



Rail Accident Investigation Branch

Rail Accident Report



**Passenger train struck by object at Washwood
Heath
6 March 2010**

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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Passenger train struck by object at Washwood Heath, 6 March 2010

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Summary

A passenger train passing the site of track maintenance work at Washwood Heath, Birmingham on 6 March 2010 struck a piece of rail being moved as part of the maintenance work. The front and lower side of the train were damaged by the impact and the driver of the train was slightly injured. None of the passengers on the train or workers on the site were injured.

The accident was caused by a combination of factors including:

- the unsafe system of work adopted for the maintenance work did not comply with the *rule book* or Network Rail's procedures;
- the supervisor in charge of the relaying work was not adequately managed and was not challenged over his unsafe method of work; and
- the lack of effective review of the safe system of work at the planning and implementation stages.

The RAIB has made four recommendations to Network Rail, the owners of the infrastructure. The recommendations relate to independent checking of safe systems of work, supervision of staff at the Saltley infrastructure maintenance delivery unit (IMDU), the training and assessment of existing staff for safety leadership roles and changes to operating procedures. A recommendation regarding understanding the causes of rule violation made in a previous report in 2006 was also relevant here.

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 The terms left and right in this report are relative to the direction of travel.
- 4 Appendices at the rear of this report contain the following:
 - abbreviations are explained in appendix A; and
 - technical terms (shown in *italics* the first time they appear in the report) are explained in appendix B.
- 5 In this report the terms *crane controller* and *machine controller* are used extensively. Network Rail requires that when a *road-rail vehicle* (RRV) is used on its infrastructure it is operated under the control of a responsible person (in addition to the operator of the RRV). This person is known as the machine controller. The machine controller's responsibilities include setting up a safe system of work for the RRV and its operator. If the RRV is to be used to lift objects, Network Rail requires the machine controller to have additional competence to plan the lift. Machine controllers with this additional competence are known as crane controllers. There is a further level of competence for persons who are competent to control lifts where two RRVs are used to lift the same object. This competence is *crane controller tandem lift*.

The Accident

- 6 The accident occurred at 19:25 hrs on 6 March 2010 as train 1D76, the 19:19 hrs service from Birmingham New Street to Nottingham was passing Washwood Heath in Birmingham (figure 1). The train consisted of a 3-car 'Turbostar' *diesel multiple unit*, no. 170104 and was travelling on the *up* main line. The leading vehicle of the train struck a length of rail that was being moved as part of track relaying work being carried out on the Lawley Street through siding line. The rail was being lifted by an RRV working on the up goods line. Figure 2 shows a plan of the site.
- 7 There were 70 passengers and two crew members on the train. The train driver was shaken and slightly injured as he quickly moved across the cab to avoid the impact. Nobody else was injured.
- 8 The driver stopped the train and reported the strike to the Network Rail signaller.
- 9 The site staff working on the track relaying site did not report the accident despite the machine operator and crane controller being aware of it.

The organisations involved

- 10 The train was operated by CrossCountry Trains (XC Trains Ltd, part of the Arriva group), who also employed the train driver. The track was owned by Network Rail, who also maintained it, and was part of its London and North Western Route. Network Rail's infrastructure maintenance delivery unit at Saltley was undertaking the track relaying at the time. The RRV was owned by AP Webb Ltd who also employed its operator.
- 11 CrossCountry Trains, AP Webb and Network Rail freely co-operated with the investigation. The RAIB is concerned to note that key evidence on site was moved, and some of the site staff involved did not co-operate fully with the RAIB by withholding information about the accident from the RAIB inspector who attended the site. These actions contravened the Railways (Accident Investigation and Reporting) Regulations 2005. The RAIB has written to Network Rail to remind it of the obligations of its staff under the Railways (Accident Investigation and Reporting) Regulations 2005. Network Rail has taken action to reinforce these requirements to its staff.

Key personnel

- 12 *Track section manager 1* (TSM1) was the section manager for the stretch of track where the accident occurred. He had been the section manager since September 2008 and had worked in the railway industry since 1977, when he started as a *trackman*.

- 13 Assistant track section manager 1 (ATSM1) was an assistant to TSM1 and started work in the rail industry as a trackman in 1989. He held a number of Sentinel competencies. The ones relevant to this accident were *senior person in charge of possession*, *engineering supervisor (ES)*, *controller of site safety (COSS)* and crane controller tandem lift. He had held these competencies since the inception of the Sentinel system in 1999.
- 14 The person in charge of the possession (PICOP) started work in the rail industry as a trackman in September 2005. He became a leading trackman in 2008 and worked on the track between Birmingham and Tamworth. He was certificated as a probationary PICOP in December 2009 and was undertaking PICOP duties for the first time on the day of the accident. He was being mentored by his line manager, ATSM1, at the time.
- 15 The COSS had worked in the rail industry for nine years and had been a track chameleon for a year. He had held the COSS competency for five years and his line manager was ATSM1.
- 16 The crane controller of the RRV involved in the accident, crane controller 1 (CC1), had worked in the rail industry for seven years and had been a machine controller for four years. His Sentinel competencies included engineering supervisor, PICOP, machine controller and crane controller. He was not certificated as crane controller tandem lift. His line manager was a track section manager (not TSM1).
- 17 The operator of the RRV had worked for AP Webb since 2003 and had qualified as a plant operator in December 2002.
- 18 The RRV operator, COSS, PICOP and ATSM1 had all the qualifications required by Network Rail for the duties they were to perform on the site. As noted in paragraph 16, CC1 did not hold the crane controller tandem lift certificate at the time of the accident.

Location

- 19 The accident occurred close to Washwood Heath no.1 signal box, which was not manned at the time. The railway at this location consists of five tracks (figure 2):
 - Lawley Street through siding (which was being relaid at the time);
 - up goods;
 - up main;
 - *down* main; and
 - down goods.

The train was passing on the up main at the time of the accident. The Lawley Street through siding and the up goods were under *possession* for track relaying work. All the other lines were open to traffic at normal *line speed*. The line speed on the up main was 75 mph (120 km/h), though a 40 mph (64 km/h) speed restriction ended 973 m (1065 yds) before the site of the accident.



Figure 1: Extract from Ordnance Survey map showing location of the accident

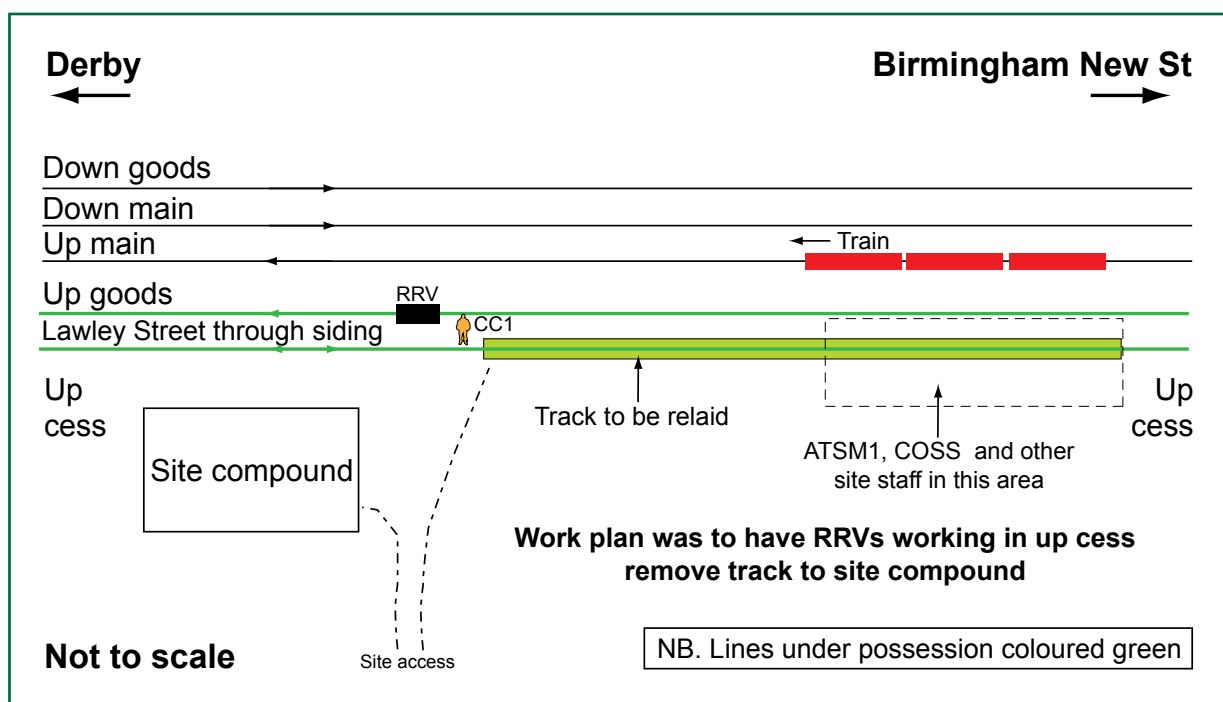


Figure 2: Plan of the site



Figure 3: Damage to the front of the train

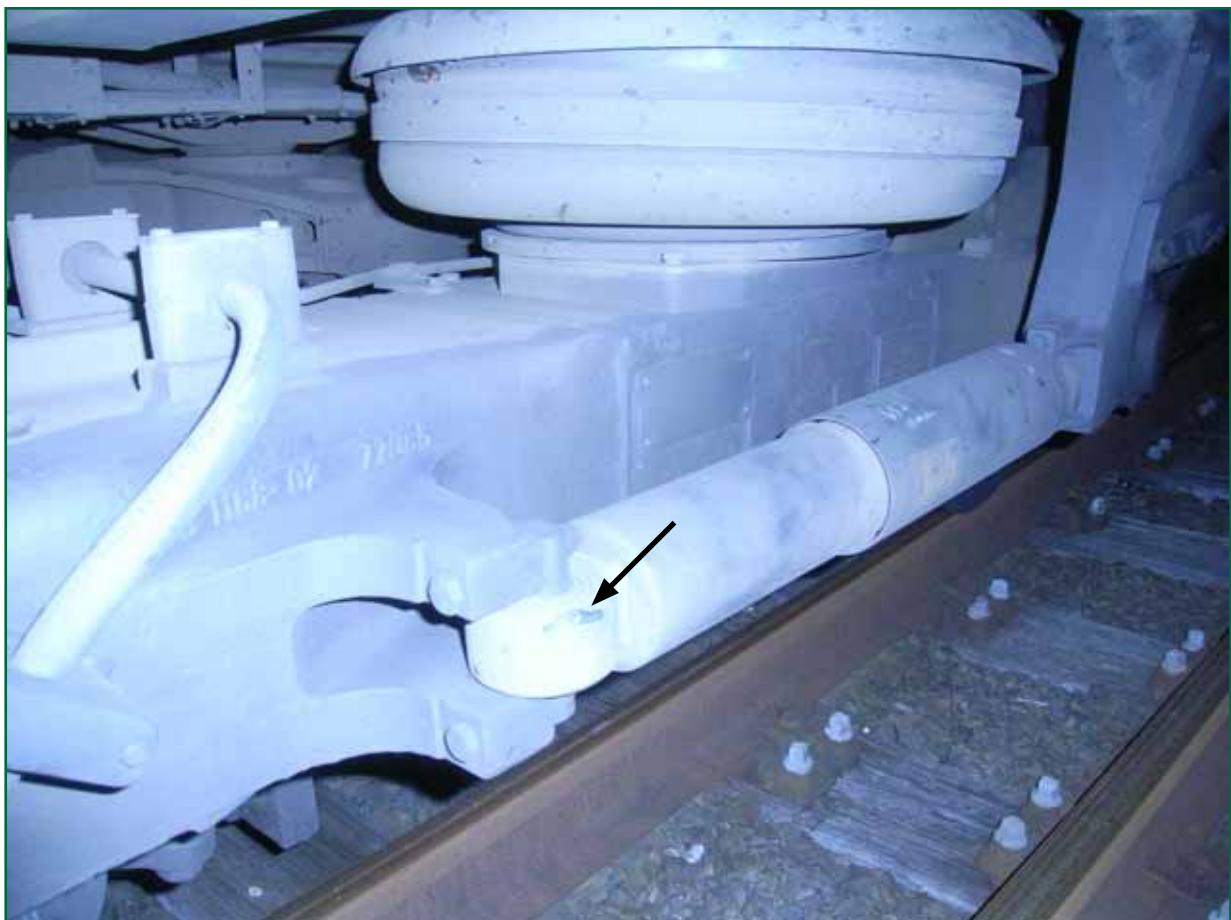


Figure 4: Damage to the leading bogie of the train

Events preceding the accident

- 20 The Lawley Street through siding was being relaid. The main relaying work was being done over two weekends and the weekend of 6/7 March 2010 was the second of these. There were further weekends booked for *ballasting, tamping, rail stressing* and finishing off work. The first weekend's relaying work took place on 6/7 February 2010 and involved the relaying of nine 60 ft (18.3 m) lengths of track. The work planned for the weekend of 6/7 March 2010 involved the relaying of 14½ lengths of track.
- 21 The possession was due to start at 13:00 hrs on 6 March but did not start until 13:34 hrs as a freight train to the nearby container depot was late arriving. Further delays occurred due to awaiting delivery of equipment to allow the RRVs to *on-track* and due to a defect with one of the RRVs.
- 22 The work involved the use of RRVs to lift out the old track, level the ballast and lay the new sleepers and rails. All of the old track had been removed and taken to the site access point before it became dark (sunset was at 17:51 hrs).

Events during the accident

- 23 One of the RRVs, an excavator crane, was moving new rails closer to where they would be required later in the shift. The RRV was operating on the up goods line adjacent to the site access point near Washwood Heath no.1 signal box.
- 24 The RRV was being driven by its operator and was working under the supervision of a crane controller, CC1. There were no other staff in the vicinity of the RRV.
- 25 While moving one of the new rails, the rail swung out into the path of train 1D76 which was approaching on the up main line.
- 26 The train driver saw the load swinging out and applied the emergency brake. The rail struck the train. The train was travelling at 50 mph (80 km/h) at the time.

Consequences of the accident

- 27 The plastic fairing on the front of the train was broken and gouged in four places and loosened from its mountings (figure 3). The *bogie* sideframe was dented above the *axle box* and the *yaw damper* was gouged at one end (figure 4). The train was returned to Birmingham New Street station and taken out of service.
- 28 The rail end was damaged by the impact (figure 5).

Events following the accident

- 29 The driver stopped the train and made an emergency call at 19:27 hrs on the *NRN radio* to report the accident to the Network Rail route control office. He then spoke to the signaller to report the accident and to arrange for the adjacent down line to be blocked to allow him to examine the train. The driver reported that his train had struck what he thought was a girder being lifted by an RRV working on an adjacent line. The signaller blocked all lines and the driver examined his train. He reported the extent of the damage to the signaller.



Figure 5: Damaged rail end

- 30 The staff working on the track renewal site did not report the accident to the signaller.
- 31 The signaller contacted the person in charge of the possession and told him that a train had struck a girder. The signaller told the person in charge of the possession to stop work on the site and await the arrival of a mobile operations manager.
- 32 The accident was reported to the RAIB at 19:50 hrs. The RAIB attended the site to commence a preliminary examination.

The Investigation

Sources of evidence

- 33 Evidence was obtained from the following sources:
- statements by AP Webb, CrossCountry Trains and Network Rail staff;
 - data from the train's on train data recorder;
 - photographs taken by the RAIB;
 - records from Network Rail's Saltley IMDU;
 - records from Saltley signal box;
 - the rule book, GE/RT8000; and
 - documents and standards supplied by Network Rail.

Previous occurrences of a similar character

- 34 Since May 2007 there have been 23 instances of trains running on lines open to traffic (as opposed to trains running on tracks under possession) striking tools or equipment associated with engineering works. This figure excludes instances where a train strikes equipment designed to protect the possession, ie *possession limit boards* and *detonators*.
- 35 In 14 of these cases the work was being done on a line that was open to traffic (ie working in the *red zone*) and the tools or equipment were not moved sufficiently clear of the passing train. The other nine cases involved tools or equipment being left on the line after the possession was given up or being put on the wrong line.
- 36 The records since 2007 do not report any instances of RRVs working adjacent to a line open to traffic striking a passing train.

Key Information and Analysis

Site arrangements

- 37 The lines that were under possession were under the control of a PICOP. Network Rail procedures do not require the PICOP to be at the site of the work and he was not present at the time of the accident. The PICOP co-ordinates the work of the individual supervisors working in the possession. In this case there was only one item of work, the track renewal, and this was under the control of ATSM1, who was undertaking the role of the ES supervising the relaying work.
- 38 There were two RRV excavators working as cranes at the site removing the old track and relaying the new. Each RRV was under the control of a crane controller, one of whom was ATSM1. There was also a COSS present at the site, supervising the safety of the staff relaying the track. The COSS was in charge of setting up the safe system of work for the staff. The safe system of work was planned by ATSM1 (paragraphs 44 to 54). The arrangements were that the track to be relaid (the Lawley Street through siding) and the track next to it (the up goods line) were to be blocked to traffic. *Site wardens* were to be used to ensure that nobody strayed too close to the open lines beyond the two blocked tracks, as required by rule book (GE/RT8000) module T7.
- 39 Rule book 'Module OTP' states that the crane/machine controller of an RRV is responsible for the safe operation of the RRV on the railway. ATSM1 changed the safe system of work from the one that was planned and briefed the changed arrangements to the RRV operators. He told them that they were to work on the up goods line, adjacent to the open line, and that they were to stop work and place their machines into a safe state when warned of an approaching train. This method of working is not in the rule book, was prohibited by the *engineering acceptance certificate* on each machine and was not familiar to the RRV operators, though they reported that they had used the same system when working at this site four weeks before. None of the RRV operators questioned the crane controller (ATSM1) on this.
- 40 After the track that was being relaid had been removed, one of the RRVs and its crane controller, CC1, moved away from the main site of the track renewal and travelled to the site access area (figure 2). Working under the control of CC1, the RRV then started to pick up some rails that were required later in the shift and to move them closer to where they were to be installed. During one of these lifts the rail swung out and was struck by the passing train.

Identification of the immediate cause¹

- 41 The RRV undertook a lifting operation in an unsafe situation; adjacent to an open line and with a train approaching on that line.**

¹ The condition, event or behaviour that directly resulted in the occurrence.

Identification of causal², contributory³ and underlying factors⁴

The 'safe system of work' adopted

- 42 **The system of work adopted was unsafe and was causal to the rail striking the train.**
- 43 **Network Rail procedures allowing TSMs and ATSMs to check their own safe systems of work is an underlying factor.**
- 44 The original 'safe system of work' planned for the work involved a *Separated Green Zone* (see paragraph 46) with the RRVs operating on the up and down Lawley Street through siding (the line to be renewed – figure 2), ie with another line between it and the nearest open line. This arrangement was in accordance with the rule book, but would have caused the renewal to take longer than the revised method of work as each track panel would have had to be picked up twice; once to lift it to the lineside and later, when the new track was in place, each panel would have had to be picked up again and carried to the stacking area. ATSM1 changed the 'safe system of work' on site to one that was not allowed by the rule book or the engineering acceptance certificate. This involved the RRVs working on the up goods line which was adjacent to the up main line that was open to traffic. The use of RRVs adjacent to open running lines is only allowed if specific additional arrangements are adopted, none of which were implemented.
- 45 Network Rail has a computer system for recording the safe system of work planned for each task carried out on track. This system is called the safe system of work planning system (SSOWPS). The planned safe system of work for the Lawley Street through siding renewal work on 6/7 March 2010 was entered into SSOWPS by ATSM1 on 1 March 2010.
- 46 The system that was planned to be used was a separated green zone. A separated green zone is a system to protect staff by blocking the line(s) on which they are working while permitting trains to pass on an adjacent line. It is defined in module T7 of the rule book and instructions on its use are contained in section 8 of module T7. They state that the working area must be separated from the line open to traffic by a minimum distance of 3 m unless a site warden is appointed, when the distance can be reduced to 2 m. The purpose of the site warden is to ensure that none of the staff stray out of the work area. The system for the protection of staff complied with Network Rail standard NR/L2/OHS/019 'Safety of people on or near the line'. This system of work is intended to protect staff; it does not cover the risk introduced by RRVs working adjacent to an open line, though it does cover the risk to site staff from RRVs. RRV use is covered by module OTP of the rule book.

² Any condition, event or behaviour that was necessary for the occurrence. Avoiding or eliminating any one of these factors would have prevented it happening.

³ 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.

⁴ Any factors associated with the overall management systems, organisational arrangements or the regulatory structure.

- 47 The system of work was planned by ATSM1 and was recorded on the Network Rail standard form. This form was produced from SSOWPS but had hand written additions and was filled out with the wrong work item number. The work being done on 6/7 March 2010 was item number 123 in the weekly notice whereas the safe system of work form had item 131 entered. This item number had been assigned to the work done on 6/7 February 2010, thereby suggesting that the form was reused from the previous part of the work. The form was not completely filled in, as the method of warning used by the site wardens was not stated.
- 48 The safe system of work plan was attached to a check sheet entitled 'Check sheet for safe system of work (prior to being issued to the COSS)'. The sheet stated that the safe system of work check had been carried out by ATSM1 on 1 March 2010. Network Rail standard NR/L2/OHS/019 did not require independent checking of the documentation describing the safe systems of work proposed by TSMs and ATSMs. The standard only required the TSM/ATSM to check safe systems of work input by other staff. The lack of a system of independent checking of safe systems of work planned by TSMs and ATSMs is an underlying factor to this accident.
- 49 The safe system of work form was duplicated and a copy was given to the COSS and the crane controller. Each of them then filled out by hand the additional information relating to their tasks. ATSM1's form was annotated to show that he was also responsible for 'machine controller – tandem lift' duties. His form was signed by the machine operators of the two RRVs that were lifting out the old track, in accordance with Network Rail's procedures.
- 50 The COSS's form was signed by all of the staff working on the site, including the RRV operators.
- 51 The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) require that lifting operations, such as those being carried out by the RRVs during the track relaying, are planned by a competent person. For RRVs carrying out lifting operations on Network Rail these requirements are defined in Network Rail standard NR/L2/RMVP/0203 'Specification for planning and undertaking lifting operations using on-track plant (OTP)'. NR/L2/RMVP/0203 requires that a written lift plan be produced in advance of the work and that, if circumstances dictate that the plan be changed on site, the new plan be documented and signed by the crane controller before the lift takes place. The lift plan showed the two RRVs working on the line that was being relaid; Network Rail was unable to provide the RAIB with a copy of any revised plan.
- 52 The possession to relay the track was 34 minutes late starting and one of the RRVs had a mechanical problem which slowed its work. There was also a problem with one of the RRV attachments. ATSM1 stated that he decided to make up some time by changing the planned 'safe system of work'. The changed system involved placing the RRVs on the up goods line, which was adjacent to the up main line that was open to traffic, and redeploying the site wardens as lookouts to warn the RRV machine controllers of approaching trains. The site wardens were planned to be used to give protection to the site staff. When redeployed they could no longer fulfil this function. ATSM1 told the COSS that the plan was changing but did not inform any of his managers of this change.

- 53 The engineering acceptance certificates for the two RRVs used for the lifting operation stated that they were not to on-/off-track or work adjacent to a line open to traffic. The engineering acceptance certificates were carried with the RRVs and ATSM1 examined them at the start of the shift, as part of his crane/machine controller checks. This engineering acceptance certificate restriction was not complied with by ATSM1 when he re-planned the work.
- 54 Witnesses stated that the same method of work had been used when the previous part of the relaying work had been done four weeks earlier. This work was not reported to have been running late and witnesses were not aware that the system of work was changed on site. ATSM1 stated that he used T2 possessions of the up main line to protect the work. The signal box records showed that the possession started at 13:09 hrs, nine minutes after the booked time, and was given up at 22:06 hrs on Sunday, almost six hours early. The signal box records did not show any T2 possessions during the work.

Adherence to Network Rail procedures – safe system of work

55 The system of work adopted on the site did not comply with Network Rail's own procedures. The non-adherence to these procedures was causal to the rail striking the train.

- 56 The use of RRVs adjacent to a line open to traffic is covered by Network Rail procedure NR/L3/INI/TK0042 'Use of ATWS to protect an adjacent open line when working with on-track plant (OTP) and other machines' and by module OTP of the rule book. However, the scope of procedure NR/L3/INI/TK0042 stated that it applied to the infrastructure investment function of Network Rail and it was not briefed to the maintenance organisation. Both the rule book and the procedure apply in such circumstances, in addition to any restrictions on machine use stated on the machine's engineering acceptance certificate.
- 57 The rule book module OTP states, in clause 11.3, that when using an item of on-track plant, if it is not possible to keep sufficient clearance from an open line then arrangements must be made to stop the traffic on that line. However, in clause 11.5 approved alternative methods that permit RRVs to work on an adjacent line are given. The situation at Washwood Heath, where the RRVs were to work adjacent to the open line, is covered in part b of this clause and requires all of the following:
- an *automatic track warning system* (ATWS) must be fitted which gives sufficient warning to enable the machines to be clear of the open line at least 10 seconds before the train arrives;
 - the method statement for the work must detail the system to be used;
 - the speed of traffic on the open line must be no more than 20 mph if no fence is used (there was no fence at Washwood Heath); and
 - the engineering supervisor must appoint a person to be in charge of this method of working.

None of these requirements were met by the 'safe system of work' adopted for the Washwood Heath renewal. Had these requirements been met it is unlikely that the accident would have occurred.

- 58 Procedure NR/L3/INI/TK0042 specifies additional measures that must be undertaken if RRVs are used adjacent to an open line in accordance with clause 11.5 of module OTP of the rule book. These measures include the following:
- a competent ATWS operator must be appointed;
 - the ATWS system must include warning lights mounted on each machine such that they are visible to the operator; and
 - no machine shall be allowed to operate if it is not possible to maintain clearance to the open line, particularly when lifting objects.

None of these requirements were met by the Washwood Heath renewal.

- 59 The system of work adopted by ATSM1 involved the redeployment of the site wardens as lookouts; one with the RRVs and one further up the line towards Birmingham to provide advance warning of approaching trains. The site warden competency is the same as that of lookout, so they were suitably qualified to perform this role. However, as a consequence the staff working on the site, who were to be protected by the site wardens, did not have site wardens with them.
- 60 The COSS for the staff working on the track was aware of the change to the planned safe system of work but he did not stop the staff from working. As the area they were working in was more than 3 m from the nearest open line (the up main), the COSS handbook, RS/502, advises that a site warden is not necessary in this case.
- 61 There were other incidences of Network Rail procedures and rules being disregarded during the work, but these were not causal to the accident. They are noted here as observations:
- The site wardens who were acting as lookouts continued to do so after dark and the distant lookout signalled 'warnings' of approaching trains by means of a hand lamp. This is not permitted by the rule book and was contrary to the tasks they had undertaken to perform when signing the COSS form. Module T7 clause 9.7 'Using lookouts' states that during darkness lookouts must not be relied upon to give a warning of trains unless special conditions apply. The list of authorised warning methods does not include the use of hand lamps (module T7 clause 9.8).
 - Network Rail has a procedure for dealing with incidents involving on-track plant, NR/L3/RVE/0168 'Initial response to incidents involving on-track plant'. This requires the machine controller of the RRV involved in the incident, CC1 in this case, to stop further operation of that machine and to report the incident to the engineering supervisor. It also requires the staff on site to preserve any evidence. The machine controller of the RRV did not report the accident and the machine continued with its task of carrying the rail to the relaying site. Neither the rail nor the RRV were in the same position when the RAIB arrived on site.

Adherence to Network Rail's procedures – planning

62 The non-adherence to Network Rail's standards for the planning and execution of track renewals is contributory to the accident.

- 63 Witness evidence indicates that the reason why ATSM1 changed the 'safe system of work' may have been because he perceived that the time available to complete the relaying was insufficient, possibly due to the late start. The perception of ATSM1 was likely, in part at least, to be due to insufficient planning associated with the relaying job
- 64 Network Rail has a suite of standards covering the planning and execution of track renewals. Most of these are written with large-scale renewal jobs in mind. These large jobs are dealt with by the asset management function of Network Rail and are carried out by renewals contractors appointed under national contracts. However, many of the standards are equally applicable to renewals work carried out by the infrastructure maintenance function of Network Rail.
- 65 The process for the renewal of a section of track starts with the identification of the need to renew it, usually arising from the routine inspections of the track. This is covered by Network Rail's procedure NR/L3/TRK/1011 'Management of permanent way inspections'. This procedure states that, if the TSM and track maintenance engineer consider that a section of track requires renewal, they prepare a *problem statement* for it.
- 66 Problem statements are dealt with in Network Rail's procedure NR/L3/TRK/6001 'Management of a problem statement'. The purpose of the problem statement is to highlight that renewal of the track may be the most cost effective way of maintaining its integrity.
- 67 A problem statement was not produced for the track renewal at Washwood Heath. Witnesses stated that this was because the work was proposed to be carried out as a *reactive track renewal* and there was no need for a problem statement.
- 68 Short-term work planned by the infrastructure maintenance part of Network Rail is dealt with in Network Rail's procedure NR/L3/MTC/PL0159 'Short term works planning in infrastructure maintenance'. 'Short term' is defined as being within 26 weeks of the date that the work is to be carried out. One of the mandatory requirements of this document is that a 'work request form' SMF/PL/0191' is produced. The work request form contains a checklist of other documents that are required to be produced. This list includes site specific method statements, temporary speed restrictions and lift plans for any lifting operations.
- 69 A work request form was not produced for the Washwood Heath renewal and the method statement used was a generic one that did not deal with the specifics of the site. The RAIB has been unable to determine the reason why a work request form was not produced.

- 70 Network Rail produced a procedure entitled NR/L3/MTC/MG0210 'Management of maintenance work within a worksite to prevent a possession overrun' in December 2009. This document had a compliance date of 6 March 2010, so was not applicable to the first weekend's work. This procedure required the infrastructure maintenance delivery unit manager to assess maintenance work items for the risk of possession overrun and rate them as red, amber or green. Items rated as red or amber were required to have contingency plans prepared to assist in managing the risk of overrun. The Washwood Heath renewal was not assessed but witness evidence was that, had it been rated, it would have been red. A contingency plan for the work was not produced.

Site supervision

71 The behaviour that ATSM1 exhibited on-site and the pressure he bought to bear on the work team was a contributory factor to the accident.

- 72 The adoption of the ad-hoc system of work meant that on-site staff were not aware of what the actual protection arrangements were. Witnesses stated that ATSM1 was a strong character who was known for getting the job done, and bought pressure to bear on his team to complete tasks quickly. The crane controller ordered the machine operator to lift the rail and take it to the relaying site at a time when the ad-hoc 'safe system of work' was not in place. A witness stated this was because of pressure from ATSM1 to be doing something.
- 73 ATSM1 was undertaking the roles of engineering supervisor and crane/machine controller as well as re-planning the work. Module OTP of the rule book states that the crane/machine controller is responsible for setting up the safe system of work for the RRV. The staff working on the site did not question ATSM1 over the work plan and witnesses stated that they did not feel able to do so.
- 74 Network Rail have a 'worksafe' procedure defined in procedure NR/L2/OHS/00112 'Worksafe procedure'. This is intended to provide a means for Network Rail staff to raise their concerns if they are asked to work in a manner which they consider unsafe. The procedure can be invoked by any member of staff and involves them stopping work on the task in question and informing the supervisor of the problem. None of the staff involved in the relaying work considered the work so unsafe that it warranted invocation of this procedure at Washwood Heath.
- 75 After the accident none of the site staff reported it and, when questioned by the RAIB on site, none of the site staff claimed to have any knowledge of what had happened. Some witnesses later stated that they were put under pressure not to admit that the accident had occurred.
- 76 The railway industry has a confidential reporting system (CIRAS) where staff can raise concerns over safety anonymously. The site staff were aware of the existence of CIRAS but none of them considered that the method of working used for the previous part of the relaying was so unsafe that it warranted a report to CIRAS.

Supervision of the person in charge of the relaying work

77 Lack of effective supervision of ATSM1 was an underlying factor to this accident.

- 78 The supervisor in charge of planning and carrying out the track renewal work, ATSM1, was not subject to effective supervision by his managers. The work plan he produced was not independently checked, and he was not prevented from discarding this system of work on site and implementing another, inherently unsafe, system of work.
- 79 ATSM1's line manager, TSM1, was present on site at the time that lifting operations were taking place adjacent to a line open to traffic. He did not examine the safe system of work documents prepared by ATSM1 and did not stop the RRVs from operating adjacent to the open line. TSM1 asked ATSM1 if the system of work was allowed by the rule book and was told that it was. TSM1 was not certificated as a machine controller and stated that he did not feel competent to question ATSM1's safe system of work.
- 80 TSM1, who was responsible for the supervision of ATSM1, reported that he had had no concerns over ATSM's safe systems of work in the past.
- 81 It is concluded that TSM1's management of ATSM1 was not effective in preventing ATSM1 from implementing an unsafe system of work on site.

Safety monitoring arrangements

82 Network Rail's safety management arrangements for work undertaken by their maintenance organisation did not prevent the unsafe system of work that was used for the Lawley Street through siding track renewal. The fact that these arrangements did not prevent the unsafe actions of some staff at Saltley IMDU was a possible contributory factor to the accident.

- 83 Network Rail has a safety assurance framework comprising a number of elements and corresponding activities which together form a hierarchy of safety monitoring interventions. These include audit, inspections, safety tours and competence assessment. The activity most closely associated with the work of the IMDU was the system of safety inspections known as 'planned general inspections'. The managers at Saltley IMDU carried out planned general inspections of their staff. These involved the TSMs, track maintenance engineers and the maintenance workforce safety advisor conducting audits of safety on particular sites. The last audit of ATSM1 was undertaken by the maintenance workforce safety advisor on 21 January 2010. The work being done at the time involved the use of an RRV in a possession of a siding and the audit examined the documentation for the job, the COSS briefing and the PPE being worn. No deficiencies in the safe system of work were recorded. The site surveillance audits did not consider whether the safe system of work is appropriate to the task being undertaken.

- 84 One of the levels in the Network Rail audit hierarchy is the system of safety inspection defined in standard NR/L2/OHS/040 'Safety Tours'. This requires that senior managers visit locations on an unannounced or announced basis. The standard states that the tours *'provide a sample check of attitudes and behaviours, conditions at work locations, the effectiveness of systems in place for managing safety and provide the opportunity for teams to raise issues with senior management'*. The most recent safety tour before 6 March to include Saltley IMDU was carried out by the acting route infrastructure maintenance director on 3 February 2010. Five sites in the Saltley IMDU area were visited and no safety concerns were raised.
- 85 The Network Rail Operations Manual NR/L3/OCS/041 had previously contained, in procedure 3-04, a requirement for nominated competent persons to carry out operational checks to ensure that the rules and regulations were being complied with in possessions. This procedure was withdrawn in June 2008. The Network Rail *National Delivery Service* carry out unannounced inspections of possessions, but these only look at the PICOP and his assistants.
- 86 The Network Rail Train Operations Manual NR/L3/OPS/047 procedure TMC06 'Unobtrusive Monitoring Of RRV And RMMM Operations' describes how Network Rail monitors the safety arrangements of RRVs in possessions. The monitoring process is also described in Network Rail procedure NR/L3/RVE/0169. A checklist is provided detailing the checks that are required but this does not include checking the protection arrangements for adjacent open lines. The lack of a system for checking that adjacent open lines are adequately protected from RRV operations is noted here as an observation.

Conclusions

Immediate cause

87 The RRV undertook a lifting operation in an unsafe situation: adjacent to an open line and with a train approaching on that line.

Causal factors

88 The causal factors were as follows:

- ATSM1 changed the planned safe system of work for one which was not allowed by the rule book, did not comply with the engineering acceptance certificate and was inherently unsafe (**paragraph 42 and Recommendations 1, 2 and 3**); and
- Network Rail's procedures for setting up a safe system of work were not adhered to (**paragraph 55 and Recommendation 1**).

89 The RAIB has been unable to determine why a non-compliant 'safe system of work' was adopted during the work on the site. Witnesses stated that they were unaware of some of the requirements of the rule book and Network Rail standards. In those cases where those involved were aware of requirements they were unable to say why they had not been followed. While it is not possible to say with certainty, the following factors are likely to have played a role:

- the original work plan may have been unrealistic;
- the alternative work plan had been used for the previous part of the relaying work, without incident;
- there was a drive to get the work done by 31 March;
- the behaviour of ATSM1 discouraged challenge by his staff; and
- ATSM1's manager did not challenge his method of work.

Contributory factors

90 The contributory factors were as follows:

- non-adherence to Network Rail's procedures for planning the renewal (**paragraph 62**);
- the behaviour that ATSM1 exhibited on site and the pressure he brought to bear on the work team (**paragraph 71 and Recommendation 3**); and
- Network Rail's safety management arrangements for work undertaken by their maintenance organisation did not prevent the unsafe system of work that was used for the Lawley Street through siding track renewal (**paragraph 82 and Recommendations 1 and 2**).

Underlying factors

91 The underlying factors were as follows:

- Network Rail's procedure for planning safe systems of work allows TSMs and ATSMs to check their own safe systems of work (**paragraphs 43 and 48 and Recommendation 1**); and
- the lack of effective supervision of the supervisor responsible for the relaying work (**paragraph 77 and Recommendation 2**).

Observation

92 The RAIB made the following observation:

- routine checks of compliance with rules and regulations during engineering possessions do not consider the protection of adjacent lines open to traffic (**paragraph 86 and Recommendation 4**).

Actions reported as already taken or in progress relevant to this report which would otherwise have lead to a recommendation being made

- 93 Network Rail discussed the matter of its staff withholding information from the RAIB at a senior level safety meeting on 29 November 2010 and have asked delivery functions within Network Rail to reinforce the obligations of the Railways (Accident Investigation and Reporting) Regulations 2005 to its staff.

Previous recommendation relevant to this investigation

- 94 The following recommendation was made by the RAIB as a result of a previous investigation which addresses factors identified in this report. It is therefore not remade so as to avoid duplication:

[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 reported in 2008 that they would consider this in a forthcoming safety initiative.

- 95 Network Rail carried out some research in this area and reviewed the behavioural issues associated with track worker safety and the role of the COSS. This has led to changes in the methods and criteria used when selecting staff to undertake safety leadership roles (such as COSS). Network Rail is currently considering the ways in which the new approach can be extended to the training and assessment of staff who are already qualified to act in such roles.

Recommendations

96 The following safety recommendations are made⁵:

Recommendations to address causal, contributory and underlying factors

- 1 *The purpose of this recommendation is to put in place a clear requirement to have safe system of work documentation for staff and OTP checked by a competent person other than its author.*

Network Rail should put in place a system that requires that all safe systems of work documents, including any subsequent changes, are independently checked by a competent person, and audit compliance with it.

- 2 *The purpose of this recommendation is to improve management surveillance and supervision at Saltley IMDU to detect instances of individual supervisors implementing unsafe systems of work and to reinforce the worksafe procedure.*

Network Rail should determine why its management systems did not prevent the unsafe system of work being used for the relaying and make the necessary changes to prevent recurrence. The investigation should also consider why staff did not attempt to invoke the worksafe procedure and how the worksafe procedure can be made more effective.

- 3 *The purpose of this recommendation is to extend the work that Network Rail is currently undertaking on behavioural issues associated with track worker safety to improve the training and assessment of existing staff (linked to recommendation 9 from the RAIB's Trafford Park investigation).*

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

continued

⁵ 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 at www.raib.gov.uk.

Recommendation to address observation

- 4 *The purpose of this recommendation is to ensure the adequacy of checks with the requirements of the rule book within possessions (including protection of adjacent open lines).*

Network Rail should review the adequacy of its arrangements for the routine checking of compliance with the rule book within possessions, including checks on compliance with rule book module OTP in respect of adjacent lines open to traffic. The review should consider the frequency of such checks and the competency of those involved. Any improvements identified as part of this review should be implemented.

Appendices

Appendix A - Glossary of abbreviations and acronyms

ATSM	Assistant track section manager
ATWS	Automatic track warning system
CIRAS	Confidential incident reporting and analysis system
COSS	Controller of site safety
ES	Engineering supervisor
IMDU	Infrastructure maintenance delivery unit
NRN	National radio network
OTP	On-track plant
PICOP	Person in charge of possession
RRV	Road-rail vehicle
SSOWPS	Safe system of work planning (computer) system
TSM	Track section manager

Appendix B - Glossary of terms

Automatic track warning system	Equipment that is installed on the track to warn track workers of the approach of a train.
Axle box	The housing on the end of an axle which contains the bearings.
Ballasting	The process of placing track ballast around the sleepers.
Bogie	An assembly of two wheelsets in a frame which is pivoted at the end of a long vehicle to enable the vehicle to go round curves.
Controller of site safety	A person who has been trained to set up and supervise a system of work for staff working on or about the line.
Crane/machine controller	A person who has been trained to supervise the use of a RRV on the railway. If the RRV is in use for lifting operations, the person is designated as a crane controller.
Detonators	Devices attached to the rail which explode when a train passes over to provide a warning to the driver.
Diesel multiple unit	A type of train, powered by diesel engines, which is capable of being operated in combination with another unit.
Down	The name generally given to lines used by trains travelling away from London. At Washwood Heath it is the line towards Birmingham.
Engineering acceptance certificate	A document carried on each RRV which certifies that the machine is allowed to work on Network Rail infrastructure and lists any operating restrictions that are necessary when doing so.
Engineering supervisor	A person who has been trained to be responsible for the work being done on a site within a possession.
Line speed	The maximum permitted speed of trains over the line in question.
National delivery service	The division of Network Rail responsible for supplying resources needed for track maintenance and renewal.
NRN radio	National radio network radio. The national radio network is a railway network for communication between trains and controllers.
On-track	The operation whereby an RRV transfers from its road wheels to its rail wheels.
Person in charge of possession	A person who has been trained to supervise the possession of a section of railway for engineering work.
Possession	The procedure whereby a railway line is taken out of use for maintenance or renewal.
Possession limit board	A sign erected on the track to mark the extent of a track possession.

Problem statement	A Network Rail document which justifies the need to renew a section of track.
Rail stressing	The process whereby continuous welded rails are tensioned to resist buckling.
Reactive track renewals	A term Network Rail uses for track renewal work that is required more urgently than the normal planning process would cater for.
Red zone	The name for the work area when working on the track while trains are running.
Road-rail vehicle	A machine capable of moving on road or rail wheels.
Rule book	The set of rules by which the national rail system is operated.
Separated green zone	A method of working on the track which involves setting up a working area safe from passing trains.
Site warden	A member of staff appointed to watch that staff working on the track stay within their safe working area.
Tamping	The process of compacting the track ballast beneath the sleepers.
Track section manager	The Network Rail employee in charge of the maintenance of a section of the line.
Trackman	A member of track maintenance staff.
Up	The name generally given to lines used by trains travelling in the direction of London. At Washwood Heath it is the line towards Derby
Yaw damper	A device attached between the bogie and body of a rail vehicle to provide a smoother ride at higher speeds.

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