram. The descriptions step forward automatically as soon as the first track circuit beyond a signal is occupied by a train, the particular signal berth they pass to being selected by the lie of the facing points in the route, whether or not a route has actually been selected and the signal cleared.

9. The layout of the track and signalling relevant to this Report is shown on the accompanying diagram. All the signals are provided with signalpost telephones and those on the Main line from Trent to Nottingham are provided with AWS inductors. All the points in the area are operated by electric point machines.

Sighting of Signals

10. Approaching Lenton South Junction along the Up North Curve line, the signal protecting the junction is TT 299, a 3-aspect signal reading either to TT 331 on the Up Main line or, with a junction indication, to TT 329 on the Up Goods line. It is located close to the actual junction, which is protected by worked trap points, and 176 yards from the actual point of collision on the Down Main line between 719 and 720 points. The approach view of this signal is 286 yards, restricted on account of the sharp curvature by buildings on the Down side of the line.

11. On the approach to Lenton South Junction from the Trent direction on the Down Main line the signal protecting the junction is TT 302, a controlled 4-aspect signal which is paired with TT 303, applying to the Down Goods line. The approach view of both these signals is extremely good and there is no possibility of confusion. The succeeding signal on the Down Main line, TT 296, which is 864 yards beyond TT 302, cannot be seen from any point on the approach side of the latter, thus there is no possibility of reading through. The actual point of collision lay 280 yards beyond TT 302 and about 100 yards beyond the first sighting point of TT 296.

12. The signals on the Down Main line on the approach to TT 302 are TT 335, 921 yards in rear, and TT 342, a further 1,585 yards back. Both are controlled 4-aspect signals but they can be set to work automatically by means of special buttons provided on the panel. A good approach view can be obtained of each of these signals.

The Trains

13. The trains involved in the collision were a special freight train conveying coal from Bestwood Park Sidings to Derby Gas Works (9L14) and the 01.30 parcels train from Liverpool (Lime Street) to Nottingham (4D02). The freight train was formed of 32 loaded 24½ ton hopper wagons and a brake van, and hauled by diesel locomotives 8115 and 8142 of Class 20 working in multiple. The gross weight of the train was 1,190 tons and the available brake force was 70 tons. The overall length of the train was 905 ft.

The parcels train comprised 13 vans of various types and was hauled by diesel locomotive 7605 of Class 25. The total weight of the train was 278 tons and the vacuum brake was connected on all vehicles. On account of the inclusion of 3 short-wheelbased vehicles in its formation, the speed of the parcels train was restricted to 45 miles/hr.

The course of the collision and damage caused

14. The actual point of collision lay between the trailing end of 720 points and the facing end of 719 points in the Down Main line approximately 59 yards beyond the 125¼ Milepost. The impact was head-on between the leading locomotive of the coal train, running cab leading and the locomotive of the parcels train which was running with No. 1 end leading. The position of the two trains after the collision is shown on the attached diagram.

15. As a result of the impact the locomotives were locked together, with their cabs almost completely destroyed. The locomotive of the parcels train was forced back some 20 feet, derailed, and lifted off its bogies. The 3 light, short-wheelbased vans in the parcels train, which were marshalled immediately behind the locomotive, were thrown out, 2 on their sides onto the Up line and one onto the roof of the locomotive. The fourth vehicle of the parcels train, a Southern Region type PMV, had been driven deeply into the rear cab of the locomotive which was crushed in as far as the boiler compartment bulkhead, and another PMV behind it had been driven into its rear end. The remaining 8 vehicles of the parcels train were undamaged and came to a stand still occupying TC 574, the overlap track circuit of Signal TT 302, thus holding both that signal and Signal TT 335 at Danger.

16. Damage to the heavy coal train was less severe. The leading bogie of the leading locomotive was derailed and the cab of the second locomotive was stove in by the leading hopper wagon which itself was derailed leading wheels only. Further back, in the part of the coal train which was still on the North Curve line, the 18th to 21st wagons were each derailed one pair of wheels.

17. The only damage to the track and signalling equipment was in the area of the trailing end of 720 points in the Down Main line. The track damage included bent stretcher bars and two damaged slide chairs and was consistent with the points having been run through whilst set in the reverse position. The track in the area was otherwise in good condition. Damage to the signalling equipment was similarly confined to the stretcher bar, lock bar, drive rod and detector rods at the trailing end of 720 points.

Details of fatal casualties

18. The three railwaymen who lost their lives as a result of the collision were the driver of the coal train, Driver F. C. Caborn, of Nottingham and the driver and guard of the parcels train, Driver G. B. Stone and Guard D. L. Sweeney both also stationed at Nottingham.

19. Driver Caborn was 45 years of age with 29 years railway service. He had been a driver for 6 years after 8 years as a passed fireman. He had a clear disciplinary record and, though he suffered from diabetes and bronchitis, had been passed as fit to continue driving by the Railway Medical Officer in September 1971. He last signed for the route concerned in July 1971 and last worked over it 2 days prior to the accident. At the time of the collision he had been on duty for 2 hours 12 minutes and had had a rostered rest day on the previous day. After the accident Driver Caborn was still in the driver's seat, but turned towards the side of the locomotive as if to shield himself from the impact. He was extricated alive from the wreckage but died in hospital later the same day. The post-mortem revealed the cause of death as crush injuries and pelvic fractures.

20. Driver Stone was 53 years of age with 35 years railway service. He had been a driver for 9 years after 14 years as a passed fireman. His disciplinary record was good and at his last periodical medical examination, at age 50, he was pronounced fit with good eyesight and colour vision. He last signed for the Trent–Nottingham route in July 1971 and had worked over it on the day prior to the accident when he had been on duty from 00.27 to 08.00. When the collision occurred he had been on duty for 5 hours and 51 minutes, having worked a parcels train from Nottingham to Derby before taking over 4D02 to work it back to Nottingham. After the accident Driver Stone was found, out of the driver's seat, facing the engine compartment door, located in the centre of the bulkhead. He was dead when released from the wreckage, the post-mortem revealing that he had died from multiple injuries.

21. Guard Sweeney was 28 years of age and had 5¾ years service as a guard. He last signed his route knowledge for the route concerned in July 1971. He had signed on duty at 21.22 the previous night and, after accompanying a locomotive from Nottingham Holding Sidings to the Parcels Concentration Depot, he worked the 22.00 parcels train to Sheffield where he arrived at 23.17. At 00.14 he relieved a Masborough guard and worked the 01.50 parcels train from Sheffield to Derby where he arrived at 02.33 before going to the Holding Sidings to join Driver Stone on locomotive No. 7605. After the accident Guard Sweeney was found in the right hand corner of the leading cab of the locomotive suggesting that he was still occupying the secondman's seat when the collision occurred. He was dead when released from the wreckage, the post-mortem revealing the cause of death as multiple injuries.

EVIDENCE

As to the collision

22. *Passenger Guard F. S. France* had worked with Driver Stone during the earlier part of his turn of duty and was one of the last persons to see and speak to him before the accident. He told me that he had booked on at Nottingham at 00.47 and had arrived at the Holding Sidings to join locomotive No. 7605 at almost the same time as Driver Stone, whom he knew well. After some delay, caused by a mishap at Netherfield and Colwick, they had worked the 19.54 Liverpool Street to Liverpool (Lime Street) parcels train from Nottingham to Derby, leaving Nottingham at 02.57 and arriving at Derby at 03.30. On the journey Guard France had travelled in the rear cab of the locomotive. At Derby the locomotive was detached to await its return working. Guard France thought that Driver Stone seemed to be in good health and his normal self.

23. The only survivor of the crews of the two trains was *Guard G. Hunt* who was in charge of the coal train and who was travelling in a brake van at the rear of his train. He had not previously known Driver Caborn, but he described him as a good driver who handled his train steadily. Because the train was fairly short, Guard Hunt was able to see the signals before their aspects went back to Red and he recalled that, from entering colour light territory at Lincoln Street, the signals were all at Green as far as Lenton North Junction where Signal TT 309 was at Yellow with the junction indicator for Lenton South. Going on to the curve the train was moving slowly at 5 to 10 miles/hr, but it kept going steadily. He was looking out for Signal TT 299 which was at Green when it first came into his view, with no junction indicator, meaning the train was routed onto the Up Main line. He saw the signal go back to Red when the head of the train was about 2 engine lengths past the signal and only a short time afterwards he felt a bump and was thrown forward, banging his head on the side of the brakevan as the train came to a sudden stop.

24. Guard Hunt noted the time as 06.18 and, taking his lamp because it was still very dark, walked up the off side of his train. About one third of the way along the train he found 4 wagons derailed near Signal TT 299 and thought that this was the reason why the train had stopped. The derailed wagons were close to the worked trap points ahead of Signal TT 299, but Hunt noted that these were fitting tight up. Using the signalpost telephone at Signal TT 301 on the Down Side, Guard Hunt spoke to the signalman at Trent telling him of the derailment. The signalman asked which lines were blocked and Hunt told him that he was not sure because he could not see. Hunt's recollection was that the signalman then told him that he "was all off for a parcels train on the Down Main" and said, "He must have run into you". I asked Guard Hunt particularly if he could be sure exactly what the signalman said to him during this conversation. He told me he could not be certain of his actual words but he knew he said that he was "off for a parcels train".

25. Guard Hunt then told me that he went forward to the head of his train and saw that a collision had occurred. He placed a track circuit operating clip on the Up Main line and then ran back to Signal TT 298 and spoke again to the signalman, asking him to call out the emergency services and block all lines. Then, unable to do anything on his own towards rescuing the trapped men, he waited for the arrival of the emergency services and guided them to the scene.

26. Working the Nottingham section of the panel in Trent signal box at the time of the collision was *Signalman W. Walters-Mabbott* who had signed on duty at 22.00 the previous evening. He confirmed that the signalling in the area had been working correctly throughout his turn of duty. At about 06.00 he had seen the coal train (9L14) described from the fringe box at Lincoln Street and, after confirming that it was right away for Derby with no relief required, he set the route for it from Lincoln Street to Lenton North Junction and from there to Signal TT 299 at Lenton South Junction. He then checked the position on the Main line, where he was already aware that the parcels train (4D02) was running late, and saw from the diagram that it was in the neighbourhood of Attenborough. At this time the route for it was set as far as Signal TT 302, with the signals in rear working automatically.

27. Signalman Walters-Mabbott told me that he then made the decision to allow 9L14 to proceed across the junction onto the Up Main line towards Beeston before allowing 4D02 to proceed further towards Nottingham. He told me that he reached this decision only after taking into consideration all the other movements that could be affected and said that unless he could get 9L14 on its way there would be a possibility of it standing at Lenton South to follow the Up passenger trains due to leave Nottingham at 06.30 and 06.42. He told me that he also took into account that the Parcels Concentration Depot had already taken 3 parcels trains and he doubted whether they could accept 4D02 immediately.

28. He therefore set up a route from Signal TT 299 to Signal TT 331, the latter already being at Green with the signals beyond it on the Up Main line working automatically. The route lights came up almost immediately and the signal showed a proceed aspect. He also set up a route from Signal TT 296 to Signal TT 287 on the Down Main line beyond Lenton South Junction so that, when 9L14 had cleared the junction, he could fill the gap in the route for 4D02 from Signal TT 302 to Signal TT 296.

29. In reply to questioning, Signalman Walters-Mabbott confirmed that, having made the decision to regulate the trains in the manner he described, he had not changed his mind as to which train to run first and that at no time had he set up a route ahead of Signal TT 302 which, as far as he was concerned, was showing a Red aspect at all times. He said that, in such a situation, it was normal practice to set a route from Signal TT 296 to Signal TT 287 so that, when Signal TT 302 cleared, it would at once display a YY aspect to let the driver know he was clear as far as Wilford Road.

30. He then described what he noted when the accident occurred. Some few minutes after setting up the route beyond Signal TT 299, he could not be certain how long, he noticed that more track circuits were showing occupied in the junction area than should normally be the case, including TC 574, and a few minutes later the Guard of 9L14 rang up and told him that his train was derailed. He then told the guard to make his way towards the junction to see what the position was there. He denied using the expression "all off for a parcels train" but thought that he might have said, not particularly to the guard but perhaps to himself, "where is the parcels train", because he realised that he could not see any track circuits showing occupied nor any white route lights in rear of Signal TT 302. While the guard was still speaking he also pulled out the Entrance button at Signal TT 335 because there was a light locomotive following the parcels train and he wanted to prevent it going any further. Apart from the description of the light locomotive, OF69, at Signal TT 335 he also noted that the description 9L14 was showing at Signal TT 331, but not until some time later did he notice that the description 4D02 had been carried forward beyond the junction to Signal TT 296.

31. Also on duty in Trent signal box at the time of the collision was *Area Controller D. Austin*. He told me that shortly after 06.00 when things were fairly quiet he heard the parcels train pass the signal box while he was standing near the Loughborough end of the panel. He then walked across to where Signalman Walters-Mabbott was working the Nottingham section of the panel and saw that there were only 2 trains moving on the panel, these were the coal train (9L14) and the parcels train (4D02). By then the latter was somewhere between Attenborough and Beeston. Whilst talking to the signalman he noticed that the route for this train was set as far as Signal TT 302, with Signal TT 335 set to work automatically. He also saw that the route was set for the coal train from Signal TT 299 to Signal TT 331, the latter being on automatic, and that Signal TT 299 was showing a proceed aspect on the panel. As he was looking at the panel he thought he recalled seeing the berth track circuit of Signal TT 299 occupied by the coal train.

32. As he stood there talking to the signalman, some 2 or 3 paces behind him and a little to one side, he noticed that 720 points were flashing out of correspondence. He also saw that the track circuit ahead of Signal TT 302 was showing occupied and that Signal TT 299 was now at Danger. He at once realized that something was wrong and went back to his desk to get out his emergency instructions with a view to being prepared. He also advised the Signal Technicians at Nottingham that there appeared to be a fault on 720 points, as these lay in their area. Within 2 or 3 minutes he heard the signalman talking to the guard on the telephone but did not recall exactly what the signalman said. However the latter told him that there had been a derailment at Lenton South, so he contacted the Deputy Chief Controller at Nottingham to advise him. Mr. Austin pointed out to me that, at that stage, he did not know that a collision had taken place. However, whilst he was talking to the Deputy Chief Controller the Guard came on the telephone again, reported the collision and requested the emergency services. Mr. Austin immediately passed this request on to the Deputy Chief Controller who called out the emergency services without delay. The time of the collision as recorded in the signal box was 06.14, the time that 720 points were observed to be flashing "out of correspondence".

33. *Chief Movements Inspector W. Egan* arrived at Trent signal box at 07.15 and interviewed Signalman Walters-Mabbott and Area Controller Austin before they went off duty. He received an assurance that the route buttons concerned had not been interfered with since the collision occurred and observed that a route had been set up from the Up North Curve line to the Up Main line at Lenton South Junction. Signals TT 299, TT 302, TT 335 and TT 342 were all at Danger and 720 points were flashing "out of correspondence". He had questioned the regulation of the trains involved and was satisfied that it was in order and he was assured by the signalman that at no time had a route beyond Signal TT 302 been cancelled. Mr. Egan then observed a test of the approach locking release time on Signal TT 302 and confirmed that it was 1 minute 50 seconds after the entrance button had been pulled out to replace the signal to danger before the route lights were extinguished, indicating that the route had been freed.

As to the signalling

34. *Signal Technician, Class 1, A. L. Towlson* was responsible for the area in which the accident occurred. On being advised of the situation he went to the Lenton South Junction, arriving at about 06.45. Immediately on arrival he checked the aspects of Signals TT 299, TT 297 and TT 298. All were at Danger. He then checked the aspects of Signals TT 302 and TT 303 which were also showing Red. He then spoke on the telephone to the Lineman on duty at Trent Signal box and told him which signals and routes were to be disconnected for protection purposes. Subsequently he had been instructed to take an AWS test meter and check the AWS ground equipment at Signals TT 302, TT 335 and TT 342. In each case the permanent magnets were correct and at full strength and there were no indications of false feeds on the electro-magnets with the signals standing at Red.

35. *Mr. A. H. Kershaw* was the Signalling and Telecommunication Supervisor for the Nottingham Area. On hearing of the mishap on the BBC news he went at once to Trent signal box where Technician Shaw told him that he had already carried out the disconnection of the following signals, TT 298, TT 299, TT 302, TT 303, TT 301 and TT 327. At about 08.30 he proceeded to Lenton South Junction in company with the Area Signal Engineer, Mr. Bowles. On arrival he examined the signal equipment in the area, including point machines and cables. He found Points 719 A and B in the normal position and 720 B, in the Down Main line, in the half-and-half position having suffered damage consistent with having been run through in the trailing direction by the parcels train. The point machine was in the reverse position and undamaged and there was no other damage to any signal equipment or cabling.

36. Subsequently Mr. Kershaw returned to the site after the trains had been removed and supervised the testing and reconnection of all the points in the area affected by the collision. This work was completed at 05.15 the following morning and all signals restored at 05.22. He then proceeded to Trent and, in company with Motive Power Inspector Wilcox, travelled on a diesel locomotive of the same class as the locomotive of the parcels train towards Nottingham under conditions almost identical to those existing at the time of the accident on the previous morning, i.e. at the same time of day and in similar weather conditions. As the locomotive approached Lenton South Junction on the Down Main line a freight train was allowed to proceed from the Up North Curve line to the Up Goods line.

37. Mr. Kershaw told me that from his observations on this test run he established the following:—

(a) All Down Main signals displayed correct and steady aspects,

(b) All AWS equipment functioned properly,

(c) Signals TT 302 and TT 303 displayed red aspects which were clearly visible and could not be confused,

(d) There were no outside lighting influences which could mislead a driver on the approach to Signal TT 302,

(e) Signal TT 296 could not be seen from any point on the approach side of Signal TT 302.

38. Subsequent to the collision a full series of tests on the signalling equipment was carried out by *Mr. E. A. Huntingdon, Electronic and Testing Assistant to the Divisional Signal Engineer.* He said that, at the site, the lamp voltages of Signals TT 302, TT 335 and TT 342 were checked. All were correct and showing red with main filament lit. The control relays between Signals TT 302 and TT 335 and between Signals TT 296 and TT 302 which clear Signal TT 335 to a yellow aspect and Signal TT 342 to a double yellow aspect were checked for false feeds and earths and all proved satisfactory. The tuned reed control systems passing through TT 302 location were checked for earth leakage and system to system faults and all readings of inductive interference ("cross-talk") between adjacent systems were well below the permitted maximum. A general examination of all the location cases revealed all to be in proper order, with no signs of irregular interference of any kind.

39. At the signal box, Mr. Huntingdon examined the conditions obtaining on the route setting system and found that a route had been set from Signal TT 299 to Signal TT 331 and that the indications on the panel were consistent with this route having been set and a train having partially passed over it. No route was set beyond Signal TT 302. Mr. Huntingdon then told me that he had carried out full control table checks of all routes of Signals TT 299, TT 302 and TT 303, including route holding and conflicting routes. He also simulated a train movement from Signal TT 299 to TT 331 and a train movement toward TT 302 by dropping the appropriate track relays. The approach locking release time on Signal TT 302 was tested and found to be 1 minute 50 seconds. He also carried out further earth leakage and system to system tests on the tuned reed systems in the relay room of the signal box and between the signal box and the signals and points at Lenton South Junction to determine whether an earth placed on the system could result in false operation of the signalling controls. A full earth was placed on the system normally feeding all routes for Signal TT 302 and, at the same time, adjacent control systems were energised with the same frequencies as those which control Signal TT 302. The value of "cross-talk" recorded was still below the maximum permitted.

40. Mr. Huntingdon told me that he had been responsible for testing in the Trent signal box area since the installation was commissioned in 1969 and that, although there had been occasional instances of signal lamps going out altogether, there had been no danger-side failures of any kind. I have since been informed, however, that apparent danger-side failures of a track circuit on the Up Mansfield goods line that were reported by the signalman on 25th and 26th July, 1972 were substantiated as having been caused by a combination of the poor state of the rail surface, which was covered with a deposit of crushed coal slack and silt deposited during violent storms during the preceding 2 days, and an electrical component in the circuitry being wrongly fitted.

41. I asked *Mr. A. A. A. Cardani, Chief Signal and Telecommunications Engineer,* British Railways, London Midland Region, who was present at my Inquiry, whether the tests outlined by Mr. Huntingdon could be regarded as adequate to confirm the integrity of the signalling at Lenton South Junction, and received his assurance on this point.

As to the trains involved

42. *Rolling Stock Inspector E. Kearton* was called out to the mishap, reaching the site at about 07.20. He examined the stock on both trains and found 5 wagons of the coal train derailed. He then examined the parcels train, paying particular attention to the condition of the brakes on the 8 undamaged vehicles at the rear of the train. He found the brakes on 6 of the vans in good order and proper adjustment. On one, adjustment was due and on another adjustment was required to make the brakes effective. He could find no signs of heavy braking, either on the vehicles or the rails. He subsequently carried out a vacuum brake test on the undamaged vehicles using another locomotive. Owing to severe damage to the leading 5 vehicles of the train he was unable to carry out any meaningful tests on them, but regarding the train as a whole, he was satisfied that the brake efficiency was within the permitted tolerances.

43. A main examination had been carried out on the locomotive of the parcels train, No. 7605 of Class 25, at Toton Diesel Maintenance Depot on 14th and 15th December 1971. At the conclusion of this examination, before the locomotive was released to traffic, it was examined by the *Planning Supervisor, Mr. G. R. Shardlow*. He told me that he had carried out a number of tests on the locomotive to check that the work had been carried out to a satisfactory standard. He found the brakes, AWS and DSD in proper order and checked that all booked repairs had been completed. In the case of this locomotive an exhaust gasket leak had been reported and he was satisfied that it had been corrected before he passed the locomotive as fit for traffic.

44. *Driver G. Bexon* took over locomotive No. 7605 at Toton DMD at 17.15 on 15th December, immediately after its main examination. He told me that he found it in very good condition, with the AWS equipment and DSD functioning properly in both cabs. After completing his duty he left the locomotive stabled in Nottingham Holding Sidings at 19.15.

45. After the collision a detailed examination of the locomotive No. 7605 was made by *Mr. B. L. Swain, Senior Technical Officer, Divisional Maintenance Engineers Department*. He told me that in the trailing cab (No. 2) he found the AWS change-end switch in the operative condition and "Off" and the change-end handle "Off", as it should have been if the AWS was working properly. In the leading cab (No. 1) the AWS change-end switch was operative and "On" as it should have been. The AWS Indicator was indicating "Black" and showed no signs of external damage. The AWS Receiver had sustained a severe blow and was slightly bent. The cable to the receiver was damaged and the cable from the locomotive body to the receiver junction box was completely severed. In the course of this examination he did not find the AWS indicator from the trailing cab.

46. Mr. Swain found the power handle broken off, but ascertained that the controller was in the "Off" position. The master handle, which selects the direction of travel, was bent towards the "engine only" position but the gearing underneath showed that it had been in the "forward" position. The EQ brake handle was broken off by the impact, but the stem of the valve was in the emergency position and he was satisfied that the brake handle had been in the emergency position before the impact. The Goods/Passenger Switch, which controls the braking rate, was correctly in the "passenger" position. He also examined the position of the various heating and lighting switches and concluded that the only heater switched on in the leading cab was the footwarmer on the secondman's side.

As to the speed of the parcels train

47. None of the railway officers present at my Inquiry was prepared to make a firm estimate of the speeds of the two trains at the moment of collision, but a consensus view was that the combined speed of impact might have been between 40 and 50 miles/hr. There was no indication that the parcels train had been exceeding its maximum permitted speed of 45 miles/hr and the time it took from passing Sheet Stores Junction at 06.01½ as recorded at Trent signal box to the moment of collision at about 06.15 is consistent with a maximum speed of not more than 40 miles/hr between Trent and Lenton South Junction after allowing for the permanent speed restriction of 15 miles/hr between Sheet Stores Junction and Trent.

48. The only witness who observed the passage of the parcels train between Trent and Lenton South Junction was *Railman W. E. Webster* who had just been relieved at Attenborough Shunting Frame and had not yet left to go home. He confirmed that the train had not been subjected to any signal check approaching Attenborough level crossing and as far as he was able to judge its speed appeared normal for the class of train.

49. The light locomotive which was following the parcels train and which was referred to by Signalman Walters-Mabbott in his evidence was being driven by *Driver A. Whitby*, stationed at Nottingham. He was not present at my Inquiry but, at my request, he later made a statement to Railway Officers in which he said that he was the driver of a pair of locomotives coupled in multiple returning from Toton to Nottingham Holding Sidings with the description OF69. He had left Stapleford at 06.00 and, after clear signals up to the junction with the Trent–Nottingham line where his speed was 20 miles/hr, he recalled that the first signal on the Main line, TT 355, was at Red but changed to Yellow as he approached. From there he received a succession of restrictive aspects as far as Signal TT 335 which was at Red. He thought that the speed he reached on the Main line was between 40 and 50 miles/hr. He had booked his time of coming to a stand at Signal TT 335 as 06.15, but said that this could have been up to 2 minutes either way. He had immediately telephoned the signalman and, as far as he could remember, the signalman told him to "wait a minute". Within a very short time he telephoned again and the signalman told him that there had been a mishap at Lenton South Junction, that a freight train had some wagons derailed and that he believed another train had run into it, but he did not know. Signalman Walters-Mabbott subsequently confirmed that this conversation had taken place after Guard Hunt's initial telephone call.

50. Driver Whitby was accompanied by *Guard K. Fitch* who also made a statement to Railway Officers in which he generally confirmed Driver Whitby's evidence, though he thought that their speed on the Main line had averaged somewhere between 30 and 35 miles/hr. He also recalled that they had received correct AWS warnings at each signal up to and including Signal TT 335 which they reached at 06.15.

Subsequent Tests

51. In order to confirm Driver Whitby's statement, a test run was carried out by Mr. J. A. McEvoy, Divisional Operating Superintendent, from Stapleford and Sandiacre to Signal TT 335 under as near as possible the conditions described by Driver Whitby. From a stand at Stapleford to a stand at Signal TT 335 the running time was between 15 and 16 minutes, in close agreement with the time recorded by Driver Whitby.

52. At my request a further thorough search was made in the wreckage of the trailing cab of the locomotive of the parcels train and this led to the recovery of the missing AWS indicator. When found it was displaying a "Black and Yellow" indication. Both indicators and the rest of the AWS equipment from the locomotive were given a careful examination in the Chief Signal and Telecommunications Engineer's Laboratories at Crewe. The operating potential of the black coil from the indicator from the trailing cab was above the specified value for new equipment but this variation was insufficient to affect its operation. No other faults, other than damage caused by the collision were found on any of the equipment.

Conclusions

53. Since no faults of any kind were found in the signalling after the accident and it was clear that the loss of detection on the trailing end of 720 points in the Down Main line had been caused by the points being run through whilst set in the reverse position, the actual time of the accident can be established as the moment the indication light for these points on the panel in Trent signal box started to flash "out of correspondence". This was recorded in the signal box as occurring at 06.14. This time is substantially confirmed by the driver of the light locomotives following the parcels train, who recorded his arrival at Signal TT 335 as 06.15, which is consistent with his statement that he had received a series of restrictive aspects since joining the Main line, indicating that he was running closely behind the parcels train. Driver Whitby also stated that he had telephoned the signalman twice within a very short time of reaching Signal TT 335 and it is clear that his second call took place after the signalman's first telephone conversation with Guard Hunt which was recorded in the signal box occurrence book as taking place at 06.16. Guard Hunt, however, recorded the time of the collision as 06.18 after which some time elapsed whilst he walked forward about 100 yards and found part of his train derailed before telephoning the signalman from Signal TT 301. This discrepancy in time is not, however, significant and is probably accounted for by the various clocks and watches used not being in exact agreement with one another.

54. The established facts about this unfortunate accident leave no doubt whatever that the coal train was proceeding through Lenton South Junction from the Up North Curve line to the Up Main line with the route correctly set for it and under clear signals. From the available evidence it seems probable that the junction signal was already at Green when it first came into Driver Caborn's view and that he continued to drive his train at a steady speed of about 10 miles/hr up to the moment of collision.

55. As a result of the very extensive tests carried out on the signalling after the accident I am satisfied that there is no possibility of a danger-side failure having occurred which could have caused any of the signals on the Down Main line to have displayed a less restrictive aspect than required by the route relay interlocking. Such a wrong aspect could only have been caused as a result of direct and deliberate interference with the signalling circuitry, either in the relay room or at the lineside, and of this having taken place there was no indication whatever.

56. Signalman Walters-Mabbott's decision to regulate the two trains in the manner he described was a reasonable one in the circumstances obtaining at the time and I accept his evidence that he had at no time set up a route for the parcels train beyond Signal TT 302. I can only conclude, therefore, that this signal was correctly at Danger as the parcels train approached and passed it and that the preceding signals applying to the Down Main line, Signals TT 335 and TT 342, were at Yellow and Double Yellow respectively. The braking distance provided from Signal TT 342 at Double Yellow to Signal TT 302 at Red was 2,506 yards, being calculated for a line speed of 80 miles/hr; this was more than adequate for the parcels train, which only required a braking distance of approximately 500 yards from its maximum permitted speed of 45 miles/hr.

57. Since the tests of the AWS ground equipment at each of these signals showed that it was in proper order and the AWS equipment on the locomotive was also tested and found to be working correctly only a short time before the collision, I must also conclude that Driver Stone received a correct AWS warning at each of these signals. The fact that the actual AWS Indicators recovered from the 2 cabs of the locomotive displayed different indications can be put down to the effects of the collision, since previous tests carried out after the collision at Albion Sidings, near Oldbury in May 1970 and described by Major C. F. Rose in his Report on that accident, showed that the indication could be altered inadvertently from "Black and Yellow" to "Black" either by an impact shock to the Receiver or to the Indicator or as a result of a short circuit in the wiring. I believe, therefore, that Driver Stone cancelled the AWS warnings he received at each of these signals in an automatic or subconscious manner.

58. There is no evidence of any fault or other occurrence, either on the locomotive or at the lineside, which might have distracted his attention from the signals as he approached and there is no suggestion that Driver Stone was suffering from any illness or condition that could have caused his incapacitation or affected his ability to drive a locomotive. It also seems unlikely that conditions in the cab were excessively hot or

stuffy since the only heating in use was the footwarmer on the secondman's side. Nevertheless I can only assume that Driver Stone was drowsing or otherwise inattentive to his surroundings and entirely failed to realize he was running into danger. The examination of the driver's brake valve after the collision revealed that it was in the emergency position at the moment of impact, but there were no signs of any heavy braking either on the train or on the track. The position in which Driver Stone's body was found would seem to indicate that he had suddenly become aware of the impending collision only a few seconds before it occurred and, having shut off power and put the brake handle into the emergency position, was making an attempt to leave the cab when the impact took place. The weight of evidence suggests that the speed of the parcels train was about 40 miles/hr and that the brake application was made too late to have any effect. The sole responsibility for this accident must rest with Driver Stone.

59. Though there is no evidence of any kind to suggest that Signal TT 302 displayed any other aspect than Red while the parcels train approached and passed it, because of doubts that have been expressed by some drivers concerning the effectiveness of the approach locking arrangements at this junction, I have examined what sequence of signal aspects could have been presented to the driver of the parcels train assuming that the signalman did, in fact, change his mind at the last possible moment and that, having set up a route beyond Signal TT 302 for the parcels train, cancelled it and then cleared Signal TT 299 for the coal train, firstly assuming that Signal TT 299 was cleared at or about the moment that it first came into view and secondly that it was cleared only when the coal train was closely approaching it. In each case the delay between the cancellation of the route beyond Signal TT 302 and the clearance of Signal TT 299 will be taken as 1 minute 50 seconds, the actual delay recorded when the approach locking release timer was tested after the accident and the few seconds actually taken to set up a route will be ignored.

60. The evidence of Guard Hunt, to the effect that the coal train ran steadily at a speed of between 5 and 10 miles/hr from Lenton North Junction until the collision occurred is a strong indication that Signal TT 299 was already at Green when Driver Caborn first sighted it, since if it had been still at Red he would have started to check his train preparatory to bringing it to a stand at the signal less than 300 yards ahead. On this basis, assuming the speed of the coal train as 10 miles/hr, at least 90 seconds elapsed between the clearance of Signal TT 299 and the moment of collision.

61. If, however, it is assumed that the coal train was already closely approaching Signal TT 299 when it was cleared, the train would have been travelling quite slowly, preparing to come to a stand. In this case it can be assumed that, with the train only 50 yards from the signal when it was cleared, its average speed to the point of collision would not be more than 5 miles/hr. On this basis the time that the coal train would have taken to reach the point of collision would still have been just over 90 seconds, as before.

62. During this period of time the parcels train, assuming its speed as 40 miles/hr, could have travelled a distance of 1 mile and hence, even without approach locking, it would have been at least this distance from the point of collision when the aspect of Signal TT 302 reverted to Red. The parcels train would thus have been 559 yards on the approach side of Signal TT 335 when the latter went back from Green to Yellow. This signal is clearly visible from this distance and an alert driver would have found no difficulty in bringing his train to a stand short of Signal TT 302. Even in this extreme case, therefore, no collision should have occurred.

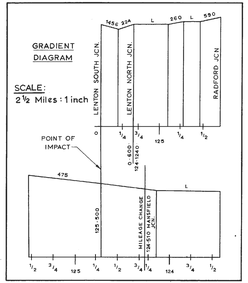
63. However, there is no reason to assume that the approach locking was other than in proper order and thus the parcels train would have been not less than 3 minutes 20 seconds running time from the point of collision at the latest moment that the signalman could have cancelled the route by pulling out the Entrance button at Signal TT 302. This means that the parcels train would still have been on the approach side of Signal TT 345, the Green aspect of which would not have been affected when Signal TT 302 was replaced to Red. The situation, therefore, would have been entirely safe and the driver of the parcels train would not have been able to see any signal change to a more restrictive aspect, since Signal TT 342 would have already been at Double Yellow when he first came within sighting distance of it.

64. These calculations show that there can be no grounds for suggesting that any action that might have been taken by the signalman could have been in any way contributory to the accident. In this particular case this point is of some importance in view of there having been a degree of conflict of evidence of the actual words used during Guard Hunt's first telephone conversation with Signalman Walters-Mabbott. In fact, what the signalman said to Guard Hunt is of no real significance because, with the signalling installation in proper order, there was no way in which he could have set up a situation which could have led to the collision.

Remarks and Recommendations

65. Although up to the date of my Inquiry there had been no danger-side failures recorded in the Trent signal box control area since the new installation was commissioned in 1969, suspicions that have been voiced to me by drivers that there might be something wrong with the signalling in my view undoubtedly stem from a number of right-side signalling failures that have occurred which have caused signals to revert to more restrictive aspects in the face of drivers of approaching trains. Such failures are not in themselves dangerous, because the approach locking ensures that no conflicting routes can be set up, but they are disconcerting to drivers and can lead to derailments, particularly of unfitted trains, if a sudden brake application is made.

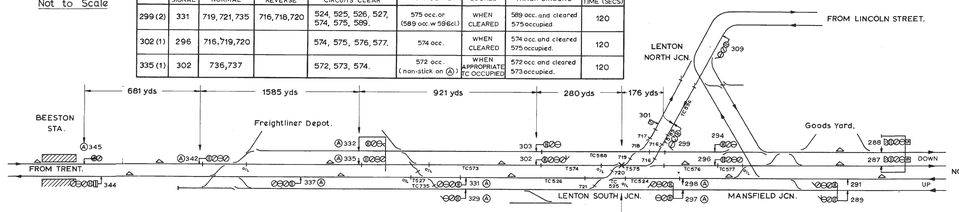
COLLISION AT LENTON SOUTH JUNCTION NOTTINGHAM (LONDON MIDLAND REGION) 16th DECEMBER 1971

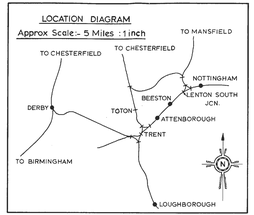


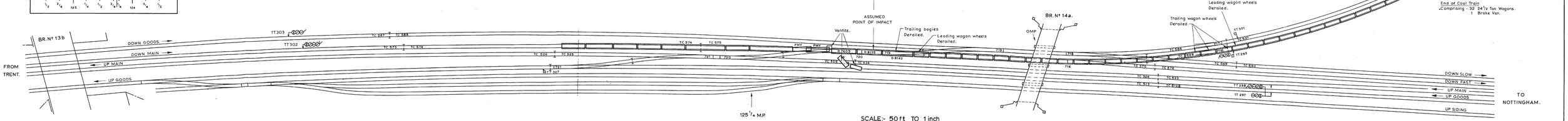
EXTRACT FROM TRENT SIGNAL CONTROL TABLES

ROUTE		REQUIRES			SIGNAL REPLACED	APPROACH	APPROACH LOCKING RELEASED BY	
Nº	TO SIGNAL	POINTS NORMAL	POINTS REVERSE	TRACK CIRCUITS CLEAR	TO DANGER BY	LOCKED	TRACK CIRCUITS	OR TIME (SECS)
299 (2)	331	719, 721, 735	716, 718, 720	524, 525, 526, 527, 574, 575, 589.	575 occ. or (589 occ. or 596cl.)	WHEN CLEARED	589 occ. and cleared 575 occupied	120
302 (1)	296	716, 719, 720		574, 575, 576, 577.	574 occ.	WHEN CLEARED	574 occ. and cleared 575 occupied.	120
335 (1)	302	736, 737		572, 573, 574.	572 occ. (non-stick on Ⓐ)	WHEN APPROPRIATE TC OCCUPIED	572 occ and cleared 573 occupied.	120

SIGNAL DIAGRAM
Not to Scale







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66. I have been informed by the Chief Signal and Telecommunications Engineer of the London Midland Region that some of these failures have been found to be due to contamination on the contact surfaces of certain of the relays used in the installation, causing an excessive electrical resistance to be developed with a consequent inability to place or maintain signals at a proceed aspect. This is being tackled by an intensive relay overhaul programme which should reduce the incidence of this kind of failure.

67. So that such failures can be promptly located and rectified it is important that, whenever they occur, they are reported without delay, and to this end the Divisional Manager of the Nottingham Division has advised all drivers that, when they are faced with aspect changes or any other circumstances affecting the signalling in the Trent area, they should report the occurrence immediately to the signal box, if necessary stopping at a signal to do so. In order to reduce to a minimum the number of occasions on which drivers are presented with this situation, it is essential that signalmen should only make use of the route cancellation facility when it is absolutely necessary to do so and, then, whenever possible, to do it otherwise than in the face of an approaching train.

68. It is also important that drivers who observe some apparent irregularity in the signalling and who report it should be told as soon as possible the result of the investigation made. There is nearly always a straightforward explanation for such an incident and I am sure it helps to maintain the confidence of drivers if they can be told the reason and can feel that a proper investigation has been made. I understand from the General Manager, British Railways, London Midland Region that, whenever possible, this procedure is now being followed.

69. I also believe it to be of value in helping drivers to understand the method of working of modern signalling installations for them to have the opportunity of visiting a signal box to see the working of the panel and to have demonstrated to them the safeguards that are built into the system. A series of such visits were arranged after the collision at Lenton South Junction for drivers from the Nottingham area and I understand that they found them helpful. I recommend that similar visits are arranged in other areas as soon as possible after new signalling has been brought into use.

I have the honour to be,

Sir,

Your obedient Servant,

I. K. A. McNAUGHTON,
Lieutenant Colonel.

The Permanent Secretary,
Department of the Environment.

APPENDIX 1

RAILWAY INSPECTORATE,
DEPARTMENT OF THE ENVIRONMENT,
2 MARSHAM STREET,
LONDON, S.W.1.
4th August 1972.

SIR,

I have the honour to report for the information of the Secretary of State that, in accordance with the Appointment dated 25th January 1972, I acted as Assessor to Her Majesty's Coroner for the City of Nottingham, Mr. A. C. G. Rothera, at the resumed Inquest into the deaths of three railway servants who lost their lives after being involved in an accident at Lenton South Junction, Nottingham, on 16th December 1971.

The resumed Inquest was held at Nottingham on 17th February 1972, and the Jury returned a verdict of Accidental Death in each case, a finding with which I was in full agreement.

I have the honour to be,

Sir,

Your obedient Servant,

I. K. A. McNAUGHTON,
Lieutenant Colonel.

The Permanent Secretary,
Department of the Environment.

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