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Mr Andrew Hall
Deputy Chief Inspector of Rail Accidents
Cullen House
Berkshire Copse Rd
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Hampshire GU11 2HP

Dear Andrew,

**RAIB Report: Fatal accident at Bayles and Wylies footpath crossing,
Bestwood, Nottingham**

I write to provide an update¹ on the action taken in respect of recommendations 1, 2 & 4 addressed to ORR in the above report, published on 26 September 2013.

The annex to this letter provides details of the action taken. The overall status of recommendation 1 is '**Implemented**'. We do not propose to take any further action in respect of this recommendation unless we become aware that any of the information provided becomes inaccurate, in which case I will write to you again.

The overall status of recommendations 2 and 4 is '**Progressing**'. ORR will advise RAIB when further information is available regarding actions being taken to fully address these recommendations.

We will publish this response on the ORR website on 27 April 2016.

Yours sincerely,

Andrew Eyles

¹ In accordance with Regulation 12(2)(b) of the Railways (Accident Investigation and Reporting) Regulations 2005

Recommendation 1

The intent of this recommendation is that a review is carried out to determine the most effective means of warning persons who may be in the path of a tram.

Where not currently the case, tram operators should review whether it is practicable and appropriate for a series of short, urgent, danger warnings, or other audible warning, to be sounded when there is a person on or close to the line who does not appear to be responding to a tram's approach. The review should take account of the human factors implications such as the method of operating the warning. Instructions to drivers should be updated accordingly and briefed as necessary.

ORR decision

1. On 18 September 2014 ORR reported to RAIB that recommendation 1 had been implemented in respect of all tram operators with the exception of Blackpool Transport Services Ltd (BTS) and Nottingham Trams Limited (NTL), which were 'In progress';
2. ORR is content that both remaining operators have implemented this recommendation: BTS by implementing a software update and revising its driver's Tram Manual, and NTL by modifying its Incentro fleet.
3. ORR, in reviewing the information received from BTS and NTL, has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, all tram operators have:
 - taken the recommendation into consideration; and
 - taken action to implement it.

Overall Status: Implemented. This concludes the full implementation of this recommendation.

Blackpool Transport Services Ltd (BTS)

Previously reported to RAIB

4. On 18 September 2014 ORR reported to RAIB that BTS, although its drivers were already aware of the requirement to sound the tram bell and horn if a pedestrian is close to the crossing, had been in discussion with both Blackpool Council and Bombardier with a view to making technical modifications to its fleet in order to meet the requirements of this recommendation

Update

5. On 1 December 2014 BTS provided the following update:

Blackpool Transport Services Ltd has now completed a software update on Flexity tram 3. The software update allows for the horn to be recorded on the data recorder and allows for a shorter horn blast interval i.e. 1 second between blasts.

However as stated in its response dated 3rd December 2013 BTS trains their drivers to sound the bell if there are pedestrians close to the crossing. If the pedestrian has not shown any sign or acknowledgement of the tram's presence the driver will sound the horn. However drivers are trained to power off before either the bell or horn are sounded. Therefore the tram will either be coasting or braking.

A tram travelling at 50kph will cover approximately 45ft a second. For this reason its tram drivers are trained to drive in a defensive manner and to use the bell/horn once braking has started.

The Blackpool system is predominantly a line of sight tramway and has gates on the majority of its crossing. These gates are a physical barrier before anyone can enter the tramway. In addition the design of the gated access endeavours to make pedestrians face oncoming trams before they attempt to cross. Any crossings that do not have gates do have alternating pens or other arrangements to ensure that pedestrians look towards oncoming trams or are moved into a better position for the driver to see them.

All crossings have been individually risk assessed and are clearly signed. In addition tactile paving has been laid to assist pedestrians who may have visual impairments. These upgrades have been approved by ORR and comply with RSP2.

6. On 13 November 2015 BTS confirmed that it had revised and re-issued the drivers Tram Manual to include the following Hazard Defence Procedures:

Hazard Defence Procedure:

- *Slow Down*
- *Sound a warning signal(bell)*
- *Sound a warning signal(Horn)*
- *Constantly re-assess the hazard*

Be prepared to STOP.

7. BTS subsequently provided copies of its revised manual and its associated Hazard Awareness Skills assessment document.



Revise Tram Manual 2013 Hazard Awareness Skills

Status: Implemented.

Nottingham Trams Limited (NTL)

Previously reported to RAIB

8. On 18 September 2014 ORR reported to RAIB that NTL was at the time undertaking a Testing & Commissioning phase of the new Citadis tram fleet and, in parallel, was fitting Automatic Vehicle Location System (AVLS) and associated systems to the existing Incentro fleet, and that horn trials were continuing.

Update

9. On 19 December 2014 NTL provided the following update:

Nottingham Trams Limited's previous response advised that it was still trialling the intermittent "togglng" of the horn in emergency situations through to the end of 2014.

Nottingham Trams Limited has found that the number of true emergency situations at higher running speeds remains very low and so the amount of in-service experience is not helpful in deciding the issue.

Its operations management are also concerned that requiring intermittent sounding of the horn in these situations puts an additional burden on drivers at a critical time.

While drivers often repeatedly sound both the tram bell and horn as potentially hazardous situations develop it cannot be guaranteed in all eventualities.

Should this become an operating procedure, and an accident occur, failure to sound a warning in this way could lead to drivers shouldering responsibility in situations outside their control.

As a result Nottingham Trams Limited has now decided to revert to the solution of automatic, simultaneous sounding of the horn and bell in emergency situations.

As previously advised the Citadis tram fleet already has this function as standard.

The horn is under driver control and the bell is sounded intermittently whenever the driver's controller is in the emergency position.

Nottingham Trams Limited is looking at an engineering solution to provide the same facility on the Incentro tram fleet and estimates that this would take until the end of March 2015 to implement.

10. On 12 February 2016 NTL provided the following update:

The Nottingham Express Transit (NET) proposal is to modify the Incentro vehicles to provide the automatic sounding the warning bell when the DBC (the driver's controller) is in the emergency brake position allowing for the use of the horn as required by the driver.

This requires modification and additional equipment to the associated vehicle control circuits and the approval from the vehicle design authority.

Following design and engineering safety reviews the modification to the Incentro fleet of vehicles has been agreed and a test installation is underway.

Once proven a fleet modification programme will be drawn up and implemented.

Status: Implemented by alternative means.

Recommendation 2

The intent of this recommendation is to improve the safety of pedestrian crossings crossed by tramways on segregated lines and where trams run at relatively high speed.

Tram operators should review the marking of the boundary of pedestrian crossings crossed by segregated tramways where trams run at relatively high speeds. The review should assess the effectiveness of the means of demarcation in the following respects:

- indicating that a pedestrian is entering into a higher risk area; and
- prompting pedestrians to look for approaching trams.

Where appropriate, the review, which should also take account of the emerging findings of RSSB's research project T984, should include identification of proposals to improve the effectiveness of the means of demarcation. Improvements that are appropriate and practicable should be implemented.

ORR decision

11. On 18 September 2014 ORR reported to RAIB that recommendation 2 was 'In Progress', as all Tram operators were at the time still required to take account of the findings of RSSB's research project T984:

- Research Programme Operations and Management Research into the causes of pedestrian accidents at level crossings and potential solutions: Research findings and conclusions: Published: December 2013

- Research Programme Operations and Management Research into the causes of pedestrian accidents at level crossings and potential solutions and appendices: Published: July 2014

12. ORR notes that Tram Operators have reviewed RSSB project T984 and found that it is not entirely relevant to line of sight tramways in the urban environment. It is also important that pedestrian crossings are consistent across each of the tram network and with the highways environment in which they operate. Tramway operators have all reviewed their crossings in the light of T984 and some have made modest improvements.

13. ORR also notes that UK Tram is taking forward the development of guidance and standards in this area under one of their working groups.

14. ORR, in reviewing the information received from all Tram Operators, has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, they have

- taken the recommendation into consideration; and
- with the exception of Metrolink, have taken action to implement it.

Overall Status: Progressing. ORR will provide a further update to RAIB when the status individual elements of this recommendation change.

Blackpool Transport Services Ltd

Update

15. On 1 December 2014 BTS provided the following update:

The Blackpool system is predominantly a line of sight tramway and has gates on the majority of its crossing. These gates are a physical barrier before anyone can enter the tramway. In addition the design of the gated access endeavours to make pedestrians face oncoming trams before they attempt to cross. Any crossings that do not have gates do have alternating pens or other arrangements to ensure that pedestrians look towards oncoming trams or are moved into a better position for the driver to see them.

All crossings have been individually risk assessed and are clearly signed. In addition tactile paving has been laid to assist pedestrians who may have visual impairments. These upgrades have been approved by ORR and comply with RSP2.

16. On 23 November 2015 BTS provided the following update:

Having read RSSB T984 It is BTS's opinion that the pedestrian crossings along the Blackpool Tramway system meet the recommendation. As mentioned in early correspondence the pedestrian crossings along the Blackpool system were designed following consultation between Blackpool Council and Blackpool Transport, taking into account ORR recommendation and guidance.

Pedestrian crossings have been designed to take into account a number of facts:

- *The angle and direction that the user approaches the crossing*
- *To minimise crossing sign clutter*
- *To encourage the user to look in the direction of oncoming trams*
- *To enable the user to look in both directions*

There are a variety of styles of pedestrian crossings throughout the system. Some have gates that put a physical block before someone can enter the tramway system. Those that do not have gates have a sheep pen style which is designed to encourage pedestrians to look towards oncoming trams or moves them into a better position for the driver to see them.

All crossings are clearly signed as recommended in RSSB T984. However the signage is kept to a minimum to avoid confusion. All of the pedestrian crossings have tactile paving to accommodate visually impaired pedestrians.

In addition tram drivers have been trained to sound the bell if there are pedestrians close to the crossing and, If the pedestrian does not show any sign or acknowledgement, that they have seen the tram, the driver will sound the horn. Drivers are also trained to power off before either the bell or horn is sounded. Therefore the tram will either be coasting or braking.

Status: Implemented.

Metrolink RATP DEV UK

Update

17. On 27 November 2014 Metrolink provided the following update:

Prior to the publication of RSSB research project T984, Metrolink RATP Dev UK revisited all the risk assessments for segregated and public crossings on the Metrolink system and concluded that they were suitable and sufficient. In light of the publication of T984, each of the crossings will undergo a further review to ensure consistency of each demarcation and danger zones. This review will take into consideration the 4 conclusions in the RSSB research project and we will also liaise with other tramway operators and UK Tram to maintain a consistent standard for tramway crossings in providing an effective means of demarcation. It is expected that all work will be completed by the end February 2015.

18. On 11 December 2015 Metrolink Trams provided the following update:

Metrolink Trams will continue to work with UK Tram and other tramway operators in order to be consistent in its approach to providing an effective means of crossing demarcation.

UK Tram is now responsible for reviewing Railway Safety Publication 2 (RSP2), which is underway. On completion of the review, Metrolink Trams will consider any changes to the demarcation of pedestrian crossings and implement changes in conjunction with the guidance and other tram operators.

In the meantime, any further risk control measures identified in its operational risk assessments will be implemented.

19. ORR is currently awaiting further information from Metrolink as to whether the initial review referred to in Paragraph 20 above was completed in February 2015.

Status: Progressing. ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.

Tramlink Operations Limited

Update

20. On 9 December 2014 Tramlink Operations Limited provided the following update:

London Tramlink (LT) has carried out rigorous risk assessments of all its Non Motorised Users (MNU) Crossings. Where the assessments have indicated that improvements should be made (including demarcation of the crossing) it has initiated a risk based improvement programme which it is currently working through.

LT notes with interest that the RSSB report suggests marking the 'Danger Zone' on crossings with a yellow block. Whilst the report acknowledges that the safety benefit may only be 'comparatively small' LT is willing to trial the proposal.

LT has identified a suitable crossing to carry out the trial and is in discussions with crossing panel manufactures to understand what may be available. Initial discussions with its usual supplier have not been favourable; they have indicated that they cannot manufacture rubberised yellow crossings [where the colour is impregnated in the actual rubber rather than painted]. In the past they have tested the production of such panels but after manufacturing they have become discoloured. They are however trialling two other initiatives, one a yellow tape applied to the panel and the other a polymer spray- they will not have the results of the trial until spring next year. Durability and slip resistance will of course be significant issues here.

LT had contacted two other manufacturers and was awaiting a response.

21. On 30 November 2015 London Tramlink provided the following update:

London Tramlink is coming towards the end of a substantial period of crossing improvements across the network. Improvements have included white line demarcation, look both way signage (eye level and ground

level) and tactile strips before each crossing. In its last letter LT indicated that if it could find a manufacturer that could produce yellow crossing panels (colour impregnated in the rubber) it would trial them at a crossing. LT has spoken to the following companies; Rose Hill Rail, Strail and Vortok Rail - none of whom manufacture this type of panel. It has also spoken to members of the Light Rail Engineering Group (LREG) who again were unable to help.

LT visited Crawley level crossing where one of the infill manufacturers were carrying out a trial using yellow tape and a polymer spray. From general observation LT's engineers did not think that the yellow markings were very durable so we have not pursued this option further.

With the above in mind LT is not in a position to carry out a trial and is therefore of the view that it cannot do anymore with regards this recommendation.

Status: Implemented

National Express Midland Metro (NXMM)

Update

22. On 4 December 2014 NXMM provided the following update:

In respect of consideration of the findings of RSSB Research Project T984, NXMM has reviewed the document and the conclusions drawn from the study.

The tramway pedestrian crossings installed on the NXMM are compliant with the requirements of RSP2, Guidance on Tramways. A review of these crossings was carried out in November 2013 in response to the above report and where specific improvements were identified, these were implemented during the first half of this year. NXMM is satisfied that all aspects of its crossing infrastructure is compliant with the original design and with RSP2 and the ORR Tramway Technical Guidance Note 2 on Pedestrian Safety, and specifically, that the barriers installed overlap to such an extent that they provide an effective means of demarcation of the crossing boundary (Ref: RAIB report paragraph 66).

In reviewing the RSSB research project, NXMM has also considered the scope of the UKTram Working Group 3a, currently reviewing the UKTram guidance on pedestrian crossings on tramways, and believe that this is far more relevant to the particular context of NXMM.

The RSSB report considers pedestrian crossings in the context of mainline rail, with its much increased speeds, signalled operations, multi operator tracks and a non standardised crossing infrastructure, whereas Working Group 3a defines its terms of reference as to:

- *review and document as case studies the approaches adopted on UK Tramways to design and manage [pedestrian] crossings,*

- *review and make recommendations for changes to relevant sections of RSP2,*
- *review and recommend changes to the existing UKTram guidance on pedestrian crossings*
- *evaluate current highway guidance for application to off street tramways, including the use of Road Safety Audits,*
- *review current practice on UK Tramways in the assessment of crossing risk on street, off street at tramstops, off street remote from tramstops, and*
- *produce guidance on the application of risk assessment at [pedestrian] crossings.*

The guidance on the UKTram website is currently under review by this working group.

NXMM participates in the activities of this group and will implement such measures as the guidance ultimately specifies so as to achieve industry best practice. As such it believes that this closes off the outstanding action against the recommendation.

Status: Implemented.

Stagecoach Supertram Ltd

Update

23. On 23 December 2014 Stagecoach Supertram provided the following update:

In respect to the recommendation Stagecoach Supertram has reviewed the findings of the RSSB research project T984 and in conjunction without risk assessments has concluded that it will be marking the “Danger Zone” through the use of coloured and textured surfaces. It has reviewed its existing control measures and has concluded that they are suitable and sufficient at this time. These controls have recently been enhanced in reaction to the original recommendations regarding the positions of fencing and lighting at identified pedestrian crossing. In conclusion in reference to the July 2014 recommendations of a single block of yellow crossing this is not a reasonably practicable control for Supertram when considering the risk profiles of its individual pedestrian crossing.

Status: Implemented.

Nottingham Trams Limited

Update

24. On 19 December 2014 NTL provided the following update:

Nottingham Trams Limited has reviewed the recommendations from the RSSB research into the causes of pedestrian accidents at level crossings – T984. The favoured solution in T984 is to provide yellow walk-boards on NMU crossings and, if carried across to tramways, would apply where trams “run at relatively high speeds”. On the current Nottingham tram network is where the alignment with Network Rail’s Robin Hood Line is shared and NTL has discussed these recommendations with them.

Following the closure of the Bayles and Wylies foot crossing Network Rail provide the control for all the remaining crossings through its signalling control centre. All crossings utilise higher levels of control than those described in the RSSB research paper. This is by telephone at Basford Chemical Works UWC, and by Miniature Warning Lights and barriers at the Hucknall crossings. Yellow demarcation is not being considered by Network Rail. It is not currently the intention of Network Rail to change the control methods at these crossings and, further to this, it is actively managing their closure where practical. NTL is assisting in this where appropriate.

Status: Implemented.

Recommendation 4

The intent of this recommendation is for Network Rail and tram operators to issue guidance to their staff and contractors on the best way to illuminate pedestrian crossings while minimising any visual impairment of pedestrians when looking out for approaching trains/trams.

Network Rail and tram operators should provide guidance to their staff or other third party on the best means to illuminate pedestrian crossings, when necessary, taking into account the following factors:

- Sufficient illumination of the crossing surface to enable pedestrians to see it;
- The possible impact on the visual capabilities of pedestrians using the crossing, in particular with respect to glare affecting their ability to detect approaching trains/trams; and
- Relevant findings from RSSB research project T984.

ORR decision

25. On 18 September 2014 ORR reported to RAIB that all Tram Operators were ‘In Progress’ with the exception of Network Rail (‘Implementation ongoing’), Blackpool Transport Services Ltd (‘Implemented’) and (National Express Midland Metro (not applicable).

26. The recommendation requires guidance to be issued to tram operator staff on the best means to illuminate pedestrian crossings. Whilst Network Rail has confirmed that it will produce guidance for use by its staff, UK Tram confirmed on 16 March 2016 that its working group WG3a is reforming after reviewing all tramway pedestrian crossings and will produce overarching

guidance for the industry on pedestrian crossings (including lighting standards) which all Tram Operators will be able to use.

27. ORR, in reviewing the information received from Network Rail, Tram Operators and UK Tram, has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005:

- the recommendation is being taken into consideration; and
- action is being taken to deliver it, although no timebound plan has yet been provided by UK Tram to deliver the tram industry guidance.

Overall Status: Progressing. ORR will provide a further update to RAIB when the status of this recommendation changes.

Network Rail

Previously reported to RAIB

28. On 18 September 2014 ORR reported to RAIB that Network Rail had engaged specialist consultants to prepare a proposal which would address the requirements of this recommendation.

Update

29. On 5 June 2015 Network Rail provided the following update:

In order to address RAIB recommendation 4 from the investigation into the Bayles & Wylies accident, specialist optical consultants were engaged to undertake research into the best means to illuminate pedestrian level crossings. This includes developing guidance for use by Network Rail staff in determining the best means of providing lighting at pedestrian level crossings. It might also result in updates or inclusions to RSSB's Level Crossing Risk Management Toolkit (LXRMTK).

The programme of research work consists of the following stages:

- *providing guidance on obtaining sufficient illumination of the crossing surface to enable pedestrians to see it*
- *assessing the possible impact on the visual capabilities of pedestrians using a crossing, in particular with respect to glare affecting their ability to detect approaching trains/trams*
- *developing a 'Guidance Document' / 'Toolkit Element' (for LXRMTK) comprising best practice for effective lighting at Level Crossings (this includes review and analysis of the applicable findings of the RSSB T984 research project report)*

The research is progressing to the agreed timescale and is due to be completed by the end of June 2015.

This extension [to 30 September 2015] is requested so that the guidance for determining the best means of providing lighting at pedestrian level crossings can be briefed to Level Crossing Managers (LCMs) and the

wider level crossing community. This will enable the guidance to be embedded within the organisation.

30. On 15 December 2015 Network Rail provided the following notification of an extension to the September 2015 completion date:

This recommendation requires Network Rail to produce guidance on the best means to illuminate pedestrian crossings.

Optical Specialists 'OptiConsulting' were commissioned to carry out this work. It should be noted that OptiConsulting have also conducted the research to address Beech Hill RAIB recommendation 2 which was given a higher priority.

A draft report has been produced as well as briefing material covering the most salient points and a method of incorporating key elements within the LXRMTK.

This extension is requested to give the Central Level Crossings Team time to:

- review the content of the latest Report*
- brief the key learning points out to the LCM Community*
- incorporate the key learning points into the LXRMTK*

I have also attached a copy of the latest draft Report together with a document summarising the key points from the draft report and a document outlining a suggested way for the recommendations from the report to be implemented in the LXRMTK etc.

Therefore on this basis an extension is requested until 29 February 2016.

Status: Implementation ongoing. ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.