

Rail Accident Report



Collision at Frognal Farm User Worked Crossing 23 October 2017

Report 12/2018
August 2018

This investigation was carried out in accordance with:

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

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Preface

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

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

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

In some cases factors are described as 'underlying'. Such factors are also relevant to the causation of the accident but are associated with the underlying management arrangements or organisational issues (such as working culture). Where necessary, the words '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 event being investigated, but does deserve scrutiny because of a perceived potential for safety learning.

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

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

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Summary

On 23 October 2017, a passenger train collided with a parcel delivery van at Frogmal Farm user worked level crossing, near Teynham, in Kent. The train was travelling at 89 mph (143 km/h). It did not derail, and no-one on the train was hurt, but the train was damaged by the impact. The van was severely damaged and the van driver suffered serious injuries.

The van driver was delivering a parcel to a property on the far side of the crossing. He initially went to an incorrect address, where he was given directions which involved going over the crossing to reach the correct address. The level crossing was equipped with power-operated gates, controlled by a button at the side of the approach road, and a telephone which vehicle drivers were required to use to contact the signaller to obtain permission to cross. Being unfamiliar with user worked crossings, the van driver did not notice the telephone and pressed the button to operate the gates. They opened, and so he returned to his van to drive across the crossing, believing it was safe to cross.

There were multiple signs associated with the crossing which were placed in a way that meant they did not stand out to the van driver. The van driver had been told that he needed to press a green button to open the gates at the crossing, and he was focused on locating this button. The fact that the gate opened when the button was pressed, coupled with the van driver's previous experience of other types of level crossing, may have reinforced his view that it was safe to cross.

The RAIB has found that an underlying cause of the accident was that the system where authorised users are responsible for briefing visitors about the safe way to use private crossings, is unreasonable in present-day circumstances.

The RAIB has made four recommendations, the first directed to Network Rail, the Department for Transport and the Office of Rail and Road to improve the signage at private crossings and review the concept of authorised users. The second is directed to the Department for Transport and the Office of Rail and Road to change the law covering the signage at private crossings. The third is to Network Rail, to improve the safety of private crossings equipped with power operated gate opening equipment. The last is also directed to Network Rail, to review the way in which it collects and maintains data about regular users of private crossings, so that it can better communicate important information about crossing safety.

Introduction

Key definitions

- 1 Metric units are used in this report, except when it is normal railway practice to give speeds and locations in imperial units. Where appropriate the equivalent metric value is also given.
- 2 The report contains abbreviations. These are 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 15:02 hrs on 23 October 2017, a parcel delivery van was struck by train 1L32¹, the 14:59 hrs service from Faversham to St Pancras, at Frogna Farm user worked level crossing near Teynham, Kent (figure 1). The train was travelling at approximately 89 mph (143 km/h) at the time of the accident.
- 4 The train driver noticed the roof of the van behind the hedge that obscured the crossing from his view in the seconds before the van pulled out onto the crossing. The van driver was not aware of the approaching train before it struck his van.

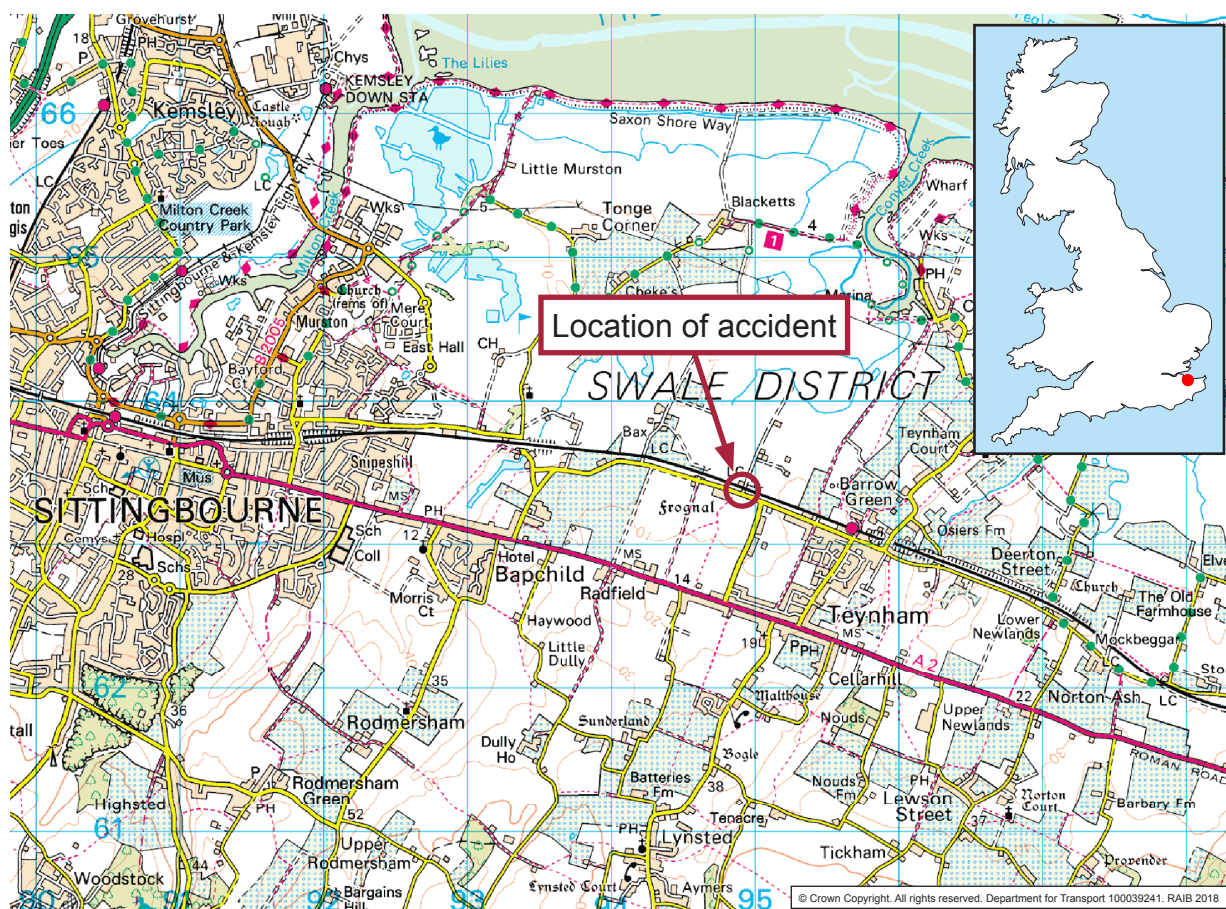


Figure 1: Extract from Ordnance Survey map showing location of accident

- 5 The front of the van was pushed round and down by the nose of the train, which turned the van round and lifted the rear of the van into the air, so that it came into contact with the second carriage of the train. The train driver applied the emergency brake, and the train came to a stand about 600 metres beyond the crossing.

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

- 6 The van driver suffered severe lacerations and two breaks in his right shoulder blade. There were no injuries to anyone on board the train, although the train driver and an acting driver manager, who was in the cab with the driver, were shocked.

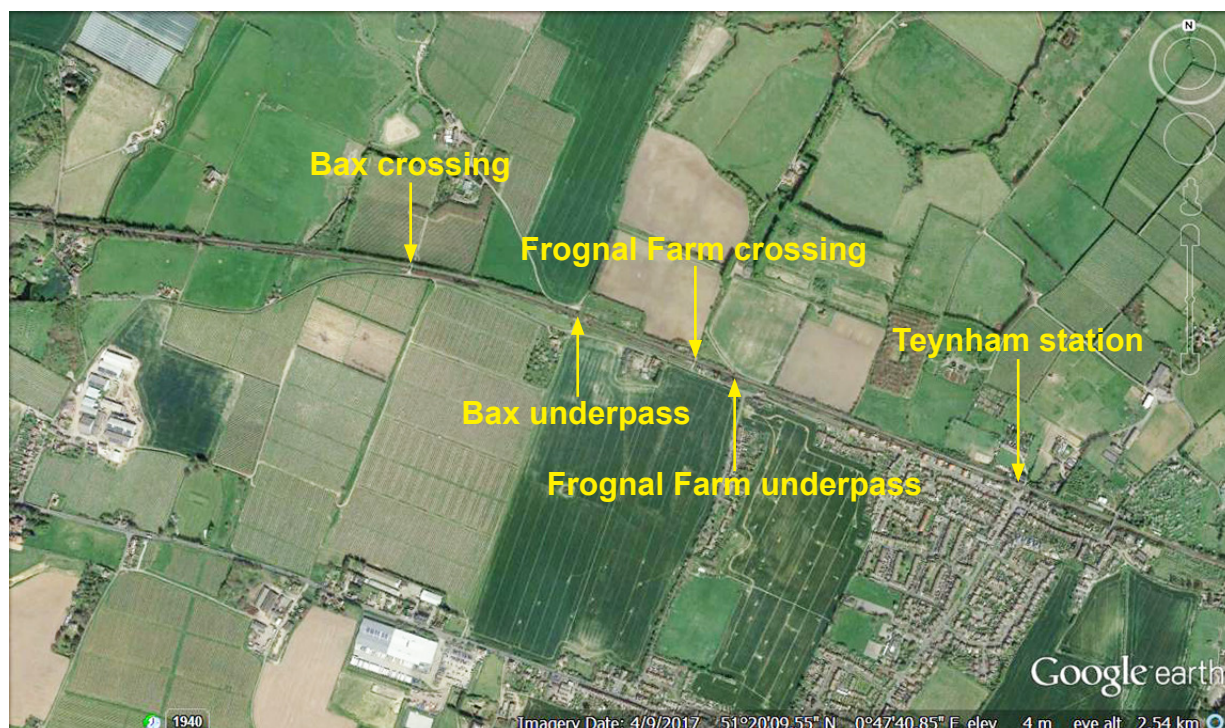


Figure 2: Overview of site showing geographical relationship of key features

- 7 The nose cone of the train was damaged, as were the earth return cables, several axle covers and the shoe arm assembly. There was gouging to the skin of the second carriage, which buckled some of the structural webbing. The level crossing gate equipment cabinet and its contents were destroyed.

Context

Location

- 8 Frognal Farm user worked crossing with telephones (UWCT) is located on the main line from London to Ramsgate, just west of Teynham station, at 47 miles 37 chains (measured from London Victoria via Herne Hill).
- 9 Bax UWCT is located 700 metres further west on the same line at 47 miles 2 chains.
- 10 Both crossings are located on turnings off Lower Road, an unclassified road which links Teynham to the east with Tonge and Bapchild to the west, and provides a through route from Teynham to Sittingbourne.



Figure 3: Reconstruction of the van driver's view of the crossing. It was not possible for the RAIB to photograph the crossing in this state in the aftermath of the accident because of the presence of recovery vehicles, and the signs were altered a short time later to reflect changes made to the crossing after the accident.

Organisations involved

- 11 Network Rail is the infrastructure manager, and employer of the signaller, the electrical control operator and the level crossing management team.
- 12 South Eastern employed the train driver and acting driver manager, and operated the train involved in the accident.
- 13 The van driver was self-employed, working under contract to DPD group.
- 14 All parties freely co-operated with the investigation.

Train involved

- 15 Train 1L32 was made up of a six carriage class 395 electric multiple unit. The investigation found that neither the condition of the train nor the actions of the train's crew contributed to the accident.
- 16 At the time of the accident there were approximately 60 passengers on board the train, and three train crew: the driver and an acting driver manager in the cab, and the on-board manager.

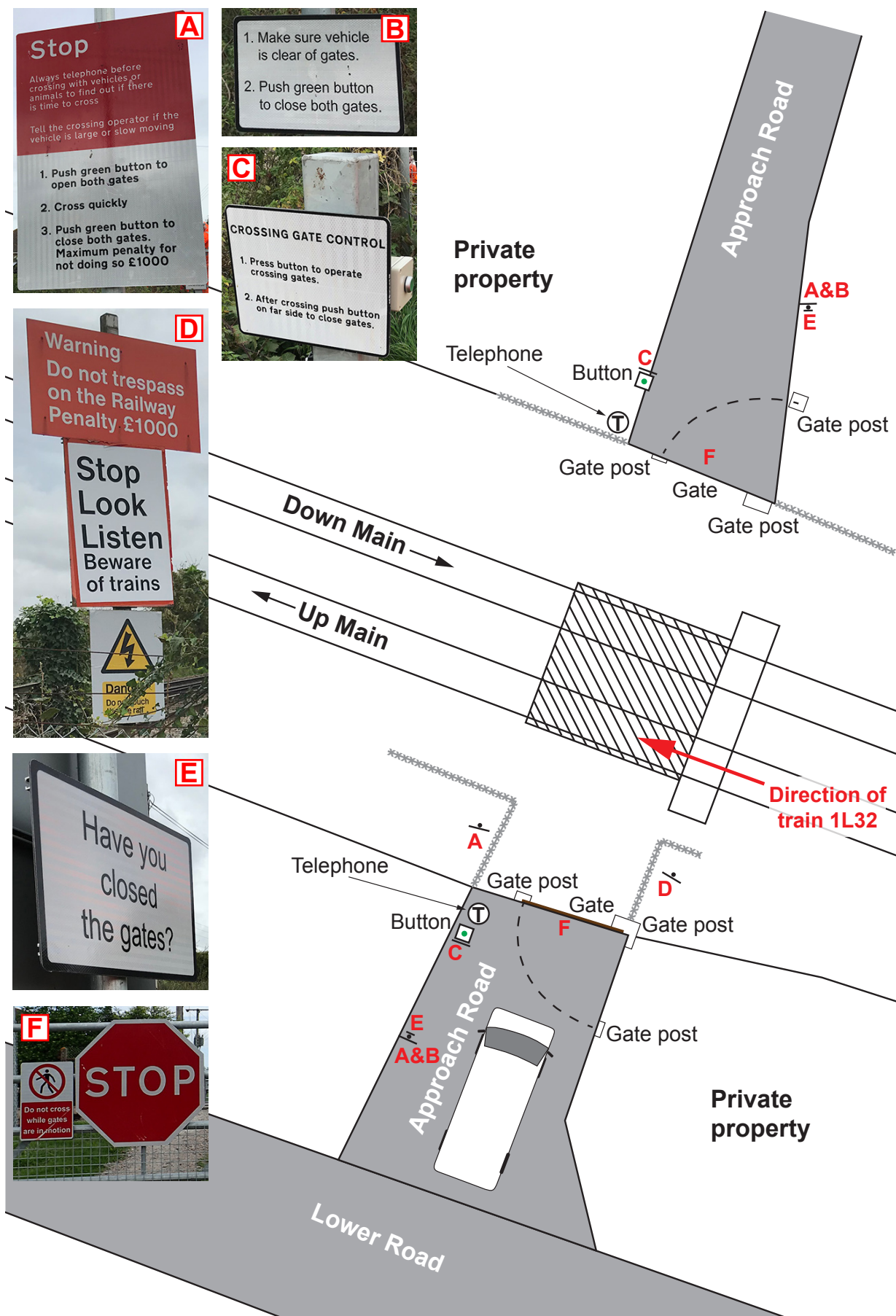


Figure 4: Frogmal Farm crossing layout showing signage placement and approximate stopping location of the van

The level crossing

- 17 Frogmal Farm UWCT is a private crossing off Lower Road, about 0.8 km (0.5 miles) west of the village of Teynham. The road over the crossing leads to a farm, and a small number of residential properties (referred to in this report as the properties on the far side of the crossing). The gated crossing has existed since the railway was opened in 1858, and has been equipped with telephones for many years. In 2017 Network Rail installed power operated gate opening (POGO) equipment at the crossing, which was commissioned on 4 April 2017. Before going over the crossing with a vehicle, users are first required to ring the signaller for permission to cross. Before the POGO equipment was commissioned, the user then had to manually open the gates. After the power operated gates were commissioned, it was intended that once permission had been given by the signaller, the user would press a button to automatically open the gates (which open away from the tracks). They would cross the railway, and press the button on the other side to close the gates behind them.
- 18 The POGO equipment is only a device to open and close the gates. It is independent of the signalling system, and so it will open the gates at any time, whether or not a train is approaching the crossing.
- 19 The crossing is fitted with telephones because there is insufficient sighting distance of approaching trains for a road vehicle driver to be able to determine if there is time to cross safely, and so the signaller must be contacted in order to gain permission to cross the railway.
- 20 The railway lines are electrified using the 750V DC third rail system.

People involved

- 21 The van driver previously held a role in retail management. He became self-employed, working for DPD group based out of Dartford, from August 2017.

External circumstances

- 22 It was a dry day, with a temperature of around 15°C at the time of the accident. There was a south-west wind of approximately 14 km/h with passing clouds. There are no known external factors which affected the course of this accident.

The sequence of events

Events preceding the accident

- 23 The van driver left the DPD Dartford depot at about 08:30 hrs and made deliveries in the ME10 3xx postcode area. He had a good run and was keeping to his schedule. After delivering parcels in Bapchild and Doddington, he drove to Teynham and made two deliveries to regular customers, one of which required him to cross the full barrier CCTV level crossing immediately to the east of Teynham station.
- 24 The van driver's satellite navigation and parcel scanning device, which directs drivers to all their deliveries on the route set up for the day, then took him to the ME9 9xx postcode area. The building it took him to was in the centre of the postcode area, but was not the correct delivery address.
- 25 One of the owners of the property at which the van driver arrived was working outside, noticed the van driver arrive and went over to meet him.
- 26 It immediately became apparent to the property owner that the van driver was at the wrong location. Witness evidence has led the RAIB to conclude that the property owner gave the driver directions to the correct delivery address via Frognal Farm crossing, explained that it was a new type of crossing, and that to open the gates, the van driver would need to press a green button.
- 27 Train 1L32 left Faversham on time at 14:59 hrs.

Events during the accident

- 28 The van driver followed the directions the short distance to Frognal Farm crossing, and stopped far enough away from the gate to permit it to open. He then looked for the green button, which was located on a post on the left-hand side of the road (figures 3 and 4).
- 29 The driver got out of his van and walked around the front of the vehicle. Locating the green button, he pressed it and the gates opened. He got back into his van and drove onto the crossing.
- 30 As train 1L32 approached Frognal Farm crossing, the train driver became aware of the roof of a vehicle, just visible above a hedge adjacent to the crossing on the left-hand side of the track. The vehicle started to move as soon as he saw it and entered the crossing directly in front of the train, which was travelling at 89 mph (143 km/h).
- 31 The impact followed at 15:02 hrs. The front of the van was hit by the nose cone of the leading carriage of the train, and was spun round. The rear of the vehicle lifted into the air so that the rear offside of the van hit the second carriage of the train, causing gouging to the second carriage and severely damaging the back of the van. The van was propelled back towards Lower Road, severely damaging, signage, fencing, and the POGO control equipment cabinet.

- 32 The train driver immediately applied the emergency brakes and pressed the emergency call button on the GSMR² train radio to send a message to stop all trains in the area.

Events following the accident

- 33 Once the train had stopped, the train driver reported the accident to the signaller who arranged for the emergency services to attend.
- 34 Upon hearing the collision at the railway crossing, people nearby ran to the railway line to offer assistance.
- 35 A local resident called the emergency services, who arrived at 15:19 hrs.
- 36 An emergency switch-off of the third rail traction current was confirmed in place at 15:29 hrs.

² Global System for Mobile communications – Radio is a national radio system which provides secure voice and data mobile communications between trains and signallers

Key facts and analysis

Background information

Delivery driving process

- 37 The van driver's day normally starts at the depot between 06:00 hrs and 07:00 hrs, taking receipt of all the packages and parcels he has to deliver that day. On a normal day, like 23 October, that would be between 60 and 90 parcels. On such a day, the van driver would generally get back to the depot around 18:30 hrs.
- 38 Information about all the parcels is pre-loaded into the van driver's satellite navigation and scanning device, which uses address information scanned by the driver from each parcel to put the parcels into a numbered sequence. This determines a delivery route that is circular, bringing the driver back to the depot as quickly as possible.
- 39 When acting as a satellite navigation system, the device sits in a cradle on the dashboard on the passenger side of the van, so the driver can touch the screen, and see it and hear it give directions, but cannot lift it from the cradle while driving. Each delivery or collection is allocated a total of three minutes, from the driver's arrival at the delivery address to setting off for the next address on the route.

POGO equipment

- 40 The POGO equipment at user worked crossings allows a crossing user to open and close the gates by push-button control. One of Network Rail's objectives in fitting this equipment was to improve safety, as the user would no longer have to manually open and close the gates, reducing the number of times that each user had to cross the railway line from five to one³. Because it would also make it easier for a user to close the gates, the POGO equipment was also expected to make it less likely that the gates would be left open, improving both safety and service reliability.

Identification of the immediate cause

- 41 **The van driver drove his van onto the level crossing when it was not safe to do so.**
- 42 The van driver got back into his van once the gates had opened and drove onto the railway, as he believed it was safe for him to go across the crossing. He did not look for (and because of obstructions he would not have been able to see) any oncoming trains.

³ To safely cross with a vehicle at a manually operated user worked crossing without POGO equipment, the vehicle driver should first seek permission to cross the line from the signaller, then open the gate nearest to them, check it is safe to cross the line, cross and open the gate on the other side of the line, check it is still safe, and cross the line for a second time to return to their vehicle. They should then cross with the vehicle. Once clear of the far side of the crossing, the vehicle driver should get out, check it is safe to cross the line for a fourth time to close the gate on the side of the crossing from where they started, then check it is safe and cross for the fifth and final time before closing the gate on the other side of the crossing, returning to their vehicle and continuing on their journey.

Identification of causal factors

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

- the van driver did not telephone the signaller for permission to cross (paragraphs 44 to 63);
- the gate opened when the button was pushed, which may have reinforced the van driver's view that it was safe to cross (paragraphs 64 to 68); and
- Network Rail installed POGO equipment at Frognal Farm crossing without detailed consideration of whether the design was suitable for the location (paragraphs 69 to 85).

Each of these factors is now considered in turn.

Request for permission to cross

44 The van driver did not telephone the signaller for permission to cross.

45 To use the crossing safely, a vehicle user must telephone the signaller for permission to cross the line. The van driver did not use the telephone, because he was not aware of the need to do so.

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

- The van driver's lack of experience of user worked crossings (paragraphs 47 to 49);
- The van driver had not received prior information about how to use this crossing safely (paragraphs 50 to 55);
- The crossing signage did not stand out and did not attract the van driver's attention (paragraphs 56 to 62); and
- The van driver was focused on looking for a green button (paragraph 63).

Each of these is now considered in turn.

Van driver's experience

47 The van driver had significant experience of level crossings with power operated lifting barriers on public roads, both from his work (he had used the one to the east of Teynham station twice, shortly before arriving at Frognal Farm crossing), and because he lived near one. He was well aware of the need to stop at such a level crossing when the barriers were down or lowering, and switch his engine off and wait for the barriers to raise before continuing on his journey.

48 In the van driver's experience, if the route across a railway was blocked by barriers, then it was not safe to proceed. If the barriers were raised, no lights were showing and the crossing was clear of vehicles, then it was safe to proceed.

49 The van driver stated that he had not previously encountered a private, user-worked level crossing before he arrived at Frognal Farm crossing on the day of the accident.

Van driver's briefing

- 50 The occupiers of the land and premises which are served by a road over a private crossing (the authorised users), and other people and organisations who have a legitimate reason to use the road, including the land owners' invitees, have a legal right to use the crossing. The property owner who gave the van driver directions to the crossing and explained that it was a new type of crossing was not an authorised user. At the time of the accident, the only recorded authorised users for Frogna! Farm crossing were the owner of the farm on the far side of the crossing, and a drainage company. There is at least one other resident living on the far side of the crossing, but they were not recorded by Network Rail as an authorised user (see paragraphs 89 to 91).
- 51 The authorised users of private crossings such as the one at Frogna! Farm have a duty of care to visitors using the crossing under the Occupiers' Liability Acts 1957 and 1984. Authorised users who are also employers owe a duty to their employees under the Health and Safety at Work etc. Act 1974, and employers and those who are self-employed have a duty under the same Act to members of the public who may have business with them. These duties require them to conduct their undertakings so as to ensure, so far as is reasonably practicable, that people are not exposed to risk. There are no regulations defining what steps duty holders should take to fulfil these duties at level crossings. However, during the investigation Network Rail advised the RAIB that it believes that authorised users should make 'reasonable attempts to warn those that they know will use the level crossing to visit their property'. Nevertheless, Network Rail also advised that where people supplying a service turn up unannounced, it may not be possible for the authorised user to brief them on the safe use of the crossing.
- 52 The authorised user at Frogna! Farm crossing (see paragraphs 89 to 91) largely relied on the signs, provided by Network Rail, to give information to crossing users, although witness evidence indicates that the owner of the farm, when he had the opportunity, did explain to his visitors that they would encounter an unusual type of crossing, and directed them to follow the signs.
- 53 When ordering goods and services that are to be delivered, it is not always possible for customers to provide instructions to the delivery company about particular requirements for delivery. In the case of the van driver involved in this accident, any delivery instructions provided only appeared on the navigation and parcel scanning device when the parcel was scanned before handing it over to the recipient, once the driver had arrived at the correct address. There was no facility in the system that the van driver was using for providing the driver with instructions on how to reach the address - the delivery instructions were only expected to relate to such things as where to leave the parcel or what to do if the occupier was out. No evidence of any delivery instructions for the package the van driver was delivering has been found.
- 54 If employers become aware that their employees need to use user-worked crossings, they have a duty, under health and safety law, to make arrangements to provide information to their staff on the safe use of these crossings. The van driver, who was self-employed, had not received a briefing on the safe use of the crossing from the company he was contracted to.

- 55 As a result the van driver did not receive a briefing on how to use the crossing from anyone, beyond verbal advice about the need to press a green button.

Crossing signage

- 56 Users of Frogmal Farm crossing were presented with nine signs of differing size and prominence on their approach to the crossing (figures 3 and 4). The van driver, having pulled onto the crossing's approach road and clear of Lower Road, had already passed the first sign. The level crossing manager (see paragraph 142) realised that users of the crossing would miss the first sign when they pulled clear of Lower Road, and so she asked for it to be repeated closer to the crossing, shortly after the POGO equipment was commissioned. An additional sign was installed on 13 April 2017.



Figure 5: The duplicated signs explaining how to use the crossing

- 57 This sign (the sign on the right in figure 5, also visible above and to the left of the crossing gate in figure 3) explaining how to use the crossing correctly, was offset to the left of the road.
- 58 The van stopped on an incline clear of Lower Road. The signage to the driver's right, the bottom of which was partially obscured by vegetation, was the sign shown as sign D in figure 4.
- 59 There was a stop sign on the gate, and a sign warning people not to cross while the gates are in motion. These were mounted on the gate and so were immediately in front of a vehicle driver as they approached the crossing. There was a small sign on the button facing Lower Road, with two numbered instructions on it in small type.

- 60 The signs for the crossing were spread over quite a wide area, and there was nothing immediately apparent to a user to tell them that they needed to be aware that there was a risk to their safety if they did not follow the instructions on the sign to their left (sign A in figure 4).
- 61 The sign that had the information on it explaining how to use the crossing, (sign A in figure 4) was not designed or presented in a way that stood out to users of the crossing. Because the van driver stated that he did not see or read the signs, the wording on the signage is not considered to be among the causal factors in the accident. However, this is discussed further in paragraphs 92 to 101.
- 62 Confusion is created by the multiple signs with separate and slightly differing messages. There is no sense of ordering of the signs, and the placing of the signs did not make them conspicuous (figure 3).

Van driver's focus

- 63 The information from the owner of the property at which the van driver had initially attempted to deliver the parcel, led the van driver to understand that the green button was the key piece of equipment for operating the crossing. The van driver's goal was to locate the green button to operate the crossing, not to look for and comprehend an array of signage.

Assumption associated with POGO equipment

64 The gate opened when the button was pushed, which may have reinforced the van driver's view that it was safe to cross.

- 65 The types of level crossing with which most motorists are familiar have powered lifting barriers (either full or half barriers) with flashing red lights (known as 'wigwags'), and there is no need for the user to interact with the crossing to operate it. When the barriers are down and the lights are flashing it is not safe to cross, and when the barriers are raised and the lights are extinguished it is safe to cross.
- 66 Private crossings are operated on a different basis. At a public road crossing with gates or barriers, the railway operator provides a system to protect the road user. At a private crossing the user is responsible for ensuring their own safety. This normally involves following instructions given by the signage at the crossing, reinforced as necessary by information provided by an authorised user or an employer.
- 67 The van driver was almost certainly not aware of the concept of a private crossing, and had not been given any information on how to use it. Witness evidence indicates that he was not aware of the signage at the crossing as he was focused on finding the green button, which he had been told would operate the gates. He stated that when he pressed the green button, he was surprised that the gates opened so quickly, but he had assumed that as they had opened it was safe to cross. Given his previous experience of public level crossings, this was not an unreasonable assumption for him to make. It was, however, wrong.

- 68 The risk assessment process for the POGO crossing concept put together by Network Rail's central level crossings team in September 2013, had accepted that users unfamiliar with this type of crossing might come to the crossing and not fully understand how to use it. The mitigations put forward were the provision of clear signage (paragraph 84), and that visitors would be briefed by the authorised user (paragraph 86). The first of these mitigations was not effective in this case and the second was not possible.

Appreciation of risk associated with POGO equipment

69 Network Rail installed POGO equipment at Frognal Farm crossing without detailed consideration of whether the design was suitable for the location.

- 70 Network Rail's South East route level crossing management team had, in line with Network Rail and Office of Rail and Road (ORR) policy, been looking to close level crossings in their area. Frognal Farm and Bax crossings both had high relative risk ratings (see Appendix C). Since the rating for Frognal Farm crossing was A4, and for Bax A3, they had both been considered for closure.
- 71 To provide alternative access routes for the occupants of the properties at the two locations a number of proposals had been put forward. These included installing a bridge and putting in a road to link two pieces of land, widening and lowering (to give more height for large vehicles) one or both of the cattle creeps that run under the railway just to the east of each of the crossings, or closing one of the two crossings and providing a link road across one or other of the authorised users' land. However, by the end of 2015 it was clear that these all proved either disproportionately expensive or unacceptable to the authorised users of the crossings.
- 72 As funding had been earmarked to reduce the risk at the two crossings, the route level crossing team did not want to do nothing and lose the funding or the potential contribution to the reduction of risk across all their level crossings. They considered whether there was another way of achieving a reduction of risk level at these two crossings.
- 73 The team knew that POGO equipment had been considered previously by the Network Rail central level crossing risk reduction team. Designs had been drawn up for POGO installations at Frognal Farm in February 2014, and at Bax in April 2014.
- 74 The route level crossing team understood that the POGO crossing equipment was an off-the-shelf product available from Network Rail's central services, that it was already fully risk assessed, and that installing the equipment should reduce the exposure of risk to users of the crossing by reducing the number of traverses from five to one⁴.

⁴ See footnote 2, paragraph 40.

- 75 However, both Frogmal Farm and Bax crossings serve a number of occupiers, some of them private residents, and this makes it impracticable for many of the people arriving at the crossings, and not already familiar with them, to be given any warning that they are approaching a crossing where they must take action to ensure their own safety. This means that the provision of POGO equipment, without measures to adequately inform and educate users about how it worked, may actually have resulted in an increase in risk. This resulted from the possibility that users who were unfamiliar with this type of crossing might not understand that the powered gates would open regardless of whether a train was approaching (paragraphs 65 to 67, see paragraph 97).
- 76 This occurred because the route level crossing management team did not appreciate that this new risk might arise. In addition the Network Rail central team did not understand all the risks associated with POGO crossings, and did not provide the right information to local staff to equip them to make the decisions about the suitability of this type of crossing (paragraphs 77 to 85).

Management of the risk associated with POGO crossings and provision of information

- 77 The central level crossings team at Network Rail offered the POGO equipment as an off-the-shelf product to routes that were considering ways of reducing risk at level crossings. The POGO equipment had been developed and approved for installation by Network Rail following a number of trials of new ways of operating private crossings which had taken place at individual crossings since 2000. This type of POGO equipment was first tried out at Oakwood Farm level crossing, near Knaresborough in Yorkshire, from 2009. A modified version was installed at the same site in 2012, and based on experience with this, in 2013 Network Rail began a project for installing POGO equipment more widely.
- 78 When the project started in 2013, it was envisaged that there would be approximately 300 POGO installations, which included Bax and Frogmal Farm (paragraph 73). The risk assessment carried out at this stage of the project is described in paragraphs 90 to 95 of [RAIB report 07/2016](#). Although this risk assessment included consideration of how a user unfamiliar with this type of crossing might approach it, the POGO equipment at Oakwood Farm crossing had been installed before this risk assessment was carried out. The signage therefore did not address the risk of users who were unfamiliar with this type of crossing not understanding how to use it safely. Following a collision at Oakwood Farm crossing in May 2015 ([RAIB report 07/2016](#), see paragraph 125), the project was put on hold while various issues with risk assessment, product suitability and reliability were resolved. When Network Rail central offered the product to the routes again in 2016, after revising the criteria for installing POGO equipment, estimates of the number of suitable locations had dropped to approximately 80, and that quantity of equipment was purchased and held at a central store.
- 79 As described in paragraph 104 of [RAIB report 07/2016](#), in September 2013, Network Rail's independent human factors consultant recommended that before POGO equipment was more widely implemented, Network Rail should conduct user testing. They recommended that a hazard assessment should be undertaken at a trial site to assess how well the instructions could be seen and understood. This recommendation had not been implemented by Network Rail prior to the installation of POGO equipment at Oakwood Farm, Frogmal Farm and Bax crossings.

- 80 When the South East local team contacted the central team during autumn 2016 to ask for details of POGO equipment for Bax and Frognal Farm crossings, they were informed that designs had already been prepared (paragraph 73), because the two locations had previously been considered as suitable for the POGO installation. The central team stated that when they sent the documentation to the route, with the designs from 2014, they made it clear that the designs would need to be updated with any changes that had come out of the review (paragraph 78) while the project had been on hold.
- 81 The central team had a clear expectation that the designs would also need to be reviewed to take into account any local risks at each of the crossings. However, this was not effectively communicated to the local team. The local team was not aware of the issues that had been found at Oakwood Farm, and stated that they did not understand that the designs would need revisiting.
- 82 At Frognal Farm, the actual layout of the signs did not correspond either to the specific design for the crossing that had been prepared in 2014, or the generic design for a POGO crossing (drawing number 2965-UWC-SD-010 rev A) which was also provided to the installation team. However, had the installation corresponded to the design for Frognal Farm crossing, the instructional sign shown in figure 5 would not have been provided at all and there would have been no information for users on how to use the crossing properly. The original design did not show a position on the drawing for the instructional sign at Frognal Farm. This appears to have been an oversight which was not detected by Network Rail's process for checking and approving the design.
- 83 Witness evidence indicates that the installers in March 2017 did their best to install the equipment in accordance with the intent of the 2014 design with the information that they had available, having collected all the signage required for POGO crossings from the central stores. Despite the error noted in paragraph 82, this included the instructional sign shown in figure 5.
- 84 The Network Rail central team did not appreciate that the design did not effectively mitigate the risk at the crossings (paragraph 68), and one factor in this was that they had an unrealistic expectation about the extent to which it was possible for all authorised users to brief every person that would want to use the crossings (paragraph 86). This expectation was supported by an information leaflet⁵ prepared by Network Rail's legal department, which stated:
- 'Crossing Safely***
- ...An authorised user is also responsible for the safety of their invitees and must brief all their invitees on the safe use of the crossing'.*
- 85 The result of this lack of understanding of the risk and poor communication between the central and local teams was that the POGO equipment was installed at these two crossings without proper consideration of its suitability for use at such locations, and the measures needed to minimise the risk to users unfamiliar with this type of crossing.

⁵ 'User worked crossings obligations and responsibilities', May 2015.

Underlying factor

The concept of authorised users

86 The system by which authorised users are responsible for briefing visitors about the safe way to use private crossings is not reasonable in present day circumstances.

87 Network Rail's stated view, as expressed publicly in the information leaflet that it issued to users (paragraph 84), was that private crossings operate on the basis that the authorised users for each crossing will brief any invited guests, tenants or employees who need to use the crossing on its safe use. The van driver was delivering a parcel to a resident of one of the properties on the far side of the crossing and he was not briefed on how to use the crossing by anyone.

88 The duties of authorised users, and Network Rail's understanding of those duties, are described in paragraphs 51 to 55, which also set out the practical difficulties associated with this system. It is no longer reasonable (if it ever was) to expect authorised users to provide information to everyone who may approach a private level crossing about how to use it safely. This is particularly difficult where, as at Frogna Farm, the crossing is immediately adjacent to a public road and there is little or no opportunity to use gates or notices to alert drivers that they are approaching a private crossing.

89 Network Rail has stated that it identifies legitimate authorised users by comparing the original land ownership plans from when the railway was constructed with current Ordnance Survey plans. The current ownership of the lands previously served by the crossing are identified. Network Rail then looks at the land use and whether the right to use a level crossing still exists or whether it has outlived its statutory purpose (for all, or for specific landowners). Once these have been established then the company looks at those who occupy lands (other than the landowner), and those categorised as invitees of the landowner, and any crossing rights which are (legitimately) claimed.

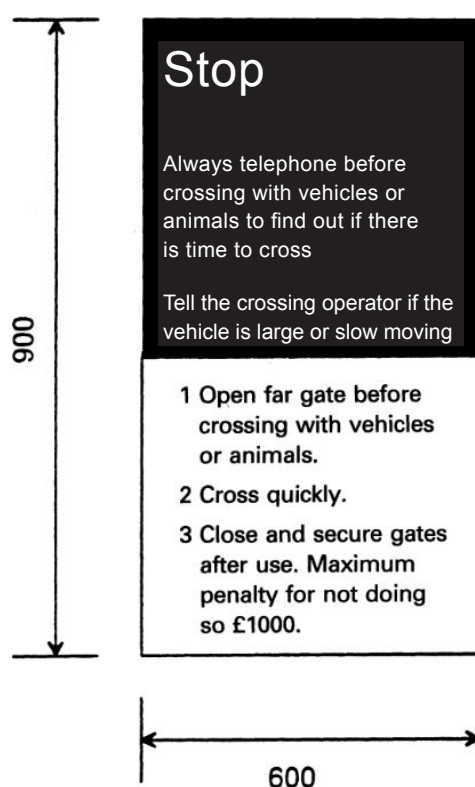
90 Network Rail's records indicated that Frogna Farm UWCT had two authorised users, one of which was the owner of the farm at the far end of the road to which the level crossing leads, and the other was a drainage company. However, during the investigation the RAIB identified that there are other residential properties served by the crossing, whose occupiers do not have the status of authorised user. It is not practicable for an authorised user to have knowledge of, or engagement with, visitors to other properties on the far side of the crossing.

91 The RAIB asked Network Rail to apply its process (paragraph 89) to check the listed authorised users for the crossing. Network Rail then identified that the drainage company is not an authorised user in its own right, but was an interested party because it was an invitee of the authorised user. It also identified that the other freeholder on the far side of the crossing should have been listed as an authorised user of the crossing but was not, as a result of errors in data verification.

Observations Appropriateness of signage and wording

92 **The signage was not clear, contained conflicting information and did not convey the most important action required to the crossing user.**

93 The Private Crossings (Signs and Barriers) Regulations 1996⁶ prescribe the signs to be used at a user worked crossing with and without telephones. POGO equipment had not been invented when these regulations were made, and so the sign that should be used at a crossing with telephones, shown at diagram 103 in the regulations (figure 6) does not explain how to use a POGO crossing. There are currently no appropriate signs in the regulations for crossings with new technology such as POGO equipment, and the signs used at Frognal Farm and other POGO crossings were designed by Network Rail for use in conjunction with other, legally specified, signs.



Upper section—White lettering on red background

Lower section—black lettering on white background

Instructions for use at a vehicular crossing with a telephone

Diagram 103

Figure 6: Legally specified sign for UWCT

94 When devising a sign giving instructions on how to use POGO crossings, Network Rail chose to modify the diagram 103 sign to keep it as close as possible in appearance and wording to the sign mandated by the regulations.

95 The most important piece of information to convey to the unfamiliar user at a user worked crossing where it is not possible to see if trains are coming in sufficient time to make an informed decision as to whether it is safe to cross, is that the user **must** phone the signaller to ask for permission to cross the line.

⁶ SI 1996 no. 1786.

- 96 The instructions are not concise and they do not capture the reader's attention. The most important instruction on the sign, to contact the signaller for permission to cross, is not a numbered instruction, and it is therefore easy to overlook. In addition it is difficult to pick out in the white text on the red background.
- 97 Neither this sign, nor any of the others at the crossing, makes it clear to the user that it is not safe to cross the railway without permission from the signaller, nor do they explain that pressing the button will open the gates regardless of whether or not there is a train coming.
- 98 Comparison of the signs at the crossing with the American standard ANSI Z535 which is aligned to ISO 3864 and is viewed as good practice for signage, indicates poor practice in the two signs that explain how to use the crossing (figure 6). Following the standard:
- 1) the signal word, 'stop' in this case, should be in upper case; and
 - 2) the signal word should be the only word in white-on-red – the rest of the text should be black-on-white.
- 99 After he had walked around the van, the van driver would have approached the button from the railway side and therefore would not see the sign facing Lower Road on the other side of the button (figure 7). However, had he read this sign, he would not have seen an instruction to contact the signaller, as the sign merely instructed the user to push the button to operate the gates and to close the gates after crossing.
- 100 Of the nine signs (paragraph 56), seven did not convey the detail of how to use the crossing and contained conflicting information. One of the signs displayed information about the need to close the gates after the crossing had been used, and was on the same post as the first of the signs that explain how to use the crossing.
- 101 The two signs on the gate did not give any information as to how to use the crossing safely from a vehicle driver's perspective, and the three signs on the right, which were partially obscured by vegetation, also gave no instruction as to how to use the crossing safely.



Figure 7: Sign and green push button

Retention of Data

102 Network Rail was unable to find occurrence books for Frogna Farm User Worked Crossing pre-dating July 2016.

- 103 Each time a road vehicle driver telephones to request permission to use a private crossing, the signaller is required by the railway rule book to make a record of the call, and the outcome (ie whether or not permission is given). This record is kept in an occurrence book, which is maintained for each crossing that a signal box or signalling workstation supervises. During the investigation, the RAIB requested the last five years of occurrence books for Frogna Farm and Bax UWCT crossings in order to get a clear understanding of their use and whether it had changed over time. Network Rail was only able to locate occurrence books covering 5 April 2016 onwards for Bax and 11 July 2016 onwards for Frogna Farm.
- 104 Network Rail's company standard NR/L3/INF/02226 issue 3 Section 3.2 'Corporate Records Retention Schedule' states that logs, registers, worksheets including train register books, and occurrence books are to be kept for six years from the last entry.
- 105 By not retaining crossing data it becomes difficult for Network Rail to understand the recorded use at the crossings, or compare the recorded use against any actual use surveys that may be undertaken. It also becomes impossible to understand how the usage of a crossing has changed over time. All of this information is important for the effective management of risk at level crossings.

Discharge of traction current

106 The traction current was not discharged until 27 minutes after the accident.

- 107 The accident was reported to the signaller by the driver of 1L32 at 15:02 hrs, but the traction current was not discharged until 15:29 hrs, which meant that the van driver, who had alighted from his vehicle and had started to walk along the track towards the train, was walking close to a live conductor rail.
- 108 Section 6.1.1. of module DC of the railway rule book⁷ states that the electrical control operator should be contacted immediately it is known that a person is in contact with, or is in danger of coming into contact with the conductor rail equipment, so that an emergency switch-off of the traction current may be made. Section 6.1.4 provides the following instructions to signallers as to what to do in the event of an emergency likely to need traction current to be discharged:
- 6.1.4 Additional instructions for signallers**
- If you become aware of an emergency, you must carry out the appropriate train signalling regulations before asking for the electricity to be switched off.*
- 109 The electrical control room operator stated that the accident had resulted in a tripping of the power supply, but that it had been immediately recharged in accordance with normal procedures. The signaller was engaged in talking to the train driver as well as taking a call from a witness to the accident at the crossing telephone. At 15:26 hrs the signaller started making arrangements for an emergency isolation of the third rail system, which were confirmed at 15:29 hrs with the electrical control operator.

⁷ GE/RT8000 DC Issue 4.

Relative assessment of risk at Frognal Farm UWCT and Bax UWCT

110 The route level crossing team incorrectly believed that Bax crossing was used more intensively than Frognal Farm crossing.

- 111 The route level crossing management team believed that Bax was a more intensively used crossing than Frognal Farm. POGO equipment was installed at both crossings on 31 March 2017, but it was removed from Bax crossing four months later after three near misses in quick succession, the last of which was with a household fuel oil tanker.
- 112 The driver of the tanker contacted the signaller to explain that he had had a near miss, and said that he had misunderstood the signage at the crossing.
- 113 The route level crossing management team decided to remove the POGO equipment from Bax crossing. After discussion with the Network Rail central team responsible for POGOs, they agreed to leave the equipment in use at Frognal Farm on the basis that the crossing was less used and had lower levels of misuse than Bax.
- 114 When a user contacts the signaller for permission to use each of these crossings, details of the call are recorded in an occurrence book held at the controlling signal box. The RAIB's analysis of the available occurrence books for the two crossings show that out of the 17 months for which it is possible to compare data, Frognal Farm crossing was used more than Bax crossing in 13 of those months.
- 115 Network Rail's records shows more examples of deliberate misuse at Bax than at Frognal Farm. Much of the recorded misuse for Bax is the gates being left open and children playing with the phones. This misuse is mainly reported by signallers receiving nuisance calls, or by train drivers reporting that the crossing gates have been left open. From cab rides RAIB ascertained that it is not possible to see whether the gates have been left open or closed at Frognal Farm crossing from the cabs of either the class 395 or 375 trains which use the line, as the gates are obscured from the train drivers' view by the lineside fencing and vegetation.
- 116 After the POGO installation, signallers had raised concerns that they were receiving fewer legitimate calls from Bax crossing. The route health and safety team used the data from the occurrence books to demonstrate that since the POGO equipment had been installed, the number of callers ringing to use the crossing had significantly dropped. June 2016 was compared with June 2017 and indeed from this data there were 2.7 times more calls in June 2016 than there were in June 2017. However it is clear from the data that June 2016 was harvest time and there were a significant number of tractors using the crossing, the equivalent harvest month in 2017 was July and in fact there were five more recorded crossings in July 2017 than in June 2016 at Bax.
- 117 However, on the basis of the assessment of the POGO resulting in fewer phone calls and taking into consideration the three near misses, the POGO equipment was decommissioned at Bax on 31 July 2017.
- 118 The data from the occurrence books over the 19 months for which there is available data for Bax crossing shows a gradual decline in the number of requests for use of the crossing throughout the entire period, with the exceptions being harvest months.

- 119 In contrast, the RAIB's analysis of the data for Frogmal Farm UWCT shows a gradual increase in the number of recorded uses of the crossing, especially once the POGO equipment was installed. From the RAIB's analysis of the evidence, there were equally strong reasons for decommissioning the POGO equipment at Frogmal Farm crossing as well as that at Bax crossing, after the near misses at Bax crossing.

Similar experience of POGOs at other locations

- 120 On 14 March 2018, there was an accident at Routs No.8 crossing, a short distance outside Ipswich on the Felixstowe branch in Suffolk. This crossing is also fitted with POGO equipment, and it also has miniature stop lights which indicate to users when it is safe to cross. It is a private crossing, and the road over it gives access to a number of business premises. The driver of the vehicle in this case was visiting a car spares business.
- 121 The owner of the business had met the vehicle driver at the gates of the crossing and conducted him to the premises. The vehicle driver had not visited the site before and stated that he was not aware he had passed over a level crossing, or that he had passed miniature warning lights indicating whether it was safe to cross the railway.
- 122 After concluding his business, the vehicle driver got back in his car and headed back towards the main road. The gates to the crossing were open, and still not appreciating that he was crossing a railway, the vehicle driver drove over the crossing. On the crossing his car was struck by the locomotive of a freight train travelling at 50 mph (81 km/h).
- 123 The use of the land served by Routs No.8 crossing has changed significantly over a number of years, from a single occupier to multiple businesses, resulting in a large number of visitors. There had been a very near miss on the same crossing on 2 February 2018 resulting in the prosecution of the car driver responsible.
- 124 The evidence relating to the events at Routs No.8 crossing indicates that many visitors to the businesses and residential properties served by the crossing were not receiving any briefing on how to use the crossing safely. The single authorised user was not in a position to provide such briefings, and there were no effective arrangements for the various occupiers to do so.

Previous occurrences of a similar character

- 125 An accident occurred at Oakwood Farm user worked crossing near Knaresborough in Yorkshire on 14 May 2015 ([RAIB report 07/2016](#)), when a passenger train collided with a tractor. The train was carrying 66 people and travelling at 65 mph (105 km/h), but did not derail. The collision caused the front of the tractor to become detached from its cab. The tractor driver suffered minor injuries, and the train driver was treated for shock. However, in different circumstances the consequences could have been much worse.

- 126 The tractor driver began crossing the railway after the illuminated warning at the crossing started to display a red light. This was probably because he was unfamiliar with the crossing's operation; it had been fitted with POGO equipment since he had last visited it. It is likely the tractor driver did not recheck the warning lights after first stopping on the approach to the crossing to press a button to open the gates. This particular button had not originally been intended to open the gates (it should only have been capable of being used to close them, as there was another button closer to the crossing, which should have been used to open the gates). It was situated at such a distance from the crossing that the time it took for the tractor driver to stop, open the gates and then drive onto the crossing, was greater than the time between the warning light turning red and the arrival of the train. There was no sign at the button to warn the driver to recheck the warning light before going over the crossing. The investigation also found that the warning light was not conspicuous among the many signs present at the crossing.
- 127 The underlying causes of the accident were that Network Rail did not ensure that the risks at the crossing were adequately mitigated (paragraphs 78 to 79 of this report), and that the process for the introduction of the POGO equipment was not adequately managed. Recommendation 2 from the Oakwood investigation report is re-made in this report (recommendation 3) and augmented to address the specific issues found at Frognal Farm, as it has been found that it had not been fully addressed or understood.

Summary of conclusions

Immediate cause

128 The van driver drove his van onto the level crossing when it was not safe to do so (paragraph 41).

Causal factors

129 The causal factors were:

- a. The van driver did not telephone the signaller for permission to cross (paragraph 44). This causal factor arose due to a combination of the following:
 - i. the van driver's lack of experience of a user worked crossing (paragraph 47, **Recommendation 1**);
 - ii. the van driver had not received prior information about how to use the crossing safely (paragraph 50, **Recommendation 4**);
 - iii. the crossing signage did not stand out and did not attract the user's attention (paragraph 56, **Recommendation 1**); and
 - iv. the van driver was focused on looking for a green button (paragraph 63, **Recommendation 1**).
- b. The gate opened when the button was pushed which may have reinforced the van driver's view that it was safe to cross (paragraph 64, **Recommendation 3**).
- c. Network Rail installed POGO equipment at Frogmal Farm crossing without detailed consideration of whether the design was suitable for the location (paragraph 69). This causal factor arose in part because:
 - i. Network Rail (Central) did not understand the risks associated with POGO crossings and did not provide the right information to local staff to equip them to make the decisions about the suitability of this type of crossing (paragraph 76, **Recommendation 3**).

Underlying factor

130 An underlying factor was that the system in which authorised users are responsible for briefing visitors about the safe way to use private crossings is not reasonable in present day circumstances (paragraph 86, **Recommendation 4**).

Additional observations

131 Although not linked to the accident on 23 October 2017, the RAIB observes that:

- a. the signage was not clear, contained conflicting information and did not convey the most important action to the crossing user (paragraph 92, **Recommendation 2**);
- b. Network Rail was unable to find occurrence books for Frognal Farm User Worked Crossing pre dating July 2016 (paragraph 102, no recommendation); and
- c. the traction current was not discharged until 27 minutes after the accident (paragraph 106, **Learning point 1**).
- d. the route level crossing team incorrectly believed that Bax crossing was used more intensively than Frognal Farm (paragraph 110, **Recommendation 4**).

Previous RAIB recommendations relevant to this investigation

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

Previous recommendation(s) that had the potential to address one or more factors identified in this report

[Investigation into safety at user worked crossings, RAIB report 13/2009, Recommendation 8](#)

133 The RAIB considers that implementation of recommendation 8 in [RAIB report 13/2009](#) could have resulted in the provision of signage which alerted unfamiliar users to the correct way to use the crossing.

134 This recommendation read as follows:

The Department for Transport, in consultation with the Office of Rail Regulation⁸, should review the requirements for signs prescribed by law for use at private crossings, and revise them as necessary, taking into account the need to convey information and instructions clearly and unambiguously to diverse users.

135 In August 2015 RSSB⁹ reported to the RAIB that the Level Crossing Strategy Group, which included representatives of the Department for Transport (DfT), ORR and RSSB, had agreed to hold an industry event in the autumn of 2015 which was expected to lead to an agreed implementation plan for changes to signs at level crossings. The RAIB learnt in March 2018 that prototypes of new signs had been produced for consideration by the industry and the regulator (see paragraph 147).

[Accident at Oakwood Farm UWC, 14 May 2015, RAIB report 07/2016, Recommendation 2 \(see paragraph 152\)](#)

136 The RAIB considers that more timely and effective implementation of recommendation 2 in [RAIB report 07/2016](#) could have mitigated one of the factors identified in this accident.

137 This recommendation read as follows:

Network Rail should develop and implement a programme for a timely review of the safety of other user worked crossings it has fitted with POGO equipment and those it intends to fit in the future. The review should include particular consideration of the following:

- a) the design standard for crossings fitted with POGO equipment;*
- b) the ways in which users in different types of vehicles operate the crossing gates, including the function of the gate operating buttons;*

⁸ Renamed the Office of Rail and Road on 1 April 2015.

⁹ A not-for-profit company owned and funded by major stakeholders in the railway industry, and which provides support and facilitation for a wide range of cross-industry activities. The company is registered as 'Rail Safety and Standards Board', but trades as 'RSSB'.

- c) *the clarity of instructions to enable unfamiliar users to use the crossings safely and to minimise reliance on the briefing of all visitors by authorised users (which is not always practicable);*
- d) *improving the conspicuity of the Miniature Stop Lights (eg using two Miniature Stop Lights on each side of the crossing, the use of larger ‘road traffic light’ style red and green lights, flashing red Miniature Stop Lights, or wig wag lights) and the number and clarity of the signs, to minimise confusion and distraction; and*
- e) *whether the opening of the gates should be disabled unless the Miniature Stop Lights are displaying green lights.*

This review should draw on the findings from recent relevant research (eg RSSB’s research into signs at private level crossings (T983) and human factors advice). Any measures for safety improvements at such crossings should then be implemented at higher risk locations and incorporated into the standards for future designs.

- 138 Network Rail reported to ORR on 30 August 2016 that it intended to carry out a safety review of the provision of POGOs at UWCs. This would take account of human factors, behaviour and interaction with POGO (and miniature stop lights) at UWCs, equipment and positioning, signage requirements and ergonomic layout and consider RSSB research T983. ORR reported to the RAIB in April 2017 that it was content with the approach Network Rail was taking in addressing this recommendation, although it considered the proposed timescales to be challenging. Since submitting its initial response, Network Rail had extended the timescale for completion to 30 September 2017.
- 139 The review had not been completed by the time the accident occurred in October 2017, and evidence from Network Rail indicates that its scope did not include POGO crossings without miniature stop lights, such as Frogmal Farm. Had point (c) of this recommendation, in particular, been addressed, the van driver might have been made more aware of the instructions he needed to follow in order to use Frogmal Farm crossing safely.

[Investigation into safety of automatic open crossings \(locally-monitored\), \(AOCL\) on Network Rail’s managed infrastructure, RAIB report 12/2011, Recommendation 3](#)

140 The RAIB considers that more effective implementation of recommendation 3 in [RAIB report 12/2011](#) could have mitigated one of the factors that led to this accident.

- 141 This recommendation read as follows:

Network Rail should review, and as necessary update, its processes, guidance, training and briefing of its staff, on how to identify and assess the specific human and local factors at level crossings, so that it can establish whether further mitigation measures should be implemented.

- 142 ORR reported to the RAIB in June 2014 that Network Rail had reviewed and updated its processes, guidance and training to staff as part of its wider National Level Crossing Programme which focused on identification, assessment and management of risk. It had also recruited 100 Level Crossing Managers, who are responsible for identifying, assessing and managing risk at level crossings. They are supposed to develop good knowledge of crossings within their area and undertake risk assessments, asset inspections, fault rectification and limited maintenance. The mandatory training programme for level crossing managers included detailed guidance on how to identify and assess the specific human and local factors at level crossings including distraction and impatience. ORR concluded that Network Rail had implemented the recommendation.
- 143 A fuller understanding by Network Rail's local staff of the way in which Routs No.8 crossing in particular, but to a lesser extent, Frognal Farm and Bax crossings were being used and by whom, might have led to a better understanding of the risks at these crossings. This, coupled with a better understanding by local staff of the human factors risks associated with POGO crossings, might have led to a decision not to install this technology at these crossings.

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

- 144 Following the accident, the RAIB issued urgent safety advice to Network Rail on 7 November 2017 (see Appendix D), covering the need to review and revise the design and wording of the signs at user worked crossings with POGO equipment.
- 145 Network Rail (central) issued instructions to the routes asking them to assess the risk at user worked crossings with POGOs and to declutter signage to remove confusion for users. This was reported as completed by 8 December 2017.
- 146 The work was reviewed by the central team and any route with sites that were felt still to be confusing to users were issued with a special instruction notice to improve the crossing signage further.
- 147 Proposed new signs for private level crossings have been produced jointly by representatives of Network Rail, ORR and the DfT.
- 148 Network Rail is in discussion with representatives of parcel delivery companies about ways of making their employees aware of the hazards of private level crossings.

Actions reported that address factors which otherwise would have resulted in a RAIB recommendation

- 149 Network Rail has decommissioned the POGO equipment at Frognal Farm crossing. The POGO equipment at Bax crossing remains out of use.
- 150 Network Rail has put the POGO project on hold, and no further POGO crossings are to be commissioned pending a review.

Background to the RAIB's recommendations

- 151 There are two recommendations below which are re-made and slightly augmented from when they were originally published. The first is recommendation 8 from RAIB's class investigation into safety at user worked level crossings ([RAIB report 13/2009](#)) (paragraph 133). The original recommendation asked for the law on signage at private crossings to be reviewed. At the time, the Law Commission and the Scottish Law Commission were preparing to review the whole of the law relating to level crossings, with a view to updating and simplifying it. The result of this review was published in September 2013. Among many other recommendations, it recognised that the detail of the regulations that prescribe the signs to be used at private crossings required updating. The Department for Transport, which had awaited the results of the Law Commissions' work before taking action on the RAIB's recommendation, accepted the need for revised signs, and has supported the railway industry in preparing possible prototypes (paragraph 147). Despite ongoing work in this area, no revised regulations have been produced to enable these signs to be used. The RAIB has therefore found it necessary to strengthen the recommendation in this report.
- 152 The second recommendation which has been repeated in full in recommendation 3, is recommendation 2 from RAIB's report into the collision between a train and a tractor at Oakwood Farm user worked crossing ([RAIB report 07/2016](#)) (paragraph 136). Some aspects of this recommendation are not directly related to the accident at Frognal Farm UWCT, although they are relevant to the accident at Routs No.8 crossing (paragraphs 120 to 124). The RAIB is repeating this recommendation because it became clear, during the investigation into the accident at Frognal Farm, that the recommendation was not being implemented as intended, and was only being applied to Oakwood Farm and other crossings that had both POGOs and miniature warning lights, rather than, as intended, to all POGO crossings.

Recommendations and learning point

Recommendations

153 The following recommendations are made¹⁰:

- 1 *The intent of this recommendation is to enable crossing users who may be unfamiliar with user worked crossings to safely operate and traverse such crossings, in view of the increasing number of reasons that people may need to use user worked crossings without necessarily having been briefed on their use.*

Network Rail, with Office of Rail and Road and Department for Transport support, should review and revise the information offered to users of private level crossings, including consideration of signage wording and diagrams, the conspicuity and placement of signage, and the actions that the user needs to take, including operation of the gates or barriers, and communication with the signaller. The review should also consider, alongside the presentation of information, practicality and feasibility of the current arrangements by which authorised users are expected to brief and inform other potential users of the crossing, in view of the increased dependence of occupiers on delivered goods and services from a plethora of sources, and other factors which may increase the number of crossing users (paragraphs 129a.i, 129a.iii, 129a.iv).

- 2 *The intent of this recommendation is to bring the law covering signs at private level crossings up to date and into line with good practice, to effectively convey the safe method of traversing the crossing to the user. This recommendation strengthens recommendation 8 of the RAIB's class investigation into safety at user worked level crossings, which was made in June 2009 and has not yet been implemented.*

As part of its support for the work identified in recommendation 1, the Department for Transport, in consultation with the Office of Rail and Road, should change the requirements for signs prescribed by law for use at private crossings, taking into account the need to convey information and instructions clearly and unambiguously to diverse users (paragraph 131a).

¹⁰ Those identified in the recommendations have a general and ongoing obligation to comply with health and safety legislation, and need to take these recommendations into account in ensuring the safety of their employees and others.

Additionally, for the purposes of regulation 12(1) of the Railways (Accident Investigation and Reporting) Regulations 2005, these recommendations are addressed to the Office of Rail and Road and the Department for Transport to enable them to carry out their 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.

- 3 *The intent of this recommendation is to improve the understanding that users of private level crossings equipped with power operated gates have of the process for using such crossings safely, so that the risks created by automating part of a user worked crossing are appropriately mitigated. This recommendation repeats recommendation 2 of the RAIB's report on the accident at Oakwood Farm level crossing on 14 May 2015 because there is evidence that the original recommendation was not being implemented as intended.*

Network Rail should develop and implement a programme for a timely review of the safety of other user worked crossings it has fitted with POGO equipment and those it intends to fit in the future. The review should be based on a proper understanding of the risks associated with POGO equipment and include particular consideration of the following:

- a) the types of location where the installation of POGO equipment is likely to be unsuitable;
- b) the design standard for crossings fitted with POGO equipment;
- c) the ways in which users in different types of vehicles operate the crossing gates, including the function of the gate operating buttons;
- d) the clarity of instructions to enable unfamiliar users to use the crossings safely and to minimise reliance on the briefing of all visitors by authorised users (which is not always practicable);
- e) improving the conspicuity of the miniature stop lights (eg using two miniature stop lights on each side of the crossing, the use of larger 'road traffic light' style red and green lights, flashing red miniature stop lights, or wig wag lights) and the number and clarity of the signs, to minimise confusion and distraction; and
- f) whether the opening of the gates should be disabled unless the miniature stop lights are displaying green lights.

This review should draw on the findings from recent relevant research (eg RSSB's research into signs at private level crossings (T983) and human factors advice). Any measures for safety improvements at such crossings should then be implemented at higher risk locations and incorporated into the standards for future designs.

In addition the review should consider, where manual crossings are partly or fully automated, making the process by which the user is informed it is safe to cross simple and intuitive and as fail safe as possible, ensuring the user is guided to make contact with the signaller where required (paragraphs 129b, 129c i).

- 4 *The intent of this recommendation is to improve the safety of private level crossings by putting in place measures to give relevant Network Rail staff valid and up to date information about all those people who may regularly use the crossing.*

Network Rail should review the way in which it collects, records and maintains data relating to people and organisations with the need to regularly use private crossings, so that local staff have an effective and efficient means of contacting anyone who is resident or whose business requires them to regularly use a user worked crossing. This review should cover:

- a) effective communication with everyone who may be affected by decisions made about changes to a crossing, using means such as correspondence, signage and publicity campaigns;
- b) determination of the extent and nature of the actual use at crossings; and
- c) establishing processes to give all people who must use the crossing regularly up to date information about any changes to the crossing, or to any responsibilities they have regarding the safe use of the crossing.

(paragraphs 129a.ii, 130, 131d)

Learning point

154 The RAIB has identified the following key learning point¹¹:

- 1 The importance of taking prompt action to switch off the traction current following accidents and incidents on electrified lines to minimise the risk of injury or further injury to anyone involved (paragraph 131c).

¹¹ 'Learning points' are intended to disseminate safety learning that is not covered by a recommendation. They are included in a report when the RAIB wishes to reinforce the importance of compliance with existing safety arrangements (where the RAIB has not identified management issues that justify a recommendation) and the consequences of failing to do so. They also record good practice and actions already taken by industry bodies that may have a wider application.

Appendices

Appendix A - Glossary of abbreviations and acronyms

ALCRM	All Level Crossings Risk Model
DfT	Department for Transport
ORR	Office of Rail and Road
POGO	Power Operated Gate Opening
RAIB	Rail Accident Investigation Branch
UWCT	User Worked Crossing with Telephone

Appendix B - Investigation details

The 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 an adjacent building, and from forward and rear facing cameras on train 1L32;
- site photographs and measurements;
- weather reports and observations at the site;
- a review of previous reported incidents; and
- a review of previous RAIB investigations that had relevance to this accident.

Appendix C - Level Crossing management

- C1 Network Rail manages its responsibilities for the safety of user worked crossings as part of its wider arrangements for the routine management of level crossings. Two key processes are involved:
- Level crossing risk assessment: regularly assessing the risks associated with collisions (and other incidents) on operational level crossings and identifying and implementing necessary control measures.
 - Level crossing asset inspection and defect rectification: regularly inspecting operational level crossings, identifying defects and managing their rectification.
- C2 Network Rail's process for level crossing risk assessment at the time of the accident was described in procedure 5-16 of its operations manual, 'Risk assessing level crossings'¹², and referenced guidance documents. It included:
- A periodic site visit to each level crossing to collect data relating to its condition, environment and use.
 - Using the collected data and the algorithms in Network Rail's all level crossings risk model (ALCRM) to quantitatively model the risk and calculate an ALCRM risk score. This is made up of two parts: a letter (A (high) to M (low)) representing the individual risk and a number (1 (high) to 13 (low)) representing the collective risk. The individual risk is an estimate of the risk to a notional crossing user. The collective risk is an estimate of the total risk generated for all crossing users and the occupants of trains.
 - Investigating different risk control options to make the crossing safer; Network Rail refers to this as optioneering, and it involves the use of quantitative (ALCRM risk score, and cost benefit analysis) and qualitative (for instance, expert judgement) assessment to identify and recommend level crossing improvements.
 - Completing a narrative risk assessment report describing the identified risks and their management, supporting information and the risk control options selected.
 - Arrangements for managing and implementing selected risk control options.
- C3 The frequency of risk assessments largely depends on the crossing's ALCRM risk score; the higher the score the more frequent the risk assessment. Risk assessments are also required in the event of other triggers, such as an accident, a near miss or a proposed operating or design change.

¹² Issue 3, published 6 December 2014, subsequently replaced by National Operating Procedure 3.08 issue 1, dated 2 September 2017 for compliance on 2 December 2017.

Appendix D - Urgent Safety Advice



Urgent Safety Advice 03/2017: Signs at level crossings

Issued 07 November 2017

1. Safety issue

Network Rail has, over the past 10 years, fitted a number of user-worked level crossings with power operated gate opening (POGO) equipment. This allows users to press a button and open motorised gates, rather than opening them manually. Since the operation of the motorised gates is not inhibited by the approach of trains, it is important that instructions for using the equipment are clearly communicated by signs at the crossing. Otherwise, there is a risk that an unfamiliar user will be misled into crossing when trains are approaching at speed.

2. Safety advice

Network Rail should urgently review the design and wording of the warning/instruction signs at user worked level crossings with POGO equipment, to ensure that the instructions are clear, and alert users to the nature and severity of the risks.

3. Issued to

Network Rail.

4. Background

On Monday 23 October 2017 at about 15:03 hrs, train 1L32, the 14:20 hrs service from Ramsgate to St Pancras, travelling at about 85 mph (137 km/h), collided with a delivery van on Frognal Farm user worked level crossing, between Teynham and Sittingbourne stations in Kent. The train was damaged, but did not derail, and none of the 80 passengers and crew on board was hurt. The van was seriously damaged and its driver suffered shoulder injuries.

Frognal Farm crossing has been provided with POGO equipment since March 2017. It also has telephones, provided so that people using the crossing with vehicles or animals can obtain permission from the signaller before going over the crossing. Once permission has been obtained, the user should press a button to operate the POGO equipment (to open the gates), cross over the line, and then press another button to close the gates.

The signs below are provided each side of the crossing to instruct users on what to do:



The signs at Frogнал Farm crossing, showing the instructions to vehicle users (left) and the telephone cabinet, gate operating button and subsidiary instruction sign (right)¹³

Signs for user worked level crossings are defined in the Private Crossings (Signs & Barriers) Regulations 1996¹. These regulations were made many years before POGO equipment came into use. There are currently no appropriate signs in the Regulations for crossings with new technology such as POGO equipment, and Network Rail has attempted to design its own signs to use in conjunction with the legally specified signs. Although the Office of Rail and Road (ORR) and the Department for Transport (DfT) are currently working on an updated and revised version of the Regulations, it is likely to be some time before this becomes law.

The RAIB concludes that the design of signage is confusing and misleading. On the large sign, the reader's eye is drawn to the numbered list of instructions, and it is easy to overlook that the first action for those crossing with vehicles or animals must be to use the telephone to obtain permission. Furthermore, the presence of a numbered list may lead users to assume that this is a comprehensive set of instructions that will allow them to cross in safety. The sign does not explain that there may be a train coming even if the gates move to the open position, and that it is therefore necessary to take care and follow the instructions closely to avoid the risk of death.

¹ SI 1996 No. 1786.

¹³ The illustration used in the right-hand image of the urgent safety advice shows the button on the north side of the crossing. The button on the south side used by the van driver before the accident is on the near side of the approach road as shown in figure 7.

The two subsidiary signs have wording which is not consistent with the large sign, and make no mention of the need to telephone before using the crossing. The subsidiary sign on the same post as the large sign is presumably intended for users who have already crossed over from the far side, but this is not made clear.

People who are unfamiliar with user-worked level crossings, such as delivery drivers, may encounter a POGO crossing without prior warning. Users might not understand what to do, might not telephone the signaller, and might cross when the gate opens in the belief that they are protected from danger. This may lead to a collision, possibly resulting in multiple fatalities.

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