



Rail Accident Investigation Branch

Rail Accident Report



**Near miss with two track workers at Penkridge,
Staffordshire
10 July 2022**

Report 09/2023
August 2023

This investigation was carried out in accordance with:

- the Railway Safety Directive 2004/49/EC
- the Railways and Transport Safety Act 2003
- the Railways (Accident Investigation and Reporting) Regulations 2005.

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Any enquiries about this publication should be sent to:

RAIB	Email: enquiries@raib.gov.uk
The Wharf	Telephone: 01332 253300
Stores Road	Website: www.raib.gov.uk
Derby UK	
DE21 4BA	

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Preface

The purpose of a Rail Accident Investigation Branch (RAIB) investigation is to improve railway safety by preventing future railway accidents or by mitigating their consequences. It is not the purpose of such an investigation to establish blame or liability. Accordingly, it is inappropriate that RAIB reports should be used to assign fault or blame, or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

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Where RAIB has described a factor as being linked to cause and the term is unqualified, this means that RAIB has satisfied itself that the evidence supports both the presence of the factor and its direct relevance to the causation of the accident or incident that is being investigated. However, where RAIB is less confident about the existence of a factor, or its role in the causation of the accident or incident, RAIB will qualify its findings by use of words such as 'probable' or 'possible', as appropriate. Where there is more than one potential explanation RAIB may describe one factor as being 'more' or 'less' likely than the other.

In some cases factors are described as 'underlying'. Such factors are also relevant to the causation of the accident or incident but are associated with the underlying management arrangements or organisational issues (such as working culture). Where necessary, words such as 'probable' or 'possible' can also be used to qualify 'underlying factor'.

Use of the word 'probable' means that, although it is considered highly likely that the factor applied, some small element of uncertainty remains. Use of the word 'possible' means that, although there is some evidence that supports this factor, there remains a more significant degree of uncertainty.

An 'observation' is a safety issue discovered as part of the investigation that is not considered to be causal or underlying to the accident or incident being investigated, but does deserve scrutiny because of a perceived potential for safety learning.

The above terms are intended to assist readers' interpretation of the report, and to provide suitable explanations where uncertainty remains. The report should therefore be interpreted as the view of RAIB, expressed with the sole purpose of improving railway safety.

Any information about casualties is based on figures provided to RAIB from various sources. Considerations of personal privacy may mean that not all of the actual effects of the event are recorded in the report. RAIB recognises that sudden unexpected events can have both short- and long-term consequences for the physical and/or mental health of people who were involved, both directly and indirectly, in what happened.

RAIB's investigation (including its scope, methods, conclusions and recommendations) is independent of any inquest or fatal accident inquiry, and all other investigations, including those carried out by the safety authority, police or railway industry.

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Near miss with two track workers at Penkridge, Staffordshire, 10 July 2022

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Summary

At 23:58 hrs on 10 July 2022, two track workers narrowly avoided being struck by a train while working close to Penkridge station. The train was travelling at 61 mph (98 km/h) towards Stafford when the driver saw the track workers standing on the line and sounded the locomotive's horn. One of the track workers saw the approaching train and warned his colleague; they both jumped clear of the track less than one second before the train reached their position.

The incident occurred because the two track workers did not have a recognised safe system of work in place to protect them from approaching trains. The track workers had split off from a larger group to operate an overhead line isolating switch south of Penkridge station. When they left the group, the track workers and the Person in Charge (PIC) did not reach a mutual understanding of the safety arrangements that would subsequently apply. At the time the train passed, the track workers believed that the line they were standing on was blocked to the passage of trains, as had been the case when they left the group. The PIC believed that the track workers were standing away from the track in a position of safety, and so he had allowed the line blockage to be removed without warning them.

RAIB's investigation found that there was no formal guidance on the arrangements and responsibilities of staff when individuals leave a PIC's safe system of work. This was a possible underlying factor. The investigation included consideration of previous investigations and found that there is a widespread acceptance that PICs and Controllers of Site Safety (COSSs) can actively observe and advise their work group on site over a greater distance than is practical or reasonable.

As a result of this investigation, RAIB has made two recommendations to Network Rail. The first relates to the improvement of processes and guidance available to PICs and COSSs to help control the risks when groups split or change during a work activity. The second relates to the practicalities of managing a group on site, and understanding how this can be improved.

RAIB has also identified three learning points relating to the importance of clear communication, the duties allowed to be undertaken by a PIC, and the importance of the availability of train mounted CCTV to assist in safety investigations.

Introduction

Definitions

- 1 Metric units are used in this report, except when it is normal railway practice to give speeds and locations in imperial units. Where appropriate the equivalent metric value is also given.
- 2 The terms 'up' and 'down' refer to the lines heading respectively towards and away from Birmingham. Distances quoted in the report are measured from a datum point at the former Birmingham Curzon Street station, via Bescot.
- 3 The report contains abbreviations. These are explained in appendix A. Sources of evidence used in the investigation are listed in appendix B.

The incident

Summary of the incident

- 4 At 23:58 hrs on 10 July 2022, two track workers narrowly avoided being struck by a freight train while they were responding to a fault with overhead line equipment (OLE) just south of Penkrudge station, in south Staffordshire.

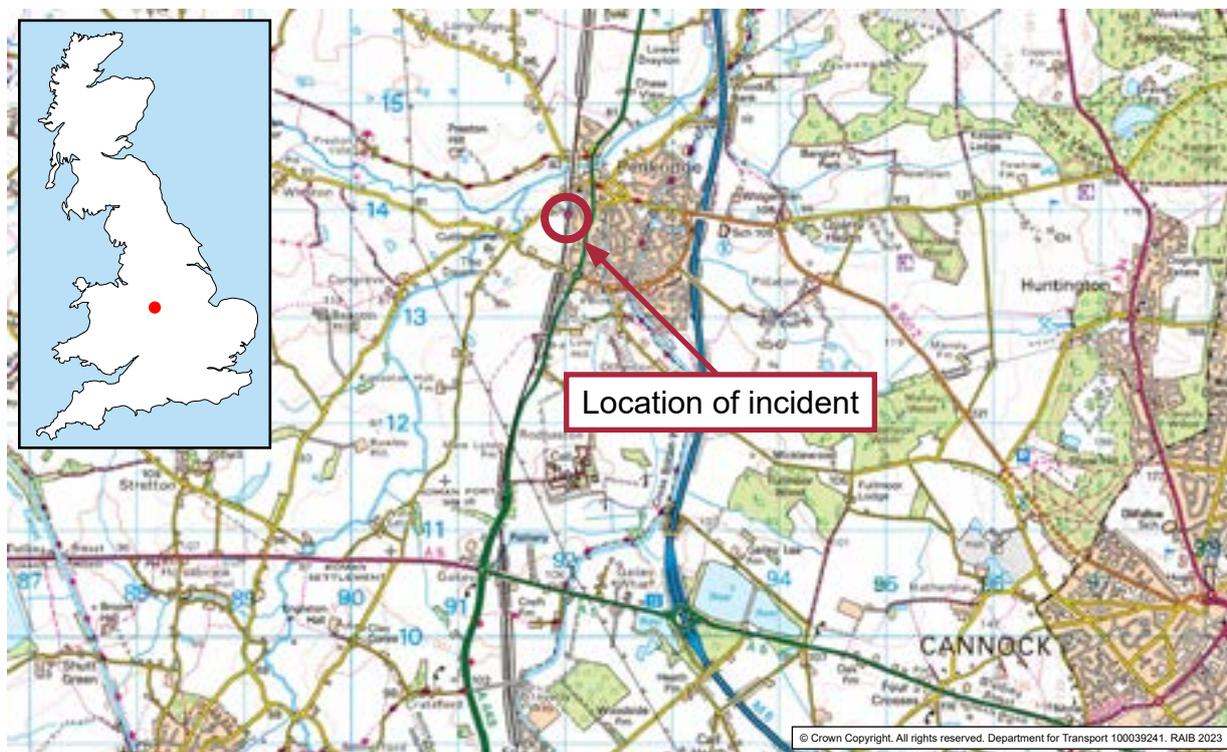


Figure 1: Extract from Ordnance Survey map showing the location of the incident at Penkrudge.

- 5 The train was travelling at 61 mph (98 km/h) as it passed the track workers who jumped clear of the track less than one second before the train reached their position. The driver then reported the near miss to the signaller.
- 6 One of the track workers suffered a minor ankle injury as a result of taking avoiding action, and both were shaken by the incident.

Context

Location

- 7 Penkrudge station is located on the line between Wolverhampton and Stafford, around 6 miles (9½ km) south of Stafford. The station is located 23 miles and 32 chains from the datum at Birmingham Curzon Street. The route normally carries a high number of passenger services travelling between Birmingham New Street and the north-west of England via the West Coast Main Line. About a quarter of a mile (400 metres) north of Penkrudge station, the route crosses Penkrudge Viaduct which allows the railway to cross over the River Penk.

- 8 The route through this area consists of two running lines, the Up Penkrigde line, which is used by trains heading towards Wolverhampton and Birmingham, and the Down Penkrigde line, which is used by trains travelling towards Stafford and the north-west. The near miss occurred on the Down Penkrigde line, around 150 metres south of Penkrigde station, at an OLE structure on which a mechanical switch is mounted (designated switch LQ-10/2). This switch is used to electrically isolate sections of the OLE (figure 2).



Figure 2: Aerial photograph showing Penkrigde station and the overhead line equipment structure and switch LQ-10/2 where the near miss occurred (courtesy of Network Rail).

- 9 The line through Penkrigde station is fitted with OLE operating at a nominal 25 kV AC. This is monitored and controlled by the electrical control room (ECR) at Rugby Rail Operations Centre (ROC). OLE is split into sections so power feeding, control, isolations and maintenance can be managed. At the incident location, the Up Penkrigde line is section LQ-9, and the Down Penkrigde line, LQ-10. Both of these sections run between Gailey (around 2 miles (3 km) south of Penkrigde) and Stafford Trent Valley Junction No. 1 at Queensville. This is where the Penkrigde lines join the West Coast Main Line. Before reaching Queensville, the Penkrigde lines pass through Rickerscote Junction, where the control of the OLE passes from the ECR at Rugby to the ECR at Crewe. These OLE sections are then further subdivided, with OLE section LQ-10B running from switch LQ-10/2 at Penkrigde to LQ-10/6 at Rickerscote Junction (figures 3 and 4).

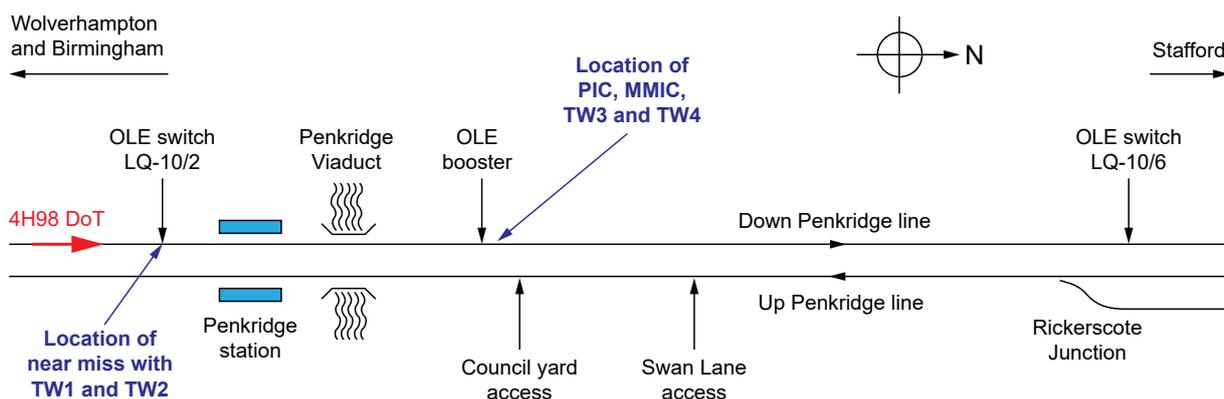


Figure 3: Schematic showing the track layout between Penkrige and Queensville, including access points and location of relevant OLE equipment.

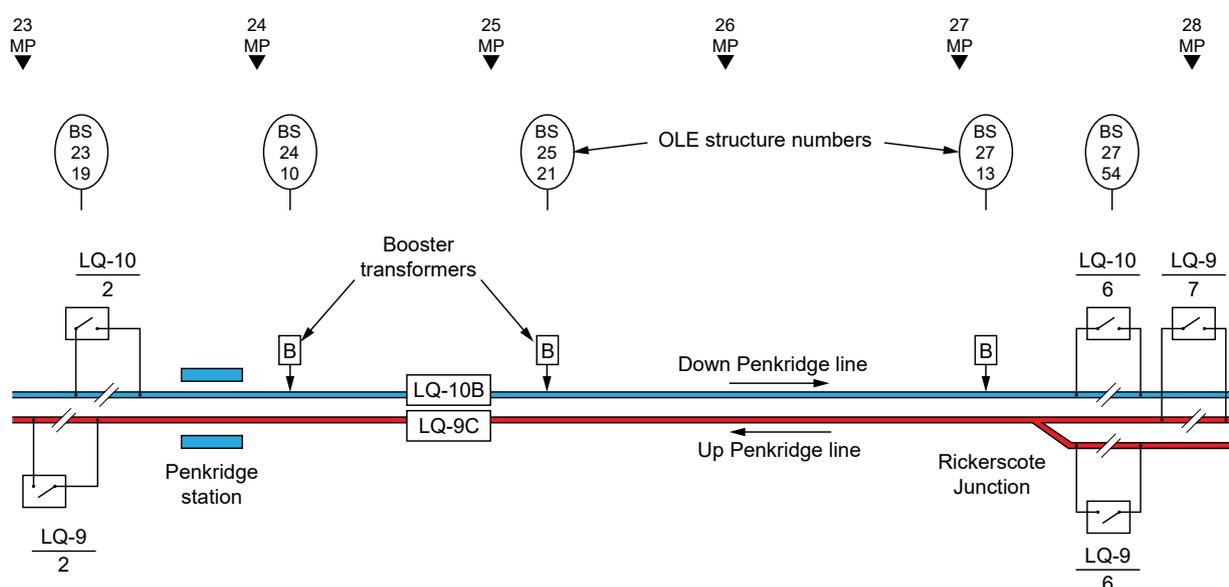


Figure 4: Simplified isolation diagram showing OLE sections LQ-9C and LQ-10B and associated equipment.

Organisations involved

- 10 Network Rail owns, operates and maintains the infrastructure at Penkrige, including the track and OLE, and employed all of the track workers involved in the incident.
- 11 Penkrige station lies in Network Rail's North West and Central region,¹ at the border between its Central and West Coast South routes. The OLE to the south of the structure on which switch LQ-10/2 (paragraph 8) is mounted is maintained by the Sandwell and Dudley maintenance delivery unit (MDU), part of the Central route. The OLE to the north of the structure is maintained by the Stafford MDU, part of the West Coast South route.
- 12 GB Railfreight Limited operated the train involved in the near miss.
- 13 Both organisations freely co-operated with the investigation.

¹ Each Network Rail region serves as a devolved management organisation within the company.

Trains involved

- 14 The train involved in the near miss, reporting number 4H98, was the 23:45 hrs freight train service between Bescot sidings and Tunstead sidings, operated by GB Railfreight. The train was hauled by locomotive 66732, which was fitted with a forward-facing CCTV (FFCCTV) system.
- 15 At the time of the near miss, a second train, reporting number 4M48, was passing on the adjacent line. This train was the 17:48 hrs freight service between Mossend and Daventry. The locomotive hauling this train was not fitted with FFCCTV.

Staff involved

- 16 The two track workers involved in the near miss were initially part of a wider team on site, which included four technicians and two managers. The Stafford OLE section manager was acting in the role of maintenance manager in charge (MMIC) and was designated as Network Rail's level 3 on-call² for the area. They had worked at Stafford depot since 2001 and were the line manager for the section supervisor and the track workers. They are referred to as the MMIC in this report.
- 17 The Stafford OLE section supervisor was acting in the role of Person in Charge (PIC), which included the duties of the Controller of Site Safety (COSS). They were also acting as a site warden (see paragraph 27) and were designated as Network Rail's level 2 on-call for the area. They had worked at Stafford depot for 18 years and are referred to as the PIC in this report.
- 18 Track worker 1 (TW1) was an OLE technician based at Stafford MDU. They had worked at Stafford for around two and half years and had held COSS competence for around a year. Their last COSS assessment was around six months before the incident.
- 19 Track worker 2 (TW2) was an OLE technician based at Stafford MDU and had worked there for around two years. TW1 and TW2 were the track workers directly involved in the near miss.
- 20 Track workers 3 and 4 (TW3 and TW4) were both OLE technicians based at Stafford MDU.

External circumstances

- 21 When the MMIC, PIC, TW1 and TW2 initially arrived on site at around 19:40 hrs on 10 July 2022 it was still light. However, by the time of the near miss at 23:58 hrs it was dark. While there was some ambient lighting coming from Penkridge station and the surrounding residential area, the team were principally reliant on torches for light and consequently decided to take a line blockage to be directly underneath the OLE above the track, where they believed the fault would be found.
- 22 The weather was dry and warm, with a light north-westerly breeze. There is no evidence that the weather conditions played a part in the incident.

² Network Rail operates a tiered level approach to its on-call incident response, with the seniority of the person called linked to the severity or complexity of a fault or incident. The higher the number of the tier, the more senior the person is within the response management structure.

Background information

Safety of staff working on or near the line

- 23 When work is to take place 'on or near the line'³ on Network Rail managed infrastructure, a safe system of work (SSoW) must be set up to protect staff from the movement of trains. This is managed in accordance with two main publications:
- a. the railway Rule Book, Railway Group standard GERT8000, which is managed on behalf of the mainline railway by the Rail Safety and Standards Board (RSSB)⁴
 - b. Network Rail's business process document NR/L2/OHS/019, '*Safety of people at work on or near the line*'.⁵
- 24 The Rule Book is a collection of documents that contains instructions for railway staff, including those who work on the track. It includes a series of handbooks, each of which details the duties of a particular role or process. Of particular note in this incident is Rule Book Handbook 7, '*General duties of a controller of site safety*', which contains the rules that a COSS should follow as part of their role. This includes the requirement to establish a SSoW and to brief all members of the group to ensure they fully understand the arrangements. A COSS must hold the appropriate competency and be clearly identifiable on site by wearing a specific armband or badge.
- 25 NR/L2/OHS/019 is an important document in Network Rail's approach to the safe planning and implementation of work on the track. It details the processes used, and the roles involved, in planning, verifying, authorising and implementing a SSoW for use when working on or near the line. It also includes details of three specific roles to be used when planning and undertaking work:
- a. The PIC, who is accountable and responsible for safe work on site, including assessing and controlling the risks associated with moving trains, the tasks being done and the location the group is working in. PIC is not an assessed competence in itself but anyone acting as a PIC must hold the COSS competence. If required, a PIC can delegate their COSS duties to another suitably competent COSS, but this must be decided during the planning process.
 - b. The planner, who plans and produces a safe work pack for pre-planned work, with input from the PIC.
 - c. The responsible manager, who appoints a competent planner and a capable PIC for each item of work, and checks and authorises a safe work pack before it can be used.

³ Someone is on or near the line if they are on the railway line itself, or they are within three metres of a railway line and not separated from it by a permanent fence or structure.

⁴ The Rule Book and its associated handbooks are available from RSSB ([rssb.co.uk](https://www.rssb.co.uk)).

⁵ NR/L2/OHS/019, issue 10 (December 2020) was in place at the time of the near miss.

- 26 NR/L2/OHS/019 also contains the ‘hierarchy of controls for operational risks’, often referred to as the ‘SSoW hierarchy’, which gives details of the various methods of working on site, using protection⁶ or warning⁷ systems, ranked by increasing relative levels of risk. When planning work, planners (and PICs during emergency work) should try and use the highest possible level in the hierarchy (that is to say, the method with the lowest relative risk), and only use a lower level (relatively less safe) method where this can be justified.
- 27 The third level from the top of the SSoW hierarchy is termed a ‘separated’ system of work. When using this system, staff must remain separated from any line open to trains by a distance of at least two metres. Where the group consists of only two people, the COSS can supervise the other person to ensure that they do not come within two metres of an open line. Where a group consists of more than two people, a site warden must be appointed, to watch the limits of the safe area and warn anybody who attempts to stray beyond those limits and too close to an open line. The Rule Book states that a site warden can have no other duties; this is to prevent them from becoming distracted. The COSS can also act as the site warden, on the condition that they take no part in the actual work. Network Rail considers that acting as a PIC (which includes the duties of a COSS) is taking part in the work, so a person cannot be a PIC and site warden at the same time (see paragraph 87).
- 28 The planning process in NR/L2/OHS/019 usually culminates in the production of a safe work pack, which details the arrangements for the work, including the SSoW selected, as well as information on how to manage task and site risks. Appended to NR/L2/OHS/019 are five ‘modules’, which define specific processes for various types of work. Module 1, which gives a process for planning and working when responding to an incident, allows for the creation of an ‘incident response pack’ (IRP), which is completed by the PIC on site, without the direct involvement of a planner or responsible manager. This module is only to be used for responding to unforeseen events which cannot be pre-planned.
- 29 When creating an IRP, the PIC shall determine what system of work from the SSoW hierarchy is to be used, selecting the highest level in the hierarchy that is suitable, and make any necessary arrangements with the signaller. PICs should be provided with access to any relevant information needed for them to plan this properly, such as details of the running lines on site, task risk control information and details of any site-specific hazards. Once the IRP is completed, the PIC will brief the work group on its contents, including details of protection/warning arrangements, task risks, site risks and any relevant controls put in place. They should then continue to monitor the conditions on site, rebriefing the workgroup should the IRP need to be amended. Once the incident response is complete, the PIC should return the IRP to a planner or responsible manager for review.

⁶ Protection systems of work (formally known as green zone working) protect staff from being struck by a train by either stopping train movements altogether or by providing separation between staff and train movements.

⁷ Warning systems of work (formally known as red zone working) provide a warning of an approaching train to staff, so that they can reach a position of safety at least ten seconds before the train passes.

- 30 Two revisions to NR/L2/OHS/019 have been released since the incident: issue 11 in September 2022, and issue 12 in June 2023 (for compliance by September 2023). A previous version, issue 9, released in March 2017, made significant changes to some of the basic concepts of the standard. It introduced the role of PIC and their involvement in the planning process, and the inclusion of task risk controls in the safe work pack.

The sequence of events

Events preceding the incident

- 31 The MMIC worked during the daytime of 10 July 2022 as the Stafford OLE section manager. Due to a shortage of staff, they spent the day undertaking routine OLE inspections at various locations around the area. They completed this work at around 15:00 hrs.
- 32 Track workers TW1 and TW2 were rostered to start their night shift at 19:00 hrs that evening. The PIC and track workers TW3 and TW4 were all rostered to start their shift at 21:00 hrs.
- 33 At 18:22 hrs, the circuit breaker controlling the power supply to OLE section LQ-10, which runs on the Down Penkridge line between Gailey and Stafford (paragraph 9), tripped. The ECR at Rugby tried to re-energise the section, but it immediately tripped again. The ECR contacted signallers at Rugby ROC and at the West Midlands Signalling Centre (WMSC) in Saltley to advise them of the fault. A block to electric trains was established on the Down Penkridge line through OLE section LQ-10, meaning trains using electrical traction would no longer be able to travel through this section, although other (diesel powered) trains would.
- 34 The signallers at WMSC advised various operational staff of the fault, including OLE staff at Sandwell and Dudley MDU and a Stafford mobile operations manager (MOM).⁸ As these staff began to mobilise to investigate the fault, the Wolverhampton signaller at WMSC instructed train 1O28, a diesel passenger train travelling south on the Up Penkridge line, to travel at caution through the section. At 18:56 hrs, the driver of train 1O28 reported to the signaller that they had seen nothing amiss. Train 9S93, a northbound diesel passenger train, was instructed to travel at caution over the affected Down Penkridge line, again reporting afterwards that there were no obvious issues.
- 35 At 18:57 hrs, the ECR attempted to re-energise section LQ-10 once more and, after it tripped again, requested via route control⁹ at WMSC that OLE staff would need to attend site. After being advised that an OLE team from Sandwell and Dudley MDU was already on its way, the ECR requested that OLE staff from Stafford MDU were also mobilised, as the systems available to the ECR were suggesting that the fault lay between Penkridge and Stafford and so in Stafford MDU's area of control. Route control staff at WMSC contacted the Stafford PIC and MMIC and they began to head from their homes to the Stafford MDU. As this was taking place, TW1 and TW2 arrived at Stafford MDU for the start of their shift. On being advised of the fault, they began getting equipment together to go to site. Another OLE technician, who was due to finish his shift at 19:00 hrs, offered to stay and help.

⁸ MOMs act as Network Rail's front-line response to any incidents affecting the safe and effective operation of the railway.

⁹ Network Rail staff who have overall operation responsibility for a section of line, including the management of incidents, the logging of faults and the dispatch of rapid-response maintenance staff.

- 36 Between 19:00 hrs and 19:20 hrs, the MOM and Sandwell and Dudley OLE team arrived at Penkrudge station. The Sandwell and Dudley OLE team then began an OLE inspection, working south towards their maintenance area.
- 37 By around 19:40 hrs, the various staff mobilised from Stafford MDU had arrived in the Penkrudge area to respond to the fault. To cover more ground, they split into three groups:
- The PIC, TW2 and the MOM inspected the OLE from Penkrudge station to the Swan Lane access point, with the exception of Penkrudge Viaduct (which requires a line blockage to access).
 - The MMIC and the OLE technician who had stayed on from the day shift (who also held COSS competency) inspected the OLE between Swan Lane access point and the switch at Rickerscote Junction.
 - TW1 remained in a van and drove the others to the various access points, before remaining at Swan Lane access point.

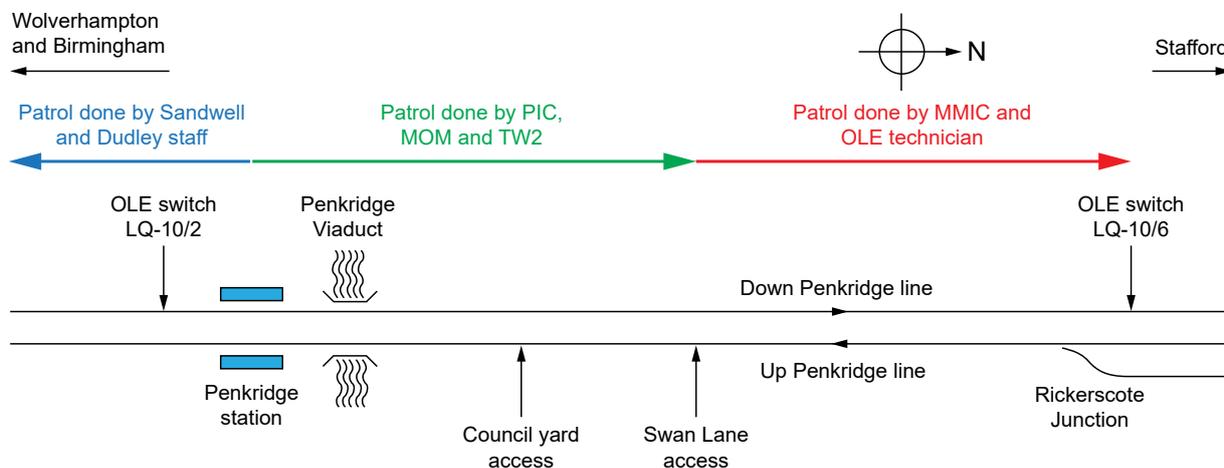


Figure 5: Schematic showing the patrols undertaken by the groups.

- 38 Both patrols undertaken by the Stafford teams were done using a separated system of work (paragraph 27). This essentially consisted of inspecting the OLE from the cess (an area adjacent to the track which may provide a safe place to stand or walk clear of passing trains if there is adequate clearance). Before starting the inspection, the PIC completed an IRP (paragraph 29), stating the use of a separated SSoW and that they would act as the site warden. The MOM and TW2 signed the IRP to confirm that they understood the arrangements.
- 39 By around 21:05 hrs, the patrols were completed, which meant the whole line (with the exception of Penkrudge Viaduct) between Penkrudge station and Rickerscote Junction had been inspected by the Stafford OLE team, and the line to the south of Penkrudge station had been inspected by the Sandwell and Dudley OLE team. No fault was identified during any of these patrols. At around the same time, two more OLE technicians (TW3 and TW4) signed on at Stafford MDU and began to make their way to site.

- 40 Once these patrols were complete, TW1 drove the MOM to Penkridge station and returned to Swan Lane access point, where TW2 was waiting. The PIC also drove from Swan Lane, to join the MMIC at Rickerscote Junction and the OLE technician from the day shift went back to Stafford MDU to sign off duty. Around this time, it began to get dark.
- 41 The MMIC contacted the ECR at Rugby and, after the MMIC confirmed that no fault had been found, a further attempt to re-energise the section was made. The section tripped immediately, but TW1, who was at the gate to Swan Lane access point, reported that, when the re-energisation was attempted, they saw a 'fireball' move along the OLE to the south of their location. They reported this to the MMIC and PIC, who then drove from Rickerscote Junction to Swan Lane access point to join TW1 and TW2.
- 42 The PIC, MMIC, TW1 and TW2 accessed the track at Swan Lane and walked to the approximate location of the fireball. Standing away from the line, the MMIC asked the ECR to re-energise the section again to allow them to pinpoint the precise location of the fault. However, when re-energisation was attempted again, there was no repeat of the fireball, or anything to indicate a fault at this location.
- 43 Following this last attempted re-energisation, the Sandwell and Dudley OLE team, who were standing at switch LQ-10/2 (paragraph 8), around 150 metres south of Penkridge station, contacted the MMIC to inform them that they had seen a 'flash' on the OLE between Penkridge station and Penkridge Viaduct. To investigate this report, the MMIC, PIC, TW1 and TW2 drove to the Council yard access point, located to the north of Penkridge Viaduct. They were joined there by TW3 and TW4, who had arrived from Stafford MDU.
- 44 The PIC decided that inspection from the cess would now be difficult in the dark, and requested a line blockage of the Down Penkridge line from the signaller, which was granted at 22:36 hrs. This line blockage was also required for crossing Penkridge Viaduct. The PIC stated to the signaller that they would need the blockage for one hour, but that they could give it up at very short notice (one minute). The PIC updated the IRP paperwork to show the line blockage taken on the Down Penkridge line. The Up Penkridge line would remain open. The PIC briefed the team on the revised IRP and nominated themselves as the site warden (as they had done earlier, paragraph 38). TW1 and the MMIC signed the IRP to confirm their understanding of the arrangements, but TW3 and TW4 did not sign the IRP, despite witness evidence stating that they were present during the briefing.
- 45 The group accessed the track and walked southwards on the blocked Down Penkridge line towards the site of the reported flash. TW3 and TW4 remained on track in the vicinity of the access point, while the PIC, MMIC, TW1 and TW2 went over the viaduct towards Penkridge station, inspecting the OLE as they progressed. No evidence of a fault was found in the area where the latest flash had been seen. Despite them becoming separated from the PIC when the group split, no new SSoW was established for TW3 and TW4 at this point.

- 46 Having completed this inspection, conversations took place between the MMIC, the Sandwell and Dudley team and the ECR to formulate a plan. There was some disagreement between the MMIC and the ECR on the best way to continue but, by around 23:30 hrs, it was agreed that a number of booster transformers¹⁰ would be inspected before any further re-energisations, to prevent further damage to OLE equipment. Around this time, the Sandwell and Dudley OLE staff were instructed to leave site by their manager, to begin their own priority maintenance work, as it was now clear that the fault was within Stafford MDU's area.
- 47 To facilitate any further attempted re-energisations of section LQ-10B, switch LQ-10/2 to the south of Penkrige station would need to be operated. The departure of the Sandwell and Dudley staff meant that Stafford MDU staff were now required to operate this switch. The PIC decided that TW1 and TW2 would do this and instructed them to go to the switch's location. By the time TW1 and TW2 left the group, the line blockage on the Down Penkrige line had been in place for over an hour.
- 48 The PIC and MMIC walked to the booster transformer to the north of Penkrige Viaduct, where they were joined by TW3 and TW4. TW1 and TW2 arrived at switch LQ-10/2 at around 23:50 hrs. At 23:52 hrs, TW1 and TW2 operated the switch on the instruction of the ECR, who asked them to remain at the switch in case further switching operations were needed. TW1 and TW2 remained standing on the blocked Down Penkrige line while they waited for further instructions.
- 49 At 23:54 hrs, following a conversation between the MMIC and the ECR, a further re-energisation attempt was made, with the Stafford OLE teams looking in different directions along the line. A flash was reported as being seen to the north of the MMIC and PIC's team, towards Swan Lane access point.

Events during the incident

- 50 At 23:54 hrs, while the MMIC was on the telephone to the ECR to discuss the next steps, the PIC received a telephone call from the signaller asking for the line blockage on the Down Penkrige line to be given up to allow a train to pass. The PIC asked for the MMIC, TW3 and TW4 to stand clear of the track and then stated to the signaller that the line was clear. The line blockage was removed at 23:55 hrs.
- 51 At around 23:57 hrs, diesel freight train 4M48 approached from the north, passed the PIC and MMIC's group on the Up Penkrige line and, shortly afterwards, began to pass TW1 and TW2 who were standing on the Down Penkrige line. At the same time, as a courtesy, the PIC called TW1 to inform them of the removal of the line blockage, but due to the noise of the passing train, they were unable to hear each other and the call was terminated.

¹⁰ A transformer which induces the full traction current into the return conductor to minimise interference effects and increase efficiency in the system.

- 52 At around 23:58 hrs, diesel freight train 4H98 approached TW1 and TW2's location from the south on the Down Penkridge line and started passing train 4M48. Train 4H98 was travelling at 61 mph (98 km/h). Seeing TW1 and TW2 on the line ahead, the driver sounded the locomotive's horn. About the same time, TW1 looked to the south, and seeing train 4H98's headlights, shouted a warning to TW2 and both staff jumped clear of the track, less than a second before the train reached their location.
- 53 The driver of train 4H98 did not make an emergency brake application because they did not believe there was enough time for it to make any difference to the train's speed in the distance available.

Events following the incident

- 54 The driver of train 4H98 brought the train to a stand at the next signal and reported the near miss to the signaller. The signaller then called the PIC to inform them of the near miss. The PIC was not aware of what had happened and told the signaller that nobody within the group was involved. The signaller then asked the PIC if they wanted to retake the line blockage. The PIC agreed and the line blockage was granted at around 00:01 hrs on 11 July.
- 55 After speaking to the signaller, the PIC contacted TW1 who confirmed that TW1 and TW2 were both clear of the track. Witness evidence indicates that there was no mention of the near miss in this conversation.
- 56 The signaller informed route control staff at Rugby ROC of the near miss. They in turn contacted the PIC and asked that work be suspended pending investigation. The PIC and MMIC travelled to Penkridge station to meet TW1 and TW2. TW3 and TW4 were asked to wait at a different access point pending further OLE inspection work. The Stafford MOM, who was already at Penkridge station, was asked to respond to the near miss and take statements from those involved.
- 57 The staff gave initial accounts to the MOM, stating that TW1 and TW2 were working under a separated SSoW and were in the cress when the train passed.
- 58 The MMIC and level 4 on-call (a senior manager within the route) had a conversation and confirmed to the route control staff at Rugby ROC that only TW1 and TW2 needed to be screened for drugs and alcohol. The MMIC drove them back to Stafford MDU for this to be done. The tests returned a negative (clear) result.
- 59 The PIC, TW3, TW4 and two further OLE technicians carried on with the OLE inspections and eventually found the fault midway between Swan Lane access point and Penkridge Viaduct, roughly halfway between where the various flashes had been seen. The fault related to a damaged cap and pin insulator (figure 6), which had allowed enough current to leak to earth to register as an earth fault, tripping the OLE section. The damaged component was at the height of the OLE wires, and not easily visible from ground level, appearing intact during the initial visual inspection (paragraphs 37 to 39) undertaken by the PIC and TW2. The final re-energisation attempt caused part of the insulator to fracture fully, dropping to the ground, so it was now visible to the staff. The insulator was replaced with a polymeric equivalent in an emergency possession later that morning. The line was fully reopened at 12:18 hrs on 11 July.

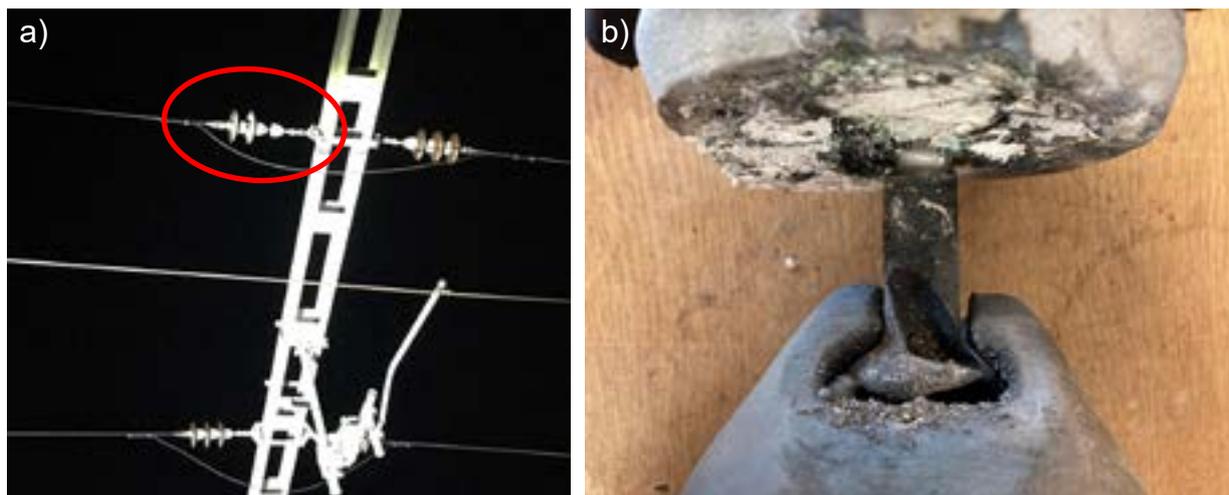


Figure 6: Picture showing a) the missing section of the cap and pin insulator and b) close up of the damaged insulator (courtesy of Network Rail).

60 The FFCCTV footage from train 4H98 was not immediately available. RAIB was provided with the footage on 20 July 2022 and RAIB's analysis showed how close the near miss really was. Upon reviewing the footage, Network Rail initiated an investigation at route level and the staff involved subsequently chose to revise their statements about the incident.

Analysis

Identification of the immediate cause

61 The two track workers were on an open line as train 4H98 was approaching.

62 FFCCTV footage from train 4H98 clearly shows at least one track worker in its path (figure 7). Witness evidence confirms that the second track worker was also in the path of the train as it approached. Both staff jumped clear of the track, less than a second before the train reached their location. The track workers were in the approaching train's path because there was no recognised SSoW in place to protect them from it.

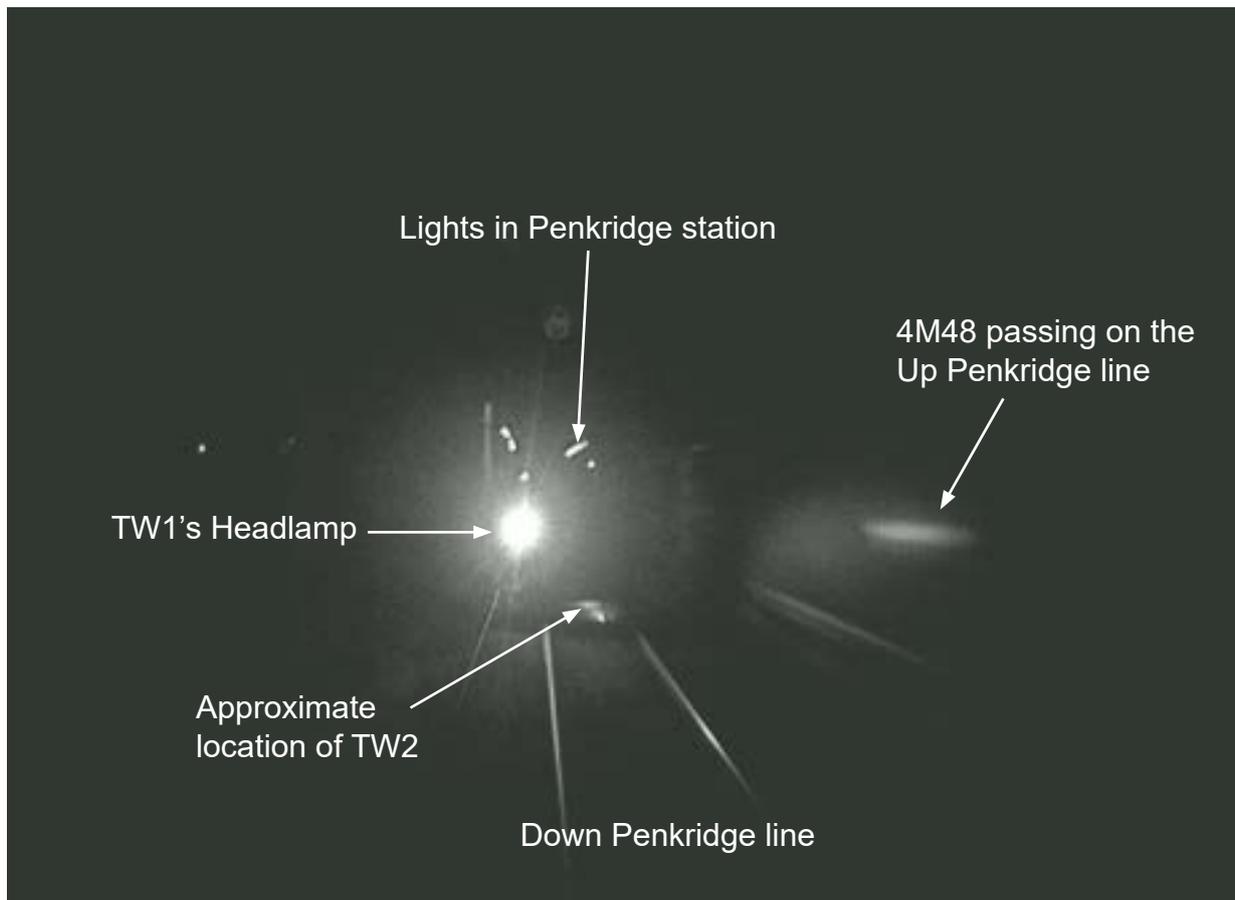


Figure 7: FFCCTV still from train 4H98 showing the headlamp of TW1 and train 4M48 passing on the adjacent line (courtesy of GB Railfreight Ltd).

Identification of causal factors

63 The two track workers were not working under a recognised SSoW that would protect them from an approaching train.

64 The track workers had previously been working under the separated SSoW established by the PIC for the wider group (paragraph 44). When TW1 and TW2 moved away from the PIC and the rest of the group, they were effectively no longer working under the PIC's control or within this system.

65 TW1 was a competent COSS, and therefore competent to establish a SSoW that would have protected both themselves and TW2 from approaching trains. TW1 did not do this because the PIC and the two track workers did not reach a clear mutual understanding of the safety arrangements which applied when the group split.

Communication of safety arrangements

66 At the time the group split, the PIC and two track workers did not come to a clear mutual understanding of the safety arrangements which would apply.

67 The PIC had a conversation with TW1 and TW2 (paragraph 47), just before the two track workers walked to the switch south of Penkrige station. There is conflicting witness evidence on the content of the conversation. However, it is clear that the PIC and the track workers had different understandings of what the safety arrangements for TW1 and TW2 were once they split from the group.

68 While there is no formal process for splitting a group midway through a task (see paragraph 78), all spoken safety-critical communications by track workers should follow the principles given in:

- Network Rail company standard NR/L2/OPS/037, '*Management of spoken safety communications*'¹¹
- Rail Industry standard RIS-8046-TOM '*Spoken safety critical communications*'¹²
- Handbook 1 of the Rule Book '*General duties and track safety for track workers*'.¹³

69 These documents aim to ensure that safety-critical communications are unequivocal and that mutual understanding is obtained by all parties involved in a safety-critical conversation.

The PIC's perception of the arrangements

70 Witness evidence indicates that, during the conversation, the PIC told the two track workers to "remain separated". Witness evidence also suggests that there was no other formal brief from the PIC to the track workers at this point regarding the ongoing safety arrangements.

71 Since the accident at Margam in 2019 ([RAIB report 11/2020](#)), where two track workers were fatally injured by a train, Network Rail has prohibited working with unassisted lookouts unless route director authorisation is granted. The Stafford OLE team had previously used unassisted lookout working for many of its visual inspections but, because of this prohibition, moved these inspections to separated systems of work. These generally took the form of staff remaining in the cess to undertake inspections, with all lines remaining open to traffic. Witness evidence indicates that this is normally referred to by the Stafford OLE staff as 'working separated'.

¹¹ NR/L2/OPS/037 issue 2, December 2007.

¹² RIS-8046-TOM, issue 2, September 2019 (available from RSSB, [rssb.co.uk](https://www.rssb.co.uk)).

¹³ Rule Book Handbook 1, GERT8000-HB1, issue 7, September 2021.

72 The PIC believed their instruction to TW1 and TW2 was clear, and that they had understood this to mean 'remain in the cess' as they would do during a visual inspection. As such, when the signaller made the request to remove the line blockage (paragraph 50), the PIC believed that the line was clear of staff and gave up the line blockage before he tried to contact TW1 or TW2.

The track workers' perception of the arrangements

73 Witness evidence indicates that the track workers did not recall the PIC's instruction to 'remain separated' (paragraph 70), and that they walked off from the group in the belief that the line blockage that had been in place for the last hour would remain in place to protect them. They also believed that if anything was to change with the system, then the PIC would contact them. Neither the PIC nor track workers made a formal confirmation of their understanding of the arrangements that would apply, such as repeating back the instructions given to confirm a mutual understanding.

74 Despite moving to a location around 400 metres away from the PIC's group, the track workers believed they were still working under the PIC's control and within the separated SSoW which the PIC had established. Handbook 7 (paragraph 24), section 4.1 instructs a COSS (a role the PIC was undertaking) that '*you must stay with your group so that you are able to personally observe and advise everyone*'. The two track workers were, however, a significant distance away from the PIC and so could not be part of the group under the PIC's control for the purposes of this rule (see paragraph 82). Both the PIC and TW1 should have been aware of this requirement, as they both held the COSS competence.

75 It is also possible that, having worked with the Down Penkridge line blocked for over an hour, and with no power supply available for electric trains, the absence of trains led the track workers to form the impression that trains would not approach on the Down Penkridge line for the duration of their work.

Potential use of a protection controller

76 According to the Rule Book, where two or more COSSs (including PICs undertaking COSS duties) need a line blockage at the same place and location, this must be done by using a protection controller (PC). A PC takes overall control of the shared line blockage and must not give it up until every COSS sharing the blockage confirms that they no longer require it. This may include having established alternative arrangements, such as a separated system of work which will protect staff from trains on the line that is about to be opened.

77 None of the staff involved in this incident held the required competence to act as a PC, and the competence is not held by any of the OLE staff based at Stafford MDU. Witness evidence also indicates that the staff involved were not fully aware of the role, or its potential uses, before this incident.

Identification of underlying factors

Guidance available to PICs and COSSs

78 There is no formal guidance provided on splitting groups, or the removal of individuals from a PIC or COSS's SSoW. This is a possible underlying factor.

- 79 The need for a PIC or COSS to formally brief their group at the start of an item of work is documented in the Rule Book, and generally well understood by staff on the railway. However, the requirements of the Rule Book and NR/L2/OHS/019 are based around each item of work being discrete, with its own safe work pack, delivered by a single work group from start to finish.
- 80 This model works well for planned work, or small, distinct incident response work packages. However, during longer incident responses, teams may be required to adapt and improvise due to the dynamic nature of the work, and there are times when a group may need to split, or have staff removed from it. Despite this, there is no guidance in the Rule Book or in any relevant standards on how a PIC or COSS in charge of a group is required to manage this process. In particular, there is no guidance, process or instruction that tells a PIC or COSS that they must inform somebody that they are no longer working under their SSoW, and that the PIC or COSS is no longer responsible for their safety.
- 81 In this incident, if the PIC had told TW1 and TW2 that they were no longer under the PIC's SSoW (because they were leaving the group), it is possible that the PIC and TW1 would have discussed safety arrangements in more detail. This might have led to TW1 understanding that they were now in charge of their own group, and setting up their own SSoW as they were now acting as a COSS.

Control of groups

82 There is a widespread belief among PICs/COSSs and the track worker community that PICs/COSSs can actively observe and advise their group over a greater distance than is realistically practical or reasonable.

- 83 In addition to TW1 and TW2 splitting from the group just before the near miss, there was at least one point earlier in the work when TW3 and TW4 were on track, but remote from the PIC, without their own established SSoW (paragraph 45).
- 84 The Rule Book is clear that a PIC or COSS must remain with their group (paragraph 74) to 'personally observe and advise'. The Rule Book does not give any guidance on the extent of an area a PIC or COSS can actually control, although RAIB found that the actions a COSS should take if their group starts to spread out are discussed during relevant training courses.
- 85 In practice, the distance that a PIC or COSS can observe and advise their group over is dependent on many factors, including:
- a. the size of the group
 - b. the complexity of the task being undertaken
 - c. the amount of involvement of the PIC or COSS with the work itself
 - d. the topography, including cuttings and embankments
 - e. the external conditions such as weather, daylight and ambient noise

- f. the curvature of the railway, and associated sighting distances
 - g. the positioning of the PIC or COSS within the group.
- 86 Because of these many variables, it is probably not realistic to define a precise physical distance that a PIC/COSS can control. However, evidence from a number of previous RAIB reports, including Bulkington ([RAIB safety digest 02/2023](#)), Paddington ([RAIB safety digest 07/2022](#)), Ynys Hir ([RAIB safety digest 06/2019](#)) and Margam ([RAIB report 11/2020](#)) shows that staff undertaking PIC/COSS duties often misjudge the distance over which they can realistically maintain control of a group, or ignore the Rule Book requirement to stay with their group altogether.

Observations

Acting as both a PIC and site warden

87 The PIC appointed themselves as a site warden, which is contrary to the intent of the Rule Book and NR/L2/OHS/019.

- 88 During the entirety of the incident response work, the PIC was using a separated SSoW, which involves the use of a site warden (paragraph 27). The PIC appointed themselves to the role of site warden. The PIC had not realised that this was not allowed within the relevant rules, because their PIC duties meant that they were taking part in the work (paragraphs 38 and 44).
- 89 A COSS can act as a site warden provided that they take no part in the actual work (paragraph 27). This is detailed in the Rule Book, Handbook 7, rule 4.6 which states that '*if you act as a site warden, you must take no part in the actual work*'. However, Network Rail considers that undertaking PIC duties is additional work over and above the duties of a COSS (paragraph 30) and constitutes taking part in the actual work. This means that a PIC cannot undertake site warden duties. This is not explicit within NR/L2/OHS/019 issues 9 to 11 but is included in a list of frequently asked questions (FAQ) to the standard published on Network Rail's Safety Central website.¹⁴
- 90 The PIC was not aware of the FAQ document or the clarification about site warden duties within it. Based on witness evidence from this and other investigations, RAIB observes that the existence of the information in the FAQ is not well known among front-line staff.
- 91 On 3 June 2023, Network Rail published issue 12 of NR/L2/OHS/019. Section 3 of this revised standard states that the PIC shall not perform the duties of a site warden.

Availability of forward-facing CCTV

92 The closeness of the near miss was only appreciated once the FFCCTV footage became available.

- 93 FFCCTV often provides critical evidence when undertaking safety investigations and may also be a useful tool for the railway industry in other contexts.

¹⁴ <https://safety.networkrail.co.uk>.

- 94 In this case, although the train driver stated that the near miss was close, there was a delay in obtaining the FFCCTV footage from train 4H98 (paragraph 60), and this in turn delayed the confirmation of how close the near miss really was. This happened in part due to the statements given by the staff involved immediately following the incident (paragraph 60). However, despite this delay, the importance of the images obtained once again underlines the significance of FFCCTV to undertaking effective safety investigations.

Previous occurrences of a similar character

- 95 To date, RAIB has published investigations or safety digests into 56 accidents or incidents involving track workers. Some of these with direct relevance to the near miss at Penkridge are summarised below:

[Near miss with track workers at Bulkington, Warwickshire, 15 November 2022 \(RAIB safety digest 02/2023\)](#)

- 96 At around 01:29 hrs on 15 November 2022, a passenger train travelling at 125 mph (201 km/h) narrowly missed a track worker on the West Coast Main Line near to Bulkington, Warwickshire, around four miles south of Nuneaton. The track worker, acting in the role of COSS, had been working on an adjacent blocked line, but stepped outside of the safe limits, before returning around two seconds before the train passed.
- 97 By the time the incident train approached the team, FFCCTV showed that it had split into two distinct groups which were approximately 55 to 60 metres apart. Given the splitting of the team, the curvature of the track and the dark conditions, the site warden, who was in the group furthest away from the approaching train, could no longer adequately monitor the position of staff working very close to the boundary. This meant that the COSS received no warning from the site warden to step back when he moved over the boundary and towards the open line on which the train was approaching.

[Near miss with track workers at Paddington, London, 18 July 2022 \(RAIB safety digest 07/2022\)](#)

- 98 At around 01:17 hrs on 18 July 2022, a passenger train entering London Paddington station while travelling at 24 mph (39 km/h) narrowly missed two track workers. They were walking very close to the line that the train was travelling on and with their backs to the approaching train. In response to the train's second audible warning, the two track workers acknowledged its approach and moved clear of the train's path between one and two seconds before it reached their location.
- 99 This incident occurred because the two track workers had moved away from lines that were blocked to railway traffic and were walking very close to an open line. This was a result of the PIC, who was also acting as COSS, not adequately planning the work or supervising the group while they were working on the track and leaving the group without appointing anyone to take over those responsibilities. Nobody in the group challenged this unsafe method of working although two experienced members of the group had the required knowledge and experience to know that it was unsafe. The PIC had also appointed himself as the site warden, which was not permitted by the Rule Book (paragraph 87).

[Track workers struck by a train at Margam, Neath Port Talbot, 3 July 2019 \(RAIB report 11/2020\)](#)

- 100 At around 09:52 hrs on 3 July 2019, two track workers were struck and fatally injured by a passenger train at Margam East Junction on the South Wales Main Line. A third track worker came very close to being struck. The three workers, who were part of a group of six staff, were carrying out a maintenance task on a set of points which they did not know to be unnecessary.
- 101 Of particular relevance to the incident at Penkridge, RAIB found that at the time of the accident at Margam the team involved had been working in two separate groups which were at least 100 metres apart. The COSS and the person who had been appointed to act as site lookout during the work were not with the group of three workers carrying out the maintenance tasks when the train approached. This meant that the COSS was not able to '*personally observe and advise everyone*' as required by the rules.

[Narrowly avoided collision between a train and a track worker at Ynys Hir, Ceredigion, 2 April 2019 \(RAIB safety digest 06/2019\)](#)

- 102 At 11:58 hrs on 2 April 2019, a track worker narrowly avoided being struck by a train at Ynys Hir, near Dovey Junction station. The track worker was one of a group of eight that had just completed fishplate oiling work on the single line that runs towards Aberystwyth. The line was open to traffic and a lookout had been appointed to provide the group with a warning of approaching trains while working and walking on the railway.
- 103 The work group became separated as they were walking back to an access point and the incident occurred because the COSS could no longer ensure that the safe system of work functioned correctly.

Summary of conclusions

Immediate cause

104 The two track workers were on an open line as train 4H98 was approaching (paragraph 61).

Causal factors

105 The causal factor was:

- a. The two track workers were not working under a recognised SSoW that would protect them from an approaching train (paragraph 63). This causal factor arose because:
 - i. At the time the group split, the PIC and two track workers did not come to a clear mutual understanding of the safety arrangements which would apply (paragraph 66, **Learning point 1**).

Underlying factors

106 The underlying factors were:

- a. There is no formal guidance provided on splitting groups, or the removal of individuals from a PIC or COSS's SSoW. This is a possible underlying factor (paragraph 78, **Recommendation 1**).
- b. There is a widespread belief among PICs/COSSs and the track worker community that PICs/COSSs can actively observe and advise their group over a greater distance than is realistically practical or reasonable (paragraph 82, **Recommendation 2**).

Observations

107 Although not linked to the incident on 10 July 2022, RAIB observes that:

- a. The PIC appointed themselves as a site warden, which is contrary to the intent of the Rule Book and NR/L2/OHS/019 (paragraph 87, **Learning point 2**).
- b. The closeness of the near miss was only appreciated once the FFCCTV footage became available (paragraph 92, **Learning point 3**).

Previous RAIB recommendations relevant to this investigation

108 The following recommendations, which were made by RAIB as a result of its previous investigations, have relevance to this investigation.

[Class investigation into accidents and near misses involving trains and track workers outside possessions, RAIB report 07/2017](#)

109 Recommendation 1 reads as follows:

Network Rail should review the ways that it equips those with safety leadership responsibilities to recognise and deal effectively with circumstances not encompassed by the planned 'safe system of work' or permit. These might include the need for additional local planning (for example when placing lookouts) or moving to a new location while carrying out mobile activities such as patrolling, asset inspections and surveying. Circumstances not covered by the plan might also arise due to rest breaks and changes to the composition of the group, or the nature of the work activity.

Appropriate action should be taken to implement any required improvements in procedures and/or the training provided to those in leadership roles. Any changes that are proposed to existing arrangements should be based on the following principles:

- a) compliance with the documented safe system of work or permit, unless this can no longer be applied, is impractical to implement or is considered to be less safe than an alternative*
- b) continued compliance with the railway Rule Book*
- c) dynamic risk assessment of the changed circumstances, and of any alternative safe system of work*
- d) empowering competent leaders to make safe decisions within clearly defined guidelines.*

110 Network Rail informed the Office of Rail and Road (ORR) that it had reviewed and made changes to how it trains staff and contractors with safety leadership responsibilities, including safety-critical communication, risk perception and leadership. The changes made were aimed at improving decision-making on site where circumstances change, so risks are still identified and adequately managed. Other considerations included improvements to the work planning system, so that dynamic changes are required less frequently, allied with much more rigorous retention criteria for those who hold COSS and related competencies. Based on these responses, ORR has reported to RAIB that it considers this recommendation to be implemented.

Recommendations that are currently being implemented

[Track workers struck by a train at Margam, Neath Port Talbot, RAIB report 11/2020](#)

111 Recommendation 4 reads as follows:

Network Rail should review its processes and programme for developing the social, cognitive and personal 'non-technical skills' of those working on or near the track, with a particular focus on those areas that are linked to effective communication, cooperation, leadership and positive team dynamics. By means of this review Network Rail should ensure that it has in place all that is necessary for the timely provision of an ongoing and sustained programme of suitable, relevant and targeted training and mentoring that will influence the mindset and attitudes of everybody involved with planning and delivery of work activities, including managers, supervisors, site leaders and team members. Network Rail should also issue practical guidance on:

- a) ways of assessing non-technical skills and development potential when selecting future site leaders*
- b) methods for evaluating and developing the non-technical skills of those already undertaking leadership roles*
- c) how to intervene when concerned about the performance of a safety leader.*

112 In October 2021, ORR reported that Network Rail had reviewed its provision of non-technical skills training and is drawing up a business-wide strategy. This includes a non-technical skills framework which is bringing together previously separate work streams. Network Rail has been liaising with RSSB on the topic to learn from others but also to feed into industry-wide improvements.

113 ORR reported to RAIB that the recommendation was still being implemented and that Network Rail is taking action to implement it by 30 October 2023.

Actions reported as already taken

- 114 Since the incident, in June 2023 Network Rail released NR/L2/OHS/019 issue 12. The remit of this revision was to 'simplify the content without changing any of the recognised principles'. Of particular relevance to this report is that the standard now includes a clarification that a PIC cannot undertake site warden duties.

Recommendations and learning points

Recommendations

115 The following recommendations are made:¹⁵

- 1 *The intent of this recommendation is to ensure that appropriate safety arrangements remain in place when groups split during activities on or near the line.*

Network Rail should undertake a review of the relevant rules, standards, procedures and training material to ensure that adequate instructions and guidance exist for Persons in Charge and Controllers of Site Safety about the actions to be taken when track workers split from a group while on or near the line.

This review should specifically examine how the safety of the staff being split from the group is maintained and the way in which modified arrangements will be planned, implemented, briefed and recorded.

Network Rail should develop a timebound programme for the implementation of any appropriate changes identified (paragraph 106a).

- 2 *The intent of this recommendation is to ensure that Persons in Charge and Controllers of Site Safety are able to maintain appropriate control of the groups for which they are responsible during activities on or near the line.*

Network Rail should undertake a review of how the Rule Book requirement for COSSs to observe and advise their group is being undertaken in practice. The results from this review should be used as required to produce appropriately updated rules, guidance and training for those planning, approving and implementing safe systems of work (paragraph 106b).

¹⁵ Those identified in the recommendations have a general and ongoing obligation to comply with health and safety legislation, and need to take these recommendations into account in ensuring the safety of their employees and others.

Additionally, for the purposes of regulation 12(1) of the Railways (Accident Investigation and Reporting) Regulations 2005, these recommendations are addressed to the Office of Rail and Road to enable it to carry out its duties under regulation 12(2) to:

- (a) ensure that recommendations are duly considered and where appropriate acted upon; and
- (b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

Copies of both the regulations and the accompanying guidance notes (paragraphs 200 to 203) can be found on RAIB's website www.raib.gov.uk.

Learning points

116 RAIB has identified the following learning points:¹⁶

- 1 This incident highlights the importance of using good safety-critical communications techniques to ensure people have a mutual understanding of safety arrangements (paragraph 105a.i).
- 2 Persons in Charge (PIC) are reminded that they cannot act as a site warden while they are undertaking the PIC role (paragraph 107a).
- 3 This incident also illustrates the importance of forward-facing CCTV in providing valuable, incontrovertible evidence to safety investigations (paragraph 107b).

¹⁶ 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where RAIB has not identified management issues that justify a recommendation) and the consequences of failing to do so. They also record good practice and actions already taken by industry bodies that may have a wider application.

Appendices

Appendix A - Glossary of abbreviations and acronyms

CCTV	Closed-circuit television
COSS	Controller of site safety
ECR	Electrical control room
FAQ	Frequently asked questions
FFCCTV	Forward-facing closed-circuit television
IRP	Incident response pack
MDU	Maintenance delivery unit
MMIC	Maintenance manager in charge
MOM	Mobile operations manager
OLE	Overhead line equipment
ORR	Office of Rail and Road
PC	Protection controller
PIC	Person in charge
RAIB	Rail Accident Investigation Branch
ROC	Railway Operations Centre
RSSB	Rail Safety and Standards Board
SSoW	Safe system of work
TW	Track worker
WMSC	West Midlands Signalling Centre

Appendix B - Investigation details

RAIB used the following sources of evidence in this investigation:

- information provided by witnesses
- information taken from the train's on-train data recorder
- forward-facing CCTV from train 4H98
- site photographs
- weather reports
- a review of relevant rule book modules and handbooks
- a review of relevant Network Rail company standards
- a review of previous RAIB investigations that had relevance to this incident.

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Any enquiries about this publication should be sent to:

RAIB	Email: enquiries@raib.gov.uk
The Wharf	Telephone: 01332 253300
Stores Road	Website: www.raib.gov.uk
Derby UK	
DE21 4BA	