DEPARTMENT OF TRANSPORT

RAILWAY ACCIDENT

Report on the Collision that occurred on 7th November 1980 at Crewe

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LONDON MIDLAND REGION

OF BRITISH RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE

£3.75 net

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DEPARTMENT OF TRANSPORT,
2 MARSHAM STREET,
LONDON SW1P 3EB.
16th May 1983

SIR,

I have the honour to report for the information of the Secretary of State, in accordance with the Direction dated 17th November 1980, the result of my Inquiry into the collision between two freight trains, that occurred at 12.23 on Friday, 7th November 1980, at Crewe in the London Midland Region of British Railways.

On a rainy day, but with good visibility, the 12.10 freight train from Guide Bridge to Bayston Hill, 6J41, formed of seven empty engineering department wagons and hauled by diesel locomotive No. 47190, ran into the rear of the 00.55 freight train from Mossend to Severn Tunnel Junction, 6V93, which was standing on the Up Salop Goods line between Salop Goods Junction and Gresty Lane No. 1 Signal Boxes in the course of changing locomotives. The locomotive of train 6J41 and the rearmost wagon of train 6V93, an empty 100 ton Class B tank wagon, were both derailed. The leading cab of the locomotive was completely demolished, while the tank wagon was extensively damaged and the tank turned over onto the adjacent Down Salop Goods line.

I regret to report that the driver and the guard of train 6J41 were killed by the collision and that the driver's assistant was seriously injured; all were travelling in the front cab of the locomotive. The emergency services were immediately summoned and were quickly at the scene of the accident. In addition, railway staff trained in first aid, based at Crewe Diesel Maintenance Depot, were rapidly alerted and rendered valuable assistance, particularly in helping to free the driver's assistant from the wreckage.

Both the Up and Down Salop Goods lines were blocked as a result of the accident and it was necessary to isolate the overhead electrified equipment in the Crewe area which delayed passenger train working. Rerailing and clearance operations were completed at 20.45 on 7th November and, after repairs to the permanent way had been completed, the lines were reopened to normal traffic at 13.25 on Sunday, 9th November.

DESCRIPTION

The Site

1. Trains passing through Crewe from north to south or vice versa either pass through Crewe Station via Crewe North and South Junctions or travel on a series of 'avoiding' lines to the west of the station. The 'avoiding' lines, to the north of Salop Goods Junction, consist of the Down and Up Liverpool Independent, the Down and Up Manchester Independent, and the Down and Up Chester Independent. From the south of the Junction the lines diverge to form the Down and Up Fast and Slow Independent, and the Down and Up Salop Goods lines. The last named lines, despite their title, can be used for passenger trains, as is described in paragraph 3 below, but their main traffic is freight.

2. The next signal box to Salop Goods Junction is Gresty Lane No. 1 which controls the junction of the Salop Goods lines with the Crewe South Junction-Shrewsbury lines. The line from Salop Goods Junction to Gresty Lane No. 1 Signal Box makes a right hand curve and visibility is restricted by a high embankment on the inside of the curve. The gradient is rising at 1 in 135 and the distance between the section signals at Salop Goods Junction (No. 60 Up Manchester Independent and No. 33 Up Liverpool Independent) and the Home signal at Gresty Lane No. 1, No. 34, is 725 metres. A plan showing the track layout, the point of collision and the relevant signalling, will be found at the back of the report together with gradient and location diagrams. The lines are electrified on the 25kV overhead system.

The Signalling

3. The signalling between Salop Goods Junction and Gresty Lane No. 1 Signal Boxes consists of colour-light signals and continuous track circuits. When a train occupies a track circuit it automatically places and maintains the signal behind it at Red and the Block Instrument at 'Train on Line'. Prior to the accident, train 6V93 would have been occupying No. 23 or No. 27 track circuit, or both, and would have maintained Salop Goods Junction's Signal No. 60 at Red behind it. Whilst

the lines between these two signal boxes are worked in accordance with the Absolute Block system for passenger trains, they can be operated on the Permissive Block System for freight trains; a second freight train being allowed to enter the occupied section and proceed cautiously with the driver prepared to stop clear of the rear end of the preceding freight train. Before a second freight train is allowed to enter the occupied section it is slowed down almost to a stand by the section signal being maintained at Red by the occupation of track circuits by a preceding train and, upon occupation of the berth track circuit, the driver then receives a distinctive subsidiary Draw Ahead aspect. This aspect consists of two white lights arranged diagonally and an illuminated letter 'C' with an indication of the route. This authorises the driver to pass the main Red aspect of the signal and proceed cautiously, prepared to stop short of any obstruction.

4. The subsidiary aspect on the Up Manchester Independent line is operated by No. 42 signal lever in Salop Goods Junction Signal Box and it cannot be displayed until the second train is within 100 yards of the signal and track circuit No. 753 is occupied. Furthermore, the subsidiary aspect is only displayed if either or both of the track circuits ahead, Nos. 23 and 27, are occupied and the Up Salop Goods line block instruments are showing 'Train on Line'. If the section ahead has no trains on it and the block instruments show 'Line Clear' the main aspect, Signal 41, can be cleared from Red to Yellow or Green with the appropriate route indicator by the signalman in Salop Goods Junction Signal Box. Thus there are two distinct signals, each operated by a different lever in the signal box, Nos. 41 and 42, depending on the position of the Block Indicator which shows whether the section to Gresty Lane No. 1 Signal Box is clear or occupied.

The Course of the Accident

5. The Mossend to Severn Tunnel Junction freight train, 6V93, approached Salop Goods Junction on the Up Liverpool Independent line and was accepted by the signalman at Gresty Lane No. 1 Signal Box with the bell signal 2-4-2. After being brought to a stand at Salop Goods Junction, the train proceeded into the section under the authority of Subsidiary Signal 34 and then stood behind the previous train to enter the section for approximately 25 minutes. When the first train had departed, 6V93 was drawn up to the Gresty Lane No. 1 Home Signal 34, whereupon the diesel locomotive No. 40196 and 'dead' electric locomotive No. 87009 were detached after the air brakes had been fully applied on four of the six vehicles of the train, the brakes of the fourth and fifth vehicles of the train being isolated, and the hand brake of the leading vehicle had also been fully applied. As the diesel locomotive which was to take the train forward, No. 47247, was setting back prior to coupling up, the collision at the rear of the train occurred.

6. The Guide Bridge to Bayston Hill train, 6J41, was also accepted by the signalman at Gresty Lane No. 1 Signal Box under the 2-4-2 bell signal. It was brought to a stand at Salop Goods Junction on the Up Manchester Independent line and entered the section under the authority of subsidiary Signal 42, together with the route indication for the Up Salop Goods line. The train, which consisted of diesel locomotive No. 47190 and 7 empty civil engineering department vacuum braked 'Sealions', weighed 271 tons and had a brake force of 137 tons. The driver accelerated the train over the Junction and up the 1 in 135 gradient, despite the limited visibility due to the right hand curve and the fact that he should have been fully aware from the signal he had received at Salop Goods Junction that there was another freight train in the section ahead.

7. The maximum speed train 6J41 achieved before the driver cut off power and applied the brakes prior to colliding with the back of the stationary train 6V93, and the speed on impact are two matters which have been the subject of considerable tests and technical investigations and are dealt with in detail in paragraphs 48-53 of this Report. Taking into account that the stationary wagons of train 6V93 consisted of bogie steel carriers loaded with steel coils and an empty 100 ton gross laden weight class B bogie tank wagon, giving a total weight of 528 tons and a brake force of 171 tons, and assuming that all the brakes that were operating functioned correctly, the fact that train 6V93 was pushed forward some 10 yards indicates from theoretical calculations that the speed of train 6J41 on impact must have been at least 11 mile/h. From an examination of the damage to the 100 ton tank wagon at the rear of train 6V93 and the locomotive of train 6J41, see photographs opposite and paragraphs 8 and 9 below, it is clear that the actual speed on impact was considerably higher than this and likely to have been in the region of 25 to 30 mile/h.

Damage to the Trains

8. The damage to the stationary wagons of train 6V93 was confined to the rearmost bogie steel carrier, BBA 910436, and the 100 ton tank wagon, BRT 84137. The former had its rear two Oleo

buffers sheared off, a broken brake pipe and cock, a bent reservoir pipe, a bent draw bar hook, and five bent stanchions, while the latter was extensively damaged, both bogies being totally derailed, the tank becoming detached from them and rolling over onto its side on the adjacent Down Salop Goods line. The underframe was completely torn away from both ends of the tank back as far as the sub-bogie bolsters. The tank itself, although extensively damaged, was not punctured and thus, even if it had not been empty, would not have presented a hazard. The main damage to the tank included the ripping away of the lagging and cladding sheets at both ends and heavy damage to the side sheets. Both dished ends of the actual tank were severely distorted but not holed. A number of circumferential seams were distorted but none had actually been torn apart. Barrel strakes, steam coils and ladders had all been heavily damaged.

9. The damage to train 6J41 was largely confined to the front end of locomotive No. 47190, the cab of which was completely demolished and the leading bogie derailed. Although the driver's controls were extensively damaged, a detailed examination indicated that the driver had shut off power and had made an emergency application of the brakes prior to the collision. The first three 'Sealion' wagons had suffered damage to buffers and headstocks, and the second wagon from the locomotive was derailed at the trailing end and had ridden up onto the third wagon. Brake pipes between the second and third wagons had become disconnected in the collision.

Damage to Permanent Way and Signalling

10. A total of 24 sleepers had to be replaced in the track in the area of the point of impact, but otherwise the track was undamaged. The signalling equipment was unaffected, as was the 25kV overhead line equipment.

Evidence

11. *Guard J. G. Huddleston* booked on at Guide Bridge at 06.00 and was instructed to proceed to Stockport to join the T.24 ballast train, 6J41, to conduct the train guard, Guard Chohan, from Sandbach to Gresty Lane. Huddleston said that he had acted as a conductor guard for Guard Chohan two days before the accident on the same route as far as Sandbach and the latter had impressed him as being able and intelligent. He duly met the train at Stockport and boarded the rear cab of the locomotive where he found Guard Chohan and Driver Sehofield; Driver Kirkman was in the front cab. The train proceeded to Sandbach to run round, thence to Chelford to unload ballast and thereafter to Wilmslow to run round again prior to returning with the empty wagons to Sandbach. It then worked forward to Crewe, Gresty Lane, en route to Bayston Hill.

12. At Sandbach, Chohan had told him that he had some knowledge of the Crewe area and Huddleston had explained what action would have to be taken at Gresty Lane. During the run round movements at Sandbach and Wilmslow he and Chohan shared the guard's duties, but on neither occasion was a brake test carried out. Guard Chohan coupled the locomotive to the train, but Huddleston was quite certain that the brake pipes were connected correctly as he saw them when he went to place the tail lamp on the rear wagon of the train. While travelling on the train he did not notice anything unusual in the braking of the train, although Driver Schofield commented that the locomotive was very slow at creating vacuum. When the train was ready to depart from Wilmslow, Huddleston said that Chohan had told him "You can go now. I am quite conversant now with what we have talked about", from which he understood that Chohan no longer required his assistance as a conductor guard to Gresty Lane.

13. Huddleston freely admitted that he had been given definite instructions to conduct Chohan to Gresty Lane and that there was no question of his being authorised to leave the train at Wilmslow and not to proceed to Crewe. On being further questioned, he admitted that he was not certain that Chohan was sure of the movements he had to undertake at Gresty Lane, but he assured me that when he further questioned him, saying "Are you quite certain you know the route?", Chohan had replied "Yes". He thus felt he was justified in leaving the train in the charge of Chohan from Wilmslow to Gresty Lane.

14. Huddleston agreed that, in addition to explaining to Chohan about the layout at Gresty Lane, he was asked a number of questions by Driver Schofield who was also in the rear cab for much of the time and who shared the driving duties with Driver Kirkman to enable run round movements to be carried out without the drivers changing ends. He now knew that Schofield was acting as the

conductor driver and thus was surprised that the latter asked him where they placed the wagons at Crewe.

15. Huddleston said that Driver Kirkman, who accompanied him back to the station at Wilmslow, commented that Driver Schofield had relieved him and that there was no point in him going to Crewe. They returned to Stockport by passenger train and, while having some food in the mess room there, they were informed that there had been a train crash at Crewe. On learning that one of the trains involved in the accident was that which they had left at Wilmslow, they caught the next passenger train to Crewe and then walked to Gresty Lane from where they informed Stoke Control and Guide Bridge respectively of their whereabouts.

16. *Driver T. Kirkman* said that he booked on at Guide Bridge and prepared the locomotive to be used for train 6J41. He had been informed the previous day that Driver Schofield would accompany him as conductor due to the fact that, although he knew the line to Crewe, he had not worked a train from Salop Goods Junction to Gresty Lane for many years. He worked the locomotive into the ballast sidings and after backing up to the wagons a brake continuity test was carried out by Guard Chohan. No tests were carried out subsequently, despite the run round movements at Sandbach and Wilmslow.

17. Kirkman's evidence regarding the general movements of the train until he and Guard Huddleston left it at Wilmslow confirmed in general the latter's evidence. In particular, he confirmed that Schofield and he drove in turn during the run round movement to avoid changing ends and that, when dropping the stone from the ballast wagons at Chelford, the man on the ground controlling the movement of the train could be better observed from the back cab, and thus Schofield drove the train from there. Kirkman asserted that Schofield, as they changed ends at Sandbach, said "I will be taking the train to Crewe", whereupon Kirkman did not demur and in due course left the train at Wilmslow with Guard Huddleston.

18. I questioned Kirkman at length on various aspects of the braking of his train. It was obvious that he did not know whether the brake selector switch was in the 'vacuum passenger' or 'vacuum goods' position but merely had assumed it was in the former which he preferred to use on a train of this composition, as he found it enabled him to recreate the vacuum in the train brake pipe more quickly. Examination after the accident showed it to be in the 'vacuum goods' position. He stated that he found the train brakes slow acting when he made the first major brake application on approaching Ash Bridge, but said that this was commonly encountered with the 'Sealion' wagons on ballast trains. He did not consider this to be in any way abnormal and he made allowance for the slow action when making further brake applications. At no time did he have to make an emergency brake application as opposed to the normal service application.

19. *Driver's Assistant N. P. Hebblethwaite* said he took duty as Driver Kirkman's assistant at Guide Bridge on the morning of the accident. After preparing the locomotive, they proceeded to the ballast sidings where they had trouble with the brakes of one of the first set of seven wagons that were attached to it. They were then attached to a second rake of seven wagons and proceeded without incident to Sandbach, picking up Driver Schofield as conductor and Conductor Guard Huddleston on the way. His evidence confirmed that of both Kirkman and Huddleston until they left the train at Wilmslow.

20. When they left Wilmslow, Schofield and he were in the front cab and Chohan in the rear cab. They ran under clear signals until they approached the first of Crewe North Junction's signals, where they were checked for a couple of minutes before crossing over onto the Manchester Independent line. The train was brought to a stand at Salop Goods Junction Signal No. 64, whereupon Hebblethwaite endeavoured to telephone the signalman but could get no reply. He therefore telephoned the signalman at Crewe North Junction from the telephone at an adjacent signal post but, before he could get a reply, his driver signalled to say that Signal No. 64 had cleared, and so he rejoined the train. The train was next brought to a stand at Signal No. 60 at Salop Goods Junction and, at this further delay, Chohan came into the front cab to enquire about the reasons for the delay. Within about half a minute Subsidiary Signal No. 42 cleared together with the junction indicator showing that they were routed on the Up Salop Goods line to Gresty Lane No. 1 Signal Box and that another train was already in the section. He was certain that the main signal did not clear to a proceed aspect.

21. Hebblethwaite said that they proceeded over the junction with the three men in the front cab at about 10 mile/h. He estimated that the train accelerated to approximately 15 mile/h as it ascended the bank, but this was purely based on comparison with a man running and at no time did

he observe the speedometer reading. He confirmed that Schofield was the first to see the tank wagon at the rear of the stationary train ahead of them. The first thing that he was aware of was Schofield making a full application of the locomotive's straight air brake immediately followed by an emergency application of the vacuum brakes using the combination brake lever. Hebblethwaite said he thought that Schofield's reactions were fairly quick and that the train travelled less than 10 yards from the time Schofield first saw the left hand side of the tank wagon until he started to apply the brakes. The rear of the tank wagon started to come into his view on the right hand side of the locomotive soon after the brakes had been applied. He estimated that at that time the distance between the locomotive and the rear of the tank wagon was some 50 yards and soon after this Schofield had shouted to him and Chohan, who was standing behind his seat, "Hang On", or words to that effect. He estimated that the time from when he first saw the rear end of the tank wagon until the impact took place was about 7 or 8 seconds.

22. Hebblethwaite explained that when the collision took place he remained in his seat and as the end of the tank wagon crushed the front of the cab he was initially trapped by his feet. These he managed to free, but he was held by his trousers which were caught on some jagged metal. After the collision he found he was perched on top of something but whether it was the displaced seat or a piece of the cab side which had been pushed in he could not remember. Actually during the collision he remembered going forward on his knees and he felt as though he was being pushed under the barrel of the tank wagon. The tank then rolled over to one side, leaving him and the remains of the cab clear. He had rapidly been freed by Driver Lee from the train ahead and a number of men trained in first aid from Crewe Maintenance Depot.

23. I explained to Hebblethwaite that I had carried out a test the previous day using the wagons from his train and a Class 47 locomotive similar to that involved in the collision. Starting from a stand at Signal No. 42 at Salop Goods Junction, the driver had driven as closely as Hebblethwaite had described at the Railway Inquiry, namely traversing the crossovers at the junction at 5-10 mile/h and then accelerating up the bank until the train was travelling at a steady 16 mile/h, as opposed to the 15 mile/h he estimated. The driver's reaction in sighting the red banner across the track at the exact spot where the rear of the tank wagon had been was fairly slow and he then braked in the manner Hebblethwaite described Schofield's braking. The train came to a stand 80 yards before the red banner. I pointed out that a driver in a Class 47 locomotive coming round the curve could start to see the rear of the tank wagon when it was 230 yards away, could see the whole end of the tank wagon when 170 yards away and that the driver's assistant in his seat could see the whole of the end of the tank wagon when 130 yards away. Hebblethwaite agreed that there appeared to be a very big discrepancy between what had actually occurred and what would have occurred if his estimates of the speeds at the Junction and on sighting the rear of the tank wagon were accurate. He stressed that the figure of 15 mile/h on sighting the wagon was purely his estimate; it could have been more or less.

24. I then questioned Hebblethwaite about the actions of the three men in the cab from the time they left Salop Goods Junction until shortly before the collision. He agreed that he and Chohan were talking but said that Schofield did not join in, nor did he appear to be distracted by the conversation, although he had the impression that Schofield was listening to it. On being pressed further, Hebblethwaite agreed that it was quite feasible that Schofield was distracted to a certain extent even though he appeared to be looking straight ahead and thus there might have been a delay in his reaction on sighting the tank wagon ahead.

25. Hebblethwaite said he was aware that Schofield had hit his head on the locomotive windscreen wiper motor earlier in the morning but, as far as he could tell, he was suffering no ill effects from the incident. The cut on his head was so small that he was not even aware that it had occurred. Hebblethwaite did not believe that this incident had in any way affected Schofield's efficiency as a driver.

26. *Train Crew Supervisor H. Glindon* said that, when Driver Kirkman reported for duty on the morning of the accident, he asked him whether he would work a ballast train on the Crewe line and he agreed to do so. A little later Guard Chohan arrived and Glindon informed him that he would be working the ballast train but, in view of his lack of knowledge of the route to Crewe and the lines in the Crewe area, he was to pick up a conductor guard at Stockport. Glindon confirmed that he knew from an examination of their route cards that neither Kirkman nor Chohan knew the route to, and the avoiding lines at, Crewe. Kirkman had been informed the previous day that arrangements had been made for Schofield to act as a conductor driver in view of the former's lack of route knowledge in the Crewe area. Glindon confirmed that both Kirkman and Chohan appeared to be perfectly all right

when they reported for duty and that the latter, in particular, had no doubt that he was to be conducted to Crewe, Gresty Lane.

27. Glindon explained that Kirkman had not signed for the route to Crewe on his route card, but he was an ex Stockport driver and all his work at that time would have been along the Crewe, Stoke and Macclesfield lines and, in Glindon's opinion, it was for this reason that Kirkman thought that he still had Crewe on his card. As far as Glindon was concerned, however, there was no question of Kirkman driving to Crewe without a conductor and that was why Schofield had been rostered for this duty. At no time had Kirkman questioned this action.

28. *Signalman D. M. Scragg* was on duty at Salop Goods Junction Signal Box at the time of the accident. He said he had three trains in fairly close succession for the Up Salop Goods line to Gresty Lane No. 1 Signal Box. The first, train 7L92, was signalled normally and he obtained 'Line Clear'. The second train was the 6V93, Mossend-Severn Tunnel Junction, which was accepted by the signalman at Gresty Lane No. 1 under the permissive working arrangements with a 2-4-2 bell signal. He then had to go to the lavatory and, when he returned to the frame, he found that train 6J41 was standing at Signal No. 64, and the driver's assistant had been attempting to contact him on the signal post telephone. Scraggs then signalled the train down to his Starting Signal, No. 60, and had this train, as the previous one, accepted under the permissive working arrangements by the signalman at Gresty Lane No. 1 with a 2-4-2 bell signal. With the train nearly at a stand at Signal No. 60, Scragg pulled lever 42 giving a subsidiary aspect with a letter 'C' and a position 4 route indicator. A few minutes later he received the 'Obstruction Danger' signal from the signalman at Gresty Lane No. 1.

29. Scragg estimated that train 6J41 went across Salop Goods Junction onto the Up Salop Goods line at the normal speed of 10-15 mile/h. It was drizzling at the time but the visibility was quite good. He did not consider that the train accelerated unduly from the junction up the 1 in 135 bank towards Gresty Lane No. 1, but as soon as he observed the tail light of 6J41 he carried on with other signalling moves and paid no more attention to the train. He could not estimate what speed the train was travelling up the bank.

30. *Signalman C. R. Jones* was on duty in Gresty Lane No. 1 Signal Box at the time of the accident. He said that he accepted train 6V93 under the permissive arrangement as he already had train 7L92 standing at his Home Signal on the Up Salop Goods line. This subsequently moved forward and train 6V93 drew down to his Home Signal. The train was drawn by a diesel locomotive, with a 'dead' electric locomotive behind it. These were detached and departed for the depot, and the locomotive to work the train forward was drawn out onto the Up Main line ready to set back onto the train when he accepted train 6J41 under the permissive arrangement. Before the locomotive reached train 6V93 Jones noted one of the train crew running to a telephone and almost at once the guard informed him that a collision had occurred. He immediately informed Signalman Scragg and told him that the track circuit on the Down Salop Goods line was indicating 'occupied', 'Obstruction Danger' signals were exchanged and Jones agreed to summon the emergency services.

31. Jones could not estimate the speed of train 6J41 either as it approached the rear of train 6V93 or on impact. He did not notice the train at all as it approached from Salop Goods Junction, nor did his track circuit diagram help as the track circuits on the Up Salop Goods line were already indicating 'occupied' on account of train 6V93. He did not hear the noise of the collision, nor did he see any movement of the wagons of 6V93 when the collision took place.

32. *Driver G. E. Lee* said that he was in the process of driving his diesel locomotive, No. 47247, onto the Up Salop Goods line from Gresty Lane Junction to attach it to train 6V93 when from a distance of approximately 200 yards he saw the train start to move towards him. He immediately stopped the locomotive and then saw a 100 ton tank wagon topple over onto the Down Salop Goods line. The windows of his cab were closed and he did not hear the collision, but he ralised that a rear-end collision must have occurred. When the wagons were stationary, he moved his locomotive to within about six yards from the head of the train so that his locomotive was protected by the Up Home Signal, No. 34.

33. He instructed his guard, Guard Oakley, to run to an adjacent telephone and summon the emergency services and then to arrange protection. Lee made his way rapidly to the site of the collision. He said that he found Driver's Assistant Hebblethwaite fully conscious in the middle of the remains of the cab, trapped by his legs. Driver Schofield appeared to be dead. He was still more or less in his seat which had been forced back by the collision and his hand was trapped in the remains

of the door. Guard Chohan, who appeared to be dying, was trapped behind the right hand seat in the cab. He appeared to have crouched down behind it and to have suffered very severe head injuries.

34. Assisted by staff from the Crewe Diesel Maintenance Depot, Lee managed to release Hebblethwaite and place him on a stretcher obtained from Gresty Lane No. 1 Signal Box. The emergency services then arrived and they took over the task of releasing Schofield and Chohan from the wreckage. Lee said that, after the three men had been removed, he went into the rear cab to make sure that the battery switch had been turned off. Lee considered that the wagons of 6V93 had moved towards his locomotive a distance of 6 to 10 yards as a result of the collision, but he did not check the wagons or the train to see how they were braked.

35. *Guard J. A. C. Oakley* who was due to work train 6V93 on from Gresty Lane with Driver Lee, confirmed the latter's evidence. He telephoned the signalman at Gresty Lane No. 1 to call the emergency services, but the line was very bad and he was not certain if the latter understood what was required. He then took immediate action to protect the Down Salop Goods line by putting down track-circuit operating clips, a red flag and detonators. After trying to assist in releasing the train crew of 6J41, he made sure that both trains were properly braked. He secured the hand brakes on 5 wagons of train 6J41 and on 4 wagons on his own train 6V93 and went back to the rear of the former train and lit the tail lamp.

36. *Acting Supervisor J. Taylor, Divisional S & T Engineer's Department, Crewe*, was informed of the collision and with a senior technician made his way past the scene of the accident to Salop Goods Junction Signal Box. There he proceeded to carry out a preliminary test of the signalling involved in the accident, noting that the Up Salop-Gresty Lane Block needle was displaying 'Train on Line' and the Absolute/Permissive flag indicator displaying 'Permissive'. With the route set from the Up Manchester Independent line to the Up Salop Goods line, and with track circuits Nos. 23/27 and 753 occupied, and signal lever No. 42 reversed, the signal displayed a subsidiary aspect with a distinguishing letter "C" and a position route 4 indicator; the main aspect of the signal was 'Red'. When signal level No. 41 was reversed with the same conditions, only a 'Red' aspect was displayed at the signal. The signal box block shelf indicators corresponded to the signal display.

37. Mr. Taylor assisted in carrying out a full test of the signal circuitry concerned later in the day and it was found that two conductors, one in the cable feeding the main signal and the other in the cable feeding the route indicator were earthing, and also that there was a defective lamp holder in the route indicator. He assured me, however, that these faults could not possibly have affected the aspect of the signal under permissive working conditions when the track circuits were occupied. The tests proved conclusively that when train 6J41 reached the junction a subsidiary signal showing two white lights, a distinguishing letter "C" and a position 4 route indicator, with the main signal at Danger would have been displayed. It also proved that it was not possible for the signalman to have pulled lever No. 41 with track circuits 23/27 or 753 occupied.

38. *Testing Assistant P. J. Owen* said that, following the accident, tests were carried out to check the integrity of the signalling system. The results proved conclusively that the wiring and the equipment were correct with the exception of one cable between the signal and location SG1 and two conductors which, during the tests showed they were in contact to earth. Although they revealed that the circuits were not up to the high standards laid down by the Signal and Telecommunications department, they would in no way have caused a wrong side failure or, in particular, the display of a wrong aspect. For Signal No. 60 to have been falsely fed to display a wrong aspect there would have had to be at least one more earth fault and no indication of such a fault had been found throughout the testing. Mr. Owen, who had been involved in testing in the Crewe Division since 1964, confirmed that he had never been aware of any wrong side failure of Salop Goods Junction Signal No. 60, nor in any of the track circuit controls associated with the routes from that signal.

39. *Mr. J. D. Baker, Divisional Signal and Telecommunications Engineer, Crewe*, stated that the tests carried out by his staff were to determine whether or not Driver Schofield might have been misled by a false signal at Salop Goods Junction, that he might have been given a single Yellow or a Green aspect at Signal No. 60 and thus have thought that he was entering a clear section. The tests were particularly rigorous as, at the time, it was thought that there might not be a survivor from the crew of train 6J41, in which case the evidence of his department would have been extremely pertinent. Happily, Driver's Assistant Hebblethwaite had survived and had confirmed that the signal received by Driver Schofield at the entrance into the section to Gresty Lane No. 1 Signal Box, immediately before the collision was the correct one.

40. Mr. Baker said that he had questioned closely the details of the two earth leakages which had been found. He was personally satisfied that there was no risk whatsoever, even with these leakages, that a wrong aspect could have been displayed.

41. *Mr. C. Clarke, a clerical officer in the General Manager's Office at Crewe*, said that at approximately 12.15 he observed from the window of his office on the fifth floor at Rail House a train consisting of a Class 47 locomotive and seven 60-ton hopper wagons come to a stand at the Up Manchester Independent line Home signal at Salop Goods Junction. Although the braking of the train did not appear unduly severe, sparks were emitted from the locomotive's brake blocks, although none were noted from the brake blocks on the wagons. The train was detained for approximately 15 seconds at the signal, the subsidiary aspect of which then cleared to a calling-on aspect with a position-4 junction indicator being clearly visible from the office window. He was unable to estimate its speed when it moved off.

42. *Mr. M. J. Ball, a British Railways senior systems controller at Crewe*, was returning from the canteen to Rail House when he heard a locomotive on the Up Salop Goods line which, in his opinion, was working very hard with its throttle wide open. Being interested in trains, he went over to the adjacent lineside fence to look down onto the line from the top of the cutting, a place from which he quite often watched trains. He considered that the train was travelling up the bank considerably faster than normal, and estimated its speed as it passed him as about 40 mile/h, a figure he judged from his daily trips by rail to and from Alsager where there was a 20 mile/h speed restriction and, in his opinion, this train was travelling twice that speed. He noted that there were three men in the front cab.

43. Mr. Ball said that he did not see whether the train rapidly decelerated due to braking as it proceeded round the curve towards Gresty Lane, nor was there any visible or audible indication that the driver shut off power or applied the brakes. After he had turned away from the lineside he heard the sound of a collision but, at the time, he did not connect the noise with the train. To summarise, however, he was quite adamant that the train was proceeding up the bank appreciably faster than trains normally did, probably about 40 mile/h, and that there were three men, one standing, in the driver's cab.

44. *Mr. C. J. Breeze, the Assistant Station Manager, Crewe*, confirmed the evidence of other witnesses concerning the events immediately prior to the collision, the collision itself and the action taken both to summon the emergency services and also to obtain help from staff trained in first aid from the Diesel Maintenance Depot adjacent to the scene of the accident. He then made his way to the site and immediately checked the contents of the 100 ton tank wagon. The TOPS office confirmed that it had been discharged and had previously contained fuel oil and Mr. Breeze immediately passed on this information to the fire service and other interested parties.

45. Mr. Breeze said that he examined the rails in the area of the collision and, while he found no skid marks either under or in the rear of train 6J41, he found a heavy skid mark approximately 25 yards long, stretching from the damaged front of the locomotive of 6J41 forwards to where the fifth wagon of train 6V93 had come to a stand. Mr. Breeze was unable to say which vehicle had caused the skid mark, but it was clear from its position that it could only have been made by one of the vehicles of the leading train and, in his opinion, it was either the fifth steel-carrying wagon or the sixth vehicle, the 100 ton tank wagon which was actually struck by the locomotive of train 6J41. In his view the skid mark clearly indicated that the vehicles of train 6V93 had been moved forward approximately 25 yards as a result of the collision.

46. *Mr. G. H. Griffith, Divisional Traction and Rolling Stock Engineer, Stoke*, gave details of examinations of both the trains after the accident and of subsequent tests of equipment. The brake equipment was in general satisfactory on locomotive No. 47190, the brake block thicknesses were acceptable and the brake cylinders at the outer ends of each bogie were showing a piston stroke, although no air was present. Subsequent removal and testing of the brake valves indicated that the brake equipment had been in good working order and examination of the AWS equipment revealed nothing which would cause a wrong-side failure. Tests of the brakes of the wagons on train 6J41 showed that all brake cylinders had operated and brake blocks applied on wheels of five of the seven wagons. Subsequently, after the accident damage to the brake gear of the sixth wagon had been repaired, its brakes were found to operate satisfactorily.

47. Of the five loaded bogie steel-carrying wagons of train 6V93, the air brakes were found to be applied on the leading three wagons but those of the fourth and fifth were found to be isolated,

although the vehicles had not been 'carded'; the hand brakes had also been applied on the first three wagons. It was not possible to determine accurately the state of the brakes of the 100 ton tank wagon due to the extensive damage to the bogies and the brake gear.

48. Mr. Griffith explained that the fact that locomotive No. 47190 was being driven at the time of the accident with the control keys in position in each cab and with each controller unlocked would have resulted in approximately a 30% loss of power from a locomotive of this class in similar condition.

Speed and Braking Tests

49. In view of the absence of reliable evidence regarding the speed of train 6J41 as it approached the rear of train 6V93 from Salop Goods Junction and the obvious wide discrepancy between the evidence given initially by Driver's Assistant Hebblethwaite as to speed and that deduced from the extensive damage to the front end of locomotive No. 47190 and the 100 ton tank wagon, I asked the Railway Officers to carry out speed and braking tests with a locomotive similar to No. 47190 and the actual wagons from 6J41 involved in the accident. Minor repairs had been carried out to enable them to run at that time. The test, which was run the day before I held my Public Inquiry was based on the evidence given by Driver's Assistant Hebblethwaite to the Railway Officers' Joint Inquiry, namely that train 6J41 had started from a stand at Salop Goods Junction Signal No. 42, had traversed the junction at 5-10 mile/h and had then accelerated to what he estimated to be 15 mile/h up the bank towards Gresty Lane No. 1 Signal Box (see paragraph 21). A red banner was displayed across the track to indicate the position of the rear of train 6V93.

50. As stated in paragraph 23, this test had revealed that, even though the driver ascended the bank at 16 and not 15 mile/h, and that his reaction in braking, again as described by Hebblethwaite, on sighting the red banner had been slow, the train came to a stand no less than 80 yards before the banner. Thus, under these conditions, no accident would have occurred, let alone one of this magnitude.

51. Later in the same day a further test was carried out, again from a stand at Signal No. 42 and traversing the junction at not more than 10 mile/h but in this case the driver was instructed to apply full power, although this was only approximately 70% of the maximum power of the locomotive, as both control keys were in position (see paragraph 48). The train reached a balancing speed of approximately 27 mile/h ascending the bank and again on braking in the manner described by Hebblethwaite at the point at which the driver could see the complete rear end of the tank wagon ahead of him, approximately 170 yards, the train still came to a stand 45 yards before reaching the red banner.

52. From the above tests and Hebblethwaite's evidence during my Public Inquiry it was obvious that the actual conditions leading up to the accident had not even been approached and it was decided that a further series of tests would be carried out with Hebblethwaite in the cab as soon as he was medically fit enough to assist in them. These took place, again with the wagons involved in the accident, on 23 January 1981. The first test, to demonstrate to Hebblethwaite that the evidence he had given at my Inquiry was inaccurate, was similar to the first of the previous tests as far as speeds were concerned, but the brakes were only applied at a point 60 yards from the red banner representing the rear of the train, this distance being taken from Hebblethwaites evidence. Even with the greatly shortened braking distance from the red banner representing the rear of the other train, the test train came to a stand 15 yards before the banner. Hebblethwaite, who was sitting, as at the time of the accident, in the Driver's Assistant's seat during the test, immediately said that the train had been travelling far faster immediately prior to the accident. He also said that he saw the rear of the tank wagon sooner than the point 60 yards from the red banner. He walked back along the length of the train, carefully examining the sighting distance from the cross gangways of the hopper wagons. He estimated that he saw the tank wagon from a distance of some 90 yards and thus Driver Schofield had started to apply the brakes about 100 yards from the rear of the train.

53. A further test was then carried out in a similar manner to those already described but with the locomotive under full throttle and braking commencing from a speed of 27.5 mile/h at a point 100 yards from the red banner. The locomotive struck the banner at 15 mile/h and came to a stand 25 yards beyond it. Hebblethwaite commented that this was much nearer what had actually occurred,

but that he thought the speed at impact had been greater. Consequently a third test was carried out with the locomotive again being run at full throttle, but the brakes not being applied until the locomotive was 60 yards from the red banner. On this test the train achieved a maximum speed of 29 mile/h before braking commenced and the red banner was struck at a speed of 23 mile/h, the locomotive coming to a stand 65 yards beyond the banner. The speed on impact of 23 mile/h was in Hebblethwaite's opinion, approximately that which occurred when the locomotive of train 6J41 hit the rear of the 100 ton tank wagon.

Conclusions

54. The immediate causes of this collision were the excessive acceleration of train 6J41 from Salop Goods Junction up the 1 in 135 gradient towards Gresty Lane No. 1 Signal Box by Driver Schofield and his inexplicable failure to cut the throttle and apply the brakes until his locomotive was some 60 yards from the rear of the stationary train 6V93, despite the fact that the rear of the latter train could be seen from a distance of over 200 yards. Due to the unfortunate deaths of Driver Schofield and Guard Chohan in the collision, it is not possible to determine why these errors occurred, but it is clear that Schofield correctly received a subsidiary aspect with a distinguishing letter 'C' and route indication for the Up Salop Goods Line at Salop Goods Junction and should have been fully aware that he was entering the section under permissive conditions with one or more freight trains between his train and Gresty Lane No. 1 Up Home Signal No. 34, requiring him to proceed cautiously, prepared to stop short of any obstruction.

55. The great help given by Driver's Assistant Hebblethwaite, who luckily survived the collision without unduly serious injuries, both while giving evidence at my Inquiry and also during the subsequent series of trials with a train similar to that involved in the collision, has enabled the cause of the accident to be determined with reasonable accuracy. In Hebblethwaite's opinion a test with the locomotive run at full throttle and achieving a maximum speed of 29 mile/h before braking commenced at a point 60 yards from the point marking the location of the rear of the stationary train, with the speed at the point where impact would have occurred 23 mile/h, represented accurately what had occurred when the locomotive of train 6J41 collided with the rear of the 100 ton tank wagon.

56. Hebblethwaite agreed that he and Guard Chohan had been talking while in the front cab of the locomotive after leaving Salop Goods Junction until the collision. Driver Schofield had not joined in, however, although Hebblethwaite admitted that the former appeared to be listening and it was quite feasible that he was distracted from his driving duties, even though he appeared to be looking straight ahead.

57. Finally, one must question whether the accident would have been averted had the correct train crew travelled from Wilmslow to Crewe. Driver Schofield had first signed for the route from Guide Bridge to Crewe, Gresty Lane, in 1975 and had re-certified his competence to work safely over the section annually up to 16 January 1980. Thus there is no reason to doubt that he should have known the route well, even though, according to Guard Huddleston, he asked the latter a number of questions about the layout at Gresty Lane. Whether he would have been more alert after passing Salop Goods Junction if he had been carrying out his correct duties of conductor driver, supervising Driver Kirkman, is a matter of conjecture. There is no doubt, however, that Huddleston, a guard since 1947, with specific route knowledge from Salop Goods Junction to Gresty Lane since February 1974, knew the route well and, had he been carrying out his official duties of conductor guard to Chohan instead of unauthorisedly leaving the train at Wilmslow, there would have been a reasonable chance that he would have alerted Schofield to the dangers of driving at excessive speed from Salop Goods Junction or, if he had been in the rear cab with Chohan, of applying the brakes to reduce the excessive speed when running in a permissive section.

58. I am completely satisfied that the signalling at Salop Goods Junction was functioning correctly at the time of the collision and, in particular, that the section signal for the Up Salop Goods line, No. 42, was displaying two subsidiary white lights with a 'calling on' aspect and a position 4 route indicator. Under the circumstances at the time it would have been impossible for a main proceed aspect to have been displayed at the signal and thus I am completely unable to understand Driver Schofield's errors.

59. The photographs illustrating the damage to the 100 ton Class B tank wagon and the leading cab of the Class 47 diesel locomotive illustrate two particularly important aspects of British Railways rolling stock design. The barrel of the 100 ton tank wagon was designed to meet approved static vessel pressure codes in accordance with British Standard Specification 1515 and also to take into account dynamic loading. The barrel and its attachment to the wagon underframe must, in the fully laden condition, be capable of absorbing the following external forces:—

a. a minimum of four times the total weight in the direction of travel,

b. the total weight, both transverse to the direction of travel and vertically upwards,

c. twice the total weight vertically downwards.

That the tank barrel was not punctured, despite the fact that its underframe was completely torn away back as far as the sub-bogie bolsters and other serious damage, illustrates once again the sound design of the tank barrels used in the construction of tank wagons for the carriage of dangerous and hazardous goods in this country.

60. The virtually complete destruction of the leading cab of the Class 47 locomotive, on the other hand, illustrates yet again the great weakness of the majority of the cab designs on diesel and electric locomotives in use on British Railways. Such cabs above underframe level are either partially or wholly outside the main frame of the locomotive and thus in a collision offer virtually no resistance to crushing back to the first main bulkhead behind the cab. The weakness of this type of design compared with the cabs of some of the earlier diesel locomotives, such as the Class 40, has been demonstrated dramatically in two accidents into which I have inquired previously. In 1973 at Kidsgrove Station a Class 24 locomotive struck the rear of a stationary newspaper train at not more than 12 mile/h. The rearmost vehicle, a BG, suffered remarkably little damage, a buckled bogie frame, a bent gangway frame, two bent buffer rods and a broken buckeye tail piece. The locomotive's cab, on the other hand, was severely crushed and all the equipment above floor level forced back towards the bulkhead between the cab and the boiler compartment with the result that the secondman driving the locomotive was killed.

61. In complete contrast, at Glasgow, Queen Street Station, in 1977, a Class 40 locomotive ran out of control down Queen Street tunnel, entering the station at between 40 and 45 mile/h where it collided violently with the rear of the passenger train it was due to work to Mallaig. This class of locomotive, weighing some 133 tons in full working order, is carried on two bogies of 1-Co wheel arrangement with the buffing and drawgear mounted on the bogies. Each end of the body, ahead of the driver's cab, is provided with a projecting 'nose' which contains a motor-driven air blower for cooling the traction motors and an exhauster. Although not provided specifically for the purpose, the 'nose' provides substantial protection for the driver in the event of a collision, as a result of the forward extension of the main body structure and the bogie beyond the driving cab which can absorb a large proportion of the kinetic energy produced by a collision. In this accident the damage to the locomotive was minimal and the driver suffered no serious injuries. The sleeping car struck by the locomotive was so seriously damaged, however, that it was subsequently broken up; the next four coaches were also appreciably damaged.

62. While it is obviously impracticable to modify the 'soft fronted' cabs of the greater proportion of the existing diesel and electric locomotive fleet to give substantially greater protection to the driver and his assistant, I am glad to report that the Director of Mechanical and Electrical Engineering, British Railways Board, assures me that the cabs of all new designs of locomotives and multiple-units now conform with the UIC Standards. In particular, the Special Safety Regulations for the Drivers' Cabs of Tractive Units (UIC Code 617-5 OR) is being applied. This lays down:—

"2.2.1 Drivers' cabs must be built as solidly as possible and incorporated in the body frame of the tractive unit, so that any deformations caused by impact will occur behind and, possibly, in front of the driver's cab.

In particular, the front side of the driver's cab must be sufficiently fitted into the body frame and capable of appreciably withstanding deformations, in the event of a collision, especially in the area between the head stocks and the bottom of the windows.

It is recommended that the structure be guaranteed against residual deformation when subjected to the following compression stresses:

	Locomotives	*Railcars*	*Remarks*
At the bottom of windows	300 kN	300 kN	Evenly distributed
At head stock level	2000 kN	1500 kN (*UIC Leaflet 625-7*)	Applied on both buffers
	2000 kN	1500 kN	Applied in the centre-line of automatic couplers

It is furthermore recommended that the front part of the tractive unit be fitted with devices which absorb the energy produced on impact in the best possible manner by buckling, even if the damage is permanent.

2.2.2 The cab window and door frames must be very rigid; the larger the opening, the more care should be taken to observe this regulation.

Openings should not be cut for the purpose of installing equipment, insofar as possible."

These alterations in design will increase the strength of the cabs of locomotives and multiple-units many times and thus greatly improve the safety of the train crew in the leading cab.

63. I have discussed with the Officers of the Railways Board on several occasions in the past the marking of the safest areas within locomotives and that locomotive crews should be advised to reach there when a head-on or rear-end collision is about to occur. They are loth to indicate any specific area as 'safe' however, as they believe it could vary so radically, depending on where the initial point of impact occurred and the location of the collision, which might be an embankment and result in the locomotive rolling over. While I appreciate their views, I do not believe it should be left entirely to locomotive crews to decide what action to take in these circumstances. There is no doubt that the most dangerous place for the locomotive crew in a head-on or rear-end collision is to remain in the 'soft fronted' cab and I strongly recommend that the crew should be instructed to vacate the cab whenever possible in these circumstances. Finally, I recommend that the Board carries out a detailed examination into the damage that has occurred to locomotives in head-on and rear-end collisions where train crews have been killed or seriously injured over the last ten to fifteen years with a view to quantifying the risk of marking 'safe' areas to which crews should proceed in such emergencies.

I have the honour to be,

Sir,

Your obedient Servant

P. M. OLVER
Major

The Permanent Secretary
Department of Transport

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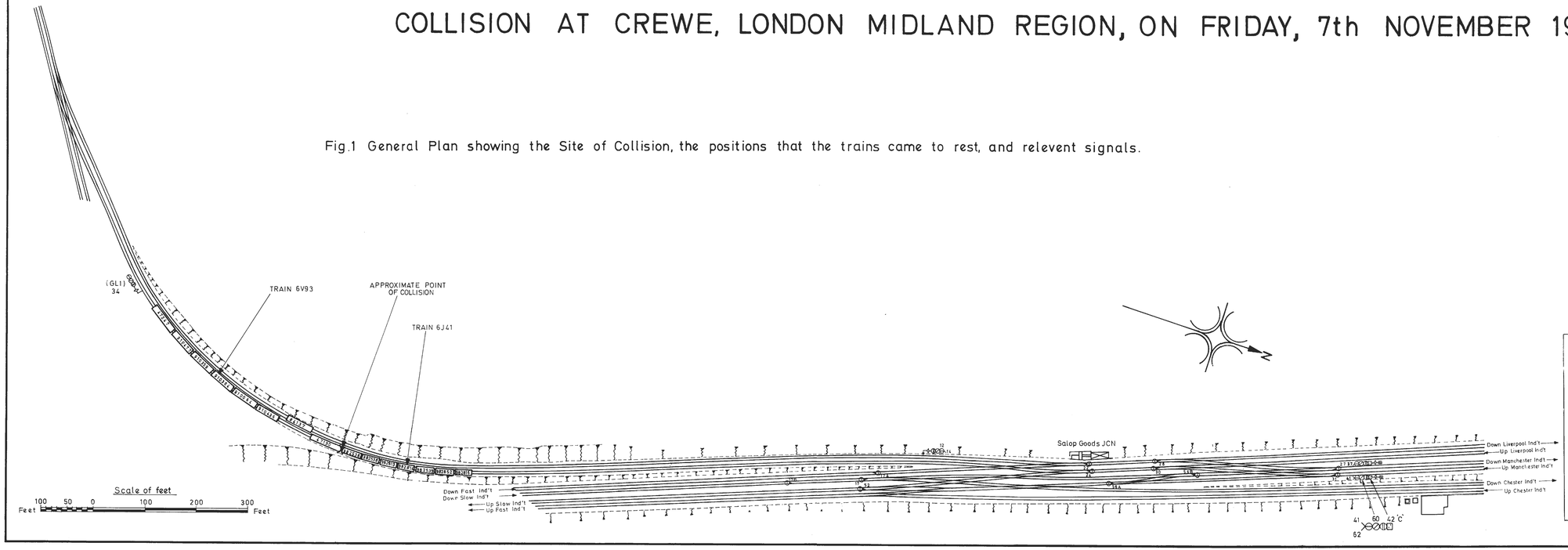
PHOTOGRAPH No. 1. General View of the crushed cab of Locomotive No. 47190 and the damaged buffer beam, underframe and detached bogies of 100 ton tank wagon BRT 84137.

PHOTOGRAPH No. 2. View showing the comparatively undamaged tank barrel of the 100 ton tank wagon, having rolled over onto the adjacent track, and the virtual disintegration of the leading cab of the locomotive.

COLLISION AT CREWE, LONDON MIDLAND REGION, ON FRIDAY, 7th NOVEMBER 1980.

Fig.1 General Plan showing the Site of Collision, the positions that the trains came to rest, and relevent signals.



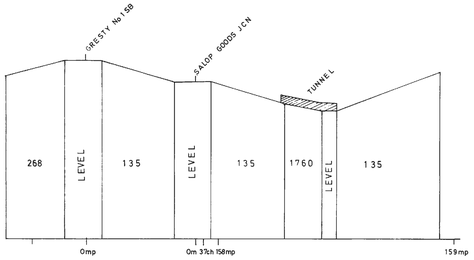
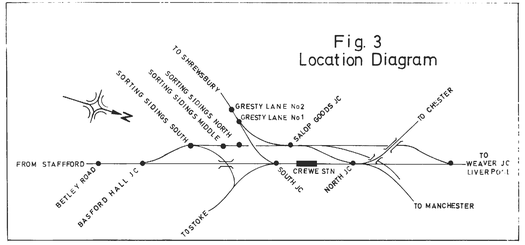



Fig. 2 Gradient Diagram