RAIB

Rail Accident Investigation Branch

# Rail Accident Report

## Passenger train collision with a derailed locomotive at Bromsgrove 23 March 2020

Report 14/2020
November 2020

This investigation was carried out in accordance with:

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



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# Preface

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

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

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

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

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

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

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

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

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

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# Passenger train collision with a derailed locomotive at Bromsgrove, 23 March 2020

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# Summary

At about 22:44 hrs on Monday 23 March 2020, the 21:05 Cardiff Central to Birmingham New Street service collided with a class 66 locomotive that had derailed at the end of a siding, south of Bromsgrove station. The passenger train suffered significant damage along one side of all three vehicles, although it did not derail. There were four passengers and two crew on board the passenger train and none reported any injuries.

The locomotive had just arrived in the siding and was to act as a 'banking' locomotive, assisting heavy freight trains up the 1 in 37 Lickey incline, to the north of Bromsgrove station. It derailed after running through the buffer stop at the end of the siding and came to rest fouling the main line. The driver of the locomotive was not injured in the collision, although the locomotive suffered damage to the corner of the leading cab.

The driver did not stop the locomotive before it reached the buffer stop because he became distracted from the driving task by personal issues arising from the national COVID-19 lockdown announced earlier that evening.

The collision occurred because there was insufficient time between the locomotive derailment and the passenger train's arrival for the alarm to be raised and the passenger train to be stopped.

RAIB has made one recommendation to Network Rail to review its processes and standards for managing buffer stop collision risk on non-platform terminal tracks.

RAIB has also identified three learning points for drivers, relating to compliance with mobile phone policies in the driving cab, informing signallers of accidents and safe exit from trains during an incident.

# Introduction

## Definitions

1 Metric units are used in this report, except when it is normal railway practice to give speeds and locations in imperial units. Where appropriate the equivalent metric value is also given. Railway mileages are referenced to a zero point at London Road Junction in Derby. ‘Left’ and ‘right’ are relative to the direction of travel of the vehicle being referred to.

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

# The accident

## Summary of the accident

3 At about 22:44 hrs on Monday 23 March 2020, a locomotive collided with the buffer stop at the end of a siding about 700 metres south of Bromsgrove station. The locomotive derailed and came to a stop foul of the adjacent main line. Less than a minute later, a northbound passenger train collided with the corner of the locomotive, but did not derail. The passenger train came to a stop between the locomotive and Bromsgrove station.

4 No-one was hurt.

5 The passenger train suffered extensive damage to one side of all three vehicles. The front left corner of the leading vehicle was particularly damaged in the area of the driver's door. The locomotive suffered damage to the front left corner of the leading cab. There was also damage to the underside of the locomotive and this resulted in a diesel fuel spill during recovery (figure 1).

6 The buffer stop, and the associated track at the end of the siding, was also damaged during the collision.


*Figure 1: The locomotive and the passenger train after the accident (second image courtesy of CrossCountry)*

## Context

### Location

7 The accident occurred at 56 miles and 8 chains, at the end of the up Bromsgrove neck siding, about 700 metres to the south of Bromsgrove station on the Bristol to Birmingham main line (figures 2 and 3). This is a siding which is routinely used by locomotives waiting to assist heavy freight trains up the 1:37 Lickey incline, a practice referred to as 'banking'. The siding runs parallel to the up Gloucester main line and ends at a buffer stop.

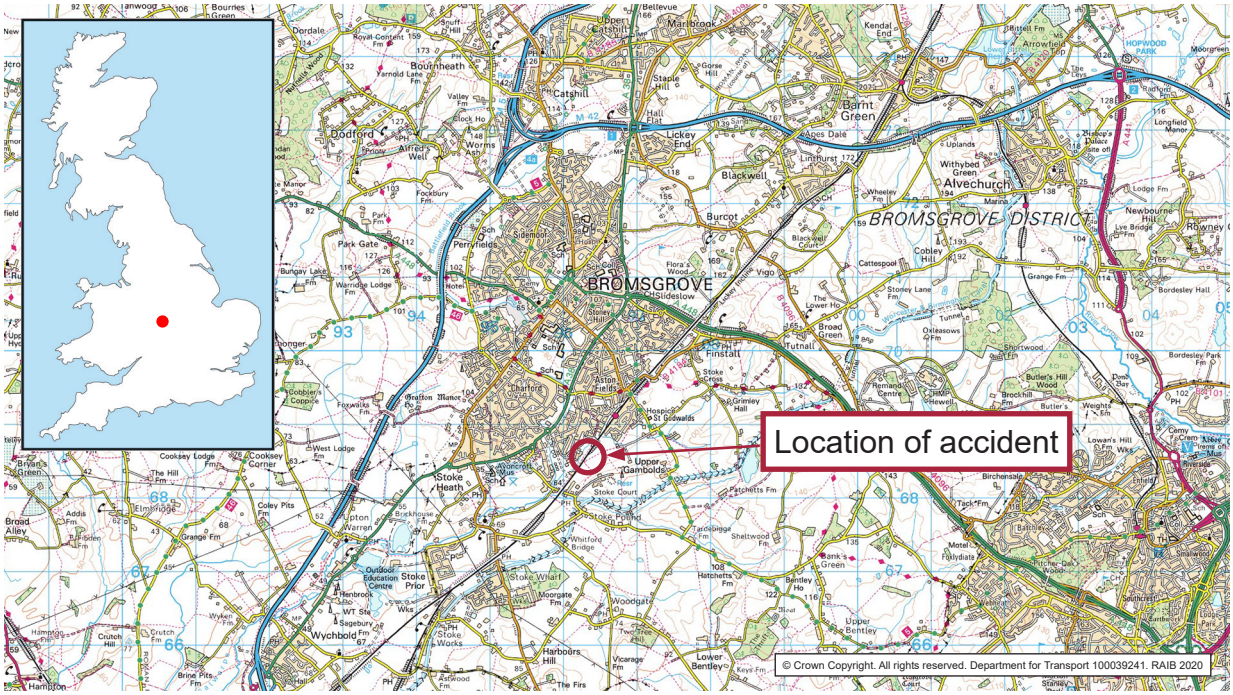


*Figure 2: Extract from Ordnance Survey map showing location of accident*

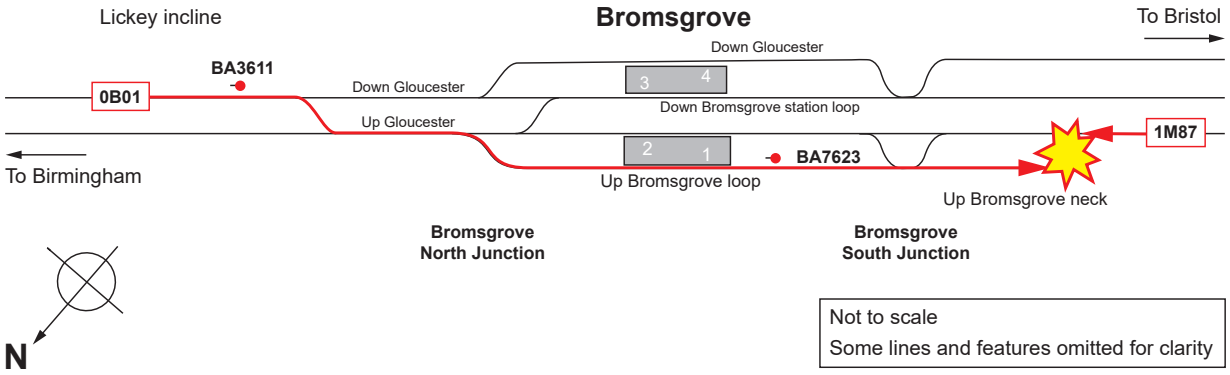


*Figure 3: Track layout at Bromsgrove, showing the route of both trains*

8 At this location, the maximum permitted speed on the up Gloucester main line is 90 mph (144 km/h). The maximum permitted speed on the up Bromsgrove neck siding is 15 mph (24 km/h). The siding and main line are on a downhill gradient of 1 in 283 and a gentle right-hand curve, in the direction of travel of the locomotive.

9 The signalling in the area is controlled from the Bromsgrove workstation which is located at the West Midlands Signalling Centre. Although the line from Birmingham as far as Bromsgrove station is electrified, the location of the accident is beyond the end of the electrified area.

## Organisations involved

10 DB Cargo (UK) Limited was the owner and operator of the locomotive and the employer of the locomotive driver.

11 XC Trains Limited (trading as CrossCountry) was the operator of the passenger train and the employer of the staff on board it.

12 Network Rail is the owner and maintainer of the railway infrastructure, including the siding and buffer stop.

13 DB Cargo, CrossCountry, and Network Rail all freely co-operated with the investigation.

## Trains involved

### *The locomotive*

14 The diesel locomotive that derailed, 66057, was part of a small sub-fleet of class 66 locomotives that had been modified to undertake banking duties on the Lickey incline. A banking locomotive is moved against, and sometimes coupled to, the rear of trains requiring assistance, in Bromsgrove station (paragraph 7), before helping to provide power up the incline. If the banking locomotive has coupled to the train, a remote coupler release is operated, disconnecting it on the move, when the train has reached the top of the incline. The train then continues, and the banking locomotive returns down the incline to Bromsgrove, ready for further duties.

15 On the night of the accident the locomotive was due to bank its first freight train from Bromsgrove at around midnight.

### *The passenger train*

16 The passenger train was a three-car class 170 'Turbostar' diesel multiple unit, number 170107. CrossCountry reported that there were 4 passengers on board at the time, including an off-duty DB Cargo driver, as well as two train crew.

17 It was operating service 1M87,[1] the 21:05 hrs train from Cardiff Central to Birmingham New Street. The train had left Worcestershire Parkway station about 12 minutes before reaching Bromsgrove, and was running about 2 minutes late. Its next scheduled stop was at Birmingham New Street.

## Rail equipment/systems involved

18 The buffer stop consisted of a metal framework that was fixed to the jointed rails. It did not contain any sliding friction elements or hydraulic buffers. It was fitted with two permanently illuminated red lights (figure 4).

19 The buffer stop was installed in its current location (figure 5) around 2004, as identified from historic satellite imagery. Prior to this, the siding had ended in a buffer stop located about 90 metres further south.

## Staff involved

20 The driver of the locomotive had worked on the railway for 18 years, with 14 of those driving for DB Cargo and its predecessors. He held the relevant competencies for driving class 66 locomotives and his route knowledge for the route to Bromsgrove was up-to-date. He regularly worked this shift, operating the banking locomotive to and from Bromsgrove. DB Cargo stated that there were no significant safety-related incidents on the driver's record.

21 The driver of the passenger train had been driving trains for 44 years. CrossCountry reported that there were no significant safety-related incidents on his record.

[1] An alphanumeric code, known as the 'train reporting number', is allocated to every train operating on Network Rail infrastructure.

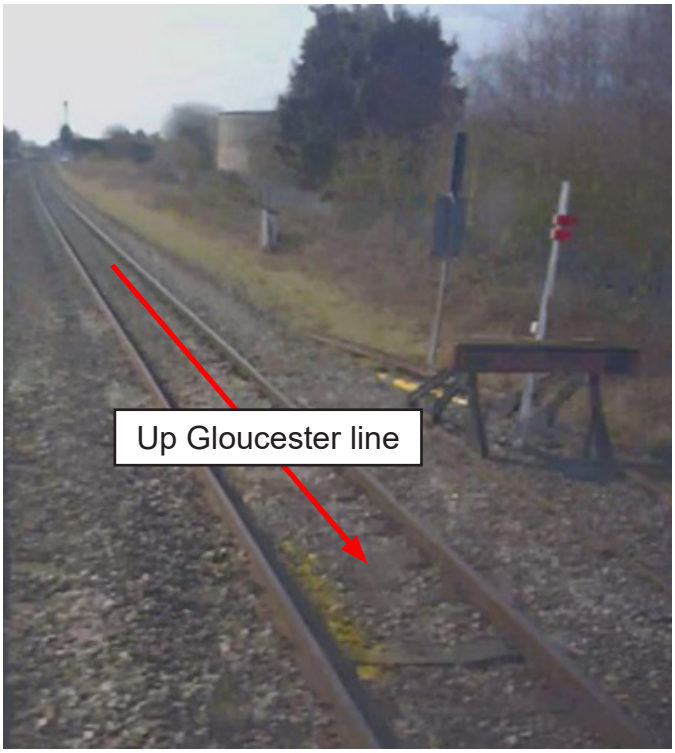


*Figure 4: Up Bromsgrove neck buffer stop (image courtesy of CrossCountry)*


*Figure 5: Location of the buffer stop (image courtesy of Network Rail)*

## External circumstances

22 It was dark at the time of the accident. The weather was clear and dry, with temperatures of between 2°C and 4°C recorded at local weather stations.

23 There was very little local illumination and no significant sources of noise nearby.

24 It is possible that if the accident had occurred during the hours of daylight, the driver might have seen the locomotive slightly earlier, and been able to reduce the collision speed a little. However, there is no evidence to suggest that any other external circumstances affected the accident.

# The sequence of events

## Events preceding the accident

25 The locomotive driver had last worked on the previous Saturday, two days before the accident. He worked the night shift, getting home at around 08:30 hrs on the Sunday morning, and rested until about midday. He spent the rest of the day at home, going to bed at around 23:30 hrs.

26 He woke at about 08:00 hrs on the Monday morning and did not try to sleep during the day.

27 At 20:30 hrs, the driver watched the Prime Minister make a statement on television relating to the COVID-19 pandemic. This was the statement which instructed people to stay at home, except for limited, predefined reasons, and that no-one was allowed to meet with friends or family unless they lived in the same household. Immediately after watching this broadcast, the locomotive driver set off to work, which was a 20-minute drive away.

28 While en-route to work, the driver received a phone call from a family member and there was a worried discussion about what the earlier televised announcement would mean for his childcare arrangements.

29 The driver arrived at Bescot yard, near Walsall, and booked on punctually, by telephone, at 21:11 hrs. He prepared the locomotive and departed at 21:32 hrs. Although this departure was 27 minutes behind the published schedule, the timetable for the journey was such that it was possible to recover this time before Bromsgrove. The locomotive travelled via the Sutton Park line before being stopped for a few minutes at a red signal at Castle Bromwich curve. At 22:07 hrs, after the signal cleared, the driver took the locomotive towards Bromsgrove via St Andrews Junction and Kings Norton.

30 After passing Kings Norton, over a period of 11 minutes, the driver received three text messages on his personal mobile phone. These were from the same family member as the earlier phone call and all related to concerns about childcare and the closure of schools. The driver sent four text message replies to these. At 22:38 hrs he received a picture message showing advice from the school relating to school provision, and he sent a text reply. Table 1 and figure 6 show details of these timings and the approximate locations at which the messages were received.

| Time | Message | Approximate Location |
|---|---|---|
| 22:24 | Text received | Kings Heath (44.5 miles) |
| 22:28 | Text reply sent | After Kings Norton (47.5 miles) |
| 22:29 | Text received | Northfield (48 miles) |
| 22:31 | Text reply sent | Longbridge (49 miles) |
| 22:34 | Text reply sent | Barnt Green (51.5 miles) |
| 22:35 | Text received | After Barnt Green (52 miles) |
| 22:36 | Text reply sent | M42 overbridge (53 miles) |
| 22:38 | Picture (of text) message received | Blackwell Road (53.5 miles) |
| 22:38 | Text reply sent | After Blackwell Road (54 miles) |
| 22:42 | - | Bromsgrove station signal |
| 22:43 | - | Buffer stop |
| 22:44 | - | Collision with passenger train |

*Table 1: Detail of message timings on mobile phone, along with later events*

31 The locomotive passed signal BA3611 at 22:39:51 hrs at 38 mph (61 km/h), and was routed from the down Gloucester line to the up Gloucester and then onto the up Bromsgrove loop through the station (figure 3). The train was only two minutes behind schedule arriving in the station.

32 The driver slowed the locomotive for the approach to signal BA7623, at the south end of the platforms in Bromsgrove station. This signal is approach controlled, meaning that it was held at red for a fixed length of time as the train approached it, before it cleared to a proceed aspect. This feature is intended to ensure that the speed of approaching trains is reduced, because of a speed restriction on the route beyond the signal. The signal is also fitted with the Train Protection and Warning System (TPWS) which will automatically stop any train passing it at red. At 22:42:01 hrs, when signal BA7623 cleared to a proceed aspect, with a route set for the up Bromsgrove neck, the driver released the brake and applied a low power demand. The train passed the signal at 6 mph (10 km/h).

33 After passing the signal, the driver's thoughts returned to the picture message that he had received at 22:38 hrs (paragraph 30). At 22:42:43 hrs, while travelling at 18 mph (29 km/h), he shut off the power, returning the controller to neutral. At this point the locomotive was travelling at less than the maximum permitted speed of 30 mph (48 km/h) for the first 350 metres towards the up Bromsgrove neck, although this limit subsequently reduced to 15 mph (24 km/h) for the last 350 metres along the siding itself.

## Events during the accident

34 The locomotive coasted for 52 seconds towards and into the up Bromsgrove neck. The locomotive's speed gradually increased on the 1 in 283 downhill gradient from 18 mph (29 km/h) to 23 mph (37 km/h).

35 At 22:43:35 hrs, and with the locomotive 40 metres from the buffer stop, the driver became aware of where he was and made an immediate, full application of the locomotive's brakes. Four seconds later, the locomotive collided with the buffer stop at approximately 21 mph (34 km/h).


*Figure 6: Approximate locations of the locomotive when messages were received and sent*

36 The locomotive tore the buffer stop off the end of the siding, pushing it for about 20 metres before coming to a stop. The locomotive ran off the end of the track, ploughing into the ballast, with only the last two sets of wheels remaining on the track. As it ran on, unguided by the track, the locomotive deviated to the left, coming to a stop with its front left corner about 600 mm away from the nearest running rail of the up Gloucester main line (figure 1).

37 The locomotive driver got out of the left side of the cab to investigate the consequences of the collision. He soon became aware of the sound and lights of an approaching passenger train, and realised that he was on an open running line. He immediately ran towards the back of the locomotive to get clear of the open line.

38 The passenger train, 1M87, was travelling at 85 mph (137 km/h) when it collided with the corner of the locomotive at 22:44:26 hrs, approximately 47 seconds after the locomotive had collided with the buffer stop.

## Events following the accident

39 The driver of the passenger train immediately applied the emergency brake, coming to a stop just south of Bromsgrove station. He reported the collision to the signaller, who blocked all the lines to trains.

40 Network Rail reported the accident to RAIB at 23:21 hrs.

41 The few passengers on 1M87 were evacuated on foot to Bromsgrove station at 23:55 hrs. The train was moved to the station at 03:00 hrs on 24 March, ready for recovery to Tyseley depot that afternoon.

42 The locomotive was rerailed by 16:00 hrs on 24 March, and left in the siding to await recovery to Toton depot.

43 Network Rail undertook remedial work to remove parts of the buffer stop that remained foul of the up Gloucester line. Work was also undertaken to clear up the diesel spillage that occurred during recovery of the locomotive. The up and down Gloucester lines were reopened to trains at 00:04 hrs on 25 March 2020. The up Bromsgrove neck remained out of use for several days until track repairs were completed.

# Analysis

## Identification of the immediate cause

**44 The locomotive became foul of the main line shortly before the passenger service arrived.**

45 When the locomotive hit the buffer stop, it continued for approximately 20 metres and deviated to the left before coming to a stop. This caused it to foul the up Gloucester line, which was open to traffic (paragraph 36). The passenger train arrived less than a minute later, and collided with the corner of the locomotive (paragraph 38).

## Identification of causal factors

46 The accident occurred due to a combination of the following causal factors:

- The locomotive derailed to a position foul of the main line (paragraph 47).
- There was no opportunity to stop the passenger train before the collision (paragraph 72).

Each of these factors is now considered in turn.

### Derailment of the locomotive

**47 The locomotive derailed to a position foul of the main line.**

48 This causal factor arose due to a combination of the following:

- The driver was distracted from the driving task as the locomotive entered the siding, resulting in the collision with the buffer stop (paragraph 49).
- The locomotive deviated to the left after collision with the buffer stop (paragraph 58).

Each of these factors is now considered in turn.

### Driver distraction

**49 The driver was distracted from the driving task as the locomotive entered the siding, resulting in the collision with the buffer stop.**

50 When the driver started work on 23 March, he had just seen the Prime Minister's announcement of the COVID-19 lockdown (paragraph 27). He had also had a telephone discussion with a family member about the impact of the announcement on childcare arrangements (paragraph 28). These arrangements had relied on support from other family members which would be prohibited under lockdown. It was clear to him that this would make it very difficult for him to continue to manage his shift working pattern.

51 The driver stated that it was his normal routine to put his personal mobile phone on silent and in his bag, prior to his driving turns, but on this occasion, he forgot to do so and it remained, on silent and vibrate, in his pocket. As a result, he was alerted to receipt of the messages from the family member and he read and replied to them while driving (table 1). The final message he received included advice from his childrens' school that further complicated the childcare issue, and the driver also replied to this. This final incoming message occurred about four minutes before the locomotive passed the signal at Bromsgrove station and five minutes before the collision with the buffer stop.

52 The driver's use of his personal mobile phone was contrary to the DB Cargo 'Mobile Phone Policy', which states:

*'Personal mobile telephones must not be used whilst in the driving cab, or on or about the running line'.*

53 The driver was aware of his employer's policy. However, the fact that the mobile phone was vibrating in his pocket, combined with the significant, unresolved childcare issue, drew him to read and respond to the mobile phone messages while he was driving the locomotive.

54 When the locomotive passed the signal at Bromsgrove station, the driver applied a little power to enter the siding, before removing it and coasting (paragraph 34). At this point, his thoughts returned to the last message relating to the school, as the childcare problem was still occupying his mind. He sent no further messages, but continued to worry about how the childcare issue could be resolved, while the locomotive coasted along the siding towards the buffer stop. The result of this was that he was temporarily distracted from the driving task while in the siding. It was only when the locomotive was about 40 metres away from the buffer stop that the driver became aware of his location and immediately made a full application of the locomotive's brakes. However, it was too late to avoid a collision with the buffer stop.

55 Although the driver had been awake for approximately 13 hours before starting his shift, there is no evidence to suggest that he was particularly tired at the time of the accident. His time awake would have affected his level of fatigue later in the shift,[2] and RAIB notes that this does not align with good practice in fatigue management. However, RAIB does not consider that fatigue contributed to the cause of the driver's distraction on this occasion.

56 DB Cargo's 'Fatigue Management Policy' places responsibility on the employee for reporting fatigue issues, either before or during a shift. DB Cargo also stated that non-fatigue related 'fitness for duty' issues, such as those involving personal circumstances, use the same reporting method. This policy states that:

*'All employees have a duty to report if they feel the onset of fatigue at the commencement or at any point during their shift, to the Control Duty Manager.'*

[2] RAIB has examined first night shift fatigue in its investigation into an uncontrolled freight train run back at Shap (RAIB report 15/2011). This also featured in a safety digest into a buffer stop collision at London King's Cross (Safety digest 15/2017).

57 At the time of signing on, which was done remotely by telephone and not face-to-face, the driver did not consider that he was fatigued, nor did he consider that this was an issue during the journey to Bromsgrove. He also did not consider that the emerging childcare issues would affect his ability to drive during his shift. As a result, he saw no need to report anything under the fatigue management reporting system either before, or during, his shift.

## Deviation of the locomotive to the left

**58 The locomotive deviated to the left after collision with the buffer stop.**

59 The locomotive hit the buffer stop at 21 mph (34 km/h), which was 40% above the maximum permitted speed in the up Bromsgrove neck. The result was that the locomotive detached the buffer stop from the end of the siding and pushed its structure ahead of it. The locomotive ran off the end of the rails and ploughed through the ground ahead of it, causing the ballast to pile up. This caused the locomotive to slow to a stop. It would also have influenced the direction in which the locomotive travelled, with this effect being largely random. In this accident, it caused the locomotive to deviate towards the up Gloucester line.

60 The speed of the locomotive as it hit the buffer stop was sufficient for it to travel far enough to become foul of the up Gloucester line before stopping. If the locomotive had not exceeded the maximum permitted speed for the siding, it would almost certainly not have travelled far enough to foul the main line.

### *Standards related to the buffer stop*

61 When the buffer stop was installed in its current location around 2004, the relevant standard for managing buffer stop risks was railway group standard GC/RT5033 issue one (‘Terminal Tracks - Managing the Risk’). This states that:

> *‘A length of straight track, greater than the length of the longest vehicle permitted to use the track, shall be provided wherever reasonably practicable at the approach to the buffer stop, so that any vehicle striking the buffer stop will do so with its longitudinal axis at right angles to the buffer beam.’*

62 Although there was a very gradual curve to the main line and the parallel siding, this was of such a large radius that the locomotive would have still struck the buffer stop square on, in line with the intent of this requirement.

63 GC/RT5033 also defined circumstances in which an overrun risk assessment was required to be carried out for a buffer stop. This stated:

> *The risks of harm to people and damage to critical structures arising from a train overrun at the following locations shall be assessed:*
>
> - *terminal or bay platforms*
> - *terminal tracks on freight lines and sidings used by trains carrying dangerous goods*
> - *where there are significant identified risks to persons or property beyond the railway boundary.*

64 Because the up Bromsgrove neck was not at a station platform, was not used by trains carrying dangerous goods and posed no significant risk to those outside the railway boundary, there was no requirement to undertake a specific overrun risk assessment under this standard. However, there would have still been a requirement for the buffer stop installation to have a more general risk assessment as required by the general duties associated with the Health and Safety at Work etc Act 1974.

65 Network Rail was unable to locate any records from installation of the buffer stop in its current location (paragraph 19) to indicate that an overrun risk assessment was carried out, nor any findings of more general risk assessments. Bromsgrove station was remodelled in 2016, but no changes were made to the buffer stop at that time.

66 However, a number of mitigations, of the types suggested in standards relating to overrun risk assessment, were present at the up Bromsgrove neck. These were:

- Two permanently lit red lights were fitted to the buffer stop, to aid visibility by any approaching trains.
- Imposition of a 15 mph (24 km/h) maximum permitted speed, to manage the impact energy in any collision with the buffer stop.
- Normal stopping position for locomotives was more than 50 metres short of the buffer stop, managing the risk of trains coming into contact with it.
- Use of an approach-controlled signal on entry to the siding, managing the speed of trains entering it.
- The Train Protection and Warning system (TPWS) was fitted at this signal. This would have the effect of stopping any trains that pass it at danger, well before they reach the buffer stop.

67 The buffer stop was not subject to any specific maintenance regime, as defined by Network Rail standard NR/L2/TRK/001 module 18 ‘Inspection and Maintenance of Permanent Way – Buffer Stops’. Network Rail did not consider the up Bromsgrove neck to be a ‘terminal track on a freight line’, and so a specific buffer stop inspection regime was not required by the standard. However, Network Rail did expect routine visual inspections of the track to identify any significant defects with the buffer stop and to flag these for attention. There is no evidence to suggest that there was any defect with the buffer stop at the time of the collision.

68 The red lights on the buffer stop were subject to regular inspection by Network Rail’s Distribution and Plant team. This included replacement of the lamps every six months. Records show that this was being carried out. In addition, CCTV from a passing train shows that the buffer stop lighting was illuminated four hours before the accident (figure 7), indicating that it was almost certainly lit at the time of the accident.

*Figure 7: Train CCTV image showing buffer stop light illuminated at 18:47 hrs on 23 March 2020 (image courtesy of CrossCountry)*

69 The current guidance on risk assessment for buffer stops is described in GIGN5633 (paragraph 84). Although intended for platform tracks, the risk assessment methodology can be applied to non-platform lines. It considers features such as the layout of the terminal track, its collision history, physical condition and any surrounding infrastructure and population. The output of the assessment is an estimation of the fatality and injury risk, expressed as *'estimated years per fatality'*.[3]

70 Although GIGN5633 does not define any action levels relating to this calculated risk, its identically titled predecessor standard, GCRC5633, indicated a first action level of approximately 3,300 years per equivalent fatality.

71 RAIB retrospectively applied the methodology of GIGN5633 to the up Bromsgrove neck, taking into account the mitigations present and the possibility of a passenger train on the adjacent up Gloucester line. This indicated a risk of one fatality every 135,000 years, considerably less than the threshold for action suggested by the earlier standard.

[3] Note that the term 'fatality' includes statistically weighted injuries, in line with railway industry standard practice.

## Operation of the passenger train

**72 There was no opportunity to stop the passenger train before the collision.**

73 The passenger train, 1M87, was running on clear signals at around 85 mph (136 km/h) on the approach to Bromsgrove. There was no possibility that the driver of the train could have stopped the train before the collision, even if he had applied the brakes on sighting the locomotive's lights in the dark. Furthermore, seeing the lights of a locomotive on the adjacent up Bromsgrove neck would not have been a reason for the driver to brake, because locomotives regularly wait in the siding. The driver had no idea that the locomotive was foul of his line until his train collided with it. However, as his train approached, he became aware of a cloud of dust that had been thrown into the air during the derailment, but he did not have time to apply the brakes before the collision.

74 The passenger train driver did not receive any warning of the derailed locomotive prior to reaching the collision site. Such a warning could have come from the signaller, if they had been alerted to the derailment by a GSM-R[4] call from the locomotive driver. Alternatively, the locomotive driver could have sent a Railway Emergency Group Call (REC), which sends a 'stop all trains' message to all trains in the vicinity. However, the locomotive driver did not contact the signaller immediately after the derailment, nor did he initiate a REC.

75 The passenger train arrived approximately 47 seconds after the locomotive collided with the buffer stop (paragraph 38). The locomotive came to a stop about four seconds after it hit the buffer stop. A cloud of ballast dust was thrown into the air, affecting the driver's visibility of the surroundings. The driver would then have taken a few seconds to recognise what had happened, having only become aware of the buffer stop four seconds before colliding with it (paragraph 35).

76 The locomotive driver's first action after the collision with the buffer stop was to get out of the locomotive to investigate whether it had derailed. He would have found this difficult to judge from the cab due to the dust cloud. Exiting the cab on a class 66 locomotive involves moving behind the driver's seat and opening a door into a short corridor. The external door then needs to be opened before the driver can climb down to ground level. This would probably have taken the driver about 20 seconds to complete. It is likely that the driver would only have reached the track about 20 seconds before the arrival of the passenger train. Therefore, he did not have time to give any warning to the signaller or to initiate a REC. The driver only had time to run to the back of the locomotive to get clear of the up Gloucester line onto which he had alighted, and on which the passenger train was approaching.

[4] A radio in the cab of a train based on a digital railway communication system that allows communication between drivers and signallers.

77 Module M1 of the railway Rule Book (GERT8000-M1 'Dealing with a train accident or train evacuation') states that in the event of a train accident, the driver should take the following actions:

- *You must immediately switch on the hazard warning indication where provided.*
- *If you cannot do this, you must display a red light forward.*
- *You must then check:*
  - *if any other lines are obstructed (if in doubt, treat them as obstructed), and decide the quickest way to stop any approaching trains*
  - *the exact location of your train.*
- *You must tell the signaller about the accident in the quickest way possible and whether the electric traction current needs to be switched off.*

78 The driver was in a state of shock and confusion having just collided with the buffer stop. He has stated that he did not consider the possibility that the locomotive was foul of the main line at this time. Therefore, he did not recognise that he needed to switch the hazard lights on. Had he switched them on, the approaching passenger train would not have seen them until a few seconds before the collision. It is possible that this would have caused the passenger train driver to apply the brakes. However, although this might have reduced the speed of the train before the collision, it would not have prevented it.

79 For the same reasons, the locomotive driver did not turn on the red tail lamps in the leading cab, nor show any other red light through the cab window. However, had he done so, again, it would have been unlikely to have had any effect on the actions of the passenger train driver because locomotives can often be seen to be waiting in the up Bromsgrove neck.

80 The driver's actions in checking what had happened to his locomotive before contacting the signaller were consistent with the wording of the Rule Book. RSSB[5] has since reported that an amendment to the Rule Book will come into force in December 2020 which will require the driver to inform the signaller of an accident before checking if any other lines are affected.

81 The 'GSM-R Handbook' (RSSB document RS523) describes the operation and functions of the GSM-R radio system fitted in trains and available to signallers and operations controllers. Section 5.3 describes the use of the REC in an emergency situation. It states:

- *A REC can be used during any emergency situation affecting more than one line or more than one train.*
- *In an emergency situation the driver may need to initiate a REC.*

[5] The railway Rule Book is maintained and published by RSSB on behalf of its members. RSSB is a not-for-profit body whose members are the companies making up the railway industry, and is registered as Rail Safety and Standards Board Ltd, but trades as RSSB.

82 Although it associates possible use of the REC with emergency situations, the handbook does not provide detailed guidance on what situations the REC should be used for and those for which it should not. Because a REC sends a 'STOP EMERGENCY' message to all trains in the relevant area, there will be situations where a REC is appropriate and others where stopping all trains is not necessary. DB Cargo stated that its training in the use of the REC uses scenarios to test the responses of drivers to emergency situations and the appropriate use of the REC. However, it also stated that there is no definitive list of situations where REC use is required and the decision is largely down to driver discretion based on the circumstances at the time. The locomotive driver did not initially consider that his locomotive could be affecting the adjacent line and so did not consider using a REC.

## Observation

Buffer stop risk assessment

**83 The standards and processes that Network Rail applies to assess the risk of overrun at buffer stops do not address those on non-platform tracks.**

84 Network Rail standard NR/L2/TRK/2102 issue 8 (Design and construction of track) requires the use of GC/RT5033 (paragraph 61) for the design of new or renewed buffer stops. GC/RT5033 has since been superseded by rail industry standard RIS-7016-INS 'Interface between station platforms, track, trains and buffer stops'. This includes the requirements for overrun risk assessment of buffer stops. Associated guidance on how to undertake buffer stop risk assessments is described in rail industry guidance note GIGN5633 'Recommendations for the risk assessment of buffer stops and end impact walls'.

85 RIS-7016-INS states that its purpose is to set out 'requirements for the design and maintenance of station platforms for their safe interface with track, trains and buffer stops'. Therefore, sidings that are not in station platforms, such as the up Bromsgrove neck, are not covered by it. The associated guidance in GIGN5633 is linked to RIS-7016-INS and so is also limited to platform tracks.

86 RAIB observes that although earlier standards had some applicability to non-passenger terminal tracks, the current standards do not. Therefore, there is no current requirement or guidance to specifically risk assess the overrun risk at buffer stops that are not located in station platforms.

## Previous occurrences of a similar character

87 RAIB has investigated a number of buffer stop collisions. Examples of these are Sudbury (RAIB report 26/2006), Chester (RAIB report 26/2014) and King's Cross (RAIB report 15/2016). RAIB has also published a safety digest into a second buffer stop collision at King's Cross (Safety digest 15/2017). However, the circumstances of this accident differ from those featured in previous investigations, and as a result none of the previously made recommendations are directly relevant here.

# Summary of conclusions

## Immediate cause

88 The locomotive became foul of the main line shortly before the passenger service arrived (paragraph 44).

## Causal factors

89 The causal factors were:

a The locomotive derailed to a position foul of the main line (paragraph 47). This causal factor arose due to a combination of the following:

i The driver was distracted from the driving task as the locomotive entered the siding, resulting in the collision with the buffer stop (paragraph 49, **Learning point 1**).

ii The locomotive deviated to the left after collision with the buffer stop (paragraph 58, No Recommendation).

b There was no opportunity to stop the passenger train before the collision (paragraph 72, **Learning points 2 and 3**).

## Additional observation

90 Although not linked to the accident on 23 March 2020, RAIB observes that:

a The standards and processes that Network Rail applies to assess the risk of overrun at buffer stops do not address those on non-platform tracks (paragraph 83, **Recommendation 1**).

# Recommendation and learning points

## Recommendation

91 The following recommendation is made:[6]

1 *The intent of this recommendation is to improve the management of overrun risk at buffer stops that are not located in station platforms.*

Network Rail should review, and revise if necessary, the processes and standards that it applies to buffer stops installed on non-platform terminal tracks, to ensure that the risks arising from potential buffer stop collisions are being adequately managed (paragraph 90).

This recommendation may also be applicable to other infrastructure operators.

## Learning points

92 This accident demonstrates the importance of:[7]

1 train drivers complying with their employer's mobile phone usage policy so as to avoid unnecessary distractions while driving.

2 informing the signaller following a train accident, even before it is confirmed that adjacent lines are obstructed.

3 train drivers, and other staff, intending to get out of their trains following an incident ensuring that they do so in a manner that does not place them at unnecessary risk from trains on lines that are open to traffic.

[6] Those identified in the recommendation 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, this recommendation is addressed to the Office of Rail and Road to enable it to carry out its duties under regulation 12(2) to:

(a) ensure that recommendations are duly considered and where appropriate acted upon; and

(b) report back to RAIB details of any implementation measures, or the reasons why no implementation measures are being taken.

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

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

# Appendices

## Appendix A - Glossary of abbreviations and acronyms

| | |
|---|---|
| CCTV | Closed-circuit television |
| GSM-R | Global System for Mobile Communications - Railway |
| OTDR | On-train data recorder |
| RAIB | Rail Accident Investigation Branch |
| REC | Railway Emergency Group Call |
| TPWS | Train Protection and Warning System |

## Appendix B - Investigation details

RAIB used the following sources of evidence in this investigation:

- information provided by witnesses
- information taken from the train's on-train data recorder (OTDR)
- closed-circuit television (CCTV) recordings taken from passing trains
- site photographs and measurements
- weather reports and observations at the site
- maintenance records relating to the locomotive and the infrastructure
- a review of relevant railway industry standards and procedures
- a review of previous RAIB investigations that had relevance to this accident.

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