RAIB

Rail Accident Investigation Branch

Rail Accident Report

Track worker struck by a train at Cheshunt Junction 30 March 2010

Department for Transport

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March 2011

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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Track worker struck by a train at Cheshunt Junction, 30 March 2010

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Summary

At 11:44 hrs on 30 March 2010 train 2B13, a passenger service running from Stansted Airport to London Liverpool Street, travelling at about 30 mph (48 km/h), struck a member of railway staff at Cheshunt Junction in Hertfordshire. The person who was struck was one of a team of eight people carrying out maintenance work on the track, and he was seriously injured. There was no damage to the train or infrastructure.

The investigation has identified that the track worker who was struck did not move to a position of safety and remained in the path of the train as it passed through the junction. The track worker had not expected the train to follow the route which took it onto the line on which he was working.

No satisfactory safe system of work had been established, and staff did not always move to a position of safety when the lookout warned that trains were approaching.

The RAIB has made two recommendations to Network Rail relating to reducing the risk of working at junctions, and the behaviour of staff working at locations with extended sighting of approaching trains.

Preface

1 The sole purpose of a Rail Accident Investigation Branch (RAIB) investigation is to prevent future accidents and incidents and improve railway safety.

2 The RAIB does not establish blame, liability or carry out prosecutions.

Key Definitions

3 All dimensions and speeds in this report are given in metric units, except speed and locations on Network Rail, which are given in imperial dimensions, in accordance with normal railway practice. In this case the equivalent metric value is also given.

4 The report contains abbreviations and technical terms (shown in *italics* the first time they appear in the report). These are explained in appendices A and B.

The Accident

Summary of the accident

5 At 11:44 hrs on 30 March 2010 a track worker, who was one of a team of eight people engaged in track maintenance work at Cheshunt Junction, Hertfordshire, was struck by the 11:03 hrs passenger train from Stansted Airport to London (Liverpool Street) via Southbury, train 2B13, travelling at about 30 mph (48 km/h).

6 The track worker was knocked down and thrown clear of the train by the impact. He was taken to hospital and found to have sustained serious injuries.

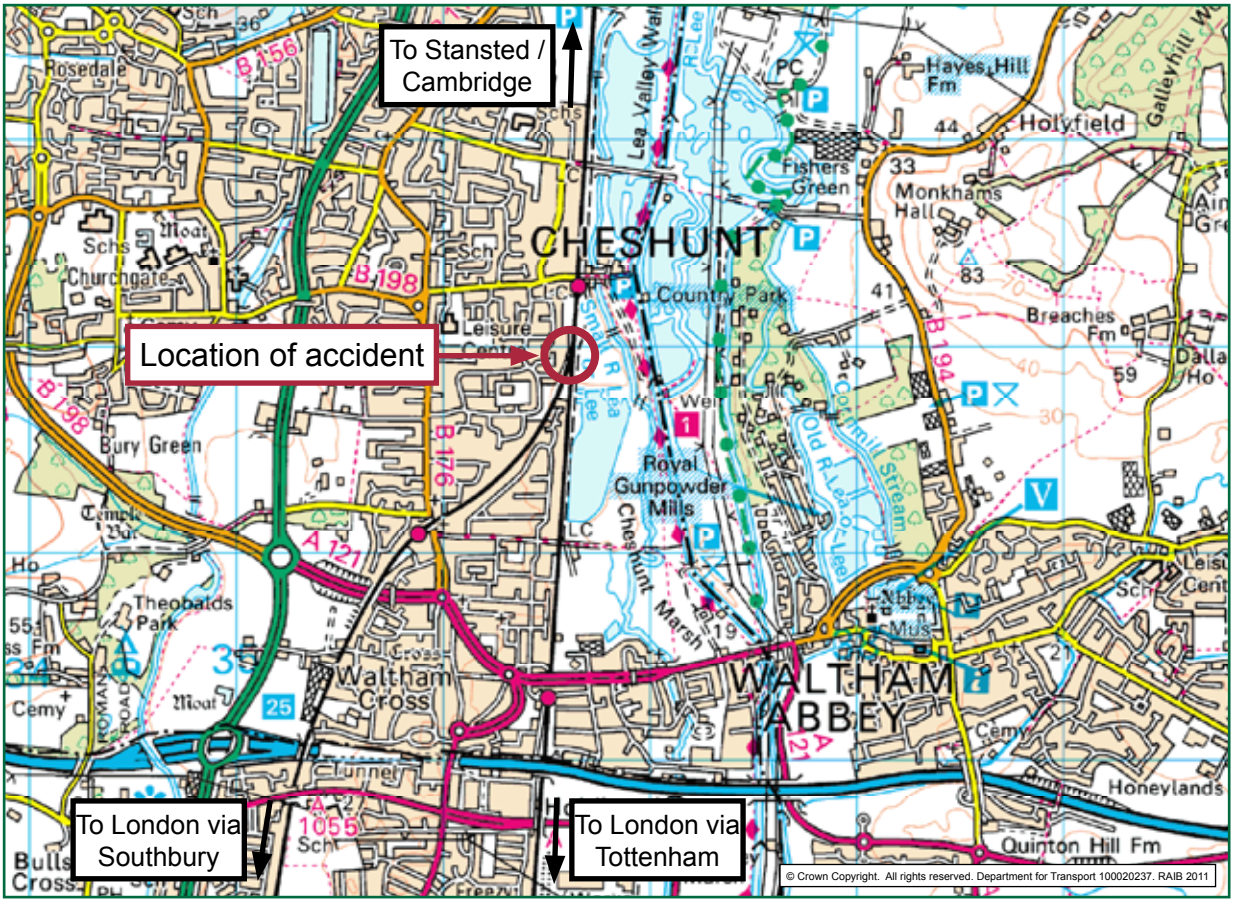

Figure 1: Extract from Ordnance Survey Map showing location of accident

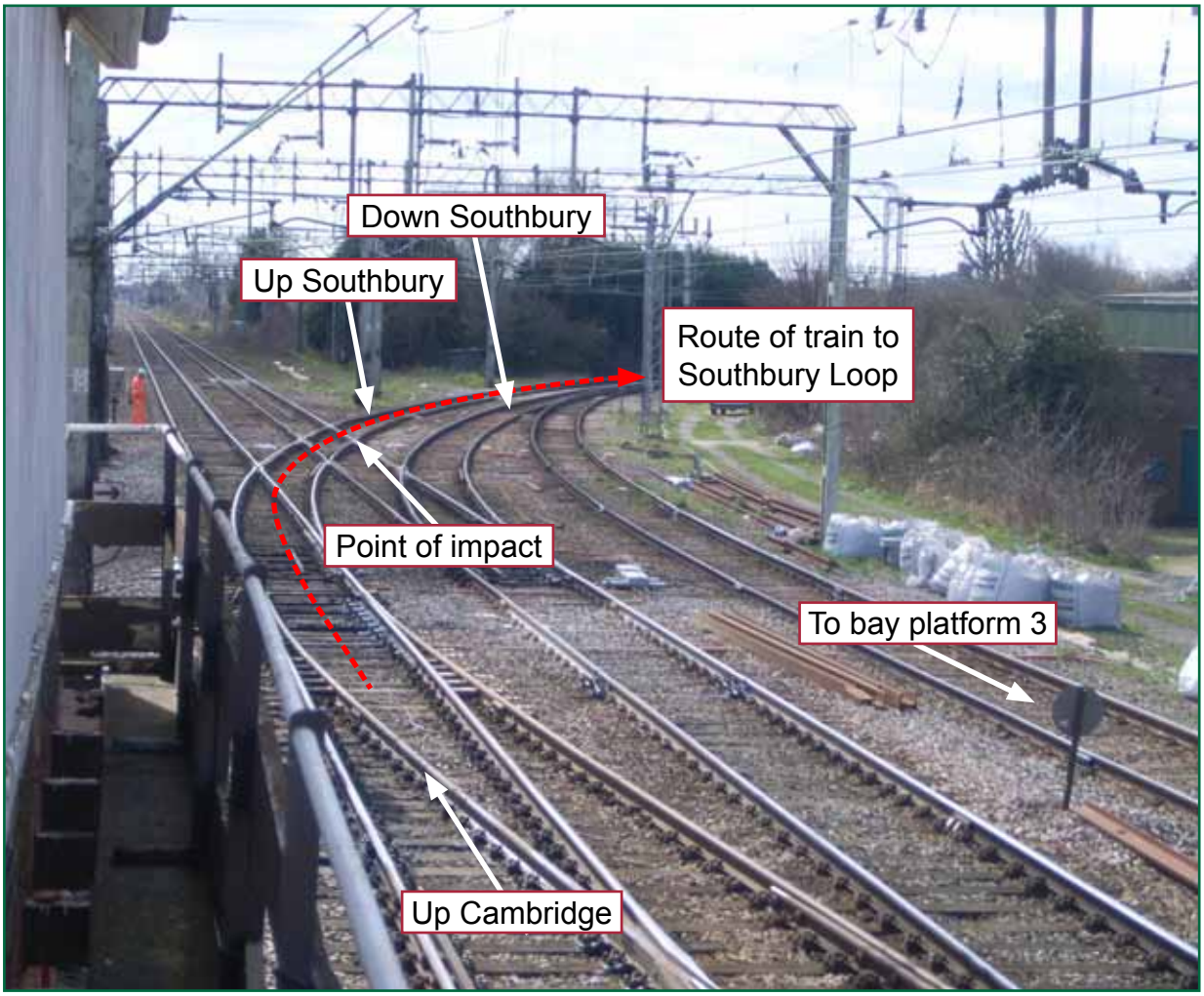

Figure 2: Cheshunt Junction seen from the north (looking south)

Organisations involved

7 Network Rail, East Anglia Route, owns and operates the railway infrastructure. It also employs the track worker who was injured, the *controller of site safety* (COSS) and the *lookouts* who were working at the site.

8 National Express (East Anglia) (NXEA) operated the train involved and employed the driver.

9 TES 2000, an agency supplying labour to the railway industry, employed the other members of the team working at the site.

10 Network Rail, NXEA and TES 2000 freely co-operated with the investigation.

Location

11 Cheshunt Junction is on the immediate London (south) side of Cheshunt station, which is some 14 miles (22 km) from London (Liverpool Street). It is on the main line from London to Stansted Airport and Cambridge, via Tottenham Hale, known as the 'Cambridge line'.

12 At Cheshunt the Cambridge line runs north – south and is straight for some 2 miles (3.5 km) on each side of the station (figure 1). The permitted speed for trains is 85 mph (137 km/h) in the *down* direction and 80 mph (129 km/h) in the *up* direction. People working on the track can see trains approaching from either direction on the Cambridge line at least 52 seconds before they reach the junction.

13 The Southbury loop line diverges from the Cambridge line nearer London at Hackney Downs and rejoins it at Cheshunt Junction. The loop line approaches the junction on a curve, restricting the visibility of trains coming from Southbury.

14 The junction itself is the divergence of two double track routes. An additional track leads from the loop line directly into the bay platform 3 at the station, enabling trains to use the bay without interfering with movements on the Cambridge line (figure 2).

15 Signalling in the area uses 4-aspect colour light signals controlled from Liverpool Street *Integrated Electronic Control Centre* (IECC). The signalling equipment performed normally and did not contribute to the accident.

External circumstances

16 The weather at the time of the accident was dry and clear, and the sky was overcast. There was no significant noise from premises outside the railway.

17 External circumstances had no effect relevant to the accident.

Train involved

18 The 11:03 hrs train from Stansted Airport to Liverpool Street (reporting number 2B13) was a 4-coach class 317 *electric multiple unit*.

19 The train was equipped with an on-train data recorder (OTDR) monitoring (among other parameters) the train's speed and the driver's use of the traction and brake controls and the warning horn. It was also equipped with forward and backward facing CCTV cameras. All these systems were active at the time of the accident and provided evidence relevant to the RAIB's investigation.

20 The RAIB has found no evidence that the maintenance, overhaul or condition of the train contributed in any way to the accident.

Staff involved

21 The injured person was employed in the grade of *Track Chargeman* at Network Rail's Tottenham depot. He had joined the railway industry in February 2001 and was promoted to Track Chargeman in June 2006 and was working in that role on the day of the accident, responsible for the team of staff working at Cheshunt.

22 The team comprised the chargeman, the COSS, two lookouts (all employed by Network Rail) and four other agency track workers (employed by TES 2000).

23 The COSS had joined the railway at Tottenham depot in April 2003, qualified as a COSS in March 2004 and became a Leading Trackman in October 2009.

Events preceding the accident

24 The agency staff, employed by TES 2000, began their day's work by assembling at Colchester about 06:00 hrs before being driven to Tottenham depot. The rest of the team, who were Network Rail staff, reported for work at Tottenham depot at 07:30 hrs. The *track section manager* instructed the chargeman that his team was to work on the Cambridge line, first between Angel Road and Ponders End stations, using an access point known as Goodwin Road, and then at another site at Cheshunt Junction five miles (8 km) further north. The chargeman received a single set of papers from the manager giving information about the sites and the systems of protection to be used (known as the *RIMINI pack*), and appointed one of the Network Rail staff as COSS. Although the chargeman retained overall responsibility for all the team, the implementation of a safe system of work was the responsibility of the COSS.

25 The team drove to Goodwin Road where they were to carry out packing of *ballast* under a rail joint on the down line, the Network Rail staff travelling in one vehicle and the TES 2000 staff in another.

26 On arrival at the access point, the COSS briefed the team, indicating, among other matters, where the lookout was to be placed and the *position of safety* to which the team were to move when warned of an approaching train. He entered this data on the form RT9909 *Record of Site Safety Arrangements and Briefing Form*, generally known, and referred to, as the *COSS Form*, which is part of the RIMINI pack. Each team member signed the form to indicate that they had received and understood this briefing, which applied to the site at Goodwin Road.

27 The site at Goodwin Road was on plain track (without points) and open to normal traffic. The route from the access point to the site of work did not require the team to cross any tracks. The COSS placed a single lookout in the *cess* on the up side of the line.

28 The team began work. During the work, when a lookout gave a warning of an approaching train by sounding his horn, the team acknowledged the warning and moved to a position of safety in accordance with Module T6 of the *Rule Book*. The position of safety, as indicated by the COSS, was the down side cess; the team remained there until allowed to return to work by the COSS after the train had passed. This method of providing protection is[1] known as *Red Zone working*. Witness evidence indicates that there was sufficient visibility, in both directions, to enable approaching trains to be seen in enough time for the team to stop work and reach a position of safety ten seconds before the train reached the site of work.

29 The team completed the work at Goodwin Road at about 10:00 hrs and drove to Cheshunt in the same vehicles. On the way they called at a petrol station for fuel and some team members also purchased food. Witness evidence indicates that the chargeman became very concerned that they were not proceeding quickly enough with the journey and that this caused him some agitation.

30 The team reached Cheshunt some time between 10:45 hrs and 11:15 hrs.

[1] Following changes which came into effect in December 2010, the terms 'Red Zone' and 'Green Zone' are no longer used in the Rule Book. However, this report refers to the rules which were in force at the time of the accident, unless stated otherwise.

31 The work at Cheshunt Junction involved packing ballast at the *diamond crossing* where the Down Cambridge line intersects the Up Southbury line. To reach the site of work from the parked vehicles the team had to cross two lines.

32 The vehicle carrying the TES 2000 staff arrived after the one carrying the Network Rail staff.

33 When the TES 2000 staff left their vehicle, the COSS had already left the area where the vehicles were parked and had appointed two members of Network Rail staff as lookouts: he instructed the *site lookout* to stand adjacent to the Up Cambridge line and the *distant lookout* to stand by the Up Southbury line (see Figure 3). He made no amendments to the COSS form, nor to any forms in the RIMINI pack, to take account of the changed location and different track layout. He instructed the site lookout to give warning of approaching trains by sounding a horn.

34 Witness evidence indicates that the COSS told the lookouts that the position of safety was in the cess adjacent to the Down Southbury line but that he did not tell the TES 2000 staff anything about the position of safety.

35 The chargeman is unable to recall the events before the accident, and there is no evidence to indicate whether the COSS told the chargeman where the position of safety was.

36 The team began work to pack the ballast at the diamond crossing.

37 Trains pass Cheshunt frequently and in the 30 minutes before the accident 11 trains passed the site of work. The Rule Book requires that when a lookout sees an approaching train they must give a warning. People on the track must acknowledge the warning, move to a position of safety and remain there until the COSS authorises them to return to work. There would have been times when the team had to remain in the position of safety for the passage of more than one train before they could return to work.

38 If staff remained in the *four foot* of the Down Cambridge line (in contravention of the Rule Book) while trains passed on the Up Cambridge line, they could continue working on the diamond crossing. Witness evidence indicates that the chargeman and COSS had remained on the Down Cambridge line at least once when a train passed on the Up Cambridge line, instead of moving to a position of safety clear of all lines, and that the chargeman stated that he was concerned that stopping work while trains passed was delaying the progress of the work.

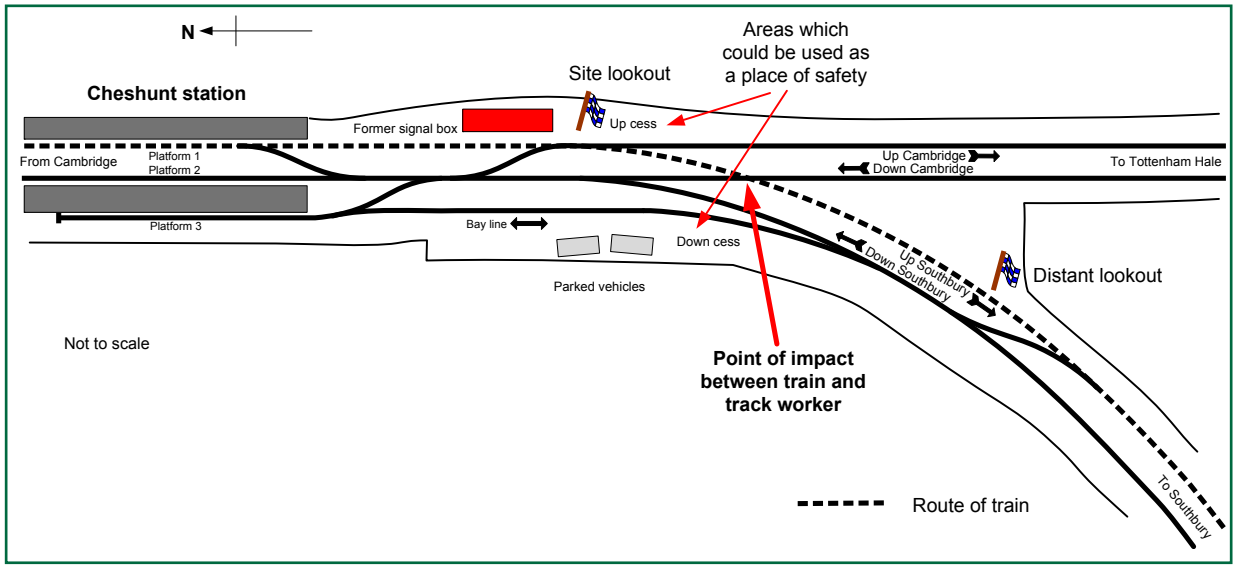

Figure 3: Track layout showing movement of train, positions of lookouts, position of safety and point of impact

Events during the accident

39 Witness evidence indicates that when the site lookout saw the 11:03 hrs train from Stansted Airport to Liverpool Street, train 2B13, approach Cheshunt station to call at Platform 1, he blew his horn to give warning of an approaching train. The forward facing CCTV on the train shows that, as it entered the station, two of the team were standing by the site lookout in the cess next to the Up Cambridge line, while four remained on or close to the Down Cambridge line.

40 Witness evidence also indicates that when the site lookout realised that the train was stopping, he shouted to tell the team that the train had stopped. The CCTV on the train shows that at least two of the team, including the chargeman, continued working and one person moved into the four foot of the Up Cambridge line twice while the train was standing at Cheshunt.

41 Since the arrival of the team at Cheshunt, all trains passing the site of work had either run along the Cambridge lines to and from platforms 1 and 2, or between the Southbury loop and platform 3. No trains had run from the Southbury loop to or from platforms 1 and 2. That was the pattern of train movements usually encountered by the chargeman and the COSS when they had previously worked at Cheshunt.

42 The train was stationary at the platform for 25 seconds. From witness evidence and the train's data recorder, on departure from Cheshunt the driver of the train sounded the train's warning horn, and the site lookout sounded another warning because the train was now moving towards the site of work. The CCTV shows that at the same time one person moved from the Down Cambridge line towards, but not into, the four foot of the Up Cambridge line. Some of the team acknowledged the driver's warning by raising one arm, and the driver sounded the horn again in acknowledgement. He noticed some of the team move away from the Up Cambridge line and perceived that others, who were standing on the Down Cambridge line, were clear of the diamond crossing with the Up Southbury loop. The driver accelerated the train to the maximum speed of 30 mph (48 km/h) permitted for a train running over the junction onto the Southbury loop.

43 At about 11:43 hrs, as the train passed over the diamond crossing, it struck the chargeman. The final image of the forward facing CCTV fitted to the train in which the track chargeman is visible shows that he was standing in the *six foot* between the Southbury lines, with his back to the train.

Events following the accident

44 The COSS attempted to contact the signaller at Liverpool Street IECC using a signal post telephone adjacent to the site. This telephone was not working, so he used his mobile telephone and requested the signaller to stop all trains approaching Cheshunt. Other team members used their telephones to summon an ambulance, and attended to the injured chargeman.

45 The COSS applied a *track circuit operating clip* to the Down Cambridge line. Another member of the team placed another track circuit clip on the Down Southbury line adjacent to where the chargeman was lying.

46 All lines through Cheshunt were closed until the injured chargeman had been removed. The main line to and from Cambridge via Tottenham was reopened at 13:16 hrs and the Southbury loop line at 13:37 hrs.

47 The track circuit clip applied by the COSS caused the signalling system to indicate that the Down Cambridge line had become occupied. This resulted in a belief in the signalling centre that the accident had occurred on that line and that therefore a down train had been involved. As a consequence train 2B13 was allowed to continue to Liverpool Street while this misunderstanding was being resolved.

48 The train driver was unaware of the accident. On arrival at Liverpool Street he was notified of what had happened and relieved of duty to give his account of events.

49 The train was taken out of service at Liverpool Street and moved to Ilford depot where it was examined by the RAIB.

The Investigation

Sources of evidence

50 The following evidence was used:

- witness statements;
- the train's OTDR data;
- CCTV recordings taken from the front and rear of the train;
- site photographs and measurements;
- observation of train movements at Cheshunt;
- staff and work records; and
- a review of previous RAIB investigations that had relevance to this accident.

51 CCTV evidence from trains that passed Cheshunt before the accident was not available because the recording equipment on those trains was defective.

Key facts and analysis

Identification of the immediate cause[2]

52 **The chargeman did not move to a position of safety and was in the path of the train as it passed the site of work.**

53 The Rule Book, Module T6, requires that when a warning is given, people working on the line must acknowledge the warning, move to a position of safety immediately, watch the train pass and remain in the position of safety until authorised to return to work by the COSS.

54 To be in a position of safety at Cheshunt Junction, a person must be at least 1.25 metres from the nearest line on which a train might approach, ie a line which is open to traffic, as the maximum permitted speed there is 80 mph (129 km/h). A train travelling southwards from Cheshunt could have passed either along the Cambridge line towards Tottenham or along the Southbury loop. Remaining where he did, less than 1.25 metres from the nearest rail of the Up Southbury line, the chargeman was not in a position of safety.

Identification of causal[3] and contributory factors[4]

Working at Cheshunt Junction under Red Zone conditions

Decision to use Red Zone working

55 **The work at Cheshunt Junction was planned to be done under Red Zone conditions. Although Red Zone working can be implemented safely, the decision that the staff should work at this location in a Red Zone, with lookout protection, was a causal factor.**

56 When planning work, the *RIMINI process* lays down a hierarchy of methods of providing protection. *Green Zone working*, which requires a line to be blocked to traffic, is above Red Zone working in the hierarchy and is therefore preferred. Network Rail Standard NR/L2/OHS/019 specifies the process for planning and documenting the arrangements for providing protection.

57 Train movements at Cheshunt are very frequent. Some nine passenger trains pass through in each direction during the off-peak hours using platforms 1 and 2. A further two passenger trains in each direction run to and from the Southbury loop using the bay platform 3. Freight trains also pass through, using both the Cambridge line and the Southbury loop.

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[2] The condition, event or behaviour that directly resulted in the occurrence.

[3] Any condition, event or behaviour that was necessary for the occurrence. Avoiding or eliminating any one of these factors would have prevented it happening.

[4] Any condition, event or behaviour that affected or sustained the occurrence, or exacerbated the outcome. Eliminating one or more of these factors would not have prevented the occurrence but their presence made it more likely, or changed the outcome.

58 Arranging and removing a blockage of the line between trains takes time. In some areas the trains are so frequent that a blockage cannot be taken, making Green Zone working impractical. The Network Rail *Green Zone Guide* lists opportunities for using Green Zone working at specific locations throughout the day. It indicates that Green Zone working is not practical at Cheshunt during the daytime, because there is less than 20 minutes between trains on each line.

59 For these reasons, work under Green Zone conditions could not be done between trains, and there was no pre-planned total blockage of the line (known as a T3 possession) available. At Tottenham depot, routine maintenance work such as was being carried out on 30 March was normally carried out in the daytime, so in this case Red Zone was the only available option. Facilitating the use of Green Zone working is the subject of the 'Go 4 Green' project described in paragraph 159.

60 The density of traffic at Cheshunt and the depot's practice of daytime working caused the person who planned the work to select Red Zone working. Although Red Zone working can be implemented safely, the decision that the staff should work at this location in a Red Zone, with lookout protection, was a causal factor.

Expectations of the team

61 **Movements of passenger trains between the Cambridge line platforms and the Southbury loop were hourly in each direction. The team were not expecting the train to run from the Up Cambridge line platform to the Up Southbury loop. For this reason not all staff moved clear of all running lines when the lookout provided a warning (see paragraphs 41 and 42). This was a causal factor.**

62 Witness evidence indicates that at least some team members believed that no passenger train passing through platform 1 at Cheshunt would use the Southbury loop.

63 In recent years the train service pattern had meant that, during normal timetabled operation, passenger trains to and from the Southbury loop line started from or terminated at Cheshunt in the bay platform 3. While that service pattern was in operation, any passenger train which approached Cheshunt from the north would be timetabled to continue southwards on the Cambridge line towards Tottenham Hale. Only during periods of disruption would any of those trains run via the Southbury Loop.

64 Reconstruction work taking place at Stratford had temporarily affected the capacity of the railway. Because of this, between 22 February and 21 May 2010 on Mondays to Fridays, one train each hour between Liverpool Street and Stansted Airport in each direction, ran via the Southbury loop instead of via Tottenham Hale, after 10:00 hrs. Witness evidence indicates that the team were not aware of this. Records show that the chargeman, and probably the other Network Rail employees in the team, had worked at Cheshunt on seven occasions in the previous 12 months. This new service pattern had only been in use on the most recent occasion, though this was only six days before the day of the accident.

65 However, regardless of the service pattern in use, it is possible for trains to be diverted from their usual route in response to changed operating conditions and without warning. The Southbury loop is a recognised diversionary route which can be used for this purpose.

66 The training material used for COSS certification includes guidance that no trackworker may rely on assumptions about the timetable or on previous experience of the routes taken by trains when ensuring staff safety. Both the COSS and the team should have anticipated that a train might run from the Up Cambridge line onto the Southbury loop.

67 When the lookout warned of an approaching train, not all the team members always moved away from the running lines to a position of safety, though they did move away from the line over which they expected the train to be routed. Although there is no witness evidence to confirm the reasons for this behaviour, it is likely that the team usually worked in this manner because the track workers saw no need to move completely clear of all lines to a position of safety, but found it easier to remain where they were. This is discussed further in paragraphs 108 to 110.

68 Train 2B13, the 11:03 hrs from Stansted Airport, was the first passenger train to run via the Cambridge line and the Southbury loop in either direction after the team had started work at Cheshunt.

69 Witness evidence indicates that none of the four Network Rail staff (the chargeman, COSS and lookouts) who were familiar with Cheshunt had noticed a train run from the Up Cambridge line to the Southbury loop before, and that they were neither expecting nor prepared for train 2B13 to do so.

The time available for work during Red Zone working

70 **The time available for work to take place on the track was limited. This extended the total duration of the work, possibly causing staff to continue working if they believed an approaching train was not going to pass over the line on which they were working. This is a possible causal factor.**

71 The RAIB observed the movement of trains for a period of one hour from 10:45 hrs on Friday 16 April to establish the conditions arising from the early visibility and frequency of trains passing Cheshunt, and therefore the conditions which the team working at Cheshunt would have experienced before the accident (figure 3).

72 The times at which an approaching train became visible and then passed the site of work were recorded. Twenty two trains passed the site and they were visible for a total of 36 minutes. Down trains become visible before they pass through Waltham Cross, the station immediately south of Cheshunt, where some trains stop. The shortest time a train took to reach the site after becoming visible was 52 seconds and the longest time 5 minutes 7 seconds[5]. The average duration of the periods when no train was visible was 1 minute 42 seconds.

73 Full data is given in appendix D.

[5] The longest time for which a down train was visible is likely to have been extended by a prolonged wait at Waltham Cross station. The second longest time in the down direction was 3 minutes 40 seconds.

74 Rule Book Module T6 'Walking as a group and working on or near the line' was in force at the time of the accident and included this instruction to the lookout: 'When you see a train approaching … you must **immediately** give a warning to the group.' The bold type appeared in the instruction[6].

75 The lookout must be positioned to be able to see an approaching train and give a warning in sufficient time for all staff to stop working and reach a position of safety at least ten seconds before the train passes.

76 At locations such as Cheshunt Junction, in clear weather a train approaching a site of work can be seen before the latest time at which the warning has to be given. The *Rail Safety and Standards Board* (RSSB) staff who publish the Rule Book understand from conversations with track workers that the usual practice is for a lookout to give the warning when they observe the train pass a point which the COSS has previously identified.

77 The *COSS Handbook*, published by the RSSB, reference RS/502, which was in force at the time of the accident but was withdrawn on 5 June 2010, instructed the COSS to 'make sure that each lookout …can clearly see the required *sighting distance*…' It did not make any reference to the COSS instructing the lookout to delay giving a warning after an approaching train had become visible[7].

78 RSSB staff's opinion is that the warning has to be given immediately the train passes the specified point rather than when it first comes in sight. However, neither RSSB nor Network Rail have produced any written guidance to this effect. This means that there is ambiguity in the way the Rule Book is expected to be applied.

79 Trains approach Cheshunt from the north and south along a straight line so that the lookout has only a 'head on' view of the train. There are no suitable features adjacent to the railway to help a lookout identify when a train passes a particular point. This makes it very difficult to estimate the distance of the train from the site of work.

80 Witness evidence indicates that the lookout gave a warning as soon as a train came into sight. The COSS had expected the lookout to delay giving the warning, to avoid an unnecessarily long time between the warning being given and a train passing, though he did not specifically instruct him to do so.

81 The RAIB's observations of train movements at Cheshunt show that the team would probably have had to stop work more than thirteen times every hour to allow trains to pass. (On several occasions, a second train came into view before the first had cleared the site of work.) The observations also showed that, if the team had complied with the rules, they would only have been able to work for more than two minutes without interruption on five occasions in each hour. Three of these occasions would have lasted for just over two minutes and two between four and five minutes. It is likely that the frequency with which the team was required to stop working to allow a train to pass, together with the length of time that they were required to wait for a train to reach the site, would have extended the time taken to complete the task.

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[6] As part of a project to improve the Rule Book, aligning it more closely with changes in the industry, a series of Handbooks, which still form part of the Rule Book, has replaced Module T6 since the accident. The relevant wording of Handbook 3 remains the same, but without the bold type.

[7] Rule Book Handbook 7, General duties of a COSS, introduced in December 2010, makes no mention of instructing the lookout to delay a warning once a lookout has sighted an approaching train.

82 It is possible that the combination of the frequency and the duration of waiting time, which reduced the time available for the work to progress, may have influenced members of the team to remain working after being warned of an approaching train by the lookout. They may have thought that the train was not going to pass immediately, because it was stopping at the station, and they could still reach the position of safety 10 seconds before it passed. Evidence from CCTV on the train involved in the accident shows some staff continuing to work after the warning had been given and this is a possible causal factor in the accident.

The state of mind of the injured chargeman

83 **The chargeman may have been distracted from responding appropriately, to the warning of an approaching train. This is a possible causal factor.**

84 The chargeman was unable to recall events between the previous afternoon and when he regained consciousness in hospital following the accident, but other evidence indicates that a particular matter, connected with the interaction between him and his line managers, was on his mind the day before the accident, and he was still preoccupied by it when he went to work on the morning of the accident.

85 There is evidence that he may have been anxious to return to Tottenham depot in time to resolve the issue before the end of the working day. This may have caused him concern about the delay in getting to Cheshunt (paragraph 29) and made him determined that the work at Cheshunt should proceed as quickly as possible. The frequent interruptions to allow trains to pass delayed the progress of the work.

86 These factors could have caused him to work in a manner which appeared to save time. In turn, this could have caused him to continue working, after a warning had been given, to maintain progress.

87 Witness evidence also indicates that the chargeman had a reputation for being slow to respond to warnings given by lookouts, and that managers had spoken to him about it.

88 The chargeman was familiar with Cheshunt. He had worked there on five occasions since January 2010. The train service pattern current at the time of the accident, which included an hourly train running from platform 1 onto the Southbury loop, only applied on one of these occasions. Being familiar with the site, and the more usual passage of passenger trains from platform 1 along the Cambridge line rather than the Southbury loop, may have influenced his action in not moving clear of the Down Cambridge line.

89 The exact state of the chargeman's mind and the influences on his thought processes cannot be established. However, combined with his reported tendency to respond slowly to warnings, they may have made it more likely that he would remain working when he should have moved to a position of safety and together form a possible causal factor.

Warning given of the approaching train

90 **The lookout did not repeat the warning when some of the team remained standing on the Down Cambridge line. This was probably a causal factor.**

91 A lookout is required to give a warning of an approaching train. At Cheshunt this was done by sounding a horn and the lookout also gave verbal warnings when a stopping train left the station.

92 When a warning is given, staff being protected by the lookout are required, by the Rule Book[8], to acknowledge the warning (by raising an arm above their head) and to move to a position of safety immediately. They must remain there until told by the COSS that it is safe to return to work.

93 Should a member of staff not move to a position of safety, the lookout must give an urgent warning by sounding a series of short sharp blasts on the horn.

94 The site lookout stated that he considered that the position of safety was the down cess adjacent to the track leading from the Southbury loop to the bay platform 3. Specifying the down cess as the position of safety prohibited staff from remaining in the four foot or on the ends of the sleepers of any track after a warning had been given.

95 Having given a warning as the train approached Cheshunt station, the lookout sounded his horn again as it restarted. Although four members of the team (the chargeman, the COSS and two of the agency staff) remained adjacent to the rails of the Down Cambridge line, where three of them were clear of the Up Southbury line but none were in a position of safety, the lookout did not repeat his warning as he expected the train to continue along the Cambridge line and he believed the staff were clear of the train if it took that route.

96 If the lookout had repeated the warnings until all the staff had moved clear of the running lines, then they might all have moved clear before the train reached the site of the accident. The absence of the repetition of the warning is therefore probably causal.

Position of safety

The position of safety was not formally specified

97 **The position of safety at Cheshunt was not entered on the COSS form and the COSS did not specify to some of the team where he had located the position of safety. This was a possible causal factor.**

98 The procedure for applying a safe system of work is given in the Network Rail instruction NR/L2/OHS/019 'Safety of People Working On or Near the Line'. It requires that after a COSS form has been completed, all entries on the form are acknowledged by the signature of each person working under the safe system of work applied by the COSS. Each signature is to confirm that the signatory has been briefed in and understands, among other things, the location of the specified position of safety.

99 A single COSS form had been issued in the RIMINI pack in respect of the sites of work at Goodwin Road and Cheshunt. The COSS had entered the position of safety to be used at Goodwin Road, but he made no entry for Cheshunt.

100 Had the COSS form been amended, or a separate COSS form made out, to take the site of work at Cheshunt into account, then, to comply with the Rule Book, each member of the team would have had to sign the form in respect of the amendment. However, it is not likely that the COSS would have asked the team to sign the form again, because the layout of the form does not make provision for more than one set of signatures.

[8] Module T6, Section 5.2 applied at the time of the accident. It has since been superseded by Rule Book Handbook 3 which requires the same responses.

101 Amending the form appropriately for Cheshunt would have required a position of safety to be formally specified.

102 A COSS is obliged to brief staff on arrival at a site of work about which lines are open to traffic, the local line speed, where lookouts are placed and how they will warn staff of an approaching train, and position of safety to which staff must move when a warning is given.

103 Witness evidence indicates that on arrival at Cheshunt the COSS briefed the lookouts about where to stand and that the down cess adjacent to the Southbury loop was the position of safety, but that he did not give a full briefing about the site of work to the TES 2000 staff. The COSS told them that the lines were open and what were the permitted speeds, but he did not specify a position of safety to them. There is no evidence to indicate whether the COSS briefed the chargeman about the position of safety.

104 Staff on or near the line are required, by the Rule Book and their training, to move to a safe position when a train passes, whether they have been given a specific position of safety or not.

105 At least four members of the team did not expect a train to run from platform 1 to the Southbury loop (paragraph 61). They did not comply with the fundamental need to move to a position of safety, clear of all tracks on which a train might run, as the train passed.

106 Not entering a position of safety on the COSS form did not remove the responsibility on the staff to reach such a position, but entering it might have prompted members of the team to behave in a safer manner. For this reason the non-completion of the COSS form is seen as a possible causal factor.

No position of safety was enforced

107 **Neither the chargeman nor the COSS enforced the use of a position of safety during the passage of trains. This was a causal factor.**

108 Witness evidence indicates that when earlier trains passed on the Up Cambridge line, some of the team remained standing close to, and possibly in, the four foot of the Down Cambridge line.

109 Even though the COSS gave no instructions as to the place where team members were to stand as a train passed, he was responsible for the safety of the team and, therefore, for ensuring that they moved to, and remained in, a position of safety. The COSS Handbook lays down that it is the COSS's 'job to make sure that the group is not put in danger by trains'. The need to remain in a position of safety while a train passes is also taught in the training in track safety given to all staff whose duties take them onto the track. The chargeman also had a general responsibility for the behaviour of his team and should have intervened to prevent unsafe actions. Additionally, the TES 2000 staff did not challenge the team's working practices, including the lack of a clear specification of a position of safety.

110 Together with the practice of staff not moving completely clear of the track when trains were passing, this indicates a degree of complacency in the way that procedures to ensure staff safety were being applied.

111 Not enforcing the use of a position of safety was a causal factor.

The issuing of a single COSS form

112 **The single COSS form was issued in respect of two sites and could only be completed appropriately in respect of one site, so no account could be taken of the requirements for implementing different safe systems of work. This is a possible causal factor.**

113 The layout of the COSS form only provides for the details of one site of work and one set of signatures to be entered. On arrival at Cheshunt the sections of the form detailing the safe system of work had already been filled in, but for the Goodwin Road site, not for Cheshunt.

114 This did not in itself prevent the COSS from adding details of the Cheshunt site of work. However, it could have led him to conclude that there was no requirement to do so, since, if there was such a requirement, either a space would have been available on the single form issued for two sites or a separate form would have been issued for the work at Cheshunt. In view of his experience, the COSS may have reached this conclusion unconsciously. If two COSS forms had been issued, he would have been obliged to give a separate briefing in order to obtain the necessary signatures from the staff present on the second form.

115 At the time of the accident it was normal practice at Tottenham depot to issue a team with a single COSS form for one shift if they were to work on several sites on the same section of line.

116 The issue of a single COSS form for multiple sites, and the design of the form to only cater for a single site, does not remind staff of the need to apply a different safe system of work, and does not prompt them to provide a separate briefing, for each site. This is a possible causal factor (paragraph 158).

Discounted factors

Competence and fitness of the COSS and chargeman

117 Both the COSS and the chargeman had been trained to act as COSS though the chargeman had not passed a recent re-assessment. Witness evidence indicates that their colleagues and supervisors considered them both to be capable of acting safely in that role though the chargeman was no longer qualified to act as COSS at the time of the accident.

118 Network Rail's records confirm that the COSS had been re-assessed as competent to work as a COSS in March 2009, and that he had not been involved in any incidents in which his competence in this role had been questioned.

119 The COSS had returned to work on the morning of the accident after a period of 4 days' leave. He has reported no factors causing him to be fatigued or otherwise unfit for duty on the morning of the accident.

120 The chargeman had worked from 07:30 hrs to 15:00 hrs Monday to Thursday inclusive and from 23:00 hrs Saturday to 07:00 hrs Sunday the previous week. He worked from 07:30 hrs to 16:00 hrs on the following Monday, the day before the accident. Although this sequence of shifts may have disrupted his normal sleep pattern, the RAIB has found no evidence that this had caused him to be fatigued at the time of the accident.

121 The chargeman did have a matter on his mind as mentioned in paragraph 84. His pre-occupation with it may have been distracted him from paying proper attention and responding correctly to warnings given by the lookout.

122 The training and physical fitness of the COSS and the chargeman are not considered to be causal factors in the accident.

Training and experience of the staff

123 All the staff present had received the appropriate training in respect of track safety to enable them to carry out their duties. The COSS and chargeman had eight and seven years experience of track working respectively; the lookouts had not less than six years experience. The TES 2000 staff had a minimum of 3 years' experience. None could be considered inexperienced.

124 Inexperience on the part of any member of the staff is not considered to be a causal factor in this accident.

Actions of the train driver

125 When a train approaches a site where staff are working on the track, the driver is required to sound the horn as a warning. If staff do not move clear out of the way of the train, the Rule book requires the driver to repeat the warning until they do so, using a series of short blasts.

126 On restarting the train from Cheshunt station, the driver sounded the train's horn as a warning since the team had continued to work while the train was standing at Cheshunt.

127 Some of the team acknowledged this by raising their arms and the driver gave a further acknowledgement of this by sounding the low note of the horn (although this is not required by the Rule Book).

128 He was aware of staff moving away from the path of his train and, since he believed them all to be clear, he had no reason to give further repeated warnings.

129 The RAIB viewed the junction at Cheshunt from the cab of several trains going from platform 1 towards Southbury. This confirmed that it is difficult for a driver to judge whether an individual standing in the area where the accident occurred is clear of the path of their train. This issue is discussed further in the RAIB's report (15/2010) on the fatal accident at Whitehall Junction, Leeds on 2 December 2009.

130 Had the driver given repeated warnings, the chargeman might have moved clear. However, the driver had seen staff move away and consequently believed that they were now clear, enabling him to concentrate on maintaining the correct speed.

131 While further warnings by the driver might have prevented the accident, his reasons for not doing so are understandable and his action cannot reasonably be considered to be a causal factor.

Identification of underlying factors[9]

The layout of Cheshunt Junction

132 **The method of Red Zone working with lookout protection at the junction had not been planned to take account of the track layout, the high level of traffic and the long sighting distances. This was an underlying factor.**

133 Red Zone protection was applied in such a way that the frequent traffic (paragraph 58), and the unusually long sighting distances of approaching trains, limited the time available for work to progress. Details of the sighting times and their effect on the time available to carry out work are given in paragraphs 71 to 73.

134 Using a different method of detecting an approaching train, such as an automatic warning system, which would result in a later warning of the train's approach, could have reduced the effect of the long sighting distances, particularly in respect of trains on the Down Cambridge line. This would have increased the amount of time available for work without increasing the level of risk.

135 Trains can run through Cheshunt Junction using several different routes. Trains travelling southwards from Cambridge can continue to Tottenham or diverge onto the Southbury loop. Although trains travelling northwards from Tottenham can only continue towards Cambridge, those coming from the Southbury loop can either continue towards Cambridge or terminate in platform 3 (figure 3). This variety of routeing increases the hazard of working on the track at the junction compared with similar work on sections of plain railway track where trains can only follow one route in each direction.

136 These three factors (the intensive traffic, the variety of routes and the long sighting distances) increased the risk. There is no evidence that the effects of these factors were properly considered at any stage in the planning of the work or the setting up of the site of work. This absence of adequate planning is considered to be an underlying factor.

Supervision of staff by managers

137 **The limited extent of supervision of the staff at Tottenham depot by managers permitted unsafe working practices to develop.**

138 Engineers and track section managers record on a spreadsheet at Tottenham depot when they make site safety inspection visits to gangs working on the track. The records made available to the RAIB show that during the financial year 2009/10 track section managers were generally making monthly visits. This complies with the Network Rail procedure (NR/L3/MTC/SE0117 – Planned general safety inspections) that each engineer and track section manager must carry out a site safety inspection each four-weekly period. Records of action taken as a result of the visits do not show any issues being identified about the suitability of Safe Systems of Work in use.

[9] Any factors associated with the overall management systems, organisational arrangements or the regulatory structure.

139 With four gangs employed at Tottenham, the data made available indicates that each gang would have had a safety visit at an average interval of five to six weeks before the accident. However, this conflicts with witness evidence which indicated that the track workers perceived the site safety inspection visits to be much less frequent. It is possible that the track workers may not have regarded the visits by track section managers as safety inspections.

140 If the staff working on the track perceived the visits as being infrequent, they may have reduced the thoroughness with which procedures were applied and recorded in the belief that they were not likely to be scrutinised. This suggests that the impact made by the visits on the teams was limited, and encouraged the development of practices, such as not standing clear of all lines when trains approached, which were contrary to the Rule Book. This is a possible underlying factor.

141 The frequency of visits has been increased locally so that in the first six periods since the accident there were 58 visits. This exceeds the requirement laid down by Network Rail.

Previous occurrences of a similar character

142 In the ten years ending 31 December 2009, 22 track workers were struck by trains and sustained a major injury, and a further 21 were killed. These accidents are described in RAIB report 30/2009 concerning the accident at Dalston Junction on 30 March 2009 and are not described again in this report[10].

143 There are similarities between issues identified in this report and others previously identified in other RAIB investigations. These previous events and recommendations with relevance to the accident at Cheshunt are summarised below. Full details of each recommendation and the actions reported to have been taken are shown in appendix E.

144 At Trafford Park in October 2005, a track worker installing warning equipment was fatally struck by a train. The accident was the subject of RAIB report 16/2006. Recommendation 9 addressed the issue of expanding research into understanding the causes of rule violation (see paragraph 107 of this report).

145 At Tinsley Green, on 17 March 2007 (report 43/2007), a track worker was late moving clear of an approaching train because the COSS had not taken into account the possibility of trains being routed over the crossover on which he was working. Recommendation 2 addressed the issue of the awareness of the COSS of the hazards of working in Red Zones beyond facing points through the updating of the COSS handbook and recommended the development of a definition of the term 'approaching train'.

146 At Ruscombe Junction, on 29 April 2007 (report 04/2008), a welder was struck and fatally injured when repairing points, possibly because he had assumed that the train was not routed towards his site of work. Recommendation 1 addressed the hazard of Red Zone working beyond *facing points*, including the development of the definition of an approaching train. Recommendation 2 concerned research into the impact of peer pressure and group dynamics on safety decision making in small COSS led work teams.

[10] All reports produced by the RAIB can be found at www.raib.gov.uk.

147 At Leatherhead Junction, on 29 August 2007 (report 19/2008), a track patrolman was struck and injured, but not fatally, because he did not move to a position of safety as a train passed where he was working, although he had acknowledged the warning given by the lookout. Recommendation 1 addressed the use of Red Zone working at Leatherhead Junction; Recommendation 2 concerned a review of the track inspection arrangements at locations where there are points so that staff are protected adequately, but it was directed to locations where sighting distance is restricted or trains speeds are high.

148 A near miss occurred at Acton West on 24 June 2008 and was the subject of RAIB report 15/2009. A trolley had been placed on a line open to traffic instead of inside a possession and was hit by a passenger train. The track workers attending the trolley moved away without being hit. Recommendation 1 concerned the issue of the geographical knowledge of the individual preparing the COSS form. It addressed the matter noted in paragraph 151 of this report.

149 An accident occurred at Washwood Heath on 6 March 2010, when a section of rail being moved at a site of work struck a passing train, and was the subject of RAIB report 1/2011. There were no injuries. Recommendation 3 was linked to recommendation 9 of the Trafford Park report and addressed the issue of the training of staff already appointed to safety leadership roles.

Severity of consequences

150 The chargeman was seriously injured in the accident. At the time of writing he has not yet been able to return to work, but he is expected to make a full recovery.

Observations[11]

Experience of planning staff

151 Although in this case the COSS form had been prepared by an experienced manager, the staff at Tottenham who normally prepare them have completed training in Core Planning Skills and hold *Personal Track Safety* (PTS) *competency.* However, their experience of working on the track varies considerably. One was previously a full time track worker, but another had been appointed from an administrative position with no previous experience of working on the track (paragraph 160).

152 As part of the Pre-Training Behavioural Evaluation Tool, explained in paragraph 160, Network Rail is developing a process for the appointment of planners. This will require a member of staff to have previous experience of working on the track before they can be considered for training and appointment to the position of planner.

[11] An element discovered as part of the investigation that did not have a direct or indirect effect on the outcome of the accident but does deserve scrutiny.

Summary of Conclusions

Immediate cause

153 The chargeman did not move to a position of safety and was in the path of the train as it passed the site of work (**paragraph 52**).

Causal factors

154 The causal factors were:

a. the decision to do the work at Cheshunt in Red Zone with lookout protection (**paragraph 60**);

b. the team only moved clear of the running line on which they thought an approaching train would be routed (**paragraph 61**);

c. neither the chargeman nor the COSS enforced the use of a position of safety that was clear of all running lines during the passage of trains (**paragraph 107**);

d. the recent introduction of timetabled, but relatively infrequent, train movements between the Cambridge line platforms and the Southbury loop, meant that the team were not expecting the train to run from the Up Cambridge line platform to the Southbury loop (**paragraph 61**); and

e. a probable causal factor is that the lookout did not repeat the warning when some of the track workers did not move clear of the running lines when a warning was given, (**paragraph 90, Recommendation 2**).

155 It is possible that the following factors were causal:

a. the time available for work to take place on the track was limited. This extended the duration of work, possibly causing staff to continue working if they believed an approaching train was not going to pass over the line on which they were working (**paragraph 70, Recommendations 1 and 2**);

b. the COSS did not formally specify the position of safety to be used at Cheshunt by entering it on the COSS form and obtaining acknowledgement by signature from the staff (**paragraph 97**);

c. the chargeman may have been distracted from responding, or may have allowed himself not to respond appropriately, to the warning of an approaching train (**paragraph 83**); and

d. the issue of a single COSS form in respect of two different sites did not prompt the COSS take account of the need to implement different safe systems of work (**paragraph 112**).

Underlying factors

156 The underlying factors were that:

a. the use of Red Zone working with lookout protection had not been planned to take into account the track layout at the site, the level of rail traffic or the sighting distances (**paragraph 132, Recommendation 1**); and

b. the staff perceived that site visits by engineers and managers were infrequent. This perception reduced the potential for these visits to modify their behaviour (**paragraph 137**).

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

157 COSS forms produced by the planners at Tottenham depot now have to be countersigned by the Track Maintenance Engineer, the depot Safety Advisor, or their equivalent, before they are issued.

158 Since the accident an instruction has been issued and implemented at Tottenham depot that a separate COSS form is to be issued for each location at which a team is to work during a shift (paragraph 116).

159 As a result of the accident at Cheshunt the Anglia Route Infrastructure Maintenance Director initiated a project known as 'Go 4 Green'. Its intention is to achieve better separation of track workers from trains by minimising the use of Red Zone working (paragraph 59). The project achieves this by enabling local managers to be more aware of when lines can be made available for maintenance, adjusting staff rosters to suit and altering maintenance scheduling to make optimum use of accessibility to the track. Local delivery units outside the Anglia Route have the option of implementing appropriate modules of the project.

160 Network Rail is completing the production of a 'Pre-Training Behavioural Evaluation Tool' to enable, among other matters, the suitability for track workers to be considered for training as a COSS to be evaluated. It addresses the need for them to be able to deal with peer group and other pressures resisting their authority. It also includes a requirement for planners to have had track experience and to pass a track competency test before they are selected for training. This addresses the observation made in paragraph 151. It addresses recommendations made in the reports in accidents at Trafford Park, Manchester on 26 October 2005 (report 16/2006) and Ruscombe Junction, Twyford on 29 April 2007 (report 04/2008).

161 Network Rail has developed an altered COSS form which requires the COSS to sign it on receipt to verify that it is accepted as correct.

162 National Express, East Anglia has a programme under way to improve the reliability of the on-train CCTV equipment. This unreliability was also an issue in an accident at Brentwood, currently the subject of an RAIB investigation.

163 In view of the reported actions indicated above, the RAIB is making no recommendations in respect of these issues.

Recommendations

164 The following recommendations are made:[12]

1 *The intention of this recommendation is to achieve consistently safe systems of work at junctions.*

Network Rail should assess the hazards and risk at each of its junctions where working with lookout protection is currently permitted with the objective of producing for each a set of predefined Safe Systems of Work taking into account local factors. These should identify the acceptability of this method of working, the protection arrangements for each part of the junction or work activity, and the specific position of safety (paragraph 155).

2 *The intention of this recommendation is to address the concern that extended sighting times, and consequent early warnings from lookouts, can cause staff to react with less urgency to initial warnings or to adopt unauthorised systems of work.*

Network Rail should evaluate the behaviour of staff working on the track at locations with extended sighting times.

The objective of this evaluation shall be:

a. to understand the methods adopted by track workers at such locations;

b. to assess the risk introduced by extended warning times;

c. to assess the risk introduced by any alternative working practices that may be identified by staff; and

d. to consider the need for additional guidance to the COSS and other safety critical staff.

Based on its understanding of current behaviour gained from this evaluation, Network Rail should establish a safe system of work to cover activities at locations with extended sighting times (paragraph 136).

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[12] 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 Regulation 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 167 to 171) can be found on RAIB's website www.raib.gov.uk.

Appendices

Appendix A - Glossary of abbreviations and acronyms

COSS	Controller of site safety
IECC	Integrated Electronic Control Centre
NXEA	National Express East Anglia
PTS	Personal Track Safety
OTDR	On-Train Data Recorder
RIMINI	Risk minimisation
RSSB	Rail Safety and Standards Board

Appendix B - Glossary of terms

Ballast	The stones or chippings on which railway track is laid.
Cess	The area along the edge of the outermost railway track(s).
Controller of site safety	A member of staff responsible for the application of a safe system of work at a worksite on a railway line.
COSS Form	A form indicating the arrangements in place at a site of work providing a safe system of work to protect track workers from train movements.
COSS Handbook	A booklet published by the RSSB indicating and explaining the duties of a COSS. It was in force at the time of the accident, but was superseded by Rule Book Handbook 7 in December 2010.
Diamond crossing	A point at which two railway lines intersect, but where trains cannot be switched from one line to another.
Distant lookout	A lookout positioned to give additional warning of approaching trains to the site lookout, in cases where the site lookout would not otherwise be able to give sufficient warning to staff at the site of work.
Down line (down side)	The track on which trains run away from London.
Electric multiple unit	An electric train consisting of two or more coaches, including at least one powered vehicle, with driving cabs at each end, which can be coupled to other units and operated as a single train.
Facing points	Points positioned so that routes for trains passing over them diverge in the normal direction of travel.
Four foot	The area between the rails of a railway line.
Green Zone Guide	A Network Rail document indicating the possibilities for Green Zone working across the network.
Green Zone working	A method of providing track workers with a safe system of work which requires blocking the line on which they are working to train movements. If possible, it should be used in preference to Red Zone working.
Integrated Electronic Control Centre	A signal box controlling a very large area of railway in which signallers use visual display units to control the movement of points and associated signal aspects.
Lookout	A member of staff whose sole responsibility is to look out for and give warning of approaching trains.
Lookout Operated Train Warning System	Equipment operated by a lookout remote from a site of work to warn staff of an approaching train.

Personal Track Safety competency	An awareness of the rules and practices relating to the safety of staff when on or about the railway track, which is proven by an examination following training, repeated every two years.
Position of safety	A place where it is safe to stand when a train is passing and which is at least 1.25 metres from the nearest line on which a train might approach. It must be possible for all workers at a site to stop working and to reach it 10 seconds before an approaching train passes.
Rail Safety and Standards Board	The body which issues the Rule Book and other standards. It is independent of all other railway bodies.
Record of Site Safety Arrangements and Briefing Form	A form indicating the arrangements in place at a site of work providing a safe system of work to protect track workers from moving trains.
Red Zone working	A method of providing track workers with a safe system of work on a line which is open to the passage of trains. It is described in paragraph 28.
RIMINI pack	A set of papers indicating the procedure to be put in place at a site of work to provide a safe system of work, including protection from moving trains, for staff working on the railway track. It includes the COSS form.
RIMINI process	A planning process used to ensure that the system of protection applied at a site of work minimises the risk to track workers. The planner starts at the method with minimum risk and works down a standard list of protection methods until he reaches the first system that he can apply, given the conditions at the location concerned.
Rule Book	A publication detailing the procedures to be used for operating and working on the railway.
Sighting distance	The minimum distance at which a train can come into the view of a lookout to enable him to give adequate warning to the staff he is to alert of its approach so that they can reach the position of safety 10 seconds before an approaching train passes. It is calculated by the COSS and depends on the line speed, the ease with which staff can stop working and the distance to the position of safety. The actual sighting distance achieved may be greater and may depend on ambient weather conditions.
Site lookout	The lookout positioned to warn staff working on the track of an approaching train.
Six foot	The area between the tracks of a double track railway line.
Track chargeman	A person in charge of a team which maintains or repairs the track.

Track circuit operating clip	A device which connects each rail of a section of track electrically, simulating the presence of a train to the signalling equipment, causing signals controlling that section of track to be held at danger.
Track section manager	The manager responsible for maintenance and repair of the track over a section of route.
Up line (up side)	The track on which trains run towards London.

Appendix C - Key standards current at the time

RS502, COSS Handbook	Issued by the RSSB in April 2005, now superseded by Rule Book Handbook 7.
Rule Book, Module G2	Issued by the RSSB in June 2003 and came into force on 6 December 2003; withdrawn in June 2010 and superseded by Rule Book Handbooks 1 – 5.
Rule Book, Module T6	Issued by the RSSB in October 2007, came into force on 1 December 2007. Since superseded by Rule Book Handbook 3.
Rule Book, Module T7	Issued by the RSSB in October 2006, came into force on 2 December 2006.

Appendix D - Data on train movements recorded at Cheshunt, 16/04/2010

Number of trains passing the site	22
Total time during which an approaching train was visible	36 minutes
Shortest period during which no train was visible	27 seconds
Longest period during which no train was visible	4 minutes 48 seconds
Average duration of each period during which no train was visible	1 minute 42 seconds
Shortest time taken for a train to reach the site (down)	52 seconds
Longest time taken for a train to reach the site (down)	5 minutes 7 seconds
Shortest time for a train to reach the site (up)	59 seconds
Longest time for a train to reach the site (up)	2 minutes 54 seconds
Average time for a train to reach the site	2 minutes

Appendix E - Previous recommendations relevant to this investigation

Trackworker fatality at Trafford Park, 26 October 2005, RAIB report 16/2006, published August 2006

Recommendation 9

Network Rail should consider further work and the expansion of the current programme of research into understanding the causes of rule violation, in direct contravention to the training people have received to include track safety skills.

Network Rail did this work as part of its 'SAF7' safety initiative. This led to changes in the way that safety staff, such as COSSes, are selected. Network Rail is currently implementing these changes for the selection of new safety staff. Existing staff are not included in this process at present, leading to recommendation 9 of the investigation into an accident at Washwood Heath.

Near miss involving a trackworker at Tinsley Green Junction, 17 March 2007, RAIB report 43/2008, published December 2007

Recommendation 2

Network Rail should update the COSS handbook and associated training material with the objective of ensuring that staff that are qualified to act as COSS are fully aware of the hazards associated with working in a Red Zone at locations beyond facing points and can set up appropriate safe systems of work. Included in the revised documentation should be a clear definition of the term 'approaching train'.

Network Rail developed a definition of an 'approaching train' and it was issued by the RSSB in April 2010.

Trackworker fatality at Ruscombe Junction, 29 April 2007, RAIB report 04/2008, published February 2008

Recommendation 1

Network Rail should update the COSS handbook and associated training material with the objective of ensuring that staff that are qualified to act as COSS are fully aware of the hazards associated with working in a Red Zone at locations beyond facing points and can set up appropriate safe systems of work. Included in the revised documentation should be a clear definition of the term 'approaching train'.

Network Rail developed a definition of an 'approaching train' and it was issued by the RSSB in April 2010.

Recommendation 2

Network Rail, in consultation with RSSB, should carry out human factors research into the impact of peer pressure, group communications and dynamics on safety decision making in small COSS led work teams. This should include a consideration of how teams are constituted and how a relatively inexperienced COSS can deliver authority, compliant behaviour, leadership and a challenge function. The findings of this research should be used to inform a review of training and management systems.

Network Rail has enhanced the selection procedure for staff who are to be trained to COSS competence.

Trackworker struck at Leatherhead, 29 August 2007, RAIB report 19/2008, published October 2008

Recommendation 1

Network Rail should prohibit red zone working at Leatherhead Junction.

This recommendation has been implemented.

Recommendation 2

Network Rail should review the inspection arrangements for S&C throughout its network, especially at junctions where sighting is restricted by curvature or train speeds are high, so that staff carrying out the inspection are adequately protected, considering for example:

- *S&C inspection in non-traffic hours, or other green zone arrangements*
- *provision of suitable lighting to enable inspection in green zone in darkness; and*
- *train operated warning systems.*

The routes to be taken by staff patrolling the track have been specified and the associated Safe System of Work reviewed.

Accident at Acton West, 24 June 2008, RAIB report 15/2009, published in June 2009

Recommendation 1

Network Rail should:

a. *re-brief the requirements (now in standard NR/L2/OHS/019) for the COSS pack to be prepared and checked by individuals who have geographical knowledge of the relevant area and for COSSes to have geographical knowledge of the area in which they are to work;*
b. *take steps to achieve compliance with the requirements defined in 1a; and*
c. *conduct a compliance audit after a suitable period of time to confirm that these requirements defined in 1a are being implemented satisfactorily.*

Network Rail has issued an Infrastructure Safety Bulletin to re-brief the requirements of parts a and b and has amended the audit process to meet the requirement of part c.

Accident at Washwood Heath, 6 March 2010, RAIB report 01/2011 published in January 2011

Recommendation 3

Network Rail should extend the work it is undertaking to improve the methods and criteria used when selecting staff to undertake safety leadership roles (such as COSS) to include consideration of the training and assessment of those staff who are already qualified in those roles.

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