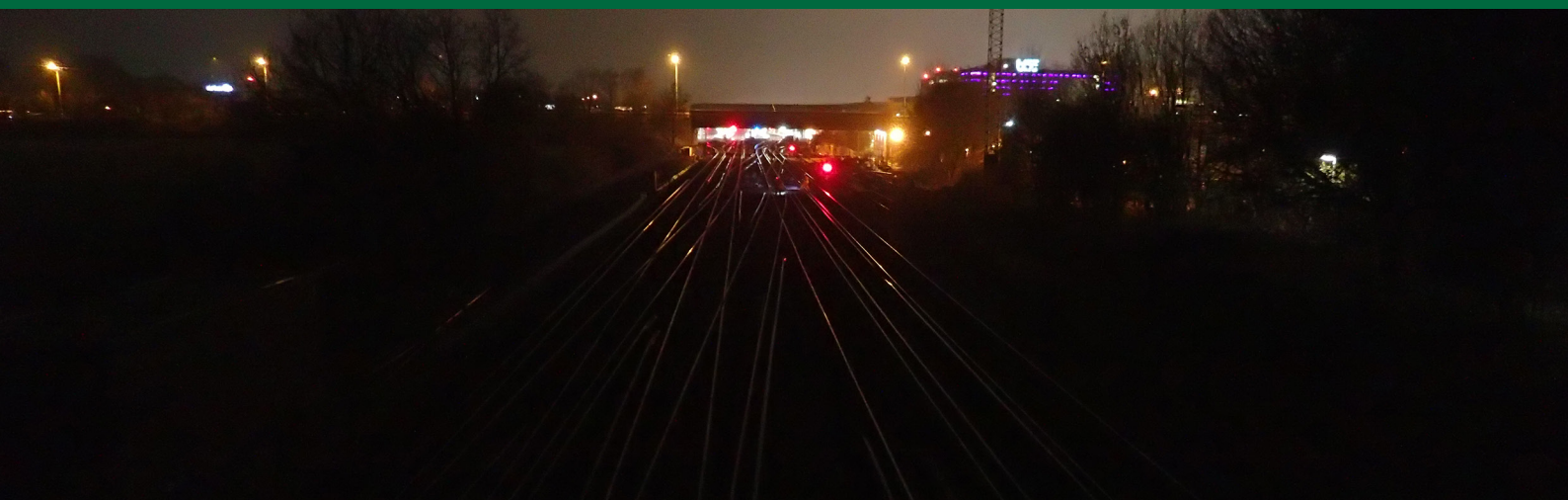


Rail Accident Report



**Near miss with a track worker near Gatwick
Airport station
2 December 2018**

Report 12/2019
September 2019

This investigation was carried out in accordance with:

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

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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.

The RAIB's findings are based on its own evaluation of the evidence that was available at the time of the investigation and are intended to explain what happened, and why, in a fair and unbiased manner.

Where the RAIB has described a factor as being linked to cause and the term is unqualified, this means that the 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 the RAIB is less confident about the existence of a factor, or its role in the causation of the accident or incident, the RAIB will qualify its findings by use of words such as 'probable' or 'possible', as appropriate. Where there is more than one potential explanation the 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 the RAIB, expressed with the sole purpose of improving railway safety.

Any information about casualties is based on figures provided to the 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. The 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.

The 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 a track worker near Gatwick Airport station, 2 December 2018

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Summary

At 23:24 hrs on 2 December 2018, a track worker narrowly avoided being struck by a train between Horley and Gatwick Airport stations, on the boundary between Surrey and West Sussex. The track worker, a controller of site safety (COSS), was undertaking work related to the electrical isolation of conductor rails and moved out of the path of the train just before it reached him.

The Network Rail isolation planning process meant that BAM Nuttall planners lacked the information needed for them to establish the exact location at which work was to be carried out on the track. The planners lacked the skills and experience needed to understand this and so provided a system of work which provided no protection from train movements at the actual location of the task. The COSS recognised that the planned system of work lacked adequate protection from train movements, but undertook the task without implementing an alternative safe system of work. A second track worker involved in the isolation task did not challenge the COSS about the unsafe method of working. The underlying factor was that Network Rail isolation processes did not provide planners outside Network Rail with sufficient information to always be able to plan safe systems of work.

The RAIB has recommended that Network Rail should improve its isolation planning processes so that safe system of work planners receive the information they need to plan all associated work safely. The RAIB has also recommended that BAM Nuttall should improve its safe system of work planning process to ensure that its planners do not plan work without sufficient information to identify appropriate protection measures.

The RAIB has also identified four learning points relating to working in accordance with appropriate safe systems of work, challenging unsafe work practices, planners seeking additional information when needed to plan safe systems of work and use of train horns.

Introduction

Key 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 report contains abbreviations explained in Appendix A. Sources of evidence used in the investigation are listed in Appendix B.

The incident

Summary of the incident

- 3 At 23:24 hrs on 2 December 2018, a track worker narrowly avoided being struck by a train between Horley and Gatwick Airport stations, on the boundary between Surrey and West Sussex (figure 1). The track worker was a controller of site safety (COSS) who, together with a strapping operative, had gone onto the railway to remove short circuiting straps (cables forming a temporary connection between conductor rails and running rails). The COSS moved out of the path of the train, around one second before it reached him, when it was travelling at around 35 mph (56 km/h). Nobody was injured.

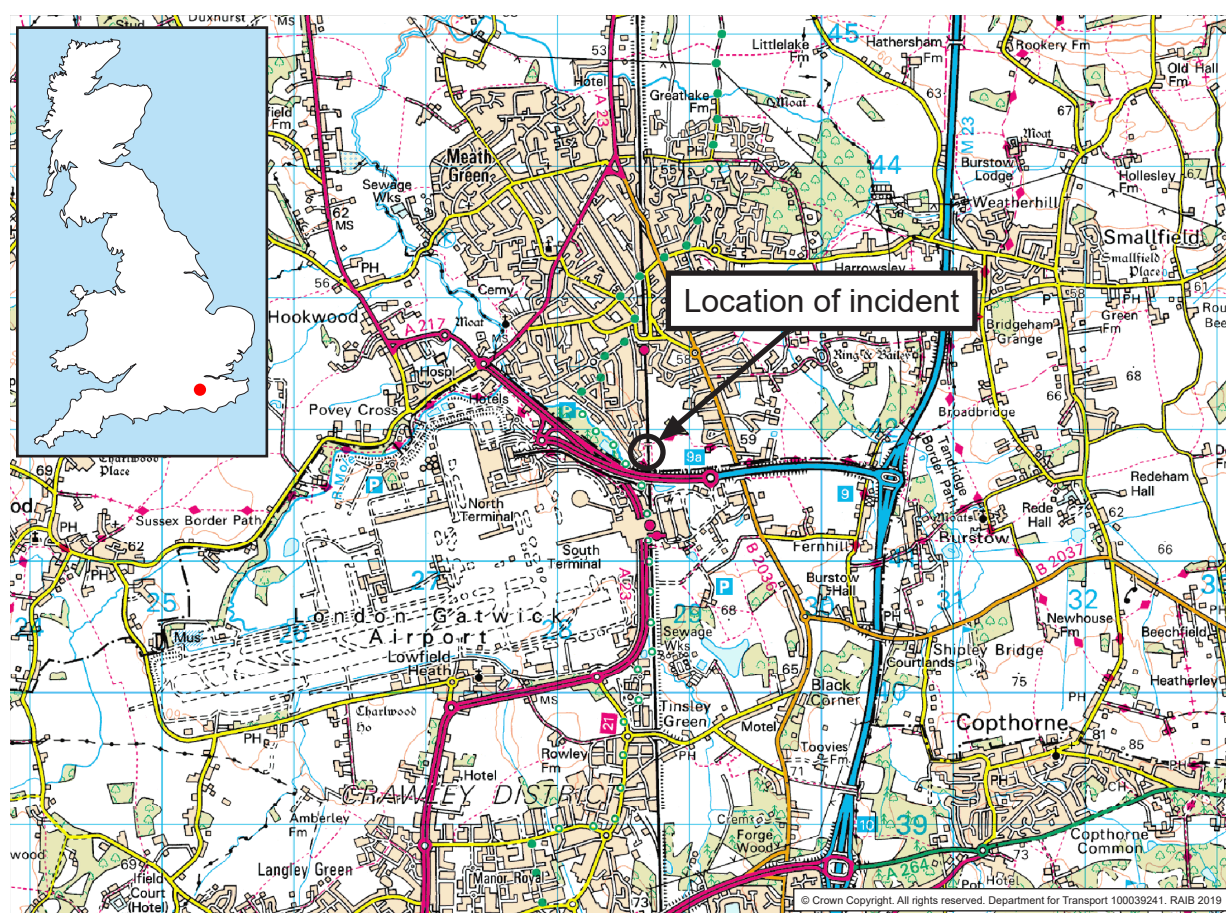


Figure 1: Extract from Ordnance Survey map showing location of incident

Context

Location

- 4 The incident occurred about 400 metres north of Gatwick Airport station on the main line between London and Brighton at about 26 miles 22 chains¹ from a zero datum at London Bridge station. The line is part of Network Rail's South East route.

¹ 1 chain = 22 yards (approximately 20 metres).

- 5 The railway at this location comprises the up and down fast lines, up and down slow lines and crossovers between these (figure 2). The maximum permitted speeds for trains is 90 mph (145 km/h) on the fast lines, 70 mph (112 km/h) on the slow lines and 40mph (64 km/h) on the crossovers.

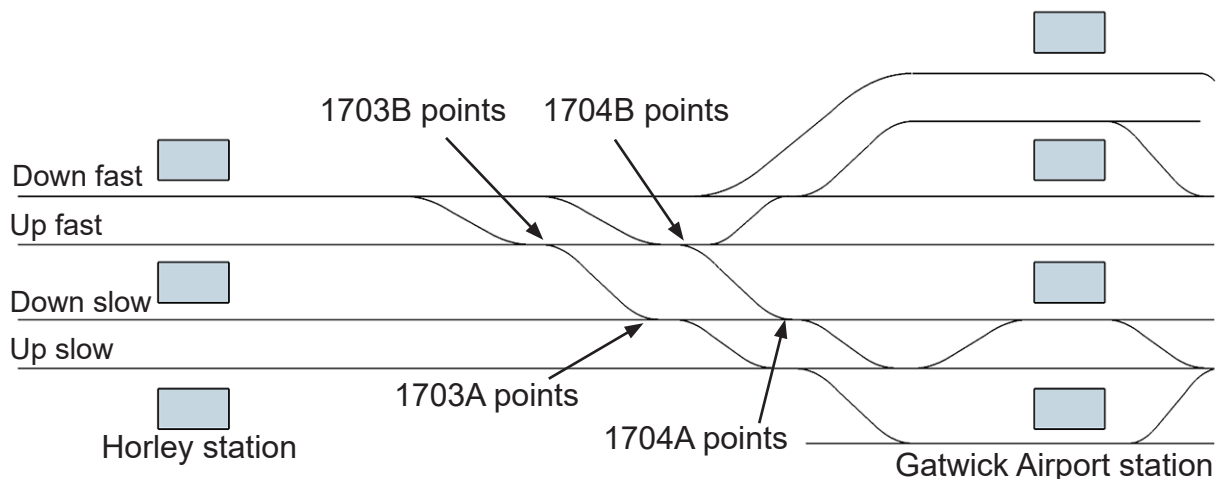


Figure 2: Track work in the area of the incident (not to scale)

- 6 All tracks in the area are equipped with a third rail to supply electric power to trains at, nominally, 750 volts (referred to as a conductor rail hereafter). These are fed from electrical substations alongside the railway and supervised by the electrical control room at Brighton. Signalling in the area is controlled by Three Bridges area signalling centre.

Organisations involved

- 7 Network Rail owns, operates and maintains the infrastructure. It also employed the isolation planner.
- 8 Southern (part of Govia Thameslink Railway) was the operator of the train and employed the train driver.
- 9 BAM Nuttall is a civil engineering contractor and employed both the senior possession manager and the safe system of work (SSOW) planner. It contracted Deploy UK Rail Ltd (Deploy) to provide other staff.
- 10 Deploy is a labour supplier and provided the controllers of site safety, the strapping operative and two of the engineering supervisors involved in the incident. These roles are described in paragraphs 13 to 18.
- 11 Each of these organisations freely co-operated with the investigation.

Train involved

- 12 The train, reporting number 1C82, was the 22:35 hrs service from London Victoria to Horsham. It was formed of a single, 5 coach, class 377 electric multiple unit. Neither the condition of the train nor the way in which it was driven contributed to the incident.

Staff involved

- 13 The senior possession manager acted as the 'responsible person' when accepting (checking) the BAM Nuttall SSOW pack (described as the Safe Work Pack (SWP) in Network Rail standard NR/L2/OHS/019²) relevant to the incident, and acted as the engineering supervisor responsible for managing railway safety when some work relating to the incident was being carried out on site. He had been a BAM Nuttall employee for 14 years and had more than 20 years railway experience. He was certified, within a Network Rail process, as competent to prepare SSOW packs and had been authorised by BAM Nuttall to accept them (individuals are not permitted to authorise a pack which they have prepared). He was also certified, again within a Network Rail process, as competent to act as an engineering supervisor.
- 14 The SSOW planner who prepared the SSOW pack for the work being undertaken at the time of the incident had been a planner for around four years and a BAM Nuttall employee for around two years. In addition to being certified as competent for this task, he was also authorised by BAM Nuttall to accept packs.
- 15 Two engineering supervisors, provided by Deploy, managed railway safety on site at different times after the senior possession manager ceased to carry out this role.
- 16 COSS1 led the team placing and removing short circuiting straps on the crossovers north of Gatwick Airport station (paragraph 21). He was provided by Deploy and had 18 years railway experience in various roles. He was certified as competent to undertake Network Rail roles including COSS (responsible for managing the safety of a group of people working on the railway) and 'level B strapping and testing', a competency required to fit short circuiting straps.
- 17 The strapping operative who was working with COSS1 when the incident occurred had worked on the railway for three years and was also provided by Deploy. He was certified to undertake level B strapping and testing, and COSS duties. However, he was not acting as a COSS at the time of the incident.
- 18 The isolation planner whose duties including identifying the location at which short circuiting straps were required from an electrical supply viewpoint was a Network Rail South East route employee.

Railway infrastructure and equipment

- 19 The infrastructure at the location of the incident includes two crossovers between the up fast and down slow lines. One, about 450 metres north of Gatwick Airport station, links 1703A points on the down slow line to 1703B points on the up fast line. The other, around 160 metres nearer the station, links 1704A points on the down slow line to 1704B points on the up fast line.
- 20 Conductor rails are provided on one side of each of the fast and slow lines. Two short conductor rails, known as floaters, are positioned alongside each crossover (figure 3). The pair of floaters at each crossover are linked by a cable, with the floater nearest the down slow line connected to the conductor rail by a cable and a hook switch, which can be opened and closed to allow the electrical feed to both floaters to be disconnected and reconnected.

² Network Rail Level 2 Business process: Safety of people at work on or near the line (NR/L2/OHS/019, issue 9, compliance date 3 July 2017).

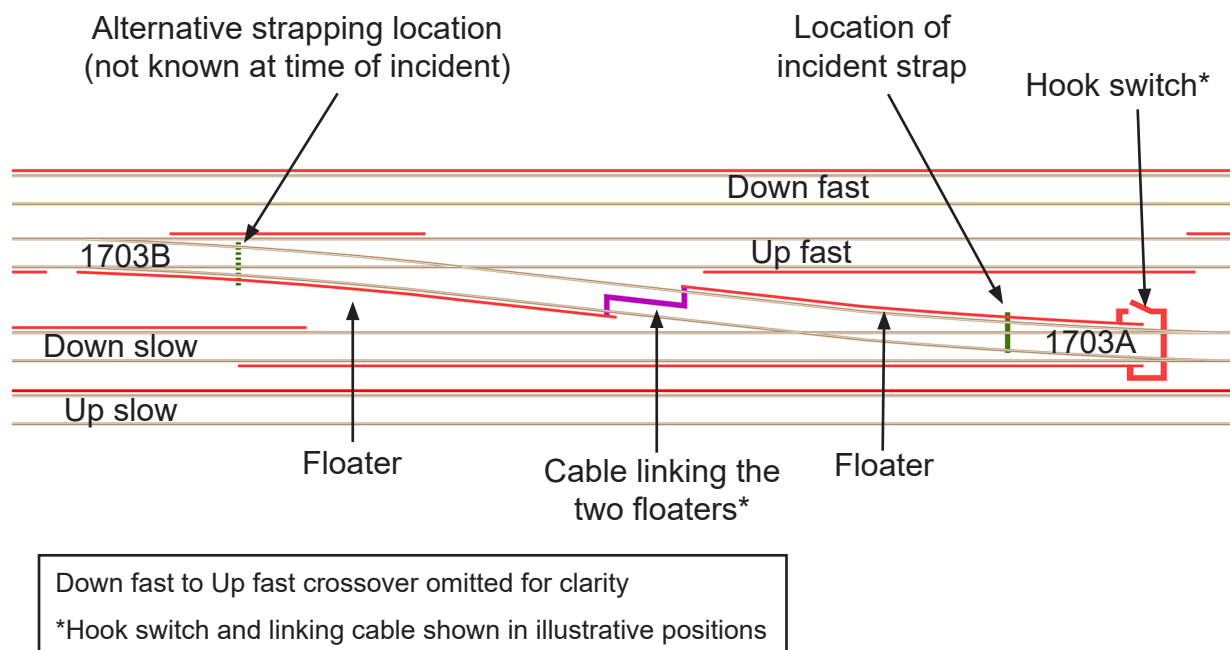


Figure 3: Crossover between 1703A and 1703B points (1704 points similar)

- 21 When engineering work is carried out on or near conductor rails, it is necessary to isolate these rails. This involves disconnecting the electrical feed and fitting short circuiting straps to temporarily connect the conductor rails to the rails which carry train wheels (figure 4). Connecting these rails causes circuit breakers to trip if power is accidentally restored to the conductor rail. This could occur if a mistake were made in a control room or if, contrary to the intended operation of trains in these circumstances, an electric train moves across the gap between a live and an isolated conductor rail allowing the electrically connected power pick up shoes at each end of a coach to touch both conductor rails simultaneously.

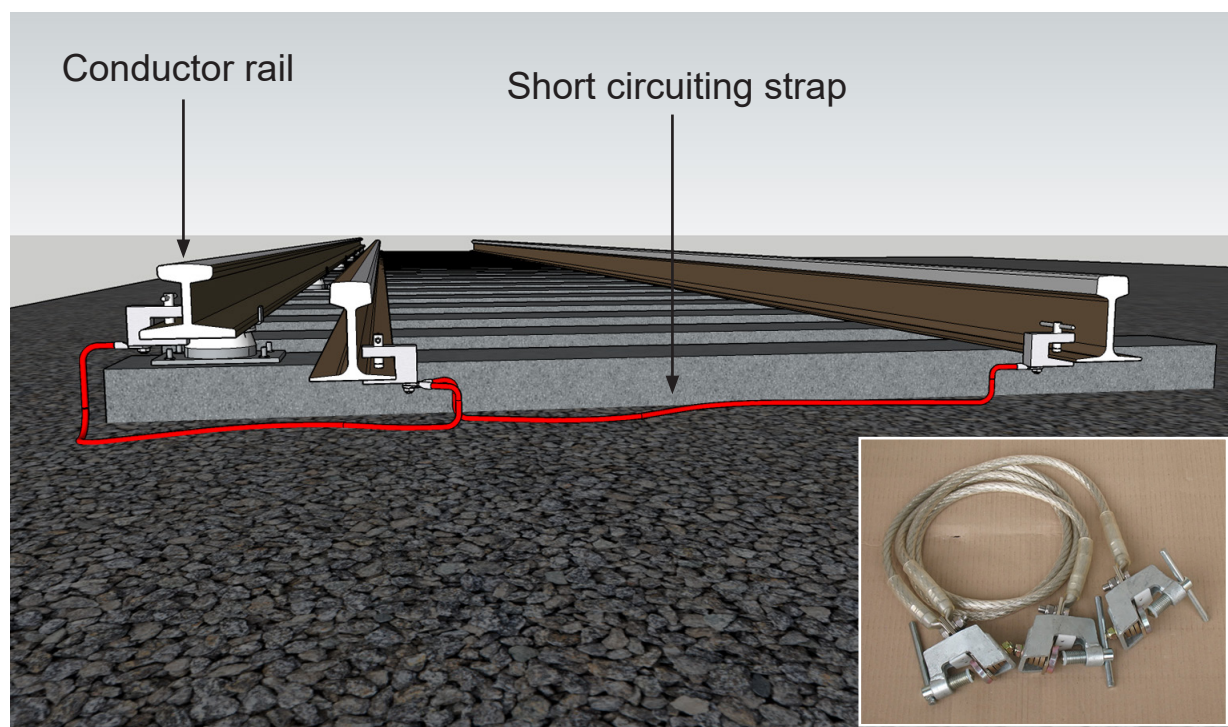


Figure 4: Short circuiting strap (inset photograph of strap (courtesy of Unipart Rail))

External circumstances

- 22 The short circuiting straps were placed and removed during the hours of darkness. There is no fixed lighting provided at the site so, although there is some light from the nearby airport, the strapping team used handheld and head torches.
- 23 The weather³ when the straps were applied (the early hours of Saturday morning) was cloudy with some light rain. The temperature was around eight degrees centigrade and there was an 8 mph (13 km/h) wind from the south-south-west.
- 24 The weather when the straps were being removed (late on Sunday evening) was also cloudy with some light rain. The temperature was around 13 degrees centigrade and there was a 20 mph (32 km/h) wind from the south west.

³ Weather data collected from the weather station at Gatwick airport and accessed via www.wunderground.com.

The sequence of events

Events preceding the accident

Planning

- 25 Conductor rail isolations were needed so BAM Nuttall could undertake drainage works on the fast lines at the south end of Horley station, about 800 metres north of the incident site. This was being carried out within a possession⁴ which stopped regular train movements on various lines between Stoats Nest Junction, about 19.3 kilometres north of the incident site and Tinsley Green Junction about 2.1 kilometres south of the incident site. The lines within the possession included the up and down fast lines, but not the up and down slow lines, in the vicinity of the incident.
- 26 The worksite⁵ required for the drainage works was within the possession and extended from about 5.3 kilometres north of the incident crossover to about 1.1 kilometres south of this crossover. Conductor rails within the worksite needed to be isolated to protect workers from the risk of electric shock while undertaking the drainage work. BAM Nuttall's roles included preparing SSOW packs intended to protect staff from train movements while they were installing and removing the short circuiting straps required to provide the isolation.
- 27 Protection from electrical risk required Network Rail's isolation planner to identify locations where the conductor rails were to be disconnected from the electrical supply, identify locations where short circuiting straps were required and include this information on an isolation form, known as the B2 form. A draft version of the B2 form was available to BAM Nuttall in early November 2018 and contained the location of strapping positions near the ends of the worksite. Strapping at the crossovers was not included in this draft information.
- 28 A member of BAM Nuttall's planning team referred to this draft B2 form and, on 9 November, produced SSOW packs for strapping at the north and south ends of the worksite. The SSOW planner accepted these on 26 November 2018.
- 29 The final version of the B2 form was issued to BAM Nuttall by the Network Rail isolation planner on 29 November 2018. This now included the additional requirement to strap the floaters adjacent to 1703A points and adjacent to 1704A points. The BAM Nuttall SSOW planner created an extra SSOW pack to cover this work and it was accepted by the senior possession manager on the same day. Also on that day, all three (north, south and floater) strapping SSOW packs were sent to Deploy for distribution to the controllers of site safety intended to carry out these tasks.

⁴ A possession is a temporary closure of part of the railway to allow safe access to the track for workers. Access to a possession controlled by a Person In Charge Of Possession (PICOP).

⁵ A worksite is an area within a possession into which access is controlled by an engineering supervisor. People working within a worksite do so either as an individual holding an appropriate safety qualification or as part of a group supervised by a COSS.

- 30 The SSOW pack for strapping at the south end of the possession was issued to COSS1 and the pack for the floaters at 1703A and 1704A points was issued to a different COSS. Deploy state that, as required by Network Rail processes, both these controllers of site safety had emailed Deploy to confirm that they had verified and accepted the relevant pack before the shift in which these straps were to be installed.

Early hours of Saturday 1 December 2018

- 31 The strapping teams met the senior possession manager, in his role of engineering supervisor, at BAM Nuttall's site compound near Horley station at around 03:00 hrs on Saturday 1 December. BAM Nuttall had provided a crew van in the compound for the engineering supervisor to use as an office and as the location at which he would provide the task briefings which the rule book required him to provide to controllers of site safety working in his worksite. There was a delay of around one hour accessing the site compound as the code for the gate padlock was not known to the staff present and this delayed the start of the engineering supervisor's briefings.
- 32 While staff were gaining access to the compound, the person in charge of the possession (PICOP) arranged for possession support staff to disconnect the electrical supply to the conductor rails within the worksite by withdrawing circuit breakers in substations at Great Lake Farm and Gatwick and by opening the hook switches at 1703 and 1704 points. A line block of the up and down slow lines was taken to enable the possession support staff to operate the hook switches safely. At 03:58 hrs, the PICOP gave the engineering supervisor authority to instruct installation of the short circuiting straps near both the north and south ends of the worksite, and at 1703 and 1704 points.
- 33 The engineering supervisor started his COSS briefings in the crew van at around 04:00 hrs, and briefed the north and south strapping tasks before the strapping task at the crossover floaters. He unintentionally gave the south end strapping task to the COSS who had been sent the SSOW pack for strapping the floaters at 1703 and 1704 points.
- 34 The engineering supervisor then briefed COSS1 that he was to strap the floaters on 1703 and 1704 points. During this briefing, COSS1 noticed that this was not the task for which he had verified and accepted the SSOW pack. However, as the other controllers of site safety had set off to undertake the tasks briefed to them, COSS1 agreed to undertake strapping of the floaters. He was given a SSOW pack for this work and signed a form in this pack confirming that he had verified and accepted it.
- 35 COSS1 and the strapping operative then went to Gatwick Airport station where COSS1 briefed the strapping operative about the content of the SSOW pack and the strapping operative signed the pack to confirm he had received the briefing. COSS1 and the strapping operative walked to the north end of Gatwick Airport station and onto the railway alongside the fast lines (which were closed to regular traffic) and continued walking to the crossovers.
- 36 When COSS1 and the strapping operative reached the crossovers, they fitted the straps at 1703A and 1704A points. This required work in the four-foot of the down slow line (between the rails, figure 5) which was open to traffic, but no trains passed.

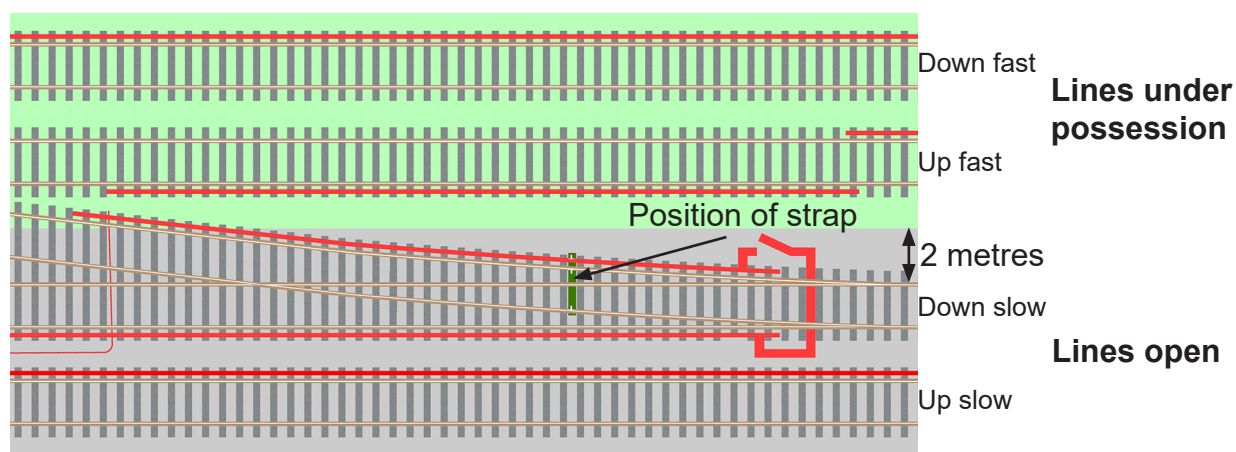


Figure 5: Strap location at 1703A points

- 37 At 05:37 hrs on Saturday morning, COSS1 called the engineering supervisor and confirmed that straps were in place at 1703 and 1704 points. He and the strapping operative then returned to the access point at Gatwick station, left site and returned to their homes.

Late hours of Sunday 2 December 2018

- 38 At 23:08 hrs on Sunday 2 December 2018, an engineering supervisor provided by Deploy was on duty and received confirmation from the PICOP that it was safe to remove short circuiting straps protecting the worksite in preparation for re-opening the line. This engineering supervisor telephoned COSS1 at 23:10 hrs and asked him to remove the straps which he and the strapping operative had placed the previous evening. The engineering supervisor undertook this briefing by telephone, as allowed by Network Rail procedures.
- 39 After COSS1 had briefed the strapping operative about the required work, and the strapping operative had signed the SSOW pack confirming that this had been done, they accessed the line at the north end of Gatwick Airport station. They then walked to 1704A points where the strapping operative stopped to remove the strap. While he completed this task, COSS1 carried on walking to 1703A points where he started to remove the strap.
- 40 After the strapping operative had finished removing the strap from 1704A points and was walking in a position of safety towards COSS1, he observed a train approaching from Horley station. He was not sure which line it was on and so did not try to warn COSS1 of its approach. The train was on the down slow line, from which COSS1 was removing the last end of the strap on 1703A points.
- 41 The driver of train 1C82 stated that he saw COSS1 on the line ahead of him just after passing through Horley station, and immediately sounded the train horn. The on-train data recorder (OTDR) shows this was a warning of about 0.5 seconds duration sounded when the train was about 11 seconds (about 235 metres) from COSS1. Images from the forward facing CCTV camera on the train show COSS1 working in the four-foot and give no indication of him responding to the warning. Immediately after sounding the horn, the train driver applied the train brakes, passing through the steps to full service brake (step 3) in 3 seconds.

- 42 Around 6.5 seconds before reaching COSS1, when the train was about 122 metres from 1703A points, the driver sounded the horn and did so continuously for around 5.5 seconds until about 1 second before the train reached COSS1.
- 43 When the train horn was sounded for the second time, the CCTV images show COSS1 starting to stand up and then stepping sideways out of the four-foot holding the short circuiting strap (figures 6 and 7). COSS1 raised his arm to acknowledge the train once he was clear of its path.



Figure 6: Forward facing CCTV image when train 1C82 was 3 seconds from COSS1 (courtesy of Southern)



Figure 7: Forward facing CCTV image when train 1C82 was 1 second from COSS1 (courtesy of Southern)

Events following the accident

- 44 The train stopped around 110 metres beyond COSS1 and the driver called the signaller to report a near miss.
- 45 COSS1 and the strapping operative were asked by the engineering supervisor to go to BAM Nuttall's site office at Horley where, in accordance with Network Rail procedures in these circumstances, COSS1 provided a sample for drugs and alcohol testing (paragraph 74).

Key facts and analysis

Identification of the immediate cause

46 COSS1 was in an unsafe position when the train approached.

47 The forward facing CCTV footage recorded by train 1C82 shows that COSS1 was in the four-foot of the down slow line at 1703A points as the train approached (figure 6). COSS1 was stationary and leaning down while removing a short circuiting strap. He moved clear of the train around one second before it passed him.

Identification of causal factors

48 The incident occurred due to a combination of the following causal factors:

- the SSOW planners did not identify a safe system of work because they lacked the skills and experience needed to appreciate they had not been provided with the information they needed to do so (paragraph 49);
- COSS1 did not implement a safe system of work (paragraph 64); and
- the strapping operative did not challenge the method of working (paragraph 75).

Each of these factors is now considered in turn.

Safe system of work planning

49 The SSOW planners did not identify a safe system of work because they lacked the skills and experience needed to appreciate they had not been provided with the information they needed to do so.

50 The SSOW pack for installing and removing short circuiting straps at 1703A and 1704A points was prepared by BAM Nuttall's SSOW planners based on information contained on a form (the B2 form) prepared by Network Rail's isolation planners. This form described the position of the straps as '26 miles 22 chains – 1703 points & 26 miles 30 chains – 1704 points'. It did not specify whether strapping at the A or B end points was required but the chainages correspond to 1703A and 1704A points on the down slow line. These positions could be identified at the site of work because there are lineside markers provided at almost every chain (figure 9). Although the 22 chain marker was missing, those for 21 chains and 23 chains were present.

51 The B2 form that was prepared was based on the electrical requirements needed to isolate the specified conductor rails. It complied with section 5 of Network Rail's standard NR/L3/ELP/27115⁶ which specifies that:

'The location of all Short Circuiting Devices to be operated and short circuiting straps to be fitted shall be shown on the isolation form'.

⁶ Network Rail Level 3 Work Instruction: Arrangements for isolation of the conductor rail for pre-planned possessions of the line (NR/L3/ELP/27115, issue 4, compliance date 1 December 2018).

- 52 Strapping operatives are required to place the straps at or close to the positions shown on the B2 form. They can be moved a small distance from the specified position if necessary to avoid local obstructions such as protective boards on a conductor rail. Significant changes are not permitted as this could cause incorrect operation of the signalling system due to the straps disrupting the small electric current passed through the running rails by the signalling system to determine the position of trains.

d.c. ISOLATION PROCEDURE A - NR/L3/OCS/3091 - B2

Network Rail

ELECTRICAL CONTROL ROOM: BRIGHTON			CURRENT ISOLATION No. BTN662		
Possession of the STOATS NEST JN & TINSLEY GREEN JN			ISSUE No: 2 PAGE No: 1 of 1		
Possession of the			WON No: KS36 ITEM No: 78		
Possession of the			SUPP No: EO No:		
Protection limits: Down Fast/Quarry: 1661pts to 1733pts			DATE: Sat 01 to Mon 03 December 18		
Protection limits: Up Quarry/Fast: 1732pts to 1662pts			PICOP CONTACT NUMBER		
Protection limits: Down Platform Loop:			BOOKED TIME OF POSSESSION		
Protection limits: Reversible Loop:			FROM: 0100 TO: 0400		
Protection limits:			Saturday Monday		
Protection limits:			AUTHORITY TO TEST ISOLATION GIVEN		
Current Affected - Line(s)	Substation / TP Hut	Circuit Breaker(s) Numbers	Hook SW / CTS / CTI NUMBERS		
			To open	To close	To remain open
Up/Down Quarry	COULSDON NORTH	B093.094.099.100	T4885		
Up/Down Fast	STAR LANE	B099.100.103.104	4887		
Down Platform Loop	MERSTHAM	B103.104.111.112	9793		
Reversible Loop	REDHILL (A)	B111.112.167.168	9794		
	WHITEBUSHES	B167.168.171.172			
	SALFORDS	B171.172.175.176			
	GREAT LAKE FARM	B175.176.179.180			
	GATWICK	B179.180.183.184	Floater		
			2347		
			9732		
Location of Short Circuiting Straps			Transfer of PICOP		
WORK SITE	ACTIVITY	LINE	Worksite limits	Additional Short Circuiting Strap Locations	DATE
			M/C	M/C	TIME
A	Maintenance	Up/Dn Quarry	14m41c	17m23c	FROM
				15m71c	TO
B	Track Work	Up/Dn Quarry	18m40c	20m03c	
		Up/Dn Fast	22m49c		
C	Track Work	Up/Dn Fast	22m74c		
		Floater		26m22c-1703pts	
		Floater		26m30c-1704pts	
		Up/Dn Fast	26m78c		

Figure 8: B2 form relating to the incident (extract)



Figure 9: Typical chain marker, not at incident site

- 53 General requirements for safety of people at work on or near the line (NR/L2/OHS/019) include:
- 'The planner...shall have suitable and sufficient task and site risk knowledge and experience, or shall consult with those who can provide such knowledge to discharge this responsibility'.*
- 54 For work in possessions, NR/L2/OHS/019/mod 2⁷ refers to the person in charge (PIC). This is the person in charge on site when the work is being undertaken and was the relevant COSS for each strapping operation. NR/L2/OHS/019/mod 2 states:
- The planner and person in charge...shall produce a SWP that includes the protection arrangements, task and site risk controls that are required to undertake the work safely...*
- The planner in consultation with the person in charge shall assess potential risks associated with adjacent open lines'.*
- 55 Therefore, BAM Nuttall's planners needed to establish whether installation of the straps at 1703A and 1704A points required work outside the possession. If the work was entirely on tracks within the possession, arrangements for the possession should protect staff from train movements. If any of the work was on or close to lines outside the possession, the SSOW needed to include additional precautions, for example implementing a line block on the appropriate line, to stop trains for a short period of time while strapping work was being undertaken.
- 56 Although the chainages on the B2 form corresponded with strapping positions on the down slow line the SSOW planner and the responsible manager responsible for authorising the SSOW pack were not aware of this. They did not have ready access to information (eg a track layout plan) showing that the chainages corresponded to points on the down slow line.
- 57 The planner who prepared the SSOW had very rarely, if ever, produced SSOW packs for strapping floaters and had never prepared one for 1703A or 1704A points. He assumed that, as the specified strapping mileages were within the mileages covered by the possession limits for the fast lines (14 miles 20 chains to 27 miles 46 chains), staff installing the straps would be protected from train movements by the arrangements for the possession. He did not consider the possibility that work at these mileages could be on an open line (the down slow line) alongside, but outside, the possession. As a result, the SSOW pack for installing the straps at 1703A and 1704A points did not include arrangements for train movements to be stopped on the down slow line. Therefore, the pack did not provide a safe system of work at the strapping location and did not meet the requirements of NR/L2/OHS/019 and NR/L2/OHS/019/mod 2 (paragraphs 53 and 54).
- 58 The SSOW packs were required to be authorised by a responsible manager in accordance with NR/L2/OHS/019. The senior possession manager undertook this role for the SSOW pack covering strap installation at 1703A and 1704A points.

⁷ Network Rail Level 2 Business Process: Safety of people on or near the line, Module 2: Planning and working in a possession (NR/L2/OHS/019/mod02, issue 1, compliance date 1 March 2017).

59 NR/L2/OHS/019 requires that:

'The responsible manager shall...provide the planner with the resources, including documents and guidance, to enable them to perform their role...

By authorising the SWP the responsible manager agrees [...] the specific safe system of work is available for use in the location; and the task risk has been adequately assessed and control measures identified'.

- 60 The responsible manager did not appreciate that the planned system of work did not provide adequate protection for staff. He was also not aware that the SSOW planner did not have all the information needed to identify a safe system of work.
- 61 The packs for strapping activities at the crossovers and at both ends of the worksite were prepared without input from the PICs expected to undertake this work (paragraphs 53 and 54), because BAM Nuttall had not made arrangements for these PICs to participate in preparation of the packs. It could have been difficult to make these arrangements for strapping at the crossovers because of the short time available to complete the associated SSOW pack (paragraph 63). This constraint did not apply to preparing the packs for strapping at the ends of the worksite.
- 62 The limited amount of information contained on the B2 forms and the lack of alternative sources of detailed information relating to the strapping task at the crossovers meant that the SSOW planner and the senior possession manager should not have completed and issued the SSOW pack without seeking further information. There is no evidence that lack of time influenced their decision not to seek further information. However, the RAIB notes that the time available to do this was very limited as a consequence of timing constraints imposed by Network Rail processes.
- 63 These processes meant that finalised isolation details (including the first indication that strapping was required at 1703A and 1704A points) were not issued by Network Rail isolation planners until the morning of the day on which finalised SSOW packs had to be prepared and issued to the COSS expected to undertake the work. Issue on that day was required so that each COSS could comply with the Network Rail requirement to review and verify the content of the packs one shift in advance of the work taking place. These timescales gave SSOW planners little time to research possible issues and, even if minded to do so, almost no opportunity to undertake a site visit.

Site Work

64 COSS1 did not implement a safe system of work.

- 65 Strapping operatives are trained that they must fix straps at, or very near, the position specified on the form giving isolation details (B2 form, paragraph 27). COSS1 stated that, during the engineering supervisor's briefing before installing the straps (paragraph 34), he was clear which lines were open, knew the strapping points were on or near an open line, and knew no arrangements had been made to stop trains on this line while the straps were installed.

- 66 COSS duties include ensuring adequate protection from moving train risk for the group of people to whom the COSS is assigned. The COSS is required to check that the proposed SSOW is adequate and can be implemented as planned. If this is not the case, the COSS is required to stop the planned work and, if appropriate, to follow a specified process for establishing an alternative SSOW.
- 67 COSS1 stated that, during this briefing, the engineering supervisor marked the strapping position of the points 1703A and 1704A on a plan, acknowledged that these were on the down slow line but assured him that, although open to traffic, no trains would actually run on this line. The engineering supervisor denied this. An assessor was present in the van during this briefing to undertake a routine assessment needed to maintain the engineering supervisor's qualification to undertake this role, but could not recall the details of the conversations during the briefing. No plan annotated as described by the COSS has been found.
- 68 There is no evidence that COSS1 discussed train movements on the down slow line with the engineering supervisor who asked him to remove the straps on the Sunday evening (paragraph 38). If this had happened, it may have alerted this engineering supervisor to a possible intention for the work to be carried out without proper protection arrangements.
- 69 COSS1 also stated that, when agreeing to install the straps at 1703A and 1704B points on Saturday morning, he thought this could probably be done from a 'position of safety', just leaning into the area open to traffic. He appreciated this was impractical as soon as he arrived to fit the straps on Saturday morning and so was aware it was not possible before setting out to remove the straps on the Sunday evening.
- 70 COSS1's decision that he and the strapping operative should install and remove the straps on a line open to traffic was inconsistent with the SSOW pack which required a separated site of work, where all workers must stay at least 2 metres from lines open to traffic. This is described in section 4.6 of the handbook 7 of the railway rule book as:
- 'If it is only you [the COSS] and one other person in the group, you do not need to appoint a site warden, but you must make sure neither of you go any closer than 2 metres (6 feet 6 inches) to the nearest running rail of the open line.'*
- 71 COSS1 could have, but did not, request a modification to the SSOW by seeking an appropriate manager's authority to modify the SSOW to allow use of a line blockage for the strapping work as had been arranged for the protection staff opening the hook switches (paragraph 32). The COSS could not have changed the safe system of work to use a lookout as this is not permitted during the hours of darkness when the maximum speed of trains on any open line is greater than 20 mph (30 km/h). The SSOW pack included a blank line blockage form for use if the method of protection needed to be revised, but this was not used when installing, or when removing, the straps.
- 72 At the time of the incident, COSS1 and the strapping operative were not together; the strapping assistant had just finished removing a strap at 1704A points and COSS1 was removing the strap at 1703A points. This was inconsistent with the SSOW pack which stated:
- 'The COSS MUST NOT undertake strapping duties. The COSS is to establish SSOW and ensure straps are placed at the correct location.'*

73 Separation of COSS1 and the strapping assistant was also inconsistent with the railway rule book (handbook 7 section 4.1) which states:

'You [the COSS] must stay with your group so that you are able to personally observe and advise everyone until work is completed and your group is no longer on or near the line'.

74 The possible reasons for COSS1 deciding to install and remove the straps on a line open to traffic include that:

- he believed they were quick jobs so exposure to risk was minimal provided he kept a look out for trains (in fact removal of the strap at 1703A points by COSS1 at the time of the incident took longer than expected because it was caught in the ballast, a situation which could have been a distraction from looking for trains);
- the strapping team was not required to remain on site after completing installation of straps on Saturday morning or after removing the straps on Sunday evening so there was an incentive to complete the job quickly and go home;
- there was possibly some time pressure when installing the straps (but not when the incident occurred during strap removal) because of delays caused when getting into the site compound (paragraph 31); and
- the weather was disagreeable on both nights, giving an incentive to minimise the time spent outdoors.

75 **The strapping operative did not challenge the method of working.**

76 The strapping operative stated that, while installing and removing straps, he was uncertain which lines were open to traffic. He did not seek clarification from COSS1 but looked out for trains himself. He stated that COSS1's briefings (paragraphs 35 and 39) told him that the "*next line over from where we're working*" would be open. This description was possibly unclear because the track layout at the strapping location differed significantly from that adjacent to the access point where the briefing was held.

77 The strapping operative's basic track safety training and COSS training included the Network Rail requirement that a COSS must remain with the group to whom they have been assigned (paragraph 73). The strapping operative was aware that this was not the situation when COSS1 went to 1703A points while he remained at 1704A points, but did not challenge this.

78 The strapping operative stated that he did not feel that he could question COSS1 as COSS1 was a much more experienced person with a strong character and the strapping operative's previous experience suggested he would be ignored.

Identification of underlying factor

Planning for isolations

- 79 **Network Rail's processes for isolating conductor rails did not provide SSOW planners outside Network Rail with sufficient information for them to prepare a SSOW pack.**
- 80 Requirements for planning the electrical aspects of conductor rail isolations are given in Network Rail standard NR/L3/ELP/27115, 'Arrangements for isolation of the conductor rail for pre-planned possessions of the line'. This requires isolation planners to identify, and show on a B2 form, appropriate strapping locations based on electrical and signalling requirements (paragraph 21).
- 81 The isolation details provided by the isolation planners on B2 forms are taken from a library of controlled drawings (known as comprehensive track diagrams) and sample forms which have been created and verified for standard possession areas. These include specified positions for the short circuiting straps.
- 82 In order to identify a safe system of work compliant with Network Rail requirements (paragraph 53), SSOW planners need to know additional information about the railway infrastructure, including the position of strapping locations relative to nearby railway tracks. However, there is no requirement for the isolation planners to provide this additional information.
- 83 Network Rail does hold the additional information but it is not on a single system and there is no formalised means of providing this to SSOW planners outside Network Rail. The information was not available to BAM Nuttall SSOW planners before the incident (paragraph 56). It is possible that some SSOW planners do have access to this information if they work for organisations which have acquired it in connection with activities other than preparation of SSOW packs.
- 84 Safe systems of work should be based on the safest practical means of working. As the strapping positions shown on the B2 form were outside the possession area, working at these positions required train movements on the down slow line to be stopped using a line block or an alternative method. Alternative positions for these straps were available within the possession on the up fast line at points 1703B and 1704B (see figure 3). The Network Rail risk hierarchy for selecting the appropriate SSOW considers working in a possession as safer than other methods of protecting staff from train movement risk. The option to use the fast line positions was not included in the library of standard isolation arrangements used by the isolation planners (paragraph 81) and so was not included on the B2 form and thus could not be considered by the SSOW planner.

Factor affecting the severity of consequences

- 85 It is very likely that sounding of the train horn by the driver (paragraph 43) provided COSS1 with the warning needed for him to get out of the path of the train and so avoid more serious consequences.

Previous occurrences of a similar character

- 86 The RAIB has investigated a number of accidents and near misses involving track workers on Network Rail's infrastructure. It has previously identified track worker safety as an area of particular concern in annual reports and is currently investigating the tragic death of two track workers at Margam on 3 July 2019. Several themes associated with this type of work are considered in the RAIB's class investigation of irregularities with protection arrangements during infrastructure engineering work ([RAIB Report 07/2017](#)) and led to a recommendation relevant to the incident near Gatwick Airport (paragraph 92).
- 87 The RAIB also investigated an incident close to Egmonton level crossing, on the East Coast Main Line, in which a group of track workers narrowly avoided being struck by a train ([RAIB Report 11/2018](#)). The group had been working under an unsafe and unofficial system of work. Although the person who set up the system of work was qualified, experienced and deemed competent by his employer, neither his training nor reassessments had instilled in him an adequate regard for safety and the importance of following the rules and procedures. Additionally, none of the team involved challenged the unsafe system of work that was in place at the time, even though some were uncomfortable with it. A recommendation from this investigation is relevant to the incident near Gatwick Airport (paragraph 95).

Summary of conclusions

Immediate cause

88 COSS1 was in an unsafe position when the train approached (paragraph 46).

Causal factors

89 The causal factors were:

- the SSOW planners did not identify a safe system of work because they lacked the skills and experience needed to appreciate they had not been provided with the information they needed to do so (paragraph 49, **Recommendations 1 and 2, Learning point 3**);
- COSS1 did not implement a SSOW (paragraph 64, **Learning points 1 and 2**); and
- the strapping operative did not challenge the method of working (paragraph 75, **Learning point 2**).

Underlying factor

90 Network Rail's processes for isolating conductor rails did not provide SSOW planners outside Network Rail with sufficient information for them to prepare a SSOW pack (paragraph 79, **Recommendation 1**).

Factor affecting the severity of consequences

91 Use of the train horn very likely avoided COSS1 being struck by the train (paragraph 85, **Learning point 4**).

Previous RAIB recommendations relevant to this investigation

Previous recommendations that had potential to address one or more factors identified in this report

[Class investigation into accidents and near misses involving trackworkers RAIB report 07/2017, Recommendation 2](#)

- 92 The following recommendation sought action to address similar issues to those identified in this report (poor system of work and lack of challenges, paragraphs 64 and 79). The recommendation read as follows:

The intent of this recommendation is to improve the non-technical skills of track workers.

Network Rail should review the effectiveness of its existing arrangements for developing the leadership, people management and risk perception abilities of staff who lead work on the track, as well as the ability of other staff to effectively challenge unsafe decisions. This review should take account of any proposed revisions to the arrangements for the safety of people working on or near the line. A time-bound plan should be prepared for any improvements to the training in non-technical skills identified by the review

- 93 ORR reported to the RAIB on 4 December 2018 that Network Rail has reviewed existing training arrangements for non-technical skills provision for track workers and put in place a time bound plan for delivering improvement. A non-technical skills training course has been developed by Network Rail for all track workers including controllers of site safety. ORR therefore consider the recommendation as implemented and proposes to take no further action unless it becomes aware that the information provided becomes inaccurate.
- 94 Based on recent investigations, the RAIB remains concerned about the standards of leadership, people management and risk perception among staff undertaking work on track.

Other relevant recommendations

[Near miss with group of trackworkers at Egmonton level crossing, Notts \(RAIB report 11/2018 Recommendation 1\)](#)

- 95 This recommendation seeks management actions intended to ensure that those with safety leadership roles act appropriately and so addresses a similar issue to that identified in this report (poor system of work, paragraph 64). The recommendation reads as follows:

The intention of this recommendation is to both strengthen safety leadership behaviour on site and reduce the occurrences of potentially dangerous rule breaking by those responsible for setting up and maintaining safe systems of work (ie COSS, SWL, PIC [site staff with safety responsibilities]).

Network Rail should review its processes for monitoring and managing the safety leadership of its staff in COSS, SWL or PIC roles, in order to identify improvements such that only those who exhibit satisfactory safety attitude, leadership and compliance with safety rules and procedures, undertake these roles. The review should include consideration of the following:

- *risk based analysis of the non-technical skills required for different work scenarios (ie under protection and warning systems of work);*
- *evaluation of the effectiveness of non-technical skills training since its initial introduction;*
- *assessment tools (eg COSS pre-course workbook, 360 degree feedback) to assist managers with monitoring the ongoing suitability of staff for safety leadership roles; and*
- *using re-certification training and assessments, independent of line managers, to reinforce good safety leadership and the importance of compliance with the rules.*

Network Rail should then implement the identified improvements to relevant working practices and procedures.

- 96 The ORR had not provided the RAIB with a report concerning implementation of this recommendation before completion of the RAIB's Gatwick investigation. This is because the Gatwick report is being published less than one year after the Egmonton report and one year is the statutory time limit for such a report to be provided. However, Network Rail has provided the RAIB with the following information:

Network Rail has reviewed the effectiveness of current practices and training and gathered information from other groups and sources who work in this area. Network Rail has plans in place to create Safety Leadership Competence/ Capability, which will include sociometric testing and personal behaviours. Network Rail intends to change the recertification training and assessment for Network Rail staff, which will mirror industry best practice and bring the identified improvements to Network Rail through changes to the relevant working practices and procedures.

Actions reported as already taken or in progress relevant to this report

- 97 Network Rail isolation planners have now established that strapping the floater on the crossover between 1703A and 1703B points can be done at either the A or B ends; and that the same applies for the crossover between 1704A and 1704B points. Strapping is usually only needed in conjunction with work on the up fast line (B point ends); electricity supply arrangements make this unnecessary if the down slow line conductor rail is isolated. Standard strapping arrangements for possessions of the up fast line now give mileages corresponding to the B ends where strap installation is unaffected by train movements on the down slow line. These strapping locations have been marked by plates attached to track sleepers.
- 98 BAM Nuttall has stated that, following the incident, Network Rail has made available the additional information needed to prepare SSOW packs for installing short circuiting straps on conductor rails.
- 99 Network Rail has stated that remote isolation devices are being fitted in some conductor rail areas. These allow staff to disconnect electrical supplies and to earth conductor rails without the electrocution risk due to working close to live, or possibly live, electrical conductor rails. The devices are operated from positions which are not close to tracks and so also avoid the risk of staff being struck by trains while undertaking these activities. These devices are installed on the Brighton main line and will be brought into use when staff training is complete. However, they will not be fitted to all isolation locations and will not be fitted at the points involved in the Gatwick incident.

Recommendations and learning points

Recommendations

100 The following recommendations are made⁸:

- 1 *The intent of this recommendation is to ensure the effective transfer of information needed to prepare safe systems of work for isolation activities. It is anticipated that both switching and earth strapping will be covered, possibly by simple diagrams showing the exact locations at which staff must work. The detail of implementation is expected to take account of the programme for installing and bringing into use remote switching and isolation facilities in some areas, the need for adequate precautions until these are operational and the possibility that these facilities may not become operational at the times currently programmed.*

Network Rail should improve its processes for planning conductor rail isolations so that safe systems of work planners are provided with simple, clear and precise information about the locations at which isolation work will take place.

- 2 *The intent of this recommendation is to ensure that safe system of work planners issue plans to site workers with accurate and appropriate protection for the location and nature of the work being undertaken. This should apply to all site activities, not only work relating to isolation of conductor rails. It is anticipated that work already undertaken by BAM Nuttall since the incident will contribute to implementation of this recommendation.*

BAM Nuttall should improve its safe system of work planning and checking processes so that:

- all safe systems of work plans include protection for the actual positions at which people are required to work;
- safe system of work planners seek additional information if they lack the information needed to identify and document safe methods of working; and
- persons in charge of work participate in the planning process as required by Network Rail standards.

⁸ 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.gov.uk/raib.

Learning points

101 The RAIB has identified the following important learning points⁹:

- 1 It is essential that track work is undertaken in accordance with the approved safe system of work, or after following the appropriate formalised system for establishing an alternative safe system of work.
- 2 Challenging inappropriate safety behaviours, and applying a worksafe process (stopping work if safety concerns are not resolved) when appropriate, are essential for everyone's safety.
- 3 Safe work planners must seek additional information before completing a safe system of work pack if they lack the detail of the task needed to confidently plan it safely.
- 4 The value of sounding the train horn as a warning if drivers see people in, or possibly in, a position of danger was demonstrated during the Gatwick incident when it almost certainly saved the life of the track worker involved. The rule book requires the warning to be given as repeated short horn blasts.

⁹ 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when the RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where the 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
OTDR	On train data recorder
PIC	Person in charge
PICOP	Person in charge of possession
SSOW	Safe system of work
SWP	Safe work pack

Appendix B - Investigation details

The RAIB used the following sources of evidence in this investigation:

- information provided by witnesses;
- training materials;
- site documentation;
- meetings;
- Network Rail and Railway Group standards;
- observation of strapping activities at the incident site including attendance at the engineering supervisors brief;
- information taken from the train's on-train data recorder (OTDR);
- CCTV recordings taken from the train;
- site photographs and measurements;
- weather reports and observations at the site;
- a review of previous reported incidents; and
- a review of previous RAIB investigations that had relevance to this accident.

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