DEPARTMENT OF THE ENVIRONMENT

RAILWAY ACCIDENT

Report on the Collision that occurred on 23rd October 1974 at Bridgwater

IN THE
WESTERN REGION
BRITISH RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE

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RAILWAY INSPECTORATE,
DEPARTMENT OF THE ENVIRONMENT,
2 MARSHAM STREET,
LONDON SW1P 3EB.
30th December 1975.

SIR,

I have the honour to report for the information of the Secretary of State, in accordance with the Order dated 24th October 1974, the result of my Inquiry into the collision between two freight trains that occurred at 05.04 on 23rd October 1974 on the Down Main line at Bridgwater, in the Western Region of British Railways.

The 19.42 (22nd October) Derby to Exeter Riverside Class 6 freight train, hauled by a diesel locomotive, having passed at Danger a multiple-aspect colour-light signal, collided at approximately 45 mile/h with the rear of the 18.28 (22nd October) Ince and Elton to Bridgwater company freight train which was standing waiting to be crossed over via the Up line to Bridgwater yard. The rear two vehicles of the latter train were telescoped and extensively damaged, both driving cabs of the locomotive of the Derby to Exeter train were badly crushed, and the following 15 wagons were derailed and piled up in confusion.

The appropriate emergency services were promptly alerted by the Senior Railman on duty at Bridgwater. I regret to report that the guard of the train from Derby was trapped in the debris of the rear cab of the locomotive and died as a result of the multiple injuries he sustained. The driver and secondman of this train were detained in hospital but were not seriously injured.

Both the Up and Down lines were damaged and obstructed by wreckage, but following repairs they were reopened at 18.05 and 22.00 respectively on 24 October. During the blockage all through trains were diverted and a bus service replaced local trains.

On the night of the collision it was dark but the weather was fine and clear.

DESCRIPTION

The Site

1. The accident occurred on the Down line immediately to the north of Bridgwater Station which is situated some 33 miles from Bristol Temple Meads on the double track main line to the West of England which at this point runs due North and South. From milepost 145½ at Highbridge Station to 151 miles 10 chains the Down line is straight with no gradient greater than 1 in 500. It then curves to the left at a radius of 192 chains and the collision occurred at 151 miles 27 chains on this curve (the Up direction is towards Bristol). The yard is on the Up or west side of the line to the north of the station. Access from the Down line to the yard is through a facing crossover onto the Up line and thence through a connection facing to the Up line into the yard. Both these connections are worked from a ground frame. The diagram at the back of this report shows the layout of the main line and yard in the area, together with the positions of the relevant signals. At 151 miles 12½ chains there is a bridge carrying the A39 road over the railway. There are no other bridges between that point and Bridgwater Station and in the Down direction it is the first bridge for over two miles.

The Signalling

2. The running lines at Bridgwater lie within the area controlled by Bristol Signal Box and are worked under the Track Circuit Block Regulations. Control of the signalling is from an entrance-exit push-button panel on which the routes set and the occupation of track circuits are shown, as well as the stop and proceed aspects of controlled signals, the position of points, and the state of ground frame releases. The safety interlocking relay equipment is housed in a local relay room at Bridgwater and is operated from Bristol over a non-vital Time Division Multiplex (TDM) System whereby controls are transmitted to, and indications received from, the remote relay room. At the time of the accident all the 3-aspect colour-light signals were equipped with the Western Region Automatic Warning System (WRAWS). A signal is replaced to Danger when the first wheels of the train enter the overlap track circuit of the signal. Track circuits are either of the Aster or DC quick release types. There are full track circuit and point controls on signals and full approach and route locking is provided.

3. The points and shunting signals at Bridgwater are operated manually from a 6-lever ground frame situated at the north end of the Up platform at Bridgwater Station. The points are fitted with facing-point locks and are electrically detected. To enable the points and signals to be worked from the ground frame, Annetts keys to unlock the levers can be released in two stages from the Bristol panel by buttons 703 and 704. Button 704 releases the Up and Down crossover, 703 releases the connection from the Up Main to the yard. Signal B 618, which is facing to a running movement on the Down line, is cleared automatically when a route is set on the main line. With the two other shunting signals it is operated by ground frame levers after a release has been given. A train on the Down Main line requiring access to the yard should be brought to a stand with Signal B 80 at Danger and then allowed to proceed under the authority of the subsidiary signal to Signal B 618 at Danger. Then, once the releases have been given, the ground frame can be used to signal it into the yard.

	Signal number	Controlled or Automatic signal	Automatic operation facility	Signal type	Distance from previous signal	Sighting distance
Down line						
	B74	Controlled	Yes	3-Aspect	—	1122 yards
	B76	Controlled	Yes	3-Aspect	1 mile 785 yards	1 mile 704 yards
	DM 147	Automatic	—	3-Aspect	1 mile 533 yards	2 miles 1100 yards
	DM 149	Automatic	—	3-Aspect	1 mile 880 yards	Initial 4 miles 198 yards Continuous 3 miles 550 yards
	B80	Controlled	Yes	3-Aspect with position-light subsidiary	1 mile 814 yards	2 miles 1430 yards
	B618	Controlled	Yes	Position-light ground shunting signal	1188 yards	572 yards
	B82	Controlled	Yes	3-Aspect	1 mile 506 yards from B80	Initial 682 yards Continuous 462 yards
Up line						
	B3	Controlled	Yes	3-Aspect with position light subsidiary signal Bracket mounted	—	—

Where two sighting distances are quoted there is a point after the initial sighting where the signal is obscured for a period before becoming visible continuously until it is passed.

4. Details of the relevant running signals are given in the table above. All are post-mounted and have signalpost telephones connected to the Bristol Signal Box panel except where shown. All are to the left of the track to which they apply. Some controlled signals may be set to operate automatically.

5. The panel in Bristol Signal Box is equipped with a 4-digit alpha-numeric train describer system. Descriptions are stepped from one signal berth to the next provided the signal shows a proceed aspect and the track circuit in advance of the signal is occupied. Associated with Bridgwater is the facility for the transmission of a Down train's description to the fringe signal box at Cogload. As a train passes Signal B 80, provided the conditions are met, the description is automatically transmitted to Cogload Junction Signal Box as the 'first train coming' and the description is also moved to the berth of Signal B 82. The transmission is done directly between Bristol and Cogload Junction Signal Boxes from information received at Bristol from Bridgwater. If a route is not set up beyond a signal, the description remains in the signal berth even if the overlap track circuit is occupied. The signalling between Bristol and Cogload was commissioned on 18th March 1972.

The Trains

6. The 18.28 company train from Ince and Elton to Bridgwater (6V35) consisted of diesel locomotive No. 47 441 hauling 13 privately-owned bogie pallet vans conveying Shellstar bagged fertiliser traffic for Bridgwater. These vans are of 80 tons gross laden weight, of all steel construction, and are sub-divided into 8 compartments with doors in the sides of the wagons. The total length of the train was 705 feet 5½ inches and the weight, including the locomotive, was 1082 tons. All the vans are airbraked, the total brake force available being 619 tons. The maximum permitted speed of the train was 60 mile/h.

7. The 19.42 Derby to Exeter Riverside freight train (6V86) consisted of Class 45 diesel locomotive No. 125 which is fitted with the British Railways Automatic Warning System (BRAWS) hauling 42 wagons of which 29 were loaded and 13 were empty. The wagons were a mixture of mineral wagons, vans, bogie bolsters and other types. The train was fully fitted with the vacuum brake, had a total weight, including the locomotive, of 767 tons, a length of 1136 feet, and a brake force of 286 tons. It did not convey a brake van and accordingly the guard was travelling in the rear cab of the locomotive. The maximum permitted speed of this train was 45 mile/h. Since the track at Bridgwater and the locomotive were fitted with different types of AWS, the driver would not have been receiving indications after leaving Bristol.

The Course of the collision and damage caused

8. 6V35 arrived at Bridgwater at about 04.55 on 23rd October. The train came to a stand on the Down line in rear of Signal B 618 prior to being crossed over via the Up line to the yard. The guard had gone forward to the station and, with the senior railman, had requested that Bristol Signal Box give the releases to enable him to use the station ground frame to perform this movement. Shortly afterwards 6V86, travelling at approximately 45 mile/h, collided violently with the rear of the standing freight train. The force of the collision was such that the locomotive of the stationary freight train was driven forward about 100 feet and the two rear pallet vans of its train were telescoped and extensively damaged, spilling their load of bagged

fertiliser onto the track. The locomotive of the rear train was seriously damaged at both ends, both cabs were crushed, the body frame was distorted, the rear bogie displaced and extensively damaged, and much pipe work was broken and wiring damaged. Behind the locomotive 15 wagons were derailed and piled up in confusion, one mineral wagon landing upside down on top of the rear cab of the locomotive. Both Up and Down main lines were blocked by the wreckage of the wagons. Some 240 feet of continuously welded rail track and numbers of track components had to be completely replaced. There was no damage to signalling equipment.

EVIDENCE

As to the running of 6V35

9. *Driver R. A. Hacker* drove 6V35 from Bristol to Bridgwater. He told me that he had been a driver for about 20 years. He took over the train at about 04.00 and had an uneventful trip to Bridgwater via Weston-super-Mare arriving at about 04.55. He stopped the train at Signal B 618 so that he could see the signal from his driving position since he knew he had to shunt into the yard even though the signal was at proceed. The guard came forward almost immediately and said he was going to the station to telephone the panel to have the road set up to cross the train over to the yard. He saw the guard walk up the platform and then come back to the ground frame with the foreman in charge of the station. After they had spoken on the telephone he saw them stand back from the ground frame and almost immediately he felt the impact of the collision. He thought this was about 12 minutes after coming to a stand. He was holding the train stationary by a full application of the locomotive airbrake. Directly after the impact he said that he pulled himself together, grabbed his track-circuit operating clips, jumped off the locomotive, and stamped them on the Up line. He then shouted to the man in charge of the station and his guard that something had run into the back of his train and told them to get onto the panel immediately. He got back onto the locomotive, stopped the engine and proceeded to protect the Up line with his detonators. He said that the weather was dry, the visibility was very good and he had had no difficulty in seeing any of the signals between Highbridge and Bridgwater which were all displaying green aspects.

10. *Guard C. W. J. Frapwell*, a goods guard at Bath Road, Bristol for about 26 years, was the guard of 6V35. He told me that he got off the train when it stopped at Signal B 618 and went across to the office at Bridgwater Station where he found the supervisor. They had walked back together from the office to the ground frame where he used the telephone to ask the panel to give him the release to obtain the keys for the ground frame levers to operate the crossovers. The Bristol signalman had said that he would give him the release in a couple of minutes. Very shortly after that he heard the crash and his driver shouted out "its somebody run in the back of me". He had immediately used the signal post telephone at Signal B 3 to ring Bristol and tell them to stop all Up and Down traffic. He said he used that telephone because he thought it would be quicker. After that he went back to the locomotive of 6V86 and from the offside of the train spoke to the secondman, who seemed perfectly normal and replied immediately. He called to the station supervisor to get the ambulance and fire brigade and then, having asked where the guard of the train was, he went to the rear cab where he decided there was nothing he could do. He then went further back to Signal B 80, saw that it was displaying a red aspect, put his detonators down, and stayed there until he was relieved. He said that at no time did he obtain the release for the ground frame key or get the key out of the lock. He was certain that Signal B 618 had displayed white lights on the arrival of his train. He told me that he had not been able to walk the length of his train at Bristol and see whether there was a tail lamp there nor was he required to do so. He had not removed the tail lamp at any stage from his train.

11. Evidence was also given by the train's original guard that a filled and lit tail lamp had been placed on the rearmost bracket of the train at the start of its journey.

As to the signalling of the trains

12. *Supervisor W. R. Simmons* told me that he was the Bristol panel supervisor at the time of the accident and had been doing this job for approximately 4½ years. At about 05.00 he had been asked by the control office the location of 6V35, and was told by the signalman who was working the West of England section of the panel that it had arrived at Bridgwater and was waiting for the foreman to take the release of the ground frame. He relayed this message to the control office and had a word with them about an occupation before he walked across to the West of England section of the panel where his attention was drawn to the track circuits in relation to Signal B 80. He saw the approach track circuit YP occupied for about 4 to 5 seconds before it cleared and noticed that YQ, the overlap track circuit to this signal, was showing occupied. Track circuit YR was occupied by 6V35, standing at Signal B 618. He said that when he first went across, the indication for Signal B 80 was red and that the switch for this signal was in the 'On' or 'Normal' position Signals B 618 and B 82 were showing clear aspects and the operating switch for B 618 was in the 'Normal' position. Within seconds, or at most half a minute after seeing track circuit YP cleared, he noticed that a track circuit for the Up line, UM150, and that in advance of Signal B 618, track circuit YS, also became occupied. Almost immediately at about 05.06 the ground frame telephone from Bridgwater rang, the signalman answered and the shunter reported that there had been a collision which had pushed 6V35 forward past Signal B 618 by approximately 10 to 12 vehicles.

13. He told me that he had noted the train descriptions when he first went over to the panel and also later on. At Signal B 80 the description was 6V86 and that description remained in that berth; in the berth of Signal B 82 the description was 6V35. He said that he had no knowledge of any irregularities or failures of the signalling at Bridgwater except 'right-side' failures, e.g. when the detection on the points got out of adjustment putting the signals back to Danger. There had also been electronics failures but these were always

safe ones. He said that the correct procedure for a train stopping to go into the yard at Bridgwater would be for it to proceed under the authority of the subsidiary signal from Signal B 80 to Signal B 618. He pointed out that the signalman had routed 6V35 using Signals B 80 and B 82 on automatic working which was not a correct procedure although it was not unsafe. Apart from cancelling this route there were no other cancellations of routes in connection with either train.

14. *Signalman G. Bee* told me that he had been a relief signalman in the Bristol Signal Box for just over 2 years. He had left Signals B 80 and B 82 operating automatically as 6V35 approached as this was a practice which had grown up and he relied on the driver of a train requiring to shunt at Bridgwater knowing where to stop. 6V86 followed 6V35 all the way from Bristol. While he was waiting for the driver of 6V35 to call in, he had replaced the switch for Signal B 80, which was indicated as a red aspect, to the normal position. At about 05.04 either the driver or the guard of 6V35 phoned and said he was waiting for the release for the ground frame to cross to the Up line. At this time the supervisor was standing near him. He told the guard that he would give him the release and almost immediately he noticed that the track circuit in rear of Signal B 80, where 6V86 should have been standing, was clear and that the overlap was occupied, with the train description 6V86 remaining in the berth at Signal B 80. He therefore assumed that Signal B 80 had been passed at Danger. There was then a further telephone call from the same person who said "hold everything, something has happened at the rear of the train" and he noticed that the track circuits on the Up line had become occupied. A third telephone call told him of the collision and he then took the necessary emergency steps to warn the signalman at Cogload Junction Signal Box.

15. He said that he had cancelled the route to Signal B 82 and beyond by operating the switch for Signal B 618 and then replacing it to normal when the first person called in and that he thought it was very soon afterwards that he was told of the collision. He thought there had been two trains running on the Up line at that time but he could not remember exactly where they were. After replacing the switch of Signal B 80 to normal he looked at the indication on the panel and saw that it was red. When he replaced the switch of Signal B 618 that signal was showing a proceed aspect. He explained that he had been at the Bridgwater portion of the panel because he had been attempting to contact the shunter there to warn him of the approach of the train, consequently he was able to operate the switch for Signal B 80 directly 6V35 had passed the signal and replaced it to Danger.

16. *Senior Railman S. J. Cattle* was the supervisor at Bridgwater on the night of the accident. His job included issuing and collecting tickets, seeing to parcels traffic, and looking after trains that had to shunt at Bridgwater where he had been for about 20 years. He said that he was in the staff room when the guard of 6V35 came in and that he went straight out with the guard to the ground frame at the end of the platform; he thought it was about 05.02 when they arrived at the ground frame. The guard had just rung the panel, asked for the release to obtain a key, and got the message "you will have to hang on a minute or so" when within the next few seconds the collision occurred. He rang the panel from the ground frame telephone and told them that there had been a collision and then went down to the trains. On the way across the driver called out "someone's run into the back of us" and so, while the driver went to the front and the guard to the rear for protection, he went to the locomotive of the Derby train. He said he spoke to the driver and secondman who told him that they couldn't get out so he ran back to the booking office and alerted the emergency services. He then directed them to the accident after telling control what he had done. He told me that he had definitely not seen a tail lamp from the first train.

As to the running of 6V86

17. The drivers who drove 6V86 from Bescot to Gloucester and on to Bristol told me that the train handled normally throughout the journey. A brake continuity test was carried out at Bescot and although four wagons were added at Gloucester without a further brake test, the use of the brake during running showed it to be operating correctly.

18. The driver of 6V86 from Bristol on the night of the accident was *Driver A. J. Underhill.* He told me that he had been a driver for 14 years, and that for the last 9 years he had worked between Bristol, Exeter and Newton Abbott as well as on other routes. On 22nd October, as on the 21st, he began duty at 22.49 and worked the 23.12 Postal from Exeter to Bristol Temple Meads. He was relieved at Bristol at 00.55, went to the Bath Road Depot, and reported to the supervisor. He then went to the mess room to await the arrival of the Derby to Exeter train (6V86). He spent about 3 hours there but was unable to rest very much because of men coming and going and the bright lights. He talked to some of the other men there and left at approximately 04.15 to join his train which departed at about 04.18. He did not have to make a brake test when he took over the train and he had green signals all the way, experiencing no difficulty sighting any of the signals.

19. He told me that he drove with both feet on the DSD pedal and one hand by the brake; he kept his other hand clear of the power controller unless he wanted to change its position which he thought he had done once or perhaps twice between Uphill Junction and the scene of the accident. He did not use the brake at all but maintained a speed of 45 mile/h by the use of the power controller.

20. I asked Driver Underhill to recall as many details of the landmarks and signalling as he was able to remember from Highbridge towards Bridgwater. He was not sure of the signal numbers before reaching Signal DM 147 but recollected that on a clear night it was possible to see two, and sometimes three, consecutive signals at the same time. He remembered seeing the bungalows on the right-hand side before passing through Highbridge station and recalled the Stop signal for the siding at Highbridge although it did not apply to his train this night. He could not remember passing any trains going in the opposite direction during his journey

because he had done it so many times. He was certain that on the night of the accident Signal DM 147 was green and he had felt confident that Signal DM 149 was green. He remembered closing the power controller on seeing Signal DM 149 because the train seemed to be increasing speed but he could not recollect reapplying power although he could have done so. He did not remember seeing the yellow lights on the right-hand side over the road leading into Bridgwater which he thought were about half way between Signals DM 149 and B 80. Nor could he remember seeing Signal B 80 that night although he was sure at the time that Signal DM 149 was displaying a green aspect and this meant to him that he was right away through Bridgwater. The next thing he remembered was regaining consciousness after the collision, seeing a pile of fertiliser bags in front of him, and trying to fathom out where he was. He said it was dark and he remembered speaking to a man although he did not know where he was and could not see him.

21. He then described to me the duties that he had been doing during the week before that in which the accident occurred. On Monday 14th October he began work at 10.50; on the Tuesday at 12.38; on Wednesday 10.55; on Friday 06.47 and on the Saturday at 07.10, each of these duties lasting approximately 8 hours, on Thursday he had taken a rest day. He said that he had a good nights sleep on the Saturday. On Sunday 20th October he started at 21.40 and drove a train to Bristol returning early on the Monday morning with the 01.30 freight train from Bristol East Depot to Exeter. He told me that on the Monday morning after the night duty he did not sleep well because there was a pneumatic drill in use outside his house, but on the Tuesday morning he had slept well before booking on for the duty which ended in the accident. He did not take any alcohol on the Tuesday nor was he under any treatment from his local doctor. He said that he was always tired when he was on night duty and agreed that he could have lost concentration after passing Signal DM 147.

22. Driver Underhill told me that conditions in the cab of the locomotive were comfortable with the side and front heaters on. He remembered saying to the secondman that he did not want the back ones on because it would make the cab too hot. He said they were draughty locomotives but on this particular occasion the heaters overcame the draughts, and there were no windows open. When he and his secondman joined the locomotive at Bristol they discussed the trouble that they had had the previous morning caused by a locomotive failure in front of them beyond Taunton when they were late getting home. He told me that running in the down direction between Bristol and Taunton over the past three or four weeks nothing untoward or different from normal routine had happened. There had been no temporary restrictions of speed and he could not remember seeing yellow aspects because a preceding train was close to him. He said that he did not know that the train in front of him was going to be shunted at Bridgwater and even if he had it would not have affected the way in which he drove the train, he would expect the signals to indicate to him any information needed to control his train.

23. He commented that between Uphill and Cogload driving was easier than in other parts because the track was straight and level and it was possible to see the signals for a long way. He did not think that the lack of landmarks caused him any difficulty because the line was straight. Fog or mist sometimes made driving difficult but there was not even any ground mist on the night of the accident. When the locomotive and the track were fitted with compatible AWS he found that it was of very great help to him.

24. *Secondman R. Sellick* told me that he was in good health, was based at Exeter, and was passed as a driver in November 1960. On 22nd October he booked on at 22.49 with Driver Underhill and they worked the Postal train from Exeter to Bristol. He was driving the train under the supervision of Driver Underhill because he had not signed for the route. When they got to Bristol they went to the messroom at Bath Road Depot with the guard to have a meal break. They spent about 3 hours in the mess room and during that time they talked and tried to rest but got rather bored. All 3 men stayed together all the time. Eventually, when the foreman told them that their train had arrived they went down to relieve the other crew. He said that they decided to have just two heaters on and that when the signal cleared, the driver proceeded on the journey and, so far as he could recollect, they were running on green signals. He thought that they were running at about the normal speed for that type of train as they passed through Uphill, but he could not be precise as he was not watching the speedometer. He said that somewhere near where the old Uphill Signal Box used to be, which he thought was probably about half an hour out of Bristol, he noticed that it was very draughty and on turning his head he saw the cab door on his side was open although he didn't know where it had opened. He managed to turn round and slam it shut without getting up.

25. He could not recall anything more about signals and track after shutting the door and the next thing that he could recollect was seeing bags of something right in front of his eyes. He did not remember the crash and did not remember hearing anything. He said that the protection of the train never entered his head. He was obviously confused about what happened immediately after the accident and thought that he and the driver had gone back to see that the guard was all right. He remembered asking Driver Underhill "whatever is it" and getting the reply "well it seems like a bridge has come down and we have gone into it". He said that before the collision the cab and engine room lights were off and he had not noticed any fumes in the cab.

26. He told me that on the Monday night Driver Underhill had driven the Postal up from Exeter to Bristol while he had driven the freight train back. They had been late back at Exeter on the Tuesday morning and he thought he went to bed at about 10.00 and got up at about 16.30 but said that he never had a good sleep when he was working night duties. He said that he did not get much of a rest in the Bath Road mess room because although they were there for a long time, the lights were on and it was rather noisy. He thought it was possible that he had fallen asleep after closing the cab door but he could not be sure whether he did or not.

27. *Traincrew Supervisor T. R. Ball* told me that he was the Senior Movements Supervisor at the Bristol Bath Road Depot and had been there since 1963. He remembered seeing the crew that was to take over the Derby to Exeter train when they reported to him on the night of the accident. He only saw them for a very short period but they appeared to be normal and fit for duty.

28. *Relief Signalman R. C. Jenkins* said that he was stationed at Taunton and on the morning of 23rd October he was working in Cogload Junction Signal Box. 6V35 was described to him at about 04.50 and the next thing that happened was that he received the "Obstruction Danger" bell signal from Bristol. He did not receive the description 6V86 at all on that morning.

As to the tests carried out on the signalling after the accident

29. *Technician M. L. Price* told me that he was a Senior Technician at Weston-super-Mare and was stationed there when the signalling to Cogload Junction was commissioned. On the morning of the accident he was called out from home by the Bristol signal technicians. He went straight to the relay room at Bridgwater and did not see the aspects of any signals on his way there. He held the key to the relay room and when he arrived there were no signs of the door having been forced or of any unauthorised person having been in the relay room. At the request of the Bristol technicians he disconnected the relays of the appropriate signals to provide protection and made a record of which relays were energised and which were de-energised. He could not recollect having tested any of the track circuits YR, YQ or YP recently before the collision. After making the disconnections he walked up to the site of the accident and found that there was no physical damage to any signalling equipment.

30. *Electronics and Testing Assistant M. F. Wilkins* told me that he was asked to go to the site of the collision and to arrange for the examination and testing of the signalling equipment associated with Signals B 80, DM 149 and track circuits YR and YQ. When he arrived some relays had already been disconnected. He supervised the inspection of the relays, their associated plug-boards and connectors, and the testing of the circuits controlling Signals DM 149 and B 80 together with the testing of the 48 core cable which connects the line-side signalling equipment to the relay room and the cable leading to the signal heads. The tests involved a visual examination of each relay and its plug-board together with the circuits, comparing them with the wiring circuit diagrams. The particular circuits inside the relay room and the cable outside were tested to make sure that they were free from earth or other faults. Wire counts were taken to ensure that the right number of wires were going to a particular relay contact. He found that relays which had not been removed, in particular relays repeating the track circuit relay positions of track circuits YR, YQ and YX and those controlling the Danger aspects of both main and subsidiary signals for B 80 and B 618 were correctly indicating the site conditions which existed directly after the accident. He said that he actually saw these relays in position on arrival at the site. He found that the cables and wiring used in the circuits was free from contact with any other circuits and that the insulation was good. He finally removed a number of relays for further examination under laboratory conditions. These examinations proved satisfactory and the on-site tests carried out on the circuits controlled by the removed relays were faultless.

31. He then described to me the conditions that are necessary for a train description to be stepped forward from signal berth to signal berth on the Bristol panel or from Bristol to Cogload. For a description to pass to the next signal the track circuit immediately in advance of a signal must be occupied and the relay controlling the Danger aspect of that signal must be energised, so that the signal shows a proceed aspect. The transmission from Bristol to Cogload is automatic and initiated by information from Bridgwater; as a train passes Signal B 80 exhibiting a proceed aspect, the occupation of track circuit YQ causes the train description to be transmitted from Bristol to Cogload over a separate circuit. At Cogload it is displayed as 'first train approaching' unless a preceding train description occupies that berth; the description is also transmitted to the berth of the next signal on the Bristol panel which is B 82. He also described the method whereby the description of a 'second train approaching' could have been cancelled from the Cogload display should it have been transmitted there. This would have been a complicated procedure requiring the cooperation of the signalmen at both Bristol and Cogload. He had not checked the circuits which transmitted train descriptions between Bristol and Cogload but he had not been advised of any faults and to his knowledge the system was working satisfactorily. By noting the indications on the panel in Bristol, the state of the track, and the position of the relays in the Bridgwater relay room during the test, he had confirmed that the TDM system which transmitted non-vital controls and indications between Bristol and Bridgwater and *vice versa*, was in order.

32. He told me that after the testing he had decided upon 10 possible sequences by which the two trains concerned could have been signalled. He carried out a simulation of each of these 10 sequences using the restored track, different relays in the relay room at Bridgwater replacing those that had been sent for examination, and the original wiring. He described these tests to me and the manner in which they had been carried out, with people on the ground to shunt track circuits, with observers on the ground to report signal aspects and in the relay room to note the relay positions when the panel in Bristol Signal Box was operated. During the simulations Signals B 80 and DM 149 did not display any irregular aspects and during an aspect sequence test they displayed the correct aspect sequences. During the tests he proved that irrespective of how Signal B 618 was operated, a train standing at B 618 would still hold Signal B 80 at red and DM 149 at yellow. He confirmed to me that there was no evidence of false feeds from the 110 volt or 50 volt supplies either in the relay room or to any of the wiring. He said that the only way in which Signals B 80 and DM 149 could have been made to show green aspects under the circumstances would have been if there had been a double earth fault with an extraneous feed directly into the control of the signal; any other fault would have resulted

in two aspects being illuminated at the same time. The tests carried out showed that this possibility could be excluded.

33. *Mr V. W. Matthews, Signal and Telecommunications Department Supervisor,* told me that he was responsible as maintenance supervisor for the area controlled through the Bristol panel, including works projects. When he was called out on 23rd October he went to the Bristol panel and saw that Signal B 80 was displaying a red aspect and that track circuits ahead of that signal were showing occupied. He did not notice the train descriptions then but later observed that 6V35 was in the berth display of Signal B 82 and 6V86 was still in the berth display of Signal B 80. He told me he had been involved with the installation since March 1972. He said that the only failures at Bridgwater, since commissioning, had been to safety when detection in a route had failed due to vibration and a signal had flicked back to red. So far as the transmission of indications on the TDM system to Bristol was concerned, that had been satisfactory. He told me that track circuits YQ and YP were undamaged after the collision whereas some track of that forming track circuit YR was damaged and had to be replaced. Test figures for track circuits YQ and YP obtained after the accident were all within specification. After the damaged track had been replaced track circuit YR was reconnected without any adjustments being made and on testing, the shunt values were found to be correct.

34. When I asked *Mr W. H. Whitehouse, Signal Engineer Western Region* if he was satisfied that the tests that had been carried out were adequate and that there was nothing at fault with the signalling system, he replied that the laid-down procedure had been carried out and he was satisfied that the signalling was in order.

35. *Traction Inspector, G. Taylor* told me that he had been at Bristol for 8 years and that on the night of 23rd October at about 22.30, using a locomotive, he carried out signal sighting tests from Signal DM 147 through to Signal B 80. From Signal DM 147 it was possible to see DM 149 showing a yellow aspect. To the left of the signal could be seen a slightly greenish light which from his experience he could tell was a street lamp, DM 149 was quite plain the whole of the time. Before reaching DM 149 it was possible to see the red aspect of Signal B 80, again there was a greenish light to the left of it visible after passing DM 149. Neither of the two lights interfered with the sighting of the signals. He described the signalling between DM 147 and B 80 as being on straight track with all the signals clearly visible and some signals coming into view before reaching the preceding signal; however, the intensity of the light indicated which signal was which. He said that he did not think the street lamps were a hazard to a driver in sighting his signals at any time of the night or early morning; they were much less in intensity and a driver should know that they were street lights.

As to the tests carried out on 6V86

36. *Inspector H. L. Richards, Divisional Carriage and Wagon Inspector* told me that when he tested the brakes on the undamaged vehicles marshalled 16th to the rear they were all operating efficiently, the vacuum pipes were all correctly coupled up, and the couplings between the wagons were correctly made. He had endeavoured to see every component part of the derailed and badly damaged vehicles and had not yet found any which showed wear and tear defects. He could find no evidence of the brakes having been applied to the first 15 wagons, nor were there any burn marks or scale marks on any of the wheels. From the nature of the train formation and the position of the vehicles, he thought that the speed of the train would have been in the region of 40 to 50 mile/h at the moment of impact.

37. *Mr L. Olver, Depot Maintenance Engineer,* told me that when he was able to climb into the cab of locomotive No. 125 to inspect the controls he found that it was not possible to sit normally at the driver's desk in the leading cab, which was No. 2 end, because of the damage. He found the power controller in the 'Off' position, the straight airbrake in the 'On' position, the vacuum brake in the 'Running' position, the AWS was in use and the AWS isolating switch was in the 'On' position and sealed. The cab lights were 'Off'. He later established that the 'Passenger/Goods' switch was in the 'Goods' position which was the correct position when operating a Class 6 train. The locomotive is fitted with a separate airbrake operating the locomotive brakes only, whilst the vacuum brake operates both the locomotive brakes and the train brakes. He said that this locomotive was fitted with BRAWS, with a DSD pedal, but not with a Vigilance Device. Because of the damage to the DSD it was not possible to carry out a functional test after the incident, however there was no evidence that the operating mechanism was defective. The bulkhead door between the cab and the engine room was open and could not be closed. He thought that it might have swung open and been damaged on impact so that he had been unable to check whether the seal between the door and the frame was adequate, however the ventilators in the cab roof were in order and clear of any obstruction. He said that at no time during his inspection had he seen any trace of the tail lamp of 6V35.

38. He told me that a further inspection of the locomotive at Bath Road Depot revealed that the electrical control equipment was in the first stage of field weakening which meant that the power controller must have been in the 'On' position on impact. The first stage normally functions at speeds of 45 to 48 mile/h and this gave some indication of the speed the locomotive was travelling at the time of impact. If the controller had been physically closed a sufficient time (more than about 6 seconds) before the collision, then the field divert would not have been in. He was consequently convinced that power was being applied at the time of the collision and said it would have been impossible for the impact to have put the electrical control equipment into the condition in which he found it.

39. A full brake test was carried out and the brake cylinders, of which there are 24 on this locomotive, were found in order with the exception of one cylinder. The speedometer was tested and found to be in good order, although the front cab speedometer was reading high because the circuit to the two balanced instruments had been interrupted in the rear cab due to the collision. When he inspected the locomotive at the site

of the collision the brakeblocks were hard on the wheels but, as he pointed out, it was not possible to tell whether this was as a result of a brake application being made or because the train pipe had been disrupted in the collision. The evidence on the driver's desk from the controls was that a full application had been made on the locomotive, however the power controller and airbrake handles might well have been put to the positions in which they were found by the impact and as a result of his later inspection he was of the opinion that there had been no brake application before the collision took place. He said that he would assess locomotive No. 125 as being in a good state of maintenance prior to the accident.

As to Additional Tests

40. To confirm the technical deductions made from finding the power contacts in the first stage of field weakening which would require the power controller to be 3/8 open or more, a test run was made between Bristol and Taunton on 30th October 1975 with the same type of locomotive, approximately the same load, and with a clear run at a speed limit of 45 mile/h. During the run the power controller was moved between 1/4 and 5/8 open to maintain 45 mile/h and the field divert varied from full field to the fourth stage of field weakening. Approaching Bridgwater at 45 mile/h the power controller was 1/4 open with full field conditions. The test train's journey time to passing the point of collision was 47½ minutes compared with an estimated time of 6V86 on the day of the accident of 46 minutes.

41. A further test was carried out on 30 October 1975 to check the signal aspects and panel indications displayed when trains were signalled and run in the same manner as on the night of the accident. An empty coaching stock train approximately the same length as 6V35 was signalled and ran up to Signal B 618 showing a proceed aspect and this train was followed by a light locomotive. The signal aspects seen from the light locomotive were

DM 147	Green
DM 149	Yellow—visible from DM 147
B 80	Red—visible before reaching DM 149.

The route switch for Signal B 618 was then operated and cancelled and permission was given for the light locomotive to pass Signal B 80 at Danger and to proceed to the rear of the empty stock train, the tail lamp of which became visible about 413 yards away and before passing under the A39 road bridge. Contact with Bristol Signal Box confirmed that the indications were correctly representing the situation on the ground and observers at Signals DM 149 and B 80 reported that aspect sequences were correct during the passage of both trains and were unaffected by the normalisation of the route switch for Signal B 618.

Discussion

42. The very thorough testing carried out after the accident failed to give any proof that the signalling was operating other than correctly before the collision. Driver Underhill's recollection of the signals and land marks nearing Bridgwater on the morning of the accident was incomplete although it is possible that the accident had driven it from his mind. Power was being applied to the locomotive up to the collision and the results of the test run indicate that the speed of 6V86 may have been in excess of 45 mile/h and increasing at the time of the impact. The omission of a brake test at Gloucester and the irregular manner in which Signalman Bee signalled 6V35 had no bearing on the accident and although it could not be found after the accident, there is nothing to show that 6V35 was not carrying a tail lamp.

43. At 45 mile/h Signal DM 149 would have first come into the driver's sight 5½ minutes before reaching it. After passing Signal DM 149 the train would then have travelled for a further 2 minutes with Signal B 80 in full view before that signal was passed. If Driver Underhill and his secondman had been keeping even a cursory lookout during the 7½ minutes before passing Signal B 80 they must have seen the restrictive signal aspects ahead.

Conclusion

44. I am satisfied that the signalling equipment at Bridgwater was properly designed and operating correctly before the accident and that, in consequence, because of the presence of 6V35 at Bridgwater, Signal DM 149 was exhibiting a single yellow aspect and Signal B 80 a red aspect as 6V86 approached. I therefore conclude that 6V86 was driven past Signal B 80 at Danger and into collision with the rear of 6V35.

45. The sole responsibility for the collision must rest with Driver Underhill. The DSD, the AWS and the secondman are all aids to the driver but the failure or absence of any or all of them does not relieve him of his responsibility.

46. I have little doubt that both Driver Underhill and Secondman Sellick were asleep before Signal DM 149 came into view and the secondman must also bear some blame for failing in his responsibility under Rule H 3.5.4. which states:

"The Secondman, when not otherwise necessarily engaged, must assist the driver in the observance of signals and keep a good lookout."

Remarks and Recommendations

47. Although the provision of safety devices such as AWS and the DSD in no way relieve the driver of his responsibility for staying awake and alert, the accident would almost certainly have been averted had the AWS on the locomotive and the WRAWS on the track been compatible, since if the driver had

failed to react to a warning horn on approaching Signal DM 149 an automatic brake application would have followed. The DSD on this Class of locomotive has been criticised before (Report on the Collision that occurred on 6th December 1963 at Stanton Gate) and having sat in the drivers seat of a locomotive of this Class I found that no effort was required to keep the pedal depressed. If Driver Underhill had drowsed off, I think it unlikely that the device would have applied the brakes.

48. Shortly after the accident the WRAWS between Bristol and Cogload was replaced, as planned, by BRAWS as part of the programmed re-equipment which is due for completion by the end of 1976. There is a complementary programme to convert WRAWS fitted locomotives and multiple units to BRAWS which is due to be completed by early 1976. At 31st December 1974 there were 291 route miles equipped with WRAWS still to be converted and 6 locomotives and 54 multiple-unit cabs still fitted with only WRAWS. The work is being pressed ahead and is running to time. Likewise the fitting of BRAWS to lines that previously had no form of AWS is proceeding in accordance with the policy of the Railways Board.

49. The position with regard to improvements to the DSD is different. Modifications requiring the continuous expenditure of a greater effort to keep the equipment 'on' were rejected and a Vigilance Device has been developed, as mentioned in previous reports (Report on the Collision that occurred on 27th July 1963 between Picton and Welbury and Report on the Collision that occurred on 5th March 1964 at Itchingfield Junction), which requires positive action at frequent intervals by the driver. It has been decided that this will be fitted to new locomotives but not retrospectively to the whole fleet. The two major factors behind this decision are that accidents caused by drivers becoming incapacitated are very few and that the advantages to be gained from the fitting of AWS to an increased route mileage outweigh those to be gained from the fitting of the Vigilance Device. Consequently consideration is being given to the equipping of additional routes with AWS which would formerly not have been included in the original AWS programme. Accordingly I recommend that the provision of BRAWS for the reasons given in the preceding paragraphs should be energetically pursued.

I have the honour to be,

Sir,

Your obedient Servant,

A. G. B. KING,
Major

The Permanent Secretary,
Department of the Environment.

NOTE: Driver A. J. Underhill was charged with unlawful killing and there were hearings at Bridgwater Magistrates' Court on 24th March 1975 and 28th April 1975. At the second of these the case was dismissed as "no case to answer".

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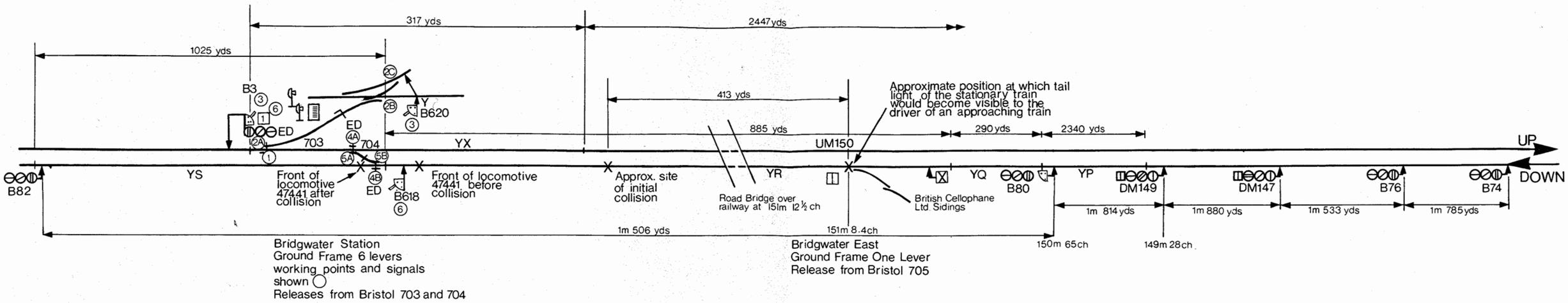
COLLISION BETWEEN TWO FREIGHT TRAINS AT BRIDGWATER ON 23rd OCTOBER 1974

LAYOUT AND SIGNAL POSITIONS



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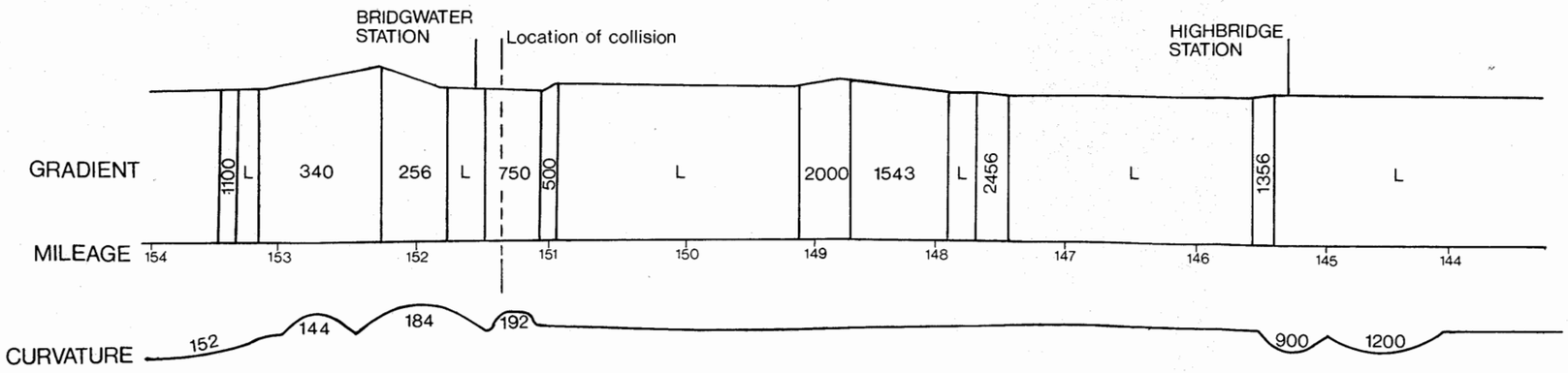

LOCATION DIAGRAM