



Rail Accident Investigation Branch

Rail Accident Report



**Near miss between a passenger train and lorry
at Mucking AHB level crossing, Essex
13 March 2019**

Report 16/2019
December 2019

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 or incident that is being investigated. However, where the RAIB is less confident about the existence of a factor, or its role in the causation of the accident or incident, the RAIB will qualify its findings by use of words such as '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 or incident but are associated with the underlying management arrangements or organisational issues (such as working culture). Where necessary, words such as 'probable' or 'possible' can also be used to qualify 'underlying factor'.

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

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

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

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

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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Near miss between a passenger train and lorry at Mucking AHB level crossing, Essex, 13 March 2019

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Summary

Shortly before noon on Wednesday 13 March 2019, a passenger train passed over Mucking automatic half barrier level crossing a few seconds after a partially loaded concrete delivery lorry had reversed clear as part of a manoeuvre to enter an adjacent Network Rail construction site. The lorry driver was following hand signals from a railway worker and drove onto the crossing after it had been automatically activated by the approaching train and red stop lights had begun flashing. A lowering crossing barrier came down on the lorry and was manually lifted by site staff, before the lorry reversed off the crossing.

The incident happened because staff involved in the work planning, and staff on site, did not recognise and manage risk associated with working near level crossings. Following the incident, Network Rail highlighted this risk in a briefing note issued to organisations and staff working on its infrastructure. The Amey Inabensa joint venture working at the construction site modified procedures and briefed staff on the risk.

The RAIB has identified four learning points covering compliance with the Highway Code, the control of construction vehicles near level crossings, taking account of nearby level crossings when planning construction work and effective management of small construction sites.

Introduction

Definitions

- 1 Metric units are used in this report, except when it is normal railway practice to give speeds and locations in imperial units. Where appropriate the equivalent metric value is also given.
- 2 References to left and right refer to the train's direction of travel when the incident occurred. Sources of evidence used in the investigation are listed in Appendix A.

The incident

Summary of the incident

- 3 At about 11:58 hrs on 13 March 2019, the 11:11 hrs London Fenchurch Street to Southend Central service passed over Mucking automatic half barrier level crossing between East Tilbury and Stanford-le-Hope in Essex, about six seconds after a partially loaded concrete delivery lorry had reversed off the crossing. The train, reporting number 2D26, was travelling at 57 mph (92 km/h) as it approached the crossing.
- 4 The lorry had stopped on the level crossing in order to reverse into an adjacent gateway, onto a site where contractors were constructing a new foundation on behalf of Network Rail. During this manoeuvre, which was supervised by a traffic marshal (referred to in this report as a banksman), a crossing barrier lowered onto the lorry. The lorry remained stationary on the crossing for about eight seconds until a site worker manually lifted the barrier to release it and the lorry reversed along the road, clear of the crossing. The train driver observed the lorry reversing away from the crossing. After the train had passed, the lorry driver, with assistance from the banksman, repeated the manoeuvre and entered the compound.
- 5 Although the incident did not result in any damage or injuries, a collision with a lorry is likely to have had serious consequences and these could have been exacerbated by a railway junction immediately beyond the level crossing. If the train had derailed, but remained upright and running in a straight line after striking the lorry, the derailed wheels would have struck the rails of the diverging route at the junction and this could have caused the coaches of the train to deflect sideways and/or overturn.

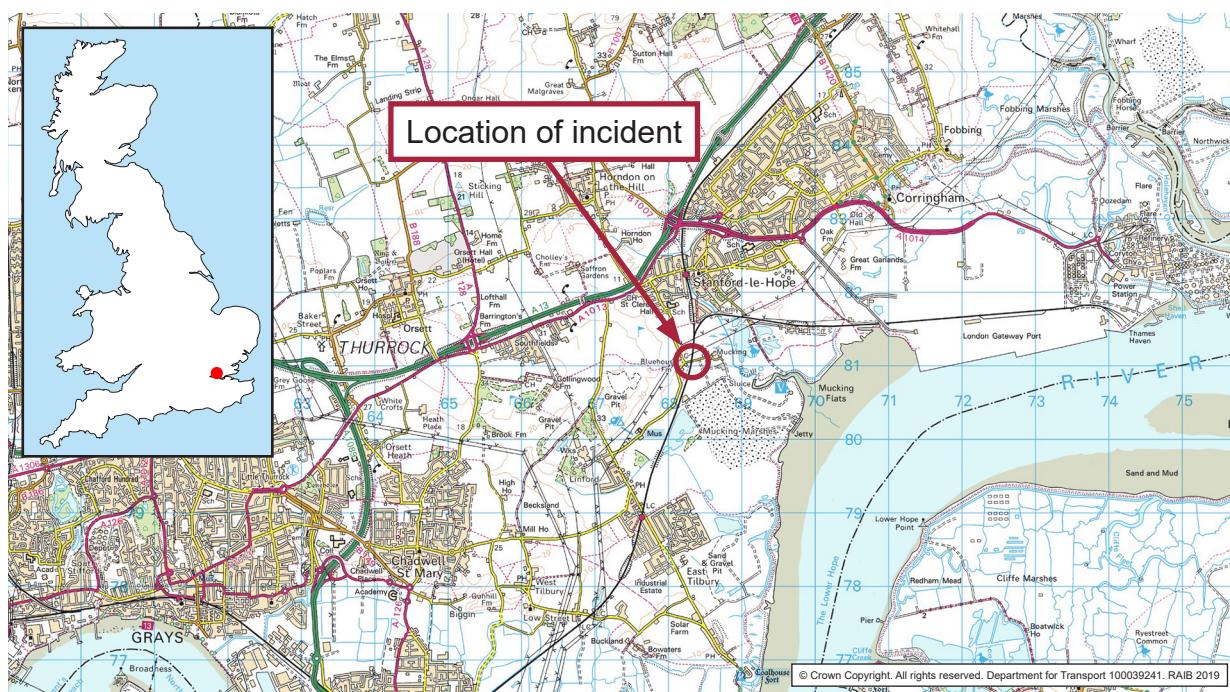


Figure 1: Extract from Ordnance Survey map showing location of incident

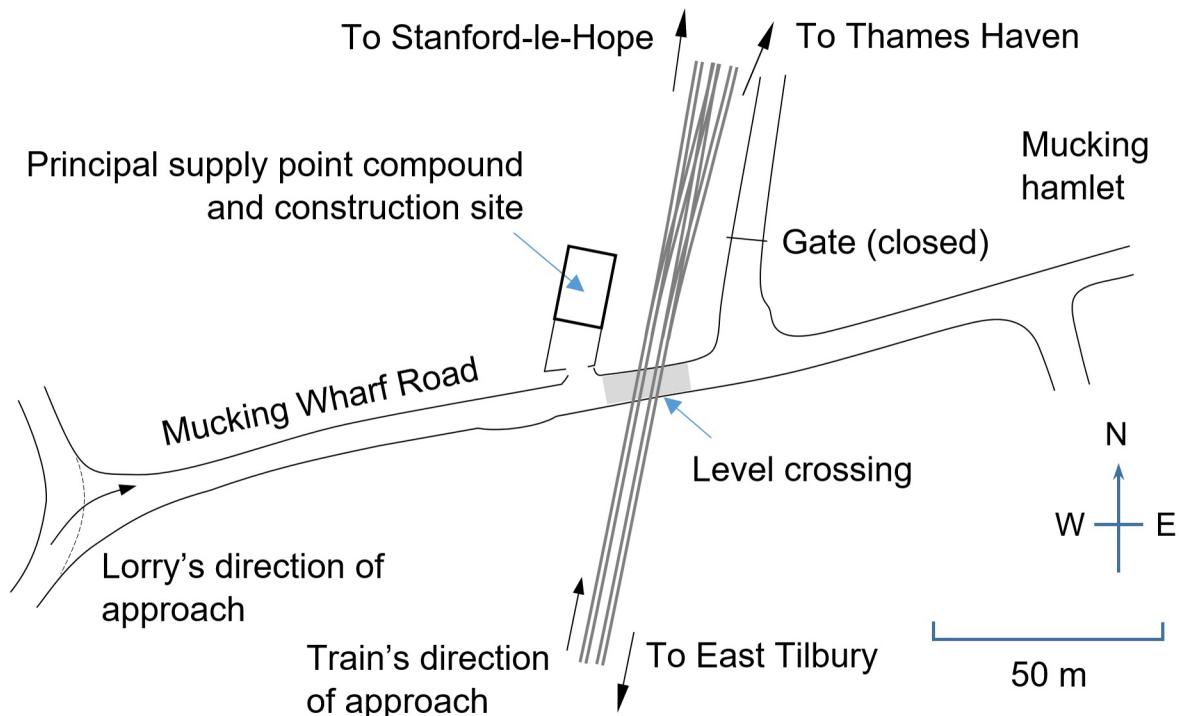


Figure 2: The site and surrounding features

Context

Location

- 6 Mucking automatic half barrier (AHB) level crossing is located on the line from London Fenchurch Street to Shoeburyness via Tilbury. It is situated between East Tilbury and Stanford-le-Hope at 26 miles 40 chains¹ on a left-hand curve in an area where the railway is running in an approximate north-south direction (figure 1).
- 7 Mucking Wharf Road crosses the railway at Mucking level crossing and runs east-west giving access to a hamlet, farmland and a wildlife visitor centre beside the Thames Estuary. A compound adjacent to the north-west corner of the level crossing, abutting both the road and the railway, contains equipment providing electrical power to railway signalling equipment (figure 2). Access to the compound is by a gate off Mucking Wharf Road. The gatepost closest to the level crossing is approximately 10 metres from the nearest railway track.

Organisations involved

- 8 Network Rail is the owner and maintainer of the railway infrastructure. Network Rail's Infrastructure Projects Southern Division was the client for a signalling power supply upgrade project which included work in the compound adjacent to Mucking level crossing.

¹ Mileage measured from London Fenchurch Street station via Purfleet. One chain is equal to 22 yards (approximately 20 metres).

- 9 Amey PLC and Inabensa SA formed a joint venture, AmeyInabensa JV, and in 2014 it was awarded a Network Rail regional framework contract to undertake project work in the south of England. The joint venture was responsible for delivering the signalling power supply upgrade project including management of the site near Mucking level crossing. Amey PLC was the Principal Contractor appointed under the Construction (Design and Management) Regulations 2015 (CDM regulations) for this project.
- 10 Resourcing Solutions provided the site staff at Mucking under contract to AmeyInabensa JV. The team it provided had worked for Amey on a full-time basis for several years.
- 11 Euromix Concrete, a subsidiary of Tarmac Trading Ltd, owned the concrete delivery lorry involved in the incident and employed its driver. It supplied concrete to AmeyInabensa JV.
- 12 Trenitalia c2c Limited (c2c) was the operator of the train and employer of the train driver.
- 13 The above parties freely co-operated with the investigation.

Train involved

- 14 Train 2D26 was formed of a 4-car, class 357 electric multiple unit, number 357203. The condition of the train and the way it was driven were not factors in this incident.

Rail infrastructure involved

- 15 The railway at Mucking level crossing is double track and equipped with overhead line electrification. It has a maximum permitted speed of 60 mph (97 km/h) in both directions. The route is controlled by a signaller located at Upminster signalling centre².
- 16 Immediately north of the level crossing, Thames Haven Junction provides access to Thames Haven and the London Gateway container port for freight trains.

Automatic half barrier level crossing

- 17 Mucking level crossing is an automatic half barrier crossing equipped with one rising barrier on each side of the railway (figure 3 and figure 4). When lowered, each barrier extends across about half the width of the road and obstructs the side of the road from which vehicles normally approach the crossing. Exits from the crossing remain unobstructed at all times.
- 18 A set of road traffic warning lights is located at each corner of the crossing, facing away from the railway and towards approaching road vehicles. Each set comprises a single amber light which illuminates continuously for three seconds when in use, and a pair of red lights which flash alternately when in use.
- 19 An audible alarm warning of crossing operation, which is provided to alert pedestrians, is not intended to influence vehicle drivers. A telephone on each side of the railway allows users to contact the signaller at Upminster in unusual circumstances, such as if crossing with an exceptionally long vehicle or in an emergency.

² Upminster integrated electronic control centre (IECC).



Figure 3: Mucking level crossing viewed from west side

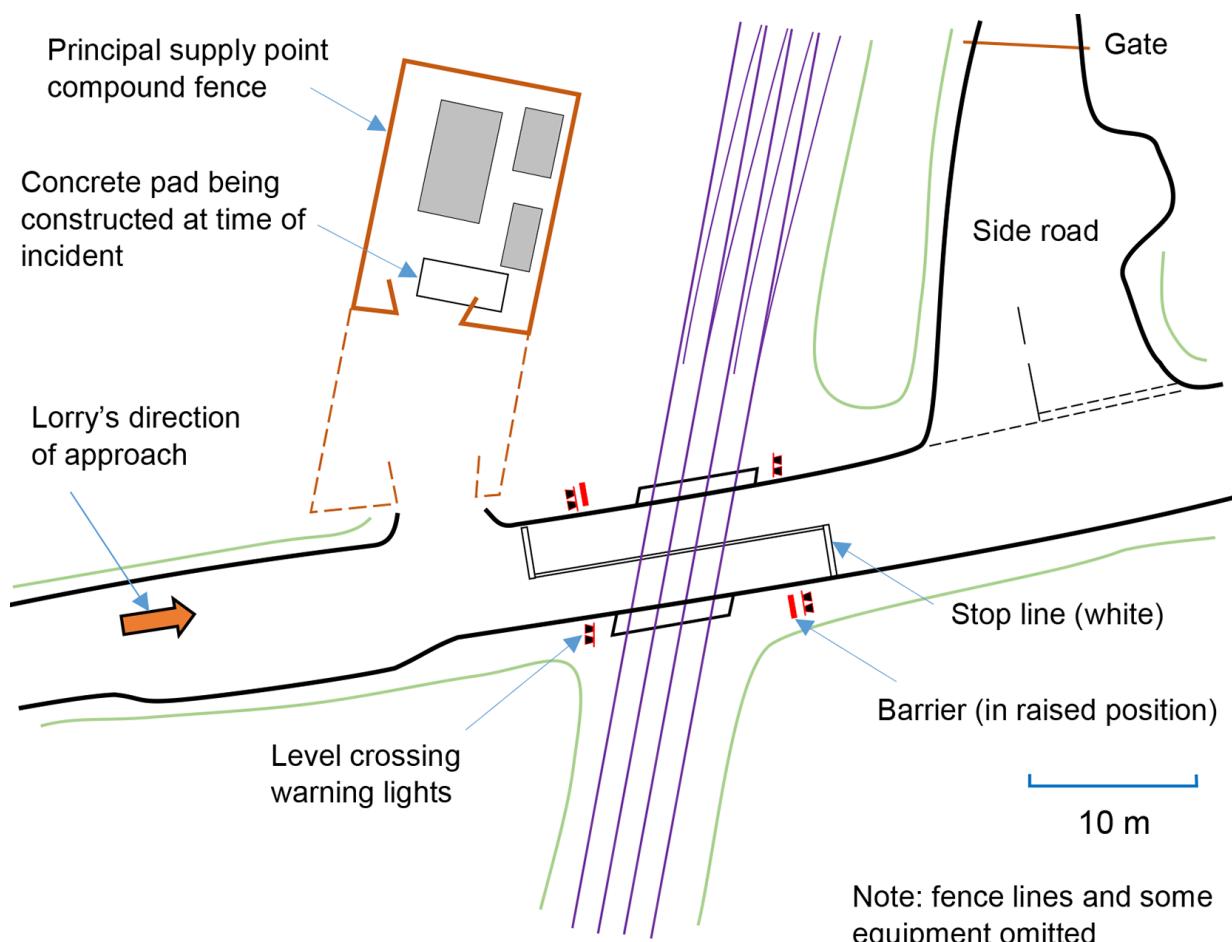


Figure 4: Plan of Mucking level crossing

- 20 When, as at the time of the incident, the crossing is in normal operating mode, it is activated automatically by an approaching train without input from the signaller. The requirements for normal operation³ specified by the Office for Rail and Road (ORR) and actual performance of the crossing during the incident are given in Table 1.

³ Level Crossings: A guide for managers, designers and operators, Railway Safety Publication 7, published by ORR, December 2011.

Event	Time from activation of crossing by train	
	Requirement	During incident
Amber road traffic lights illuminate Audible warning starts (continues until after train passes and barriers start to rise)	0 seconds	0 seconds
Amber road traffic lights extinguish Red road traffic lights start to flash	3 seconds (approx)	3 seconds
Barriers begin to lower (lowering takes 6 to 10 seconds)	7 to 9 seconds	8 seconds
Barriers reach fully lowered position	13 to 19 seconds	16 seconds (east barrier) 29 seconds (west barrier which struck lorry)
Train arrives at crossing	at least 27 seconds	31 seconds

Table 1: Mucking crossing barrier lowering sequence

- 21 This type of crossing is not provided with equipment intended to confirm that it is clear of road traffic and pedestrians before a train arrives. If a crossing barrier fails to lower fully or is broken, the signaller will be alerted when the crossing attempts to reset following the passage of a train. In this condition, the crossing barriers will not reopen and the red road lights will continue flashing.
- 22 The signaller is required to stop trains approaching the crossing in circumstances which include being notified of a problem with the crossing, or if a user asks to cross with a long or slow vehicle. However, at the time of the incident, even had an immediate warning that the barrier had struck the lorry been provided, there would have been insufficient time to significantly reduce the speed of the train before it reached the crossing.
- 23 In June 2016, Network Rail undertook a 24 hour census of traffic using Mucking level crossing as part of a level crossing assessment. This established that on the day of the census, 536 road vehicles and 90 pedestrians and cyclists used the level crossing.

Signalling power supply upgrade project

- 24 Construction work was being undertaken close to Mucking level crossing as part of a Network Rail project to upgrade the equipment supplying power to railway signalling equipment at 10 sites between London Fenchurch Street and Shoeburyness in Essex. The purpose of the project was to provide new uninterruptable power supply (UPS) equipment at existing electricity principal supply points to reduce the risk of signalling failures and train delays. The main office for the project was located at Grays, about 10 kilometres from Mucking.
- 25 The principal supply point at Mucking is located in the compound north-west of the level crossing and is within an inner compound surrounded by a substantial metal palisade fence. An outer compound, surrounded by a chain-link fence, provides space for storage of equipment and materials and is accessed by a double gate (figure 4 and figure 5).



Figure 5: Mucking principal supply point compound

- 26 The project work required at Mucking involved constructing a concrete pad foundation within the inner compound onto which a pre-fabricated equipment building would be placed.

Staff involved

- 27 The project manager was an Amey employee and had over 10 years' project management experience.
- 28 The senior construction manager was also employed by Amey and had over 15 years' experience working on railway civil engineering projects.
- 29 The assistant construction manager was also employed by Amey and had over 10 years' railway experience, including working with small civil engineering groups both on and off the track.
- 30 The site supervisor provided by Resourcing Solutions had over 20 years' experience on railway civil engineering projects. He held personal track safety (PTS), lookout, controller of site safety (COSS), individual working alone (IWA) and safe work leader (SWL1) competences.
- 31 The banksman was also provided by Resourcing Solutions and had 19 years' experience on railway civil engineering projects. He held PTS and site warden competences. He also held a vehicle banksman competency.
- 32 The lorry driver was employed by Euromix Concrete and had over five years' experience as a lorry driver. He had worked for the company for ten months and had passed its operator competency assessment in January 2019 without failing any items.

External circumstances

- 33 The weather was sunny with a westerly wind and a maximum temperature of 10 degrees Celsius. There is no evidence that external circumstances affected the incident.

The sequence of events

Events preceding the incident

- 34 Construction work for the power supply project started in January 2019, but construction work at Mucking did not start until 11 March 2019, two days before the incident.
- 35 On 13 March, the site team assembled at the power supply project's main office at Grays where the site supervisor gave a briefing. Work planned for that day included pouring of concrete for the foundation of the equipment building which was due to be installed the following week. The site supervisor appointed a banksman to supervise the concrete delivery lorry's movements and a second traffic marshal to stop other vehicles approaching while the lorry entered the site.
- 36 The senior construction manager ordered 3m³ of concrete for delivery to Mucking at 12:00 hrs. During the telephone call, he referred to the level crossing as a landmark to identify the site.
- 37 The supplier, Euromix Concrete, provided an 8m³ capacity vehicle. The lorry was larger than required for this delivery and was approximately 9 metres long with a gross vehicle weight of about 21.5 tonnes at the time of the incident (figure 6). This was the first large goods vehicle (LGV) to deliver to the site at Mucking.



Figure 6: Concrete delivery vehicle of the type involved in the incident (courtesy of Euromix Concrete)

- 38 As the lorry approached the site, driving east along Mucking Wharf Road, an open-backed 'pickup' truck being used by site staff, was moved from the compound and over the level crossing to make way for the lorry. The lorry slowed to walking pace as it approached the site, and the banksman used his hands to signal the vehicle forward (figure 7). The lorry needed to reverse into the site entrance to discharge the concrete using a chute attached to the rear of the vehicle, but the lorry driver did not stop to obtain a briefing from a member of the site team.



Figure 7: Lorry front camera view of banksman waving concrete delivery lorry forwards towards the level crossing (courtesy of Euromix Concrete)

- 39 At about the same time as the lorry passed the banksman at low speed, the amber lights on the level crossing illuminated and the audible alarm started to sound (Table 1). The red stop lights began flashing about one second before the lorry crossed the white line and moved onto the crossing and were visible to the lorry driver. At the same time, the pickup truck was being reversed into a side road on the far (east) side of the crossing (figure 8).
- 40 The banksman had been facing away from the crossing when giving his hand signal to the lorry driver. He and other site staff at the rear of the vehicle did not notice the crossing's activation for about five seconds as the noise from the lorry may have prevented them hearing the audible alarm. After being alerted by another member of staff, the banksman ran towards the level crossing with his arms raised, shouting "stop" then "back back" as the barriers started to lower.

Events during the incident

- 41 The lorry stopped on the crossing and began to reverse towards the site entrance (figure 9). Before the lorry cleared the crossing, the crossing barriers began lowering and caught between a water tank and the mixing drum on the back of the lorry (figure 10 and figure 11). The lorry stopped for eight seconds while the barrier was lifted by site staff (figure 12). It then reversed clear of the crossing six seconds before the train arrived.
- 42 Train 2D26 was approaching the crossing at 57 mph (92 km/h), travelling on the line which had been obstructed by the lorry while the barrier was lifted (figure 13 and figure 14).



Figure 8: Lorry front camera view showing its position on the opposite carriageway ready for the reversing move. The site pickup truck (visible at top of image) is reversing into a side road (courtesy of Euromix Concrete)



Figure 9: Level crossing camera view showing lorry stopped and about to start reversing manoeuvre. The crossing barrier (highlighted) has started to lower (courtesy of Network Rail)



Figure 10: Level crossing camera view of the stationary lorry and partly lowered level crossing barrier (highlighted) caught by equipment on the back of the lorry. The approaching train is hidden by the lorry (courtesy of Network Rail)

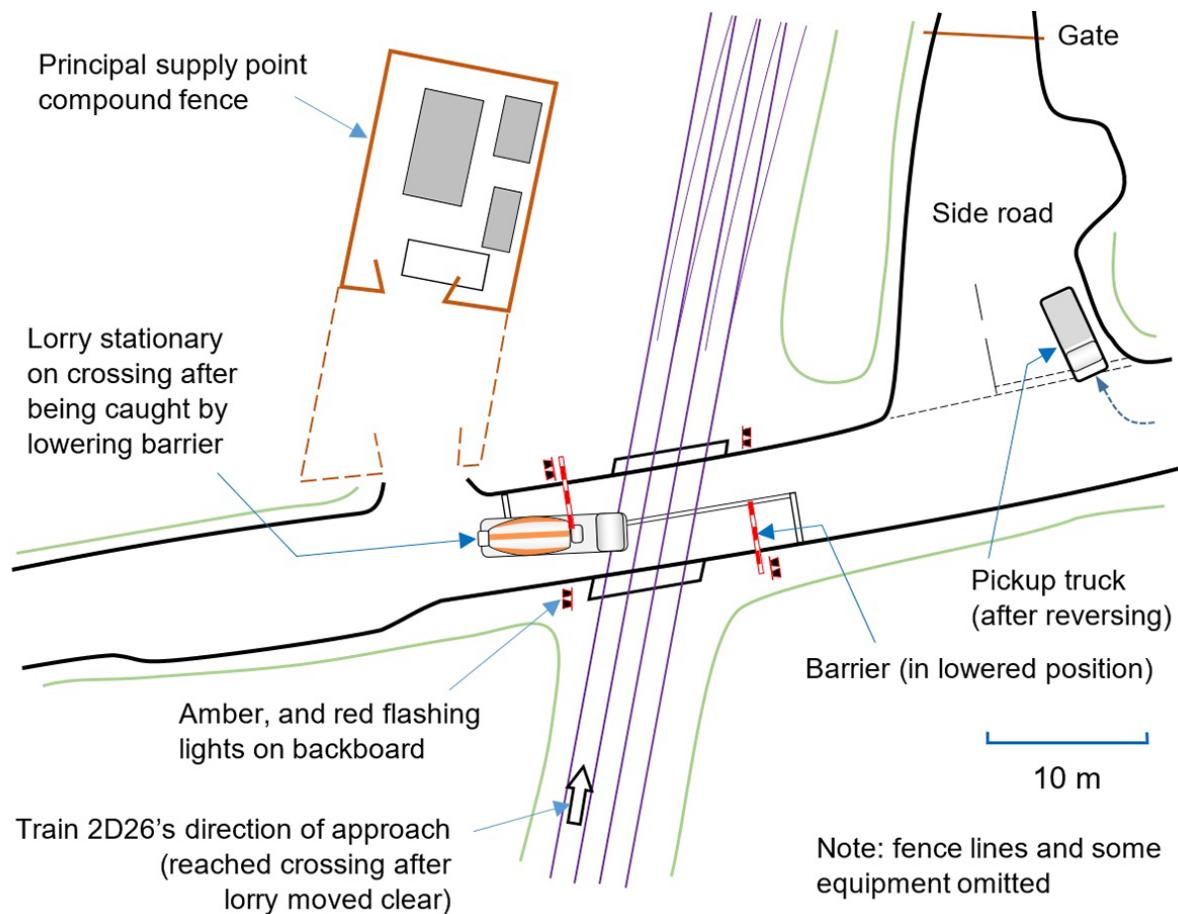


Figure 11: Diagram showing lorry's position when caught by the lowering barrier



Figure 12: Level crossing barrier being lifted by site staff to free lorry (courtesy of Euromix Concrete)



Figure 13: view from train 2D26 showing lorry reversing away from level crossing (courtesy of c2c)



Figure 14: level crossing camera view of train 2D26 approaching at 57 mph (92 km/h) (courtesy of Network Rail)

- 43 The train driver did not apply the brake or sound the train's horn before passing the crossing, probably because the lorry was already reversing away from the railway when it first became visible. The train driver's view of the level crossing was restricted by the curve in the track (paragraph 6) until about 7 seconds before the train reached the crossing.

Events following the incident

- 44 After the train passed, the lorry driver drove forwards again, guided by the banksman, and again stopped on the crossing before reversing clear of the railway and into the compound. The driver and banksman were unaware that another train was going to arrive at the crossing less than three minutes later.

Analysis

Identification of the immediate cause

- 45 The lorry was manoeuvring on the level crossing when a train was approaching.
- 46 The lorry moved onto the crossing immediately after the red flashing lights started and only moved clear of the crossing approximately six seconds before the train passed.

Identification of causal factors

- 47 The incident occurred due to a combination of the following causal factors:
- The lorry driver drove onto, stopped and reversed on the level crossing (paragraph 48).
 - Site staff did not recognise the need to take account of the level crossing when managing the large road vehicle at the site entrance (paragraph 56).

These factors are now considered in turn.

48 The lorry driver drove onto, stopped and reversed on the level crossing.

- 49 Euromix Concrete provides its drivers with an induction which includes banksman signals. Every truck carries a pack which includes the Highway Code, a company safety handbook, and banksman signals. Euromix Concrete expects its professional drivers to be familiar with the Highway Code.
- 50 Highway Code (rule 293) refers to level crossings and states:
- You *MUST always obey the flashing red stop lights.*
 - You *MUST stop behind the white line across the road.*
 - *Keep going if you have already crossed the white line when the amber light comes on.*
 - *Do not reverse onto or over a controlled crossing.*
- 51 The lorry driver had not delivered to the site before, but knew the road and had been informed that the site was near a level crossing before he left the Euromix Concrete batching plant. He was given no specific instructions about the level crossing. Video evidence shows that the lorry slowed to walking pace as it approached the site entrance. The lorry driver was waved forwards and given a 'thumbs up' by the banksman who was standing on the left-hand side of the road and was dressed in orange reflective clothing (as worn by many railway staff).
- 52 The lorry driver understood this to mean he should pass the site entrance before reversing into the site, so he continued to drive forwards onto the crossing to position the lorry for the reversing manoeuvre. He then stopped, and started to reverse. He stated that it would not have been possible to turn the lorry on the other side of the crossing because there were vans and cars parked in the side road. Video evidence from the lorry shows the pickup truck being used by site staff reversing into the side road as the lorry drove onto the crossing, temporarily obstructing the road about 15 metres beyond the level crossing (figure 8).

- 53 The driver did not stop to speak with the banksman to seek any further instructions before driving onto the crossing. This was contrary to guidance which Euromix Concrete provides to its drivers. Its 'point of delivery checklist', which is based on the principle that the driver is responsible for the vehicle and the banksman is responsible for pedestrian and vehicle movements on site, states that a driver should seek advice from a responsible manager before making a delivery in circumstances which include:

*'access to the site is restricted with a limited gap for the vehicle to enter.
the delivery address has been provided [but the driver is] not familiar with the area.*

some vehicles and pedestrians are present which need to be controlled by the banksman before moving to the delivery area.'

- 54 The lorry driver stated he saw the flashing light to his right. The (red) flashing lights cannot be seen by drivers as they cross the railway, so must have been seen before the lorry drove onto the crossing. The driver stated that he put all his trust in the site staff (who he believed were working for the railway), that it did not occur to him that it was dangerous to manoeuvre on the crossing, and that he would have stopped if someone had told him to do so.
- 55 There is no evidence that the lorry driver was fatigued or under time pressure. He had no medical issues related to driving and passed a post-incident drugs and alcohol test.

56 Site staff did not recognise the need to take account of the level crossing when managing the large road vehicle at the site entrance.

- 57 The actions of the staff on site at Mucking indicate that they were not aware of the risk associated with manoeuvring a large vehicle at this location. This was further evidenced when the same lorry, guided by the banksman, undertook a similar manoeuvre immediately after the incident had occurred while reversing into the site.
- 58 All staff working on the power supply project had attended a project induction which included a photograph of the level crossing at Mucking and identified it as a hazard. Of the group on site at Mucking, only the site supervisor had visited the site before construction work started on Monday 11 March (two days before the incident).
- 59 On 13 March, the site supervisor gave a pre-work briefing in advance of the concrete pour using a task briefing sheet (paragraph 71), and eight people signed the form to confirm they had received this briefing. The level crossing was not mentioned on the task briefing sheet, but witness evidence suggests the site supervisor referred to it in his briefing. The supervisor separately stated that he instructed the banksman that vehicles should enter the site by driving towards the crossing, stopping before the barrier and then reversing. He did not order the concrete and was unaware of the size of the lorry before it arrived, or whether sufficient space existed between the site gate and the level crossing to allow the intended manoeuvre to be completed safely.
- 60 The banksman stated that on his first day on site at Mucking (11 March), he had walked down the road and identified two side road junctions beyond the level crossing where a lorry could turn.

- 61 There is no evidence that, when directing the concrete delivery lorry on the day of the incident, the banksman was giving positive consideration to possible activation of the level crossing. He was facing away from the crossing when he was signalling to the lorry driver as the amber light came on. About five seconds after this light came on, he became aware that the crossing had activated and ran forwards, shouting with his arms raised (paragraph 40).
- 62 The banksman held a valid certificate confirming that he had passed a banksman/slinger operator's course in December 2016, and that the qualification lasted for three years. The banksman's training covered the planning and risk assessment of vehicle movements on private land, such as in a business loading bay or working yard. Although a banksman has no legal authority to direct other road traffic, the banksman had previous experience in assisting large goods vehicles to access construction sites from the public highway.
- 63 Amey considered the site team to have a good safety record. The banksman was experienced in working on and near the railway, but not controlling vehicles in the vicinity of a level crossing. He had previously worked with the site supervisor who regarded him as competent. The banksman passed a post-incident drugs and alcohol test, and there is no evidence that he was fatigued.

Identification of underlying factors

- 64 AmeyInabensa JV's management of site activities was inadequate, a factor probably linked to the cause of the incident.**
- 65 AmeyInabensa JV prepared the following documents relevant to the incident:
 - a. Construction phase plan: the CDM regulations (paragraph 9) require a construction phase plan to be prepared and maintained by the Principal Contractor (i.e. by Amey). Guidance published by the Health and Safety Executive (document L153⁴) states that this type of plan is required to:

'record the arrangements for managing the significant health and safety risks associated with the construction phase of a project... [It is used as] the basis for communicating these arrangements to all those involved in the construction phase', and must be 'drawn up before the construction site is set up' and 'appropriately reviewed, updated and revised from time to time'.
 - b. Traffic management plan: describes control of road transport vehicles.
 - c. Work package plan: describes the civil engineering works associated with the whole project.
 - d. Task briefing sheet: describes the concrete pour at Mucking.
- 66 The construction phase plan was prepared by the project manager using pre-construction information provided by Network Rail (see paragraph 79). It was accepted by the Network Rail project manager on 31 January 2019. Under section 4.2 'Significant construction health and safety risks' it states:

'A detailed traffic management plan will not be required at the PSP [construction] sites'.

⁴ Health and Safety Executive publication L153, 'Managing health and safety in construction, Construction (Design and Management) Regulations 2015, Guidance on regulations'. HSE Books 2015

- 67 The project had a high-level traffic management plan which was authorised by the AmeyInabensa JV project manager on 14 January 2019. This comprised less than two pages and focused on the project's main compound and office at Grays where most deliveries would be made. For the site at Mucking, the traffic management plan includes the following statements:

'Mucking has a level crossing adjacent the site.'

'A space exists across the track at Mucking which can be used for reversing.'

- 68 The work package plan was written by the project's senior construction manager for civil engineering work, and issued for internal review on 20 January 2019. The plan was based on his records from visits to each of the project sites, but he overlooked the need to identify that the level crossing was a specific risk at the Mucking site. He had not been issued with the project's traffic management plan and did not request it, so was not prompted to consider the level crossing at Mucking. Although the construction phase plan indicates that detailed traffic management plans were not required (paragraph 66), AmeyInabensa JV has been unable to explain why the project's traffic management plan was not issued to staff responsible for managing the construction work.
- 69 The work package plan was signed off by the project's engineering manager on 22 January 2019 without comment. A note on the front cover of this document states 'This Work Package Plan does not require acceptance by Network Rail / Client'. This note indicates that consideration had been given to Network Rail's standard for planning and managing construction work (NR/L2/OHS/0044 issue 5), clause 11 which states:

'Network Rail shall review and accept a work package plan that presents a significant railway and/or construction risk.'

A Network Rail technical briefing note for its project staff defines this situation as when:

'Hazards are present that give rise to risks that are assessed to have a significant impact (post mitigation) on the safe operation of the railway and/or the health and safety of workers.'

- 70 AmeyInabensa JV has informed the RAIB that it would have submitted the work package plan to Network Rail if it had recognised the level crossing as a hazard. During the planning phase, the site was considered 'off-track' (i.e. separated from the railway) and consequently, neither the highway nor level crossing risk was adequately considered.
- 71 The task briefing sheet was prepared by the assistant construction manager based on information contained in the work package plan. It provided information about the site and the planned activity. The assistant construction manager stated he knew of the level crossing, but was not aware that it was so close to the site, or how it would affect the work. He had relied on the work package plan (which did not contain a plan of the site or mention the level crossing) and had never been to the site.

- 72 The briefing sheet contained errors and omissions which limited its value as a briefing document and indicated inadequate management of risk at the site. The sheet did not mention the level crossing, gave an incorrect postcode for the site and incorrectly identified the 'nearest' hospital. When giving information needed to contact the Network Rail signaller, the briefing sheet omitted the signaller's phone number. It referred to using telephones located on signal posts at unspecified locations and did not mention the telephones located at the level crossing.
- 73 It is not clear who within AmeyInabensa JV held overall responsibility for civil engineering construction activities on the project. Clarity could have resulted in a site visit by the responsible manager leading to recognition and mitigation of level crossing risk. A civil works manager was appointed to the project, but left in January 2019 shortly after the project started. After his departure, the post was left unfilled for reasons that AmeyInabensa JV has been unable to establish, leaving the site supervisor unsupported and unclear who he reported to. He submitted daily record sheets to an electrical (E&P) construction manager, but this manager had no responsibility for the civils team and did not visit them on site.
- 74 It is probable that adequate consideration of the level crossing in project documentation and/or adequate management supervision of the site would have identified that the activity of getting a lorry into the compound could conflict with the safe operation of the level crossing, and that this risk would need to be mitigated.
- 75 It is possible that the approach to railway related risk by staff on site, in project documentation and in management supervision, was influenced by:
- a. the new works being constructed in an area separated from the operational railway by a substantial fence, a situation which could have led staff to give less rigorous consideration to railway related risk than normally applied to projects directly interfacing with operational railway tracks; and/or
 - b. staff having no clear understanding that the crossing operated automatically and so a train could approach at high speed even if their construction activities had made this an unsafe situation.

76 Network Rail's processes and oversight of construction activities did not recognise the risk presented by the level crossing, a factor probably linked to the cause of the incident.

- 77 In its role as infrastructure manager, railway related aspects of health and safety legislation require Network Rail to mitigate risk to railway operations so far as is reasonably practicable. In addition, for the power supply project, Network Rail also held the client role under the CDM regulations (paragraph 9) giving it responsibilities which are also defined by guidance document L153⁵ as including:
- providing the contractor with pre-construction information including '*the health and safety hazards of the site*' [generally known as a pre-construction information pack];
 - ensuring a construction phase plan is '*drawn up before the construction phase begins*';

⁵ Details of publication L153 are given in footnote 4.

- ensuring it ‘adequately addresses the arrangements for managing the risks’; and
 - ensuring that ‘the principal contractor...regularly reviews and revises the plan to ensure it takes account of any changes that occur as construction progresses and continues to be fit for purpose’.
- 78 The production of pre-construction information packs is covered by Network Rail standard NR/L2/OHS/0047. The version of the standard applicable at the time of the incident did not prompt consideration of the risk presented by level crossings. However, the staff from Network Rail’s Infrastructure Projects Southern Division who prepared pre-construction information pack for the power supply upgrade project used their own template⁶ in place of standard 0047. The local template had been in use since at least November 2016, and already included the following prompts for staff to consider the hazard presented by the presence of level crossings:
- ‘Site transport arrangements and restrictions: Add any site specific arrangements or restrictions, for example ... temporary traffic management in close proximity to level crossings.*
- Railway environment: If the works affect a level crossing, or traffic is increased across a level crossing (including user worked crossings) then Network Rail Project Manager must follow the process in NR/L2/OPS/101.’*
- 79 The completed pre-construction information pack was signed off on 18 February 2019. It required the Principal Contractor to arrange traffic management and for vehicle movements to be supervised by a competent banksman. Despite the prompts in the template, the information pack omitted any reference to the level crossing at Mucking. The crossing was not referred to during the project start-up meeting which examined each of the sites in detail.
- 80 Network Rail (Infrastructure Projects Southern Division) appointed a construction manager whose role was to monitor work quality and health and safety, undertake spot checks on some documents, raise concerns and report back to the Network Rail project team. His remit included sites on the power supply upgrade project and other projects in East Anglia. He last visited the Mucking site on 11 March 2019, and although the concrete pour was part of the planned work for this site, he had not been informed that this would take place on 13 March 2019. He did not visit the individual power supply upgrade project sites frequently, so Network Rail had little information about how site delivery traffic was being managed.
- 81 It is probable that reference to the level crossing in client documentation produced by Network Rail would have resulted in AmeyInabensa JV managing the hazard appropriately.
- 82 It is possible that the inadequate consideration of level crossing risk by Network Rail was a consequence of:
- the work being on railway infrastructure, but protected by a permanent fence and therefore assumed to have minimal impact on operational railway tracks;
 - the work was part of a Network Rail project so not subject to the controls applied by Network Rail’s asset protection processes applicable to non-railway organisations undertaking construction work close to railway infrastructure; and

⁶ IP Southern Pre-Construction Information Template Issue 8

- the new works were not on a highway and so construction activities, including use of the highway for access, were not covered by requirements of the New Roads and Streetworks Act 1991.

Previous incidents of a similar character

- 83 A near miss incident occurred on 4 July 2013 at Brooksby automatic half barrier crossing, near Melton Mowbray, Leicestershire. A contractor carrying out work near the railway had cordoned off one lane of the road and positioned stop-go boards on either side of the level crossing to control traffic using the other lane. The incident occurred when a lorry driver passed a board showing 'go' but then noticed the level crossing lights start the crossing closure sequence. Apparently unsure as to which signal to obey, the driver stopped on the crossing and needed to be instructed to move clear. A crossing barrier was damaged.
- 84 A near miss incident occurred at West Bank Hall automatic half barrier crossing on the Drax branch line near Carlton, North Yorkshire on 2 May 2019. Work was being carried out to relay the tarmac surface on the roadway on both sides of the level crossing without any special precautions relating to automatic operation of the crossing. A lorry delivering tarmac reversed onto the crossing as a freight train was approaching, and damaged a barrier which lowered onto the lorry after the level crossing closure sequence started. The train driver applied the emergency brake and was able to stop before the crossing.

Summary of conclusions

Immediate cause

85 The lorry was manoeuvring on the level crossing when a train was approaching (paragraph 45).

Causal factors

86 The causal factors were:

- a. The lorry driver drove onto, stopped and reversed on the level crossing (paragraph 48, **Learning point 1**).
- b. Site staff did not recognise the need to take account of the level crossing when managing the large road vehicle at the site entrance (paragraph 56, **Learning points 2 and 3**).

Underlying factors

87 The probable underlying factors were:

- a. AmeyInabensa JV's management of site activities was inadequate (paragraph 64, **Learning points 3 and 4**).
- b. Network Rail processes and oversight of construction activities did not recognise the risk presented by the level crossing (paragraph 76, action taken paragraph 90, **Learning points 3 and 4**).

Actions already taken that address a factor which otherwise would have resulted in a RAIB recommendation

Ameylnabensa JV

- 88 Ameylnabensa JV has reported that it has undertaken the following actions since the incident:
- a. the project's documents (paragraph 65) have been internally audited, amended and re-issued;
 - b. the project's organisation structure has been amended and re-issued to the client and project team, highlighting clear roles and responsibilities, including a review of site management levels;
 - c. the site delivery arrangements have been changed so that visiting drivers are informed of the traffic management plan in advance, and a designated 'meet and greet' location has been established for each site where the driver is briefed on how to access the site safely;
 - d. a new competence management system, combined with an identity card-based authority to work process has been introduced; and
 - e. measures to improve the organisation's safety culture have been taken, and this initiative has been acknowledged by a safety award from Network Rail.

Network Rail

- 89 Before the incident at Mucking level crossing, Network Rail had prepared an updated version of its standard NR/L2/OHS/0047 'Managing health and safety in construction'. This standard specifies the information to be provided in its pre-construction information packs. The update included adding hazards associated with working near level crossings to the list of possible safety hazards to be considered when preparing pre-construction information packs, in line with the existing guidance produced by Network Rail's Infrastructure Projects Southern Division (paragraph 78).
- 90 In May 2019, partly in response to the incident at Mucking, Network Rail issued a safety alert (reference NRA19-07) to relevant managers and contractors highlighting this incident and the need to consult railway operations staff where works or access to a construction site are within 200 metres of a level crossing. The alert also reminds people about the need to issue adequate information about the site, including site access/egress instructions, to all delivery drivers. A copy of the safety alert is included as Appendix B.

Learning points

91 Although actions taken by the parties involved mean that the RAIB has made no recommendations, the investigation has identified the following important learning points⁷:

- 1 Irrespective of any signals provided by banksmen or other people, drivers of road vehicles must always comply with all Highway Code requirements relating to the use of level crossings. All vehicle drivers must obey the flashing red stop lights (paragraph 86a).
- 2 Banksmen, traffic marshals, and others involved in the control of construction vehicle movements should ensure that any manoeuvres near level crossings do not interfere with the safe operation of the crossing. If there is a risk that vehicle movements could interfere with normal operation of a level crossing, guidance must be obtained from railway operational staff (paragraph 86b).
- 3 Construction site planning and briefings for road vehicle movements near level crossings must take account of hazards associated with manoeuvring vehicles close to level crossings (paragraphs 86b and 87).
- 4 Effective planning, management support and supervision is essential for all construction activity on or near the railway, including short duration works on isolated and/or small sites (paragraph 87).

⁷ '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.

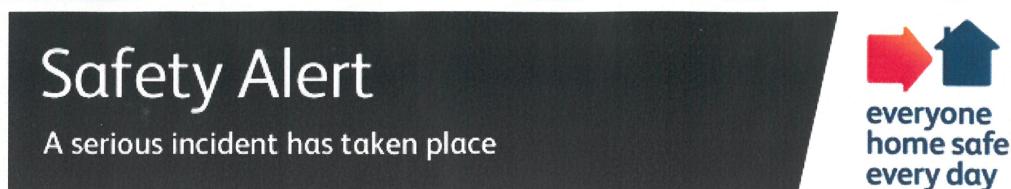
Appendices

Appendix A - Sources of evidence

The RAIB used the following sources of evidence in this investigation:

- information provided by witnesses;
- staff and personnel records;
- CCTV video evidence from a fixed camera at Mucking level crossing, cameras mounted on the front, sides and rear of the concrete delivery lorry, and a forward facing camera on the train;
- a sound recording from a microphone mounted on the concrete delivery lorry;
- level crossing data logger;
- on-train data recorder;
- Network Rail contract documents;
- AmeyInabensa JV project documents;
- Euromix Concrete driver instructions;
- Highway Code; and
- site visit.

Appendix B – Network Rail safety alert



Working safely near level crossings

Scope: All Network Rail line managers, safety professionals and RISQS registered contractors

Ref: NRA19-07

Date: 07/05/2019

Location: National



Overview

Recent incidents have highlighted the increased risk during work near to level crossings.

On 13 March 2019 a concrete lorry making a delivery to a construction site near to Mucking Automatic Half Barrier (AHB) level crossing in Essex was involved in a near miss with a passenger train. Site staff beckoned the lorry onto the crossing after the sequence started. It stopped on the crossing, trapped by the lowered barrier, before reversing into the construction site when construction staff manually lifted the barrier just before the train passed. RAIB are investigating the incident.

In February 2019 while installing red light cameras at Richborough AHB in Kent, site staff parked a vehicle close to the crossing, restricting the partially closed road across the level crossing. This risked road vehicles blocking back onto the crossing.

A further incident occurred on 2 May 2019 at West Bank Hall AHB level crossing in Yorkshire during road resurfacing. A tarmac lorry reversed onto the crossing and removed the downside barrier after the sequence started when a train approached. The freight train was able to stop just before the crossing.

Points to Consider

In each case, construction work close to the automatic level crossing did not properly consider the railway risk as trains approached.

- Are all contractors fully aware of the railway risks associated with the worksite?
- Are suitable traffic management plans put in place for deliveries to sites and work near automatic level crossings?
- Any outside party works near level crossings should be notified to Network Rail Asset Protection teams who will provide guidance to project teams.
- Where works are within 200m of a level crossing, or where access to a construction site is over a level crossing, Level Crossing Managers and Local Operations Managers should be consulted to validate that the proposed risk mitigation measures are adequate.
- Has adequate information about the site, including site access/egress instructions, been provided to all delivery drivers?

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