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27 January 2014

Ms Carolyn Griffiths
Chief Inspector of Rail Accidents
Rail Accident Investigation Branch
Block A, 2nd Floor
Dukes Court
Dukes Street
Woking GU21 5BH

Dear Carolyn,

RAIB report: Pedestrian struck by a tram at Sandilands tram stop

I write to report¹ on the consideration given and action taken in respect of the recommendations addressed to ORR in the above report, published on 14 February 2013.

The annex to this letter provides details of the consideration given/action taken in respect recommendations 1 to 5. All 5 recommendations have been implemented.

We do not expect to take any further action in respect of these recommendations unless we become aware of an inaccuracy in which case we will write to you again

We expect to publish this response on the ORR website on 12 February 2014.

Yours Sincerely

Chris O'Doherty

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

Initial consideration by ORR

1. All 5 recommendations were addressed to ORR when the report was published on 14 February 2013.
2. After considering the recommendations, ORR passed recommendations 1, 2, 4 and 5 to London Tramlink and recommendations 1 and 4 to Tram Operations Limited asking them to consider, and where appropriate, act upon them and advise ORR of its conclusions. Recommendation 3 was directed to ORR. The consideration given to each recommendation is included below.

Recommendation 1

The intent of this recommendation is for London Tramlink to improve its approach to foot crossing risk assessment in order that it can clearly identify those locations where risk is highest and also identify the factors that need to be considered to reduce risk. The revised approach should consider, but not necessarily be limited to, all of the factors identified in the 2011 risk assessment and be extended to all foot crossings on the system.

London Tramlink, in conjunction with Tram Operations Ltd, should continue to develop its process for periodically assessing risk at all foot crossings, taking into account the findings from this report in relation to factors that could affect all aspects of the safety of crossing users. The process should include the requirement to use the findings from the periodic risk assessments to identify those crossings where there are reasonably practicable measures that can be taken to reduce the risk and to produce and update a prioritised programme for safety improvements. The process should include a reference to a range of possible safety improvement measures, which should take account of good practice from elsewhere in the rail and tram industry and good practice in highway design.

Steps taken, or being taken, to address the recommendation

3. In its response of 25 March 2013, **London Tramlink** provided the following information:

The process for managing risk at foot crossings shall be reviewed and updated to ensure that it includes the following principles:

- *Since tramways are designed in accordance with Highway principles following an internal review (Maintainer/Operator) we agreed that assessing the crossings in line with highway principles would be appropriate. All B and C categorised crossings shall therefore have a Road Safety Assessment undertaken on them. **To be completed end of August 2013.** For clarification:*
 - *Category B crossings are off street crossings associated with tram stops i.e. where the tram stop is the sole destination*
 - *Category C crossings are off street crossings remote from tram stops or at tram stops where the tram stop is not the ultimate destination*
- *Assessment and intervention shall be prioritised on the basis of likelihood of an incident occurring, that is the prioritisation list shall be developed by mathematically calculating the underlying opportunity for NMUs and trams to*

*be in conflict with one another at each crossing. The resulting list will then be sense checked against past incident records. **To be completed end of April 2013.***

- *A proforma for undertaking the Road Safety Assessment will be internally agreed (Operator/Maintainer) which will consider previous incidents and tramway specific design requirements as outlined in RSP2. The incident data will not only include accidents but also near misses and reported hazard braking events. **To be completed end of May 2013.***
- *An operator/maintainer joint review of the completed assessment will be undertaken to determine whether circumstances, particularly NMU behaviour makes the assessment response unacceptable, each assessment will therefore have a recommendation sheet on whether physical or operator intervention is required and why i.e. response by the duty holders. **To be completed end of September 2013.***
- *Trigger levels for the future review of these completed assessments will be set. Such triggers will include change of use and incidents. **To be completed end of May 2013.***
- *Periodic Visual Inspections shall be undertaken to ensure that the controls and mitigation identified in inputs into the Road Safety Assessments have not changed. A proforma shall be developed to record this and the requirement for the inspections shall be put into our Asset Management system to ensure they are not missed. **To be completed end of April 2013.***

4. In its response of 25 March 2013, **Tram Operations Ltd (TOL)** provided the following information:

TOL fully endorses London Tramlink's proposed approach to the development of foot crossing risk assessments.

Crossings will be ranked in priority order according to potential collision exposure risk. The exposure risk (for non-motorised users) will be identified on the basis of 'crossing user' and 'tram timetable' data. The outcome of this analysis will be sense checked against past incident data (including hazard braking and near miss).

Factors that need to be considered to reduce hazards at each crossing will then be identified using a Road Safety Assessment.

Safety Improvement measures will take account of good practice, notably with reference to ORR's 'Guidance for Tramways' 9RSP2) & 'Tramway Technical Guidance Note 002' (Pedestrian Safety) and UK Tram's 'Segregated Tramway Crossings Guidance'.

Account will also be taken of good practice in highway design.

Good practice elsewhere in the rail industry may be appropriate for line of sight systems; however the general basis will be that, as stated in the 'Segregated Tramways Crossings Guidance' '...tramway intersections with roads, footpaths, footways, bridleways etc. should be designed in accordance with highway engineering principles'.

Referring to UK Tram definitions, London Tramlink's programme will deal with 'Off Street crossings associated with tram stops (i.e. where the tram stop is the sole

destination)' (Category B) and with 'Off Street crossings remote from tram stops or at tram stops where the tram stop is not the ultimate destination' (Category C).

On street crossings or crossings associated with highways' (Category A) are 'by definition located on the public highway and are generally governed by the requirements for all road users as set out in highway standards' (Segregated Tramway Crossings Guidance).

TOL fully endorses London Tramlink's programme for consideration of safety improvements and will fully assist in the process.

ORR met with and Tram Operations Ltd on 9 October 2013 and confirmed that the changes to the risk assessment methodology have been completed and that the assessment work based on the new criteria has also now been completed. Actions have been brought forward from the assessments and are being tracked via a specific crossings action plan.

ORR decision

5. ORR, in reviewing the responses provided by London Tramlink and Tram Operations Ltd, has concluded that in accordance with the Railway (Accident Investigation and Reporting) Regulations 2005, they have:

- taken the recommendation into consideration; and
- taken action to implement it

Status: *Implemented*

Recommendation 2

The intent of this recommendation is for London Tramlink to consider the need for removing the obstruction to pedestrians' view of approaching trams at Sandilands tram stop, to identify and take action as appropriate to deal with similar obstructions at other tram stops and to implement a process to prevent the installation of equipment in locations which are detrimental to pedestrian safety in the future.

London Tramlink should:

- a. taking into account the improvements made to the configuration of the approach to the foot crossing at the west end of Sandilands, consider whether further action is desirable to improve pedestrians' view of approaching trams as they walk from the bus stop towards the entrance to the west end of Sandilands tram stop, and implement any changes that they deem to be reasonably practicable;
- b. conduct a review of the approaches to all other foot crossings on the system from all credible directions to determine whether similar obstructions exist elsewhere, and if so, whether they can be removed; and
- c. embed within its processes for new works in and around the tramway the requirement to consider pedestrian sight lines from all credible approaches to the crossing before approving the positioning of equipment and other infrastructure.

Actions taken or being taken to address the recommendation

6. In its response of 25 March 2013, London Tramlink provided the following information:

- a. *A stage 3 Road Safety Audit will be undertaken on the changes that have been implemented at Sandilands and a Cost Benefit Analysis will be undertaken on moving the cabinets at Sandilands. **To be completed end of June 2013.***
- b. *Any changes that are proposed within the Road Safety Assessments (refer to response to recommendation 1) will go through our change process. A cost benefit analysis will be undertaken on any risk reduction recommendations.*
- c. *The modifications panel procedures shall be reviewed and other relevant documentation to ensure that designs that may affect issues such as sight lines are fully considered before the approval and the positioning of any equipment or infrastructure. **To be completed end of June 2013.***

7. ORR has examined the independent road safety audit that has been conducted at Sandilands and the assessment of the costs and benefits of moving the cabinets at Sandilands. London Tramlink have concluded that the current arrangements at the stop reduce risks as low as is reasonably practicable against the norms of highway design. The assessment they have conducted shows that there are considerable costs and high system risks in relocating the cabinets.

8. London Tramlink has updated its Modifications Panel arrangements this includes the template document for submissions to the 'Mods Panel' which now has a specific section that relates to crossings. London Tramlink have also developed a standard by which crossings are assessed and it is this document that specifically references considering sight lines from all credible approaches (this document has been supplied to ORR along with the amended modifications panel documents).

ORR decision

9. ORR in reviewing the responses provided by London Tramlink Ltd has concluded that in accordance with the Railway (Accident Investigation and Reporting) Regulations 2005, they have:

- taken the recommendation into consideration; and
- taken action to implement it.

Status: Implemented

Recommendation 3

The intent of this recommendation is for ORR to re-evaluate its guidance to tram operators on optimising sight lines for pedestrians and tram drivers in the vicinity of foot crossings, physically guiding pedestrians as they approach foot crossings so that they are encouraged to look for approaching trams and the need or otherwise for recesses under tram stop platform and paving up to rail level through tram stops. The guidance should be amended in accordance with ORR's findings.

ORR should re-evaluate and revise its guidance to tramway operators on:

- a. the need for operators to take into account pedestrian and tram driver sight lines from all credible approaches to foot crossings when planning new works on tramways;
- b the optimum angle of approach for pedestrians at crossings over the tramway; and
- c. the need for a recess under tram stop platforms and the desirability of paving up to rail level between the platform-side rail and the platform face.

Pending the re-issuing of guidance, ORR should consider how modified advice should be provided to tram operators.

Steps taken, or being taken, to address the recommendation

10. ORR has reviewed the text in the current version of RSP2 and, after consideration, believes that the text as written is sufficiently clear and already says what RAIB recommend. The document currently states “Careful consideration should be given to both visibility of pedestrians by tram drivers and visibility of approaching trams by pedestrians.”

11. ORR has reviewed the text in the current version of RSP2 and, after consideration, believes that the text as written is sufficiently clear and already says what RAIB recommend. The document currently states “Fencing or pedestrian guard rails should be provided where necessary, to guide pedestrians to face oncoming trams before they cross the track, or to direct their attention to pedestrian crossing lights.”

12. ORR’s inspectors have considered part c of the RAIB recommendation and believe that the technical feasibility of providing a recess beneath tram stop platforms is unlikely to be achievable at platforms used by low floor tram vehicles. As an example, the vehicles in Croydon have a door sill height of 350mm above rail head level. Platform surface levels need to be as close to this as possible to meet RVAR requirements. A recess would need to be at least 430mm deep [taken as the 95%ile male Shoulder breadth (biacromial) measurement in BS PP7317] to be a place that a person could be pushed into without injury. To then have a platform slab of sufficient strength to span 430mm without deflection from passenger load above would require a substantial slab depth. The minimal chest depth for a 95%ile male is 285mm, so this would allow only 65mm for a platform slab to produce a 350mm platform surface level. This is unlikely to be achievable as most pre-cast coping slabs are of 95mm to 100mm depth.

ORR decision

13. ORR has re-evaluated its guidance and found it to be sufficient in respect of points a) and b) of the recommendation. In respect of point c) ORR has considered the issue of the need for a recess under the tram stop platforms and has concluded that providing a recess is not achievable and will not therefore be including this in its guidance.

Status: Implemented

Recommendation 4

The intent of this recommendation is for London Tramlink and Tram Operations Ltd to conduct joint investigations into defined accidents and incidents on the Croydon tram network so that infrastructure issues as well as those associated with tram operations are identified.

London Tramlink and Tram Operations Ltd should jointly review and amend their procedures and/or practices for investigating accidents and incidents on the Croydon tram system so that joint investigations are always carried out if there is any possibility that the infrastructure might have contributed to the circumstances of the accident. Joint investigations should be mandatory for all significant incidents involving pedestrians being struck by trams.

Steps taken, or being taken, to address the recommendation

14. In its response of 25 March 2013, London Tramlink provided the following information:

The London Tramlink/Tram Operations Ltd procedures have been reviewed to ensure that they align. The 48 hr. incident report has been amended to ensure that the whole of the investigation team is recorded rather than just the lead and to identify whether a local or formal investigation is required.

15. In its response of 25 March 2013, **Tram Operations Limited** provided the following information:

TOL has reviewed and revised its safety investigation procedures to confirm that joint investigations with London Tramlink are required for any incident where there may be infrastructure as well as operational issues.

In order to formalise the process London Tramlink's '48 hour' incident notification reports (sent by TOL) will specify whether a formal investigation is required and state the recommended parties to take part in the investigation, thereby identifying incidents relating to (or potentially relating to) infrastructure issues (rather than, as present, identifying only the lead investigator). Joint investigations will be mandatory for all significant incidents involving collisions with pedestrians.

ORR Decision

16. ORR, in reviewing the responses provided by London Tramlink Ltd and Tram Operations Ltd, has concluded that in accordance with the Railway (Accident Investigation and Reporting) Regulations 2005, they have:

- taken the recommendation into consideration; and
- taken action to implement it.

Status: Implemented

Recommendation 5

The intent of this recommendation is for London Tramlink to take measures that will secure a high quality of safety decision-making within the organisation.

London Tramlink should conduct a review of its arrangements for taking and prioritising safety decisions and take any necessary steps to secure for the organisation sufficient competence in safety and risk management techniques so that key personnel have a clear understanding of the factors that affect risk, the constituent elements of a competent risk assessment and how to use the results to prioritise actions.

Actions taken, or being taken, to address the recommendation

17. In its response of 25 March 2013, **London Tramlink** provided the following information:

*London Tramlink shall review its Change Management Process and the interface between the responsibilities of the Health and Safety Executive, the Modifications Panel and the internal Period End Review Meeting to ensure that there is no conflict or gaps in the decision making processes. In undertaking this review, we will ensure that we take into consideration the recommendations as set out in the RSSB publication 'Taking Safety Decisions' and HSE 'Making Difficult Decisions' **To be completed end of June 2013.***

A permanent Health and Safety Manager has been confirmed which provides continuity to the support and relationships that currently exist.

18. ORR discussed this recommendation with the London Tramlink Safety Manager and the Tram Operations Limited Safety Manager at a meeting on 9 October 2013. London Tramlink has reviewed its change arrangements and has included where necessary the relevant Stakeholders in that review (i.e. Tram Operations Limited).

19. We also consider that the current London Tramlink Safety Manager is more experienced and has what RAIB called for in their text "a clear understanding of the factors that affect risk, the constituent elements of a competent risk assessment and how to use the results to prioritise actions."

ORR decision

20. ORR, in reviewing the responses provided by London Tramlink Ltd, has concluded that in accordance with the Railway (Accident Investigation and Reporting) Regulations 2005, they have:

- taken the recommendation into consideration; and
- taken action to implement it.

Status: *Implemented*