DEPARTMENT OF TRANSPORT

RAILWAY ACCIDENT

Report on the Derailment that occurred on 6th November 1976 at Hither Green

IN THE
SOUTHERN REGION
BRITISH RAILWAYS

LONDON: HER MAJESTY'S STATIONERY OFFICE

40p net

HITHER GREEN

ROUTE	EXIT	REQUIRES			
		TRACK CIRCUITS	POINTS : NORMAL (N)	(N)or(R)	(R)
304 (M) A	298 (M)	JL JM JN JO [JK W 918]	895 896 902 903 [897W 300(M) 302(M) or 304 (M) B used]		
308	304	JJ JK JL [DH W 903]	918 919 (902 W 903) (903 W 300 (M)) 300 (W) 302(M) 302(W)or 1299 A USED	903	902 W 903

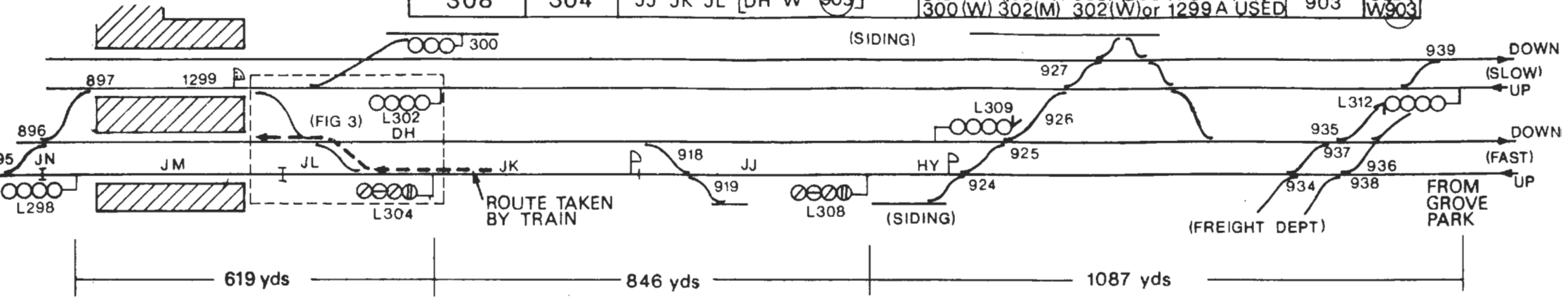


FIG 2
(not to scale)

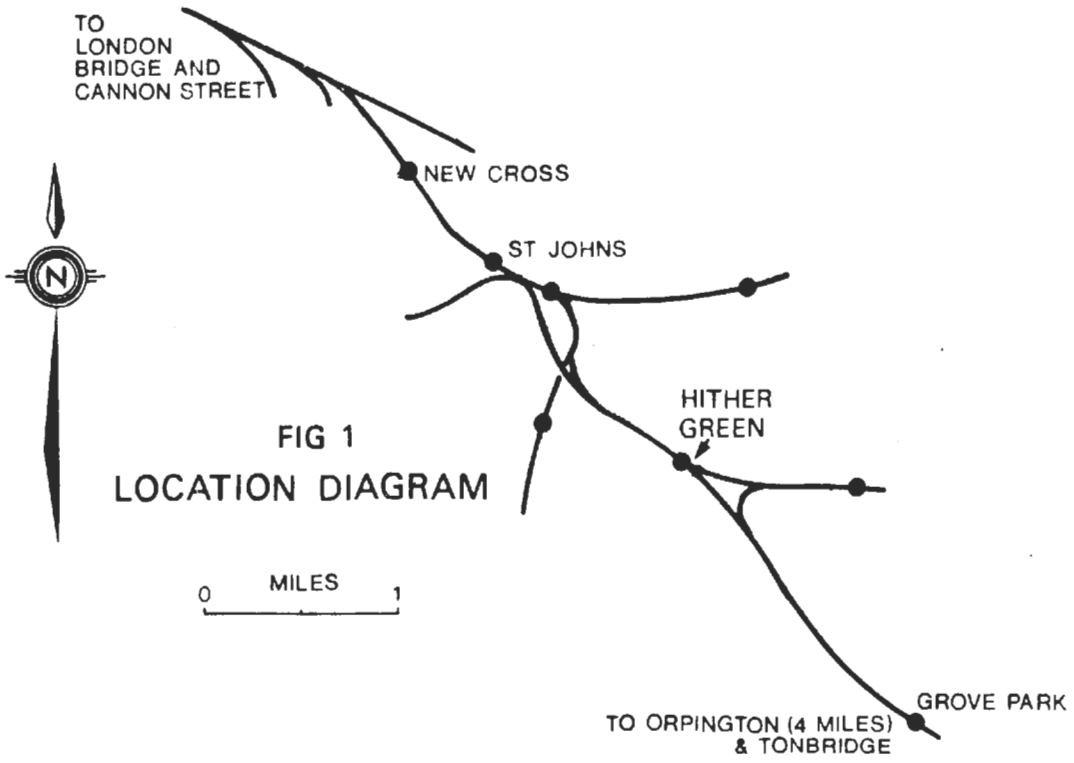
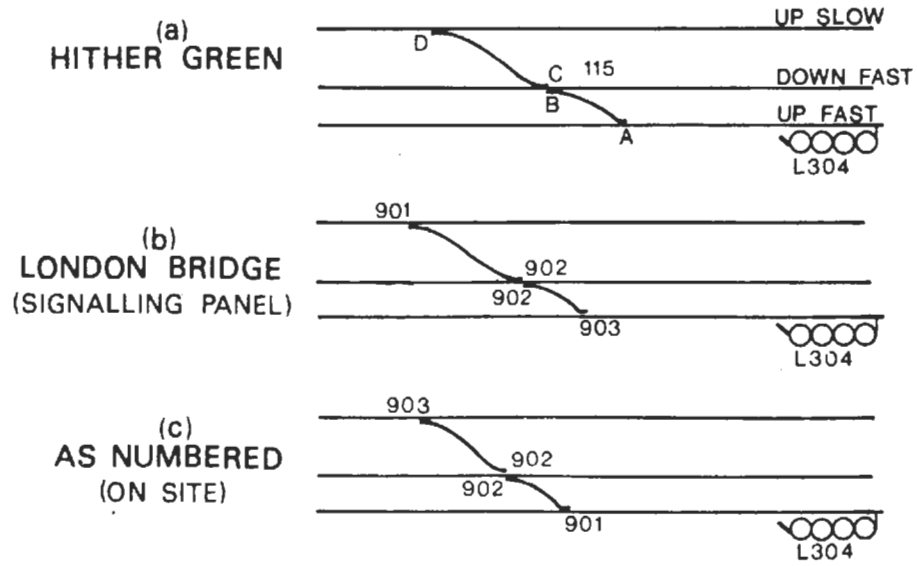


FIG 1
LOCATION DIAGRAM



NUMBERING OF POINT ENDS
[(b) & (c) SET AS AT TIME OF ACCIDENT]
FIG 3
(not to scale)

RAILWAY INSPECTORATE,
DEPARTMENT OF TRANSPORT,
2 MARSHAM STREET,
LONDON SW1.
5th August 1977.

SIR,

I have the honour to report for the information of the Secretary of State, in accordance with the Order dated 24th November 1976, the results of my Inquiry into the derailment of a passenger train that occurred at 19.15 on Saturday 6th November at Hither Green on the South Eastern Main line in the Southern Region of British Railways.

As 2W94, the 17.12 Margate to Charing Cross passenger train was approaching Hither Green on the Up Fast line, the driver observed two signals ahead of him revert from green to red aspects. On telephoning the signalman he was instructed to pass them at Danger and to proceed at Caution. He had just passed the second signal at Danger and was travelling at about 25 mile/h when his train was diverted at a facing connection, becoming derailed at switch diamonds in the adjacent Down Fast line, up which his train travelled until it came to rest some 20 yards short of the Down Fast platform of Hither Green Station. There were no casualties.

Control of the signalling in the Hither Green area had only just been transferred to the new London Bridge Signal Box and trains were being signalled by a member of the Signal Engineer's department under the supervision of an Inspector of the Traffic Department, while final testing was being completed.

The derailment occurred because an error in the electrical connections to the points had remained undetected in spite of very thorough testing. The error had no connection with the temporary fault that had caused the two signals to revert to Danger.

It was dark and the weather was dry and clear.

DESCRIPTION

The Site and Signalling

1. Hither Green lies 7¼ miles from Charing Cross on the South Eastern Division Main line to Dover via Tonbridge. Approaching Hither Green from the south the Up and Down Fast lines lie to the west of the Up and Down Slow lines as shown in figure 2 at the front of this report. The lines are electrified on the 3rd rail system at 750 V DC. The line is worked on the track-circuit block system and four-aspect colour light signals are provided. Prior to 15.00 on 6th November, (the day of the accident) it was controlled from Hither Green Signal Box situated south of the station, east of the railway. After 15.00, control of the area was taken over by London Bridge Signal Box via a new remotely-controlled relay interlocking situated in the relay room beside Hither Green Signal Box. Movement over the facing crossover between the Up Fast and Up Slow lines, on which the derailment occurred, is controlled by Signal L304 on the Up Fast line. The previous signal L308 protects connections with a freight depot. The maximum permitted speed on the Up Fast line is 60 mile/h and the gradient is 1 in 130 falling. The signals are not equipped with the automatic warning system.

2. London Bridge Signal Box contains standard signalling panels worked on the N–X system to the latest British Railways design. The panels contain standard points switches and indicator lights which are normally set for automatic working by the setting of routes on the panel, but which enable the signalman to set the points manually, either Normal or Reverse as he is required to do in the case of a signal failure. All points, signals, and track circuits had been renumbered consecutively throughout the area of control, and the Hither Green crossover, previously numbered 115 'A' to 'D' ('A' being nearest the signal box) had been renumbered 901 to 903 (901 being nearest London Bridge Signal Box), the switch diamonds where the crossover crossed the Down Fast line being L902. The points remain as last set until required to be altered for the setting of a new route which, when called, sets the points in the route itself and also in adjacent lines only, for the purposes of flank protection. The policy of using separate numbers for the point ends was introduced so that any fault on one point end did not effect the passage of trains on lines other than on adjacent ones. Most of the signals in the Hither Green area have been provided with an 'auto facility' to enable the signalman to signal trains on through routes automatically and this applied to Signals L308 and L304.

The Train

3. The train was an 8-car electric multiple-unit consisting of two four-car units Nos 7856 Class 423 (4-VEP) leading and 7129 Class 411/2 (4-CEP) trailing. The train weighed 272 tonnes and had a braking efficiency of 84·4 per cent; this would enable it to stop from 25 mile/h in 230 feet, from 20 mile/h in 140 feet and from 10 mile/h in 60 feet. These distances take into account mechanical delay and include an allowance of 2 seconds for driver reaction. The units were not fitted for operation of the automatic warning system, and had not been fully equipped with track-circuit operating clips, a new design of which, suitable for use on third rail electrified lines, was being introduced on Southern Region.

The Course of the Derailment and Accident Damage

4. The leading car of the train ran through the trailing end of the switch diamonds and was directed onto the Down Fast line without becoming derailed, but the leading bogie of the second car became derailed at them, and was slightly damaged. The only damage to the track was that one of the stretcher bars of points L902 (formerly 115B) was bent. The front of the train came to a stand 216 feet beyond the switch diamonds.

Evidence

5. Because there was no doubt as to the cause of the derailment and there was no suggestion of any other irregularities, I restricted my inquiries, other than of the driver of the train involved, to the staff who were involved with the transfer of the control of the signalling onto the London Bridge Signal Box. The man in charge of the conversion and who was on duty in the Signal Box at the time of the accident was *Mr. R. M. Bell*, the *New Works Assistant*, and I first asked him to explain, in detail, how the transfer of the signalling was carried out, and the nature of the testing done.

6. Mr. Bell told me that most of the signalling on the London Bridge scheme was of Westinghouse 'WESTPAC 4' design, but that it had been decided to design and build a new interlocking at Hither Green compatible with the WESTPAC equipment and using the same types of relays, rather than to attempt to convert the existing interlocking. The new interlocking consisted of three main parts. Firstly there was a termination panel where the cables from London Bridge, and the vital signalling cables from the local lineside installations controlling track circuits, points and signals, terminated. Secondly, there were the racks of individual relays forming the interlocking itself, wired on the rack rather than as pre-assembled sets for each point and signal function and thirdly there was an operating panel which would enable routes to be set from the relay room in an emergency and testing to be carried out on the new interlocking.

7. The new interlocking was designed in the Southern Region drawing office at Croydon where the planning of the change-over was decided. The new termination panel was erected on the site of the old one which was moved to one side to make place for it, the two being connected while the area was still under the control of Hither Green Signal Box. The new racks of relays were erected between the old ones which made the room cramped although it was still possible to work on both sets of relays. Finally the operating panel was installed at one end of the relay room.

8. Mr. Bell explained that this work had taken from September 1974 to July 1976, and that each stage had been thoroughly tested as it was completed, testing continuing until September 1976. The final change-over of control was carried out during the week-end of 6/7th November when the derailment occurred, but in the preceding few weeks individual points and signals had been temporarily connected to the new interlocking while under 'Engineer's Possession' for testing, and then reconnected to the old interlocking, so that everything had been fully tested prior to the change-over. By this time the new points and signal numbers of the London Bridge scheme had been brought into use within the lineside locations and a list showing the old and new numbers, termed a Conversion Chart, which had been available for a considerable period, had been placed in each location.

9. The procedure for the testing of points from the signal box, and in this case from the panel in the Hither Green relay room, is at Appendix A. Mr. Bell assured me that it had been assiduously followed. The technician on the ground had used the new points numbers actually marked at the points machines in conjunction with the Conversion Chart of old and new numbers, this list being far more convenient to carry than the much larger signalling plans.

10. On 6th November, which was the day of the derailment, Mr. Bell was in charge of three groups of technicians who were carrying out the change-over from the old to the new interlocking on the transfer of the control of the signalling from Hither Green to the new London Bridge Signal Box. He was personally supervising from the signal box, one group which was working in the Hither Green area where the derailment occurred. He was operating the section of the London Bridge panel affected by the work and he was being watched by an Operating Inspector. His own assistant, Inspector Barnes, was in the Hither Green relay room and his technicians were working at the lineside locations. While the change-over was being made on the Fast lines, trains were being run over the Slow lines and vice-versa. After the change-over the signals were restricted to showing only red or single yellow aspects by the use of 'Temporary Approach Controls' and this was in force until the full 'Aspect Sequence' testing had been completed.

11. Mr. Bell told me that they had begun work at 08.00 on 6th and by 15.00 the change-over had been completed and Hither Green Signal Box finally closed, and the signalling in the Hither Green area had been fully tested from London Bridge. During this time the routes were set for straight running only and the signals were restricted in displaying single-yellow aspects and set to work automatically. By 18.00 his area had been fully tested, including the testing of the aspect sequences by men on the ground and he permitted trains to run on the Fast lines on which the 'Temporary Approach Controls' were removed.

12. He told me that another of his groups working in the Grove Park area was not so well advanced. A fault had occurred in the setting of the route from Signal L309 on the Down Fast line which prevented that signal from displaying a double-yellow or green aspect. He therefore decided to signal Down trains on the Slow line, and Up trains he crossed from the Up Slow to the Up Fast line at Grove Park to enable the route to be left set so that the fault could be found. At about 18.55 he set this route for a train due to stop at Hither Green, and he routed it back again onto the Up Slow line at Hither Green into Platform No. 3 where passengers were waiting.

13. Points Nos. 901, 902 and 903 at Hither Green were correctly set reversed and indicated at London Bridge as being properly detected, and Signal L304 with its Junction Indicator cleared for the passage of the train. The following train, 2W94, was not due to stop at Hither Green and he set the route for it straight up the Up Fast line and the white route lights on the panel showed that the route was correctly set; he told me that from the Aspect Sequence testing that had just been completed he assumed that the signals were displaying green aspects. As the train was approaching Signal L308 the traffic inspector pointed out that Signals L304 and L308 had both reverted to red aspects. Bell checked all the track-circuit and points indications in the routes set but there was nothing to show why this had occurred.

14. He cancelled the routes set and then reset them but still the signal would not clear. The inspector then set the independent points switches for Points 919, 918 and 903 to the Normal position, which Bell checked, and also checked that these points were indicated as being Normal (set for the Up Fast line), and he also checked that Points 902 were set Normal although he did not set its individual points switch. When the driver of the train telephoned from Signal L308, and with the inspectors agreement, he told the driver that the two signals had failed and that he was to pass these signals at Danger and obey subsequent signals. The driver told him that he had seen the two signals revert to Danger and confirmed that he understood that he was to pass them both at Danger.

15. As this train passed Signal L304 Mr. Bell saw, on the signal box diagram, the track circuits on the Down Fast line show occupied and almost immediately the indication for detection of No. 902 points lost its Normal light and started to flash 'Out of Correspondence'. There were no trains approaching on the Down Fast line, and one on the Down Slow line had just passed. While the inspector carried out the necessary protection of the lines, he telephoned Mr. Barnes who told him that Points No. 901 were lying reversed, and that these were the points in the Up Fast line. It was then clear that the controls of points Nos. 901 and 903 had been transposed on site.

16. Mr. Bell told me that the error was soon traced to the conversion chart which is reproduced at Appendix B. He had seen similar charts during other stages of the London Bridge scheme, but had not previously seen the Hither Green chart. When I asked whether he had accepted conversion charts as being authorised issues from the drawing office he replied that he, personally, had only used them as an aide-memoire but that he was now aware that some of his staff had been using them as stage work documents. The Conversion Chart had been rechecked and no other errors had been found in it.

17. The driver of 2W94 was *Driver B. R. Sumbling* who had driven on the S.E. Main line for some 15 years. He had not originally been rostered to work 2W94 but on arrival at Cannon Street, where he had earlier had a break, another driver asked him to take over the train at Orpington which he agreed to do. He drove the 18.07 Cannon Street to Orpington train which arrived on time and there took over 2W94, the 17.12 train, which left 4 minutes late.

18. His train ran behind the 18.57 service from Orpington and the signals displayed single yellow aspects as he approached Grove Park on the Up Slow line. He was diverted to the Up Fast line at Signal L312, and when he first saw Signals L308 and L304 they were at red, but they changed to green and then to red again as he was approaching L308. He made a normal brake application and telephoned the signalman from the Signal. After being told to wait while the signalman tried to reset the route he was called to the telephone and instructed to "Pass the next two signals at Danger and to obey all others". As he had already seen both signals displaying green aspects he assumed that there had been a signal failure (and not a points failure) and that it would be safe to proceed. He therefore drove his train at about 20 to 25 mile/h at which speed he agreed he could not see any points ahead of him in time to stop short of them in an emergency.

19. On passing Signal L304 at Danger he could see the next signal L298 displaying a green aspect and had just opened his controller to the 'shunt' position to increase speed when his train was diverted towards the Up Slow line. He first thought that he had been signalled that way but when he realised that his train was running on the Down Fast line he immediately shut off power and applied the brake and his train came to a stand astride the switch diamonds in the Down Fast line. He reported the fact to the signalman from the signal-post telephone at Signal L297 just ahead of him and soon afterwards he was told by a man who said that he was a Signalling Inspector that his train was fully protected front and rear.

20. I discussed Rule Section E Clause 8.1 of the British Railways Rule Book with Driver Sumbling. This rule states "When a Hand Signalman is not on duty the Driver must not pass over any facing points, switch diamonds, or swing nose crossings until he has satisfied himself that they are correctly set in position for the route over which his train is to run". Sumbling had two comments to make—firstly that the rule was not a reasonable one because in the dark there was almost no speed at which he could have driven which would have enabled him to stop in time, and in any case he had no reason to believe that the signalman had not intentionally set the route for the crossover movement. And secondly, that having seen Signals L308 and L304 displaying green aspects before reverting to Danger, he did not consider that any points' failure could have occurred.

21. The work of disconnecting the points, track circuits, and signals from the control of Hither Green Signal Box and their reconnection to control from London Bridge was the responsibility of *Resident Engineer (Signal and Telecommunications) Mr. Barnes*. He confirmed Mr. Bell's evidence of the events on the night of the derailment and described to me how he had found that Points Nos. 901 and 903 had been transposed. It was he who told Driver Sumbling that his train was fully protected by the signalling.

22. He had been closely involved in the resignalling work in the area and had known of the Conversion Chart but, he told me, that prior to the accident he had not actually seen it. After the accident one of his supervisors had given him a copy, and he believed that it had been Mr. White. *Mr. R. Peat, Chief Signal and Telecommunications Engineer, Southern Region*, asked him if, when he received documents from the drawing office, these were numbered and entered in a book and signed for, to which he replied that they were. He could not say why he had accepted a document that was not authorised by the drawing office and which did not contain a drawing office number.

23. *Mr. White, S. & T. Supervisor* described to me how he had carried out the rewiring of Points Nos. 901, 902 and 903 to various sets of drawings in late 1973 and early 1974 and how they had been tested on 11th and 12th, and 18th and 19th September 1976. He told me that a Conversion Chart had been requested from the drawing office showing the old and new numbers and that when he received copies of it he handed them to his installers for use on site. He had put them up in the various locations and in the signal box and relay room in the Hither Green area. He had been a Supervisor on New Works since 1967 and had seen similar lists when he was working in the London Bridge and North Kent East areas. He understood that the lists were primarily to assist the maintenance technicians and not for installation work; he agreed that he had not thought to check them against drawings already in his possession.

24. The Senior Technical Officer in charge of the section of the drawing office at Croydon where the Conversion Chart was produced was *Mr. D. Penford*. He had worked in the drawing office since 1972 and, prior to being asked for the list by Mr. White, he had already prepared it for his own convenience. It was originally in his own handwriting and he had merely sent it for typing and had then distributed it without having it checked. I discussed with him his actions in the light of Office General Instruction No. 96, which is reproduced at Appendix C. He agreed that he should have had the Conversion Chart checked and properly documented but had not done so.

25. Following the derailment a very thorough check was made in the relay room to discover what caused the two signals to revert to Danger. It could only have been a fault in the circuits of the overlap track circuit of Signal L304, or of the detection circuits of points Nos. 903 or 902. A loose connection was found in the latter and after tightening, no subsequent 'safe-side' signal failure had occurred.

Conclusions

26. The derailment was caused by an error in wiring brought about by a transposition of the numbers of Points Nos. 903 and 901 on the ground, while the correct points numbers were shown on the new panel in London Bridge Signal Box. The result was that Signal L304 could be cleared for the route on the Up Fast line whatever the lie of 903 points, provided 901 and 902 points were set and locked Normal.

27. The error was first made in an unofficial Conversion Chart of old and new points numbers in the Hither Green area issued by the Southern Region Signalling and Telecommunications drawing office at Croydon without any checking or authentication; it went out unstamped, unsigned, and undated, and it was wrong; for which Senior Technical Officer D. Penford must bear full responsibility. I believe that Mr. Barnes, at least, and there may have been others, knew of the list's existence, that it must have emanated from the drawing office, and that there was a likelihood of its being used for installation purposes; if this was so he should certainly have questioned why the document was unstamped and unchecked.

28. Driver Sumbling drove at a speed which he thought was safe, although he agreed that it was too fast to comply with the Rule Book to the letter. Although he said he was looking ahead his speed was such that his train was diverted onto the Down Fast line and had there been a train approaching, a most serious accident must have occurred. However, the temporary fault that maintained Signals L908 and L904 at Danger had nothing whatever to do with the most serious installation error which was the only cause of the derailment. In fact the fault, by reducing the train's speed to 20 to 25 mile/h, much reduced the seriousness of the accident, which could have involved trains travelling on both the Up and Down fast lines at 60 mile/h.

29. British Railways Rule Section E. Rule 4.9.3. covers the duties of a signalman when a signal has failed, and reads:

> "4.9.3. When authorising the Driver to pass a defective signal, the Signalman must advise him of the circumstances and instruct him to travel cautiously to the next stop signal or as far as the line is clear towards the next stop signal as the case may be".

Following an accident in which a hand signalman was killed at a colour light signal between Weybridge and Walton on Thames on 9th December 1974, authority has been given for signalmen to authorise drivers to pass two signals at Danger if the trackside clearances at the second signal are so limited that it would be dangerous for a man to act as hand-signalman at it; but this did not apply here. Mr. Bell was therefore wrong to authorise the driver to pass both signals at Danger but should have required him to stop and telephone again from Signal L304. Had he done so Driver Sumbling might have noted the reversed position of the points and questioned the fact.

30. The two steps required to prevent future errors of this nature from occurring have already been taken by British Railways. They are:

a. That the procedure laid down in Appendix A should require the man on the ground, whenever he is testing a set of points, or a signal, to state in his message to the signal box the line on which he is standing and the direction in which he is facing.

b. That the instructions laid down in Appendix C should be amended to include "all diagrams, charts and plans concerning new or altered signalling installations", and not only "working diagrams, dog charts, cable charts, track plans etc.".

31. I have discussed Section E, Clause 8.1 of the British Railways Rule Book (see paragraph 20) with the British Railways Board and I recommend that drivers on being instructed to pass signals at Danger because of signalling faults should be instructed to proceed at a speed not exceeding 10 mile/h until clear of the affected section. My reason for recommending this maximum speed is that to leave the decision to drivers is to require them to make a decision without sufficient evidence at their disposal. The diversion or derailment of a train at 10 mile/h is likely to cause much less damage than at 25 mile/h and the risk of a train running foul of a neighbouring line would be much reduced. Driver Sumbling, in his evidence, believed that it was not practicable to drive at a speed that would have enabled him to stop his train short of 903 points in an emergency, and I agree with him.

I have the honour to be,

Sir,

Your obedient Servant,

A. G. TOWNSEND-ROSE,

Lieutenant Colonel.

The Permanent Secretary,
Department of Transport.

TEST PROCEDURE ON CONVERSION SCHEMES

1. Do not say points *Normal* but *Left Hand* (*Right Hand*) *switch closed.*

2. Electrical Technician in Charge of points, when connections complete reports to signal box "Ready to test No. 1 points".

3. Supervisor in charge of testing at signal box replies:
"Await further instructions" or "Standby, the fuses will be put in".

4. When done, the signal box will observe the indication and ask:
"What is the position A (and B) ends?"

5. Technician will reply: "A end (LH) switch closed and
(RH)
B end (LH) switch closed."
(RH)

6. Signal box will then say: "Stand clear for the operation of the points" then
"What is the position now?"

7. Technician will reply: "A end (LH) switch closed and
(RH)
B end (LH) switch closed."
(RH)

8. Signal box will observe indication and then if satisfactory will say:
"Stand clear, points will be operated three times each way."

9. The points will then be operated and the detection observed. Provided all is satisfactory on site the points will be considered to be in use.

CONVERSION CHART COMPILED BY SENIOR TECHNICAL OFFICER D. PENFORD
(Single sided)

Hither Green

Signal and Point Number Conversion

Signals

Existing	New	Existing	New
1	291	56	1321
2	341	58	1319
3	343	59	1320
4	345	60	1323
5	347	61	1328
8	295	62	1330
9	299	63	1332
10	301	66	1335
12	303	70	1336
13	307	80	294
14	313	81	342
15	317	82	344
20	293	85	296
21	297	86	300
22	305	87	302
23	309	88	306
24	311	89	1324
25	315	90	312
26	319	91	316
27	321	92	322
28	1299	95	298
29	1305	96	304
30	1353	97	308
31	1354	98	314
32	1301	99	318
33	1303	100	320
34	1304	101	330
36	1310	102	324
37	1314	A510	351
38	1311	A511	352
39	1316	A512	353
40	1306	A513	354
41	1308	A514	355
42	1312	A254	349
54	1315	A253	348
55	1317	A255	350
		A261	326
		A262	331
		A263	328

Points

Existing	New	Existing	New
110	893	154	938
111	894	155	936
112A	897	156	932
112B/C	896	160A	940
112D	895	160B/C	942
113A	898	160D	944
113B	899	161A	941
114A	899	161B/C	943
114B	900	161D	945
115A	901	162	946
115B/C	902	163	947
115D	903	164	948
119	918	165	949
120	904	167	951
121	906	168	950
122	907	170A	952
123	908	171B	953
124	911		
125	909		
126	910		
127	912		
128	913		
129	914		
130	917		
131	915		
132	916		
133	919		
144	924		
145	925		
146	926		
147	928		
148	927		
149	929		
150	930		
151A	933		
151B/C	934		
151D	935		
152	937		
153	939		

General Instruction No. 96
C/37547

S. & T. E. Department—S.R.

Authorisation of Drawings, etc.

1. All previous instructions on this subject are superseded by the following which are designed to save time in the Drawing Office:

2. *Negatives* (full sized and micro film) All to have the long stamp and also the square stamp.

Drawn by			
Traced by			
Checked by			

Amendments *always* to be certified in appropriate space of stamp by initials against "drawn by" and "checked by".

3. *Alterations*

Office copies of diagrams, control tables, wiring diagrams, etc. showing alterations to signalling or telecommunications to be initialled by "preparer" and "checker" in the oval stamp or alongside the square stamp.

(The small rectangular "prepared" and "checked" stamp will no longer be used).

Wiring diagrams, dog charts, cable charts, track plans, etc.	Office copies after initialling by "preparer" and "checker" to be submitted to the Assistant Engineer responsible for the work, who will initial in the square stamp on behalf of the Chief S. and T. Engineer.

4. *Agreement Particulars*

The person responsible for checking the diagrams/control/locking table to its office copy is to initial below the oval stamp or alongside in the case of square stamp. This initial will be taken to mean that the copy is exactly as the office copy and that the latter has been properly initialled by "preparer" and "checker". Appropriate "agreement" stamp to be added.

5. *Inspectors' Particulars*

(a) Diagrams and control tables—copies for Inspectors to be dealt with as in 4 above.

(b) Wiring diagrams, dog charts, cable charts, track plans, etc.	Copies will be initialled in the square stamp on behalf of the Chief S. and T. Engineer by the person responsible for checking them with the office copy. This initial will be taken to mean that the copy is exactly as the office copy and that the latter has been properly initialled by the "operator", "checker" and Assistant Engineer.

J. F. H. TYLER,
Chief S. and T. Engineer.

Distribution

Assistants
Assistant DO (24 copies).
27*th May* 1965

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