

Rail Accident Report



**Train collision with a road vehicle at Bratts
Blackhouse No 1 User Worked Crossing, near
Sizewell, Suffolk
22 May 2006**

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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Train collision with a road vehicle at Bratts Blackhouse No 1 User Worked Crossing, near Sizewell, Suffolk, 22 May 2006

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Introduction

- 1 The sole purpose of a Rail Accident Investigation Branch (RAIB) investigation is to prevent future accidents and incidents and improve railway safety.
- 2 The RAIB does not establish blame, liability or carry out prosecutions.
- 3 Access was freely given by Network Rail and Direct Rail Services Ltd to staff, data and records in connection with the investigation.
- 4 Appendices at the rear of this report contain Glossaries:
 - acronyms and abbreviations are explained in the glossary at Appendix A; and
 - technical terms (shown in *italics* the first time they appear in the report) are explained in the glossary at Appendix B.

Summary of the report

Key facts about the accident

- 5 On 22 May 2006, a freight train was conveying a discharged nuclear flask from Willesden Brent Yard to Sizewell via a freight only branch line that runs between Saxmundham and Sizewell (see Figure 1). As the train crossed over Bratts Blackhouse No 1 *User Worked Crossing* (UWC) on the Sizewell Branch at 19 mph (30 km/h), it was in collision with a road vehicle travelling from the north side to one of the private dwellings on the south side of the crossing. The linespeed at this point is 25 mph (40 km/h).
- 6 No one was injured in the collision. The train was not derailed but suffered some minor damage. The road vehicle also suffered some damage to its front and *nearside* front area.

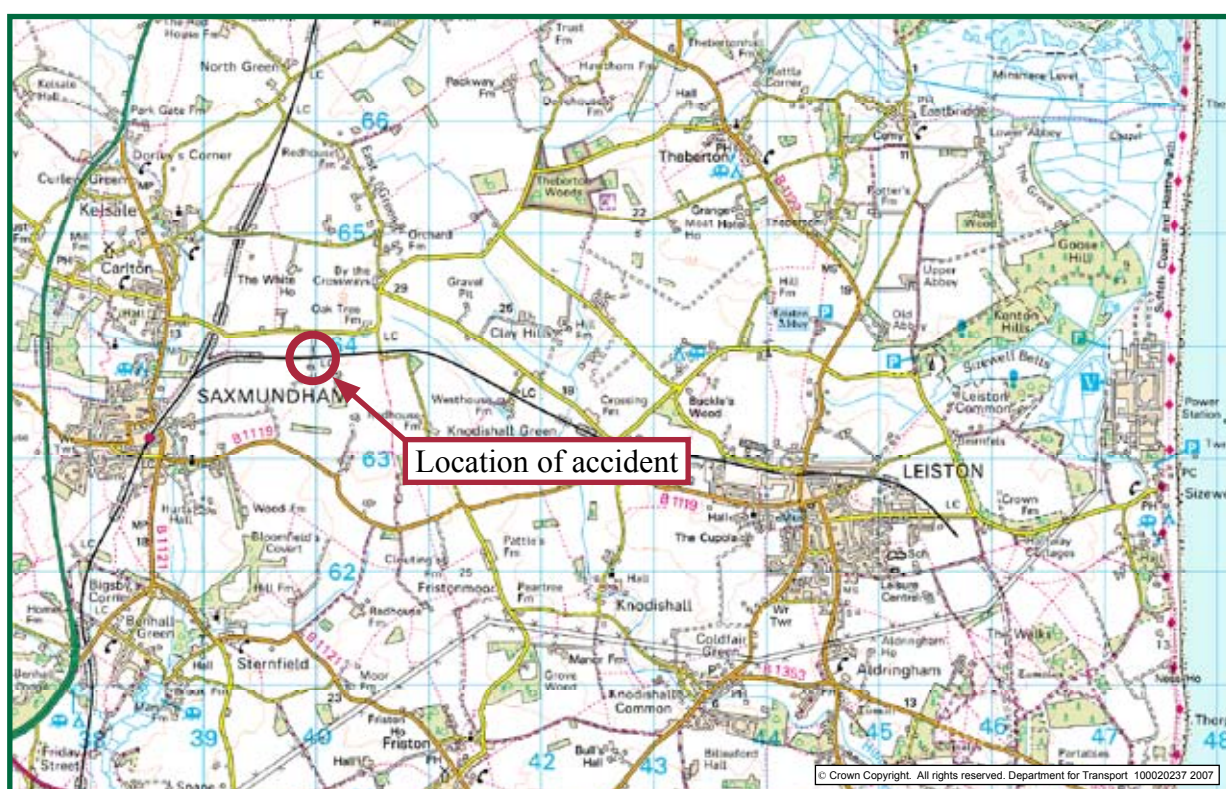


Figure 1: Extract from Ordnance Survey map showing location of accident

Immediate cause, contributory factors, underlying causes

- 7 The immediate cause of the accident was that the motorist did not stop at the designated Stop Board and drove directly onto the crossing into the path of the approaching train without looking.
- 8 The main causal factors were:
 - the gates at the crossing had been left open for some time and could not be closed. This was due to overgrown vegetation, the inadequate maintenance of the gates and the non-implementation of the findings of crossing inspections; and
 - the driver did not look for approaching trains because he had never encountered a train at the crossing before.

- 9 Some additional observations have arisen from the investigation. These cover the following areas:
- the short *warning time* at the crossing;
 - poor conspicuity of signs and non-compliant wording of instructions to users;
 - absence of a sign identifying the name of the crossing; and
 - failure of the signal box telephone recording equipment.

Recommendations

- 10 Recommendations can be found in paragraph 134. They relate to the following areas:
- communication of safety information to users of user worked crossings;
 - the quality and required periodicity of inspection and maintenance;
 - various improvements to Bratts Blackhouse No 1 UWC crossing signage;
 - steps to be undertaken where the warning time is too short to permit the safe use of the crossing;
 - the briefing of track maintenance staff of the need to preserve evidence following an accident that has been notified to the RAIB; and
 - signallers awareness of power and *Uninterruptible Power Supply* (UPS) failures.

The Accident

Summary of the accident

- 11 On 22 May 2006, a freight train, reporting number 6L70, operated by Direct Rail Services Ltd was conveying a discharged nuclear flask from Willesden Brent Yard to Sizewell. The train consisted of one nuclear flask wagon (FNA 550014) being pulled by locomotives 20310 and 20312. Locomotive 20310 was the leading locomotive and was running cab first.
- 12 At 09:21 hrs, as the train crossed over Bratts Blackhouse No 1 UWC on the Sizewell branch at 19 mph (30 km/h), the train was in collision with a Ford Focus car on the north side of the line. The car was travelling to one of the private dwellings on the south side of the crossing. The linespeed at this point is 25 mph (40 km/h).
- 13 No one was injured in the collision.
- 14 The train was not derailed. Both train and car were slightly damaged.
- 15 There was no damage to Network Rail Infrastructure.
- 16 A sketch of the site is shown in Figure 2. The view of the crossing from the cab of a train travelling from Saxmundham to Sizewell is shown in Figure 3.

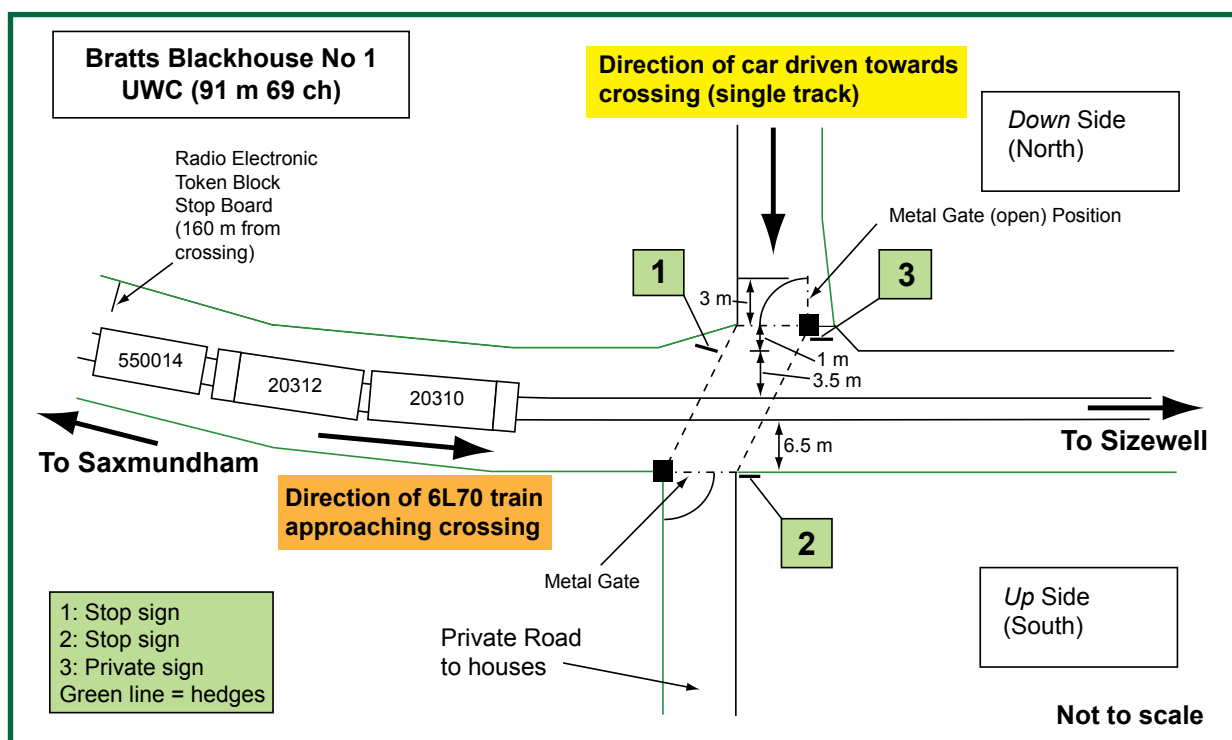


Figure 2: Sketch plan of Bratts Blackhouse No 1 UWC



Figure 3: Bratts Blackhouse No 1 UWC as seen by trains travelling from Saxmundham to Sizewell (20 m from crossing). The cone is approximately 3 m from the nearest rail.

The parties involved

- 17 Direct Rail Services Ltd operated the nuclear flask train. The train was staffed by two persons: the train driver in the cab of locomotive 20310 and the trainman travelling in the cab of locomotive 20312. The trainman travels in the rear locomotive in accordance with instructions in Appendix C, section 4.6.2 of the *Railway Group Standard GO/RM3053* 'Working Manual for Rail Staff, Handling and Carriage of Dangerous Goods'. One of the trainman's duties is to operate the five manual train crew operated crossings on the Sizewell branch line.
- 18 Network Rail is the infrastructure owner with responsibility for maintaining the UWC and also for liaising with the *authorised users* on the safe operation of the crossing.
- 19 The authorised users of the crossing were the owners of the two properties on the south side of the crossing and a local farmer. The use of the crossing is restricted to these authorised users and other people such as farm workers or delivery drivers who use the crossing with the permission of the authorised users.
- 20 The driver of the road vehicle had used the crossing intermittently for thirty six years to gain access to carry out tasks at one of the private houses on the south side. He had used the crossing six times in the week before the accident, also to work at the same house.

Location

- 21 Bratts Blackhouse No 1 UWC is a skewed crossing with metal farm type gates. Its surface is made from wooden sleepers. The approach to either side of the crossing is an unmade single width track. The crossing leads only to two private dwellings and arable farmland. The crossing is not fitted with telephones. The gates of the crossing open away from the railway tracks and if left open do not obstruct either the road or the railway.



Figure 4: Bratts Blackhouse No 1 UWC as seen from the road track on the north side.

- 22 The crossing has two stop signs, one either side, facing oncoming road traffic. On the approach to the crossing from the north side, the dirt track from the public road is approximately 250 m long with a small chicane in it at 50 m from the crossing gates. The stop sign for users is positioned to the right hand side of the dirt track; the bottom of the sign is 1.5 m above ground level. The view of the sign for oncoming traffic is obscured by vegetation and foliage. There is also a sign marked 'Private' on the left hand side, near to the gate hinge post (see Figure 4).
- 23 The north side gate is hinged on its left hand side and opens towards oncoming road traffic and when closed is 4.5 m from the edge of the nearest running rail. The stop sign is positioned within the railway boundary at 3.5 m away from the edge of the nearest running rail. On the south side, both the gate and stop sign are 6.5 m from the nearest running rail (see Figure 2).

External circumstances

- 24 The weather at the time of the time of the incident was light rain. Both the train and car had their windscreen wipers in operation.

Train(s)/rail equipment

- 25 The Sizewell branch is only used by freight trains travelling to and from the Sizewell nuclear power station. The line is predominantly level and runs over one UWC at Bratts Blackhouse and through five train crew operated level crossings.
- 26 The maximum speed of trains on the branch is 25 mph (40 km/h). The branch line is 4½ miles (7.2 km) long.
- 27 Trains run to Sizewell about once a week.
- 28 Locomotive 20310 was fitted with an On Train Monitoring Recorder, (OTMR) which recorded the speed, brake and horn applications and control positions on the locomotive.

Events preceding the accident

- 29 The train, 6L70 had left Saxmundham and stopped at the 'branch to Sizewell' *Radio Electronic Token Block*, (RETB) Stop Board, 160 m before reaching Bratts Blackhouse No 1 UWC. The driver correctly exchanged the RETB *token* and obtained the token for the section of line to Sizewell at 09:21 hrs.
- 30 The train driver, on gaining permission to proceed from the signaller at Saxmundham, accelerated towards Bratts Blackhouse No 1 UWC and reached a speed of 19 mph (30 km/h). The driver knew that he would be stopping 300 m after Bratts Blackhouse No 1 UWC so that the trainman could alight and open the first of five train crew operated level crossings on the branch.
- 31 The metal crossing gates at Bratts Blackhouse No 1 UWC on both sides were open to road traffic. Vegetation around the gates indicated they had not been shut for some time.
- 32 The train's headlight and white marker lights were correctly displayed.
- 33 The motorist had left home at about 09:00 hrs to drive the 8 miles (13 km) from home to the house on the south side of the crossing. According to the motorist he was travelling at approximately 5 mph (8 km/h) along the dirt track towards the crossing.

Events during the accident

- 34 There is clear evidence that the motorist did not stop at the crossing and did not look for oncoming trains as he had never seen a train at the crossing and therefore had no expectation of a train. He stated that the gates at the crossing were always open.
- 35 The train driver did not see the car approaching the crossing, as the single track road is bounded on both sides on its approach by mature hedges up to the railway boundary (the train at a UWC has the right of way and it is the motorist's responsibility to ensure the safe crossing of his motor vehicle).

- 36 As the leading locomotive ran onto the crossing, the train driver saw the car and immediately shut off power and made a *full service brake* application, subsequently applying the brake into the *emergency position*. The train took 20 seconds to stop and came to a stand 150 m beyond the crossing. The locomotive warning horn was not used during the incident.
- 37 Train 6L70 passed over the crossing at 09:21 hrs travelling at 19 mph (30 km/h) and collided with the car. The train's front left hand corner hit the car's nearside front corner.

Consequences of the accident

- 38 No one was injured in the collision
- 39 The train was not derailed. The damage to the locomotive was slight; two sets of cab access steps and a sand pipe on the leading locomotive were damaged.
- 40 The road vehicle suffered damage to the nearside bonnet, front wing and headlamp area.
- 41 There was no damage to Network Rail Infrastructure.

Events following the accident

- 42 The train driver immediately contacted the Saxmundham Signaller from his cab using the *National Radio Network* (NRN) radio system to inform him of the incident. The trainman contacted Direct Rail Services Ltd control and he and the driver then both walked back to the crossing to ascertain what emergency services were required. The train driver contacted the signaller again using his mobile phone with further details of the incident. There was some confusion at this point as to the name of the crossing.
- 43 The Saxmundham signal box telephone voice recorder was not working at the time of the incident. There had been a complete power failure to the system on Sunday 21 May 2006, including the Uninterruptible Power Supply, (UPS). There was no indication of this fact to the signaller and he was not aware of the failure.
- 44 British Transport Police (BTP) officers with Suffolk Constabulary were the first to arrive on site and Network Rail, *RADSAFE*, Sizewell Power Station and Direct Rail Services Ltd staff also attended.
- 45 Following clearance by *RADSAFE* and Direct Rail Services staff, the RAIB gave permission for the train to proceed to Sizewell once photographic and other evidence had been collected. Train 6L70 proceeded at 12:30 hrs to Sizewell after the sanding equipment on locomotive 20310 had been isolated.
- 46 The Network Rail *off track team* was requested to attend the crossing by Network Rail fault control to repair any damage. They found that both gates were open and were not able to close. The team repaired the approach paths for road vehicles, made both metal gates operational and cut back vegetation between the stop sign and the boundary hedge on the north side. The team left site at about 14:30 hrs. This work was done without the RAIB's authority and in contravention of the Railways (Accident Investigation and Reporting) Regulations 2005, section 7(1) as it denied the RAIB the opportunity to have evidence recorded.

The Investigation

Investigation process

47 The investigation examined:

- the condition and operation of the crossing;
- the way in which Network Rail discharged their responsibility for the safety of the crossing; and
- the circumstances of the accident and the behaviour of the train and road vehicle drivers.

48 Sources of evidence were:

- photographs and measurements taken by RAIB Inspectors;
- witness statements taken by RAIB Inspectors;
- photographs from BTP Officers;
- photographs from Network Rail staff;
- photographs from RADSAFE staff; and
- OTMR information from the locomotive, 20310.

Previous occurrences of a similar character

49 According to Network Rail, Bratts Blackhouse No 1 UWC has had a history of crossing abuse with the gates regularly being left open. The three authorised users had been written to by Network Rail on occasions in the past; the last time was September 2005, reminding them of the correct operation of the crossing.

Background

Management of UWC's

Risk

- 50 Table 1 below shows the different types of crossings on the Network Rail system, the *equivalent fatalities* normalised by a 1000 crossings per year and the equivalent fatalities per annum. Fatalities include both public and railway staff combined.
- 51 Table 1 shows that an average of 2.6 equivalent fatalities occur on UWCs per annum. Of these, 42 per cent occur at UWCs with no *miniature stop lights* (MSLs) or telephone. When normalised by the number of crossings, the rate of fatalities at UWCs is 13 per cent of that at automatic half barrier crossings (AHBs). This lower rate reflects the lower number of users at UWCs as compared to automatic vehicular crossings.

Crossing type	No. of crossings	Equivalent fatalities/1000 crossings/year	Equivalent fatalities per annum
AHB (Automatic Half Barrier)	456	6.01	2.74
AOCL (Automatic Open Crossing Locally monitored)	128	4.53	0.58
All types of station and staff crossings	181	2.76	0.5
Manned gates and manually controlled barriers	861	1.30	1.12
Footpath crossings	2593	1.14	2.96
AHB, Locally Monitored	49	0.32	0.02
Open Crossings	58	0.09	0.01
User Worked Crossings (with MSL)	129	1.85	0.24
User Worked Crossings with telephones	1668	0.75	1.251
User Worked Crossings (no telephones)	1551	0.71	1.10
All types of UWC	3348	0.77	2.591

Table 1: Crossing types and equivalent fatalities (data derived from RSSB Elsenham report).

- 52 There have only been three occasions when occupants of trains have lost their lives in UWC collisions in the forty years since 1967. Two of these were at Chivers No 1 Crossing, near Lakenheath in December 1970 and December 1976. In both cases the driver died. In July 1970 a guard, travelling in the driving instructor's seat was killed in a collision at Shalmsford Street Crossing near Canterbury¹. All three incidents involved older style rolling stock with poorer *crashworthiness* than that currently used.

¹ 'Fatal Train Accidents on Britain's Main Line Railways – End of 2005 Analysis' - Professor Andrew Evans

- 53 Data contained in the RSSB Safety Performance Report for 2005 indicates that the overall risk per *traffic moment* at a UWC is forty two times the risk at an AHB (ie the number of accidents is high compared to the low usage at UWCs). Since the risk to train occupants is very low it can be concluded that the risk to a member of public using a UWC is much higher than the risk to the user at an AHB.

Legislation

- 54 Authorised users of *occupation crossings* owe a duty of care to their visitors under the Occupiers' Liability Acts 1957 and 1984. Authorised users who are also employers also owe a duty to their employees under the Health and Safety at Work etc Act 1974. This means that authorised users are under an obligation to ensure that crossing users are instructed on the need to use the crossing correctly.
- 55 It is important that UWC gates are closed when the crossing is not being used because they protect the railway by requiring the driver to stop and leave their vehicle to open the gates. Across the rail network it is frequently observed that gates are left open. However, it is an offence under the Railways Clauses Consolidation Act 1845 (and the Transport and Works Act 1992 modified the penalty), for users of private crossings to leave the gates open.
- 56 UWCs are also covered in paragraphs 269 and 270 of the Highway Code, where they are referred to as 'user-operated gates or barriers'. The relevant advice to the road user when there are no lights on the crossing is to:
- open the gates or barriers on both sides of the crossing;
 - stop, look both ways and listen before you cross; and
 - close the gates or barriers when you are clear of the crossing
- 57 Network Rail, as Infrastructure Manager, is responsible for the provision of UWCs, their maintenance and for the recording and monitoring of incidents and accidents. In addition, the Health & Safety at Work Act 1974 imposes an obligation on Network Rail to control risk as far as is reasonably practicable. Guidance issued by the Health & Safety Executive, (ref: Reducing Risks, Protecting People, 2001, ISBN 07176 2151 0), suggests that this obligation can be met by ensuring the risks to individuals are tolerable and by implementing risk control measures where it is reasonably practicable to do so.

Responsibilities for safe use

- 58 The authorised user has responsibility for ensuring the crossing is used safely; in accordance with the Transport and Works Act 1992, 'signs and barriers at private crossings', section 55 and instructions provided by the crossing operator, Network Rail.
- 59 The authorised user is also responsible for briefing the operation of the crossing to his or her visitors.
- 60 In reality, other people such as postmen etc will also use the crossing without the explicit permission of the authorised user and the correct operation of the crossing relies on these people following the signs and instructions provided.
- 61 Instructions on how and why the user should operate the crossing correctly is sent to the authorised users at not longer than three yearly intervals by Network Rail.

Standards

- 62 There are three distinct standards applicable on the subject of UWCs.

- 63 The ORR/HSE document 'Railway Safety Principles and Guidance part 2, Section E' (ISBN 0 7176 0952 9) (RSPG) gives guidance on all level crossings including User Worked types.
- 64 The Rail Safety and Standards Board (RSSB) are responsible for the production and upkeep of Railway Group Standards, which are mandatory on Railway Group Members, including Network Rail.
- 65 RSSB Group Standard GI/RT7012 'Requirements for Level Crossings' describes the infrastructure manager's responsibilities and deals with instructions to users of UWCs, inspection frequencies, how to deal with complaints, vegetation control and records of letters sent including authorised user name lists.
- 66 Network Rail has its own company standards and procedures relating to design, maintenance and operation and which implement the above Group Standards. These are listed in Appendix C.

Maintenance and inspection

- 67 UWCs are currently risk assessed during an inspection by a Network Rail Mobile Operations or Signalling Manager. The assessment is reviewed by the Network Rail level crossing risk control team. These are undertaken every three years, but sooner if there are three or more incidents reported within a twelve month period or another accident occurs.
- 68 UWCs are also inspected by dedicated Network Rail level crossing maintenance teams annually, with work being carried out by off track teams as necessary. Work may include the clearance of overgrown vegetation restricting sightlines and the making up of approach paths for road vehicles.

Maintenance and Inspection of Bratts Blackhouse No 1 UWC

- 69 Network Rail's level crossing risk control team last inspected the crossing in January 2004 for a risk assessment, but for reasons that are unclear, this was not written up until October 2004 and not signed off as authorised until May 2005. The Network Rail level crossing inspection document required the inspector to answer the question, 'Is the crossing safe?'. In response, he recorded that the crossing was not safe and vegetation clearance should be carried out to improve sighting distances. Vegetation clearance was undertaken in May 2005 and July 2005.
- 70 A further risk assessment inspection was carried out on 31 May 2006, (ie after the accident), and completed and signed as authorised on 1 June 2006, again with the same conclusion. The next risk assessment is due to be carried out in May 2009 by a mobile operations/signalling manager and will then be reviewed by the level crossing risk control team.
- 71 The crossing was also inspected by a Network Rail mobile operations/ signalling manager every six months as prescribed by the now withdrawn company standard, NR/SP/OPS/012, 'Assessment of User Worked Crossings'. The last time was in August 2005, eight months prior to the accident, with no defects found. The next inspection was due in March 2006. The reason for the two month delay in undertaking this inspection is unclear. Inspections are now conducted by dedicated level crossing maintenance teams on a yearly basis with work such as vegetation clearance being carried out when necessary.
- 72 The crossing was also inspected by the Network Rail off track team; their last inspection was in March 2006. Recommendations for work to be undertaken, including adjustments to both north and south side gates and posts were made, but these were not carried out until 22 May 2006, after the accident.

- 73 Vegetation clearance for sighting distances was also undertaken 4 days prior to the incident on 18 May 2006 by the off track team. Whatever work was undertaken on this day was not adequate to achieve the required sighting distance because following the collision, further work was carried out to bring the sighting distance up to standard. This work, both before and after the accident should also have included suitable arrangements for the removal of vegetation from around the Stop boards, but did not.
- 74 The vegetation surrounding the stop boards and in proximity to the sightlines is located both within and outside Network Rail's boundaries².

Design and operational principles of UWC's

Crossing and warning time

- 75 At UWCs, members of the public are responsible for their own safety when crossing and have to decide for themselves if it safe or not to cross.
- 76 The crossing time of the crossing is defined, according to Network Rail's company standard NR/SP/OPS/100 version 1 dated December 2006 as the 'Time taken for a user to traverse the crossing from the decision point to a position of safety on the other side of the railway. Crossing time includes time taken for the user to make a decision to cross.'
- 77 No definition of crossing time is given in Group Standard GI/RT7012.
- 78 The warning time is the shortest possible time between a train being seen, or heard (where whistle boards are provided), and its arrival at the crossing (Ref: NR/SP/OPS/100 version 1 dated December 2006 and Group Standard GI/RT7012).
- 79 According to RSPG, the warning time at UWCs, (a minimum of 20 seconds), should be at least 5 seconds greater than the crossing time, if no additional equipment is provided.
- 80 Additional equipment is defined as:
- audible warnings from the train;
 - telephones connected to the signaller; or
 - miniature stop lights (MSLs).

Method of operation

- 81 The correct method of operation at a UWC with gates and no telephone can be summarised as follows:
- a vehicle driver on approaching the crossing should stop his vehicle 3 metres prior to the gate (to enable the gate to be opened towards him);
 - leave his vehicle;
 - read the crossing instruction sign at the gate;
 - look for trains approaching;
 - open the nearest gate towards himself;
 - cross over the crossing on foot to open the far gate;
 - return to his vehicle;

² The clearance of vegetation from outside the railway boundary is the legal responsibility of the local authority, or local landowner, although it is Network Rail that remains responsible for ensuring that the crossing's sightlines are sufficient. In practical terms this means that Network Rail may sometimes need to agree suitable arrangements for clearance of vegetation outside of its own boundary.

- drive up to the decision point;
- a final look for trains; and
- drive over.

82 When the vehicle is safely on the other side of the crossing, the driver should leave his vehicle, look for approaching trains, cross back and close the gate, recross the line and close the second gate, and then return to his vehicle.

Decision points

- 83 The decision point is the location at which users are expected to decide to cross. The decision point is a concept used in crossing management and is not supposed to be identifiable by the user.
- 84 The following table describes several definitions of the location of decision points at UWCs and their sources, either ORR/HMRI, RSSB Group Standards, Network Rail company standards or RSSB research.

	Definition	Source
Decision Point	Depends upon the local topography and is at a location from where the user will observe whether a train is approaching. In the case of a UWC this should be no nearer than 2m from the nearest running rail, but in most cases should be no nearer than 3m.	Network Rail withdrawn standard RT/LS/S/012, (although applicable at the time of the accident)
	As the point where guidance on crossing safely is visible and at which a decision to cross or wait can be made in safety. This should not be less than 3m from the nearest running rail.	RSPG Section 2, Part E
	The point at which a level crossing user makes a decision to cross or wait.	Network Rail company standard NR/SP/OPS/100 and Railway Group Standard GI/RT7012.
Final Decision Point	Is the last location at which a user can wait, clear of the line, before deciding to cross.	‘Determining to final decision point at UWCs’: report by RSSB June 2004 Not defined in RSPG, Railway Group Standards or Network Rail standards

Table 2: Decision point definitions and sources

- 85 RSSB research entitled ‘Determining the final decision point at UWCs’, was carried out in June 2004 in order to assess the need for defining a point closer to the track than the ‘decision point’ at which users should look and listen before moving onto the tracks. This research concluded that the establishment of a ‘final decision point’ may bring safety benefits at those locations where the ‘decision point’ is too far from the track to permit a clear view of approaching trains.
- 86 The RSSB research also considered the need to add 29 seconds to the crossing time to allow for the motorist rejoining his vehicle after opening the gates.
- 87 The RSSB research report concluded that:
- the addition of 29 seconds additional warning time is impracticable at many locations and could prove counter productive if it reduces the users’ perception of risk; and
 - the provision of a marker to indicate the location at which the user should make the final decision to cross would be valuable at some locations.
- 88 The RSSB and HMRI undertook consultation on the report with involved parties. They concluded that the provision of a marker to indicate decision points was not practicable due to road surface conditions at the majority of UWCs, and that more signs would ultimately further confuse the user.

Analysis

Identification of the immediate cause

- 89 The immediate cause of the accident was that the motorist did not stop at the designated stop board and drove directly onto the crossing without looking for approaching trains.

Identification of causal and contributory factors

Metal crossing gates

- 90 The metal crossing gates at Bratts Blackhouse No 1 UWC on both sides were found open to road traffic after the collision. At the time of the incident they were unable to be closed. They had become partly buried by overgrown vegetation and had been left open for some time.
- 91 There is evidence that the gates were not in regular use. Users often left the gates open but did not explain their reasons for doing so. However the RAIB considers it likely that users feel it unnecessary to close gates given the low traffic levels on the line. Over time, this lack of use combined with inadequate maintenance, resulted in the gates becoming unusable. At the time of the accident the gates could not be closed (see paragraph 46).
- 92 The behaviour of crossing users in leaving the gates open and the condition of the gates were causal factors.

Behaviour of the motorist

- 93 The motorist was not looking out for a train as he approached the crossing or as he traversed the crossing. At no point did he stop his vehicle prior to the collision.
- 94 The motorist had used the crossing intermittently for 36 years to gain access to do work at one of the houses on the south side, and had used the crossing six times in the week before the accident. He had always found the gates open.
- 95 The motorist had never encountered a train at the crossing, although he had viewed them on other parts of the line.
- 96 That the motorist had no expectation of a train.
- 97 The motorist had not been briefed by the authorised user as how to operate the crossing safely.
- 98 The motorist's lack of expectation of the train was a causal factor in this accident.

Safety issues arising

Assessment of the time taken to cross and warning times

- 99 Network Rail risk assessed and calculated *crossing times* for Bratts Blackhouse No 1 UWC on different occasions. These are detailed in paragraphs 69 to 73.

100 At Bratts Blackhouse No 1 UWC, the crossing time from *decision point* to decision point across the single rail track calculated by Network Rail was 20 seconds (using Network Rail standard RT/LS/S/012 applicable at the time of the accident). This crossing time takes into account the crossing length, its skewed design and the type of user (slowest moving). This estimate is used to determine whether the warning time is adequate.

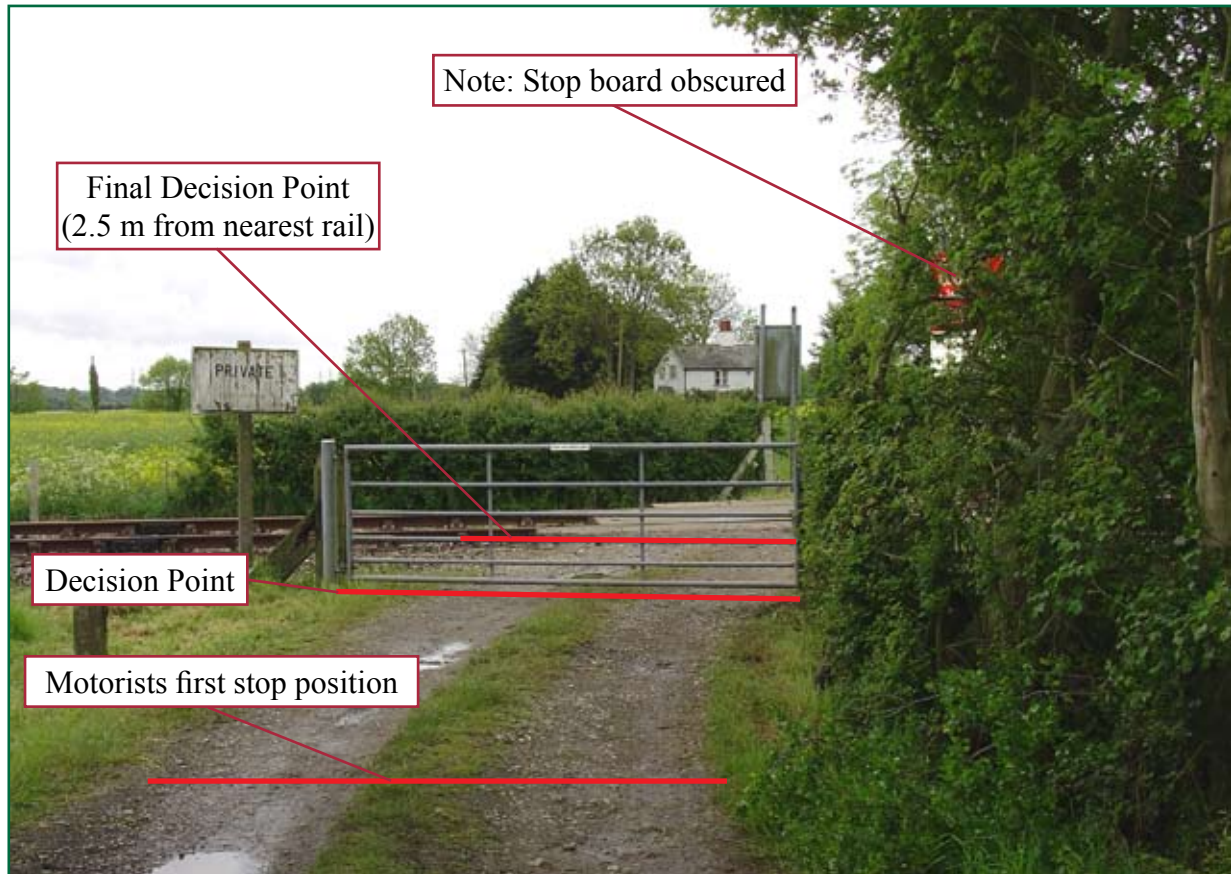


Figure 5: Decision points on the north side. Note the Stop Board to the right hand side hidden by foliage. (Photograph taken from motorist's perspective).



Figure 6: Motorist's view of approaching trains when at decision point



Motorist's view of approaching trains when at final decision point. (Motorist's eye level at 1.2 m)

101 RAIB have made estimates (using on-site data), of the crossing time and warning time of down trains for a motorist travelling from north to south. Values were calculated for each of the following:

- for a person in the driver's seat of a car that is stopped clear of the gate's opening arc;
- for a person in the driver's seat of a car with the bonnet level with the gate (ie front of car is at the decision point) (see Figures 5 and 6); and
- for a person in the driver's seat of a car with the bonnet at 2.5 m from the nearest rail (ie front of car is at the *final decision point*) (see Figures 5 and 6).

102 Table 3 compares these crossing times and warning times at different locations in proximity to Bratts Blackhouse No 1 UWC.

Location of user	Crossing time (decision point to decision point)	Warning time of down trains (from north side). Train at 19 mph (average speed of a train in this direction)
In driver's seat of car that is stopped clear of the gate's opening arc	20+ seconds	<5 seconds
In driver's seat of car - bonnet in line with gate (<i>decision point</i>)	20 seconds	<15 seconds
In driver's seat of car – bonnet is 2.5m from the track (<i>final decision point</i>)	<20 seconds	30 seconds

Table 3: Comparison of crossing and warning times at Bratts Blackhouse No 1 UWC

103 From Table 3, it can be seen that had the user stopped and looked at the decision point, the time taken for him to drive across the crossing would be longer than the warning time. It is therefore concluded that the crossing can only be used safely if one or more of the following conditions apply:

- Road users check that the line is clear at the final decision point before driving onto the crossing.
- The speed of trains is reduced in order to increase the warning time.

104 If the safety of the crossing is reliant on condition (a) above, then there would be benefit in installing a Stop sign or some other marking at the final decision point and modifying the instructions to users. This is consistent with the findings of the recent research into 'Determining the final decision point at UWCs by RSSB in 2004'.

105 Given the above, it is concluded that the warning times at the crossing were inadequate to permit the use of the crossing in accordance with instructions. However this was not a causal factor since there is evidence that the motorist did not look out for approaching trains.

Crossing signage

- 106 The stop sign for a motorist approaching the crossing from the north is on the right hand side and only visible when level with the metal crossing gates (when shut). Vegetation was obstructing the view to the sign when approaching the gate (see Figure 5). The only sign that can clearly be seen is one marked 'Private' situated on the left hand side, near to the gate hinge post.
- 107 Previous inspections and work carried out by Network Rail did not deal with the vegetation/foliage problems at this crossing, even immediately after the incident.
- 108 The wording on the sign at Bratts Blackhouse No 1 UWC is as shown in Figure 7 and is not compliant with The Private Crossings (Signs and Barriers) Regulations 1996 (Diagram 102). The existing sign requests that persons crossing with a vehicle which is unusually long, wide, heavy or slow moving should "notify nearest Station Manager".
- 109 No telephone number is provided on the sign.



Figure 7: Bratts Blackhouse No 1 UWC vehicle and Pedestrian Stop sign

- 110 The wording on the sign should read as shown in Figure 8.

Train horn

- 111 OTMR data shows that the locomotive warning horn was not used at the RETB board or during the incident.
- 112 There are no *whistle boards* on the approach to or close to Bratts Blackhouse No 1 UWC. According to the *Rule Book* Module TW1, Clause 10.2, there is no requirement for a train driver to sound the horn when moving off from a RETB Stop Board or when approaching a UWC.

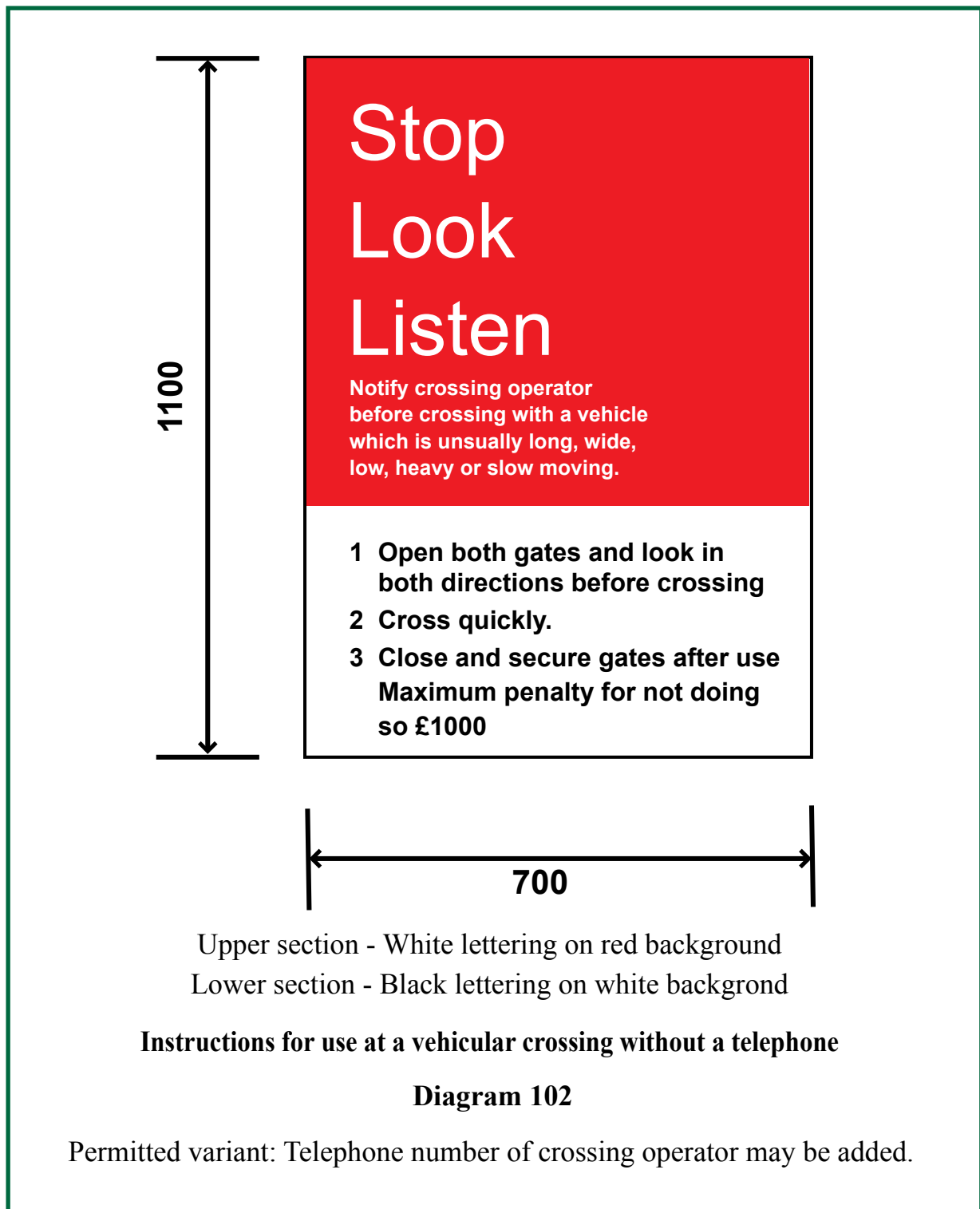


Figure 8: Diagram 102 from Private Crossings (Signs and Barriers) Regulations 1996 (Note permitted variant for telephone number to be added).

- 113 According to Network Rail documents applicable at the time of the incident (NR/SP/OPS/26 'Inspection and Risk Assessment Methodology for UWC', and NR/SP/OPS/012, Specification for Assessment of UWC), 'Whistle boards are not generally considered an adequate form of protection at UWCs'.
- 114 RSPG states that no additional protective equipment is required if the warning time is at least 5 seconds greater than the crossing time. At Bratts Blackhouse No 1 UWC, the warning time was at least 5 seconds greater than the crossing time, but only when a user is at the final decision point. Refer to table 3.
- 115 Had whistle boards been installed and if the train had used its horn either at the whistle boards or on the approach to the crossing it is possible that the motorist would have been made aware that a train was approaching. However, this is not certain given the fact that his radio was on, the air fan blowing and the car windows were closed.

The train driver

- 116 The driver of train 6L70 had booked on duty at 06:45 hrs. There were no issues of concern regarding the driver's competence or fitness to drive trains.
- 117 The train driver could not have taken any actions that would have avoided this accident. He was operating his train correctly and has no responsibility in the operation of the UWC.

Performance of the train

- 118 Data from the OTMR of the locomotive 20310 showed that the train was travelling at 19 mph (30 km/h) and took 20 seconds to stop after the driver applied the straight air brake and auto air brake.
- 119 The time taken for the train to stop and the rate of deceleration are in accordance with expectations for a train of this type and load.

Temporary Crossing Notice

- 120 Network Rail had been in contact with the authorised users of the crossing on 26 September 2005, but had not displayed a copy of the most recent letter in the form of a temporary notice at the crossing as required in GI/RT7012 Part K3.

Conclusions

Immediate cause

- 121 The immediate cause of the accident was that the motorist did not stop at the designated Stop Board and drove directly onto the crossing into the path of the approaching train without looking for approaching trains (Recommendation 1).

Causal and contributory factors

- 122 The causal factors were:
- the gates at the crossing had been left open for some time and could not be closed. This was due to overgrown vegetation, the inadequate maintenance of the gates and the non-implementation of the findings of crossing inspections (Recommendation 2); and
 - the driver did not look for approaching trains because he had never encountered a train at the crossing before (Recommendation 1).

Additional Observations

- 123 At Bratts Blackhouse No 1 UWC, there was insufficient warning time to cross in safety unless the driver stops (and looks), with the bonnet of his car within 2.5 m of the track, ie at the final decision point. This problem is exacerbated by the inadequate control of vegetation in proximity to sightlines. The sightlines at the decision point (ie the point at which the sign can be read), are too short to provide sufficient warning to cross in safety (Recommendation 4).
- 124 The signage was not conspicuous because:
- the crossing signage was not well placed for observation by an approaching motorist (see Figure 5); and
 - The sign was obscured by vegetation (Recommendation 3).
- 125 No telephone number is provided for contacting a railway employee in case of an incident (Recommendation 6).
- 126 There was no sign indicating the name of the crossing to users or railway employees (Recommendation 8).
- 127 The signal box telephone voice recorder was not working at the time of the incident. This was as the result of a complete power failure to the system, which the signaller was not aware of (Recommendation 7).
- 128 Work carried out by Network Rail's off track team was undertaken without the RAIB's permission and in contravention of the Railways (Accident Investigation and Reporting) Regulations 2005, section 7 (Recommendation 5).

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

- 129 Network Rail has already undertaken improvement works at Bratts Blackhouse No 1 UWC (see paragraph 46).
- 130 Several large trees on the north side between thirty and sixty metres from the crossing are to be removed by Network Rail to improve sighting.
- 131 The Saxmundham signal box voice recorder was in the process of being repaired on Monday 22 May 2006. After the fault on the Sunday evening, the first voice recording was made at 12:59 hrs on 22 May.
- 132 Since June 2006, the Rule Book module TW8 on level crossings, section 2.6 now requires that train drivers are to report to signallers any gates which they see have been left open.
- 133 Network Rail have brought a new risk process for level crossings into operation based on the All Level Crossing Risk Model, (ALCRM), whereby a new team of assessors have been trained and the mobile operations managers will provide the data gathering.

Recommendations

134 The following safety recommendations are made.³

Recommendations to address causal and contributory factors

- 1 Network Rail should explain to the authorised users about the method of safe operation of Bratts Blackhouse No 1 UWC and their responsibilities and confirm this in writing. In addition, a notice to comply with GI/RT7012 Part K3 should be sent to the authorised users and a copy displayed at the crossing. Network Rail should also take reasonably practicable steps to verify users' compliance with the method of safe operation (paragraphs 61 and 120).
- 2 Network Rail should audit the effectiveness and implementation of the maintenance and inspection measures mandated by Network Rail company standards for UWCs within the maintenance area that includes Bratts Blackhouse No 1 UWC and amend company practices to address deficiencies that come to light (paragraphs 69 and 122).

Recommendations to address safety issues identified

- 3 Network Rail should duplicate the stop sign on the north side to a position on the left hand side of the hinge gate post next to the 'Private' sign (paragraphs 106 and 124).
- 4 Network Rail should initiate a programme to apply the All Level Crossing Risk Assessment Model (ALCRM), to UWCs and to ensure that if there are any UWCs where the warning time is less than the crossing time then they are provided with appropriate risk mitigation measures. Risk mitigation measure to be considered should include the following:
 - clear marking of the point at which the final decision to cross should be made (if this is between the instruction sign and the track);
 - the reduction of line speed;
 - the provision of telephones, MSLs or alternative warning systems where shown to be reasonably practicable; or
 - restrictions on the use of the crossing by the authorised user (where these can be agreed) (paragraphs 99 and 123).
- 5 Network Rail should ensure that all track maintenance staff in the Anglia Area are briefed on the need to preserve evidence following an accident that has been notified to the RAIB (paragraphs 46 and 128).

continued

³ Responsibilities in respect of these recommendations are set out in the Railways (Accident Investigation and Reporting) Regulations 2005 and the accompanying guidance notes, which can be found on RAIB's web site at www.raib.gov.uk

- 6 Network Rail should modify the relevant company standard(s) to require the provision of a telephone number of the signaller on all signs at UWC's and to implement a programme for ensuring compliance (paragraphs 109 and 125).
- 7 Network Rail should ensure that the signaller at Saxmundham is made aware of power and UPS failures that will affect the operation of the voice recorder and other safety related equipment (paragraphs 43 and 127).
- 8 Network Rail should install a sign at all UWCs indicating the name of the crossing to comply with Railway Safety Principles and Guidance, Section 2 part E, paragraph 287 (paragraphs 42 and 126).

Appendices

Glossary of abbreviations and acronyms

Appendix A

AHB	Automatic Half Barrier
BTP	British Transport Police
CCTV	Closed Circuit Television
DRS	Direct Rail Services Ltd
HMRI	Her Majesty's Railway Inspectorate (Part of the ORR)
HSE	Health and Safety Executive
MSL	Miniature Stop Lights
NRN	National Radio Network
ORR	Office of Rail Regulation
OTMR	On Train Monitoring Recording Equipment
RETB	Radio Electronic Token Block
RIO	Rail Incident Officer
RSPG	Railway Safety Principles and Guidance
RSSB	Rail Safety Standards Board
UPS	Uninterruptible Power Supply
UWC	User Worked Crossing

Glossary of terms

Appendix B

Authorised User	A term used in the railway industry to denote a person or body registered with the infrastructure owner as a user of an accommodation or occupation crossing.
Crashworthiness	The capability of vehicles to withstand the effects of a crash.
Crossing Time	The crossing time is the calculated time for a user to cross over the crossing from the near decision point to the far decision point (for the purpose of the calculation, the far decision point is considered to be analogous to the point at which a user is clear of the track).
Decision Point	The point where guidance on crossing safety is visible and at which a decision to cross or wait can be made in safety.
Down	Direction of trains travelling from Saxmundham to Sizewell. The Down direction is in most cases away from London.
Emergency Brake Position	The position on the brake control that applies the maximum possible braking effort. This is beyond the normal service brake position.
Equivalent Fatalities	If injuries and fatalities are required to be taken together, they can be combined into a single measure of the number of equivalent fatalities.
Final Decision Point	The final point at which a user can wait, clear of the line, before deciding to cross.
Full Service Brake Position	The maximum service brake position that can be applied before the driver may select the emergency brake position.
Minature Stop Lights	Minature lights, usually Red and Green, used as the warning at certain types of automatic level crossing.
National Radio Network	A dedicated National Radio Network operated and maintained by Network Rail that allows direct communication between train driver and signaller.
Nearside	The passenger's side of a right hand drive road vehicle when being driven on the left hand side of the road in the normal direction.
Off Track Team	A Network Rail maintenance team responsible for work such as the clearance of overgrown vegetation at level crossings.
(Private) Occupation Crossing	A level crossing that is provided by the railway company to give access to private premises whose access road is cut by the construction of the railway.
Radio Electronic Token Block	In order for a train to proceed safely along a section of track, various signalling methods can be employed. One of them is the 'single line key token' system, where possession of the only token for a section of track enables the holder sole access to that track. Radio Electronic Token Block is a development of this principle which implements a centralised control and radio transmission system which is linked to the NRN system.

RADSAFE	A consortium of organisations that have come together to offer mutual assistance in the event of a transport accident involving radioactive materials belonging to a RADSAFE member. In the event of such an accident, RADSAFE will deploy appropriate experts to the site in order to advise emergency services and other organisations as to the safety of the radioactive load and any suitable risk management arrangements that should be implemented.
Railway Group Standard	The RSSB owns and manages these standards which are mandatory on all railway group members, ie Network Rail and train and station operating companies.
Rule Book	Railway Group Standard GE/RT8000, which incorporates most of the rules to be observed by general railway staff for the safe operation of the network.
Token	Either an electronic or physical item, where possession of the only token for a section of track enables the holder sole access to that track.
Traffic Moment	The number of road vehicles using the crossing multiplied by the number of trains passing in a given period.
Uninterruptible Power Supply	A power protection device with a battery supply that provides power when the mains fails or fluctuates wildly and some degree of power quality control when a mains or other alternating current (AC) supply is present.
Up	Direction of trains travelling from Sizewell to Saxmundham. The Up direction is in most cases towards London.
User Worked (Level) Crossing	A type of crossing where the user operates gates or barriers before and after crossing the railway. Users make their own decision if it is safe to cross or not.
Warning Time	The warning time is the shortest possible time between a train being seen or heard and its arrival at the crossing
Whistle Board	A board placed to the side of the track with a 'W' on it, indicating to the train driver he should sound his horn

Key standards current at the time

Appendix C

Rule Book GE/RT 8000 T2

ORR Railway Safety and Guidance Part 2 Section E Guidance on level crossings (01/05)

GI/RT7012 Railway Group Standards Requirements for Level Crossings August 2004 Issue 1

NR/SP/OPS/026 Network Rail Inspection and Risk Assessment Methodology for User Worked Crossings June 2002 Issue 2

NR/SP/OPS/012, Network Rail Specification for Assessment of User Worked Crossings; June 2002 Issue 3

The standard below came into force in December 2006 and both NR/SP/OPS/026 and NR/SP/OPS/012 above were withdrawn.

NR/SP/OPS/100, Network Rail Specification for Provision, Risk Assessment and Review of Level Crossings; December 2006 Issue 1

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