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Mr Andrew Hall
Deputy Chief Inspector of Rail Accidents
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Dear Andrew,

RAIB Report: Runaway of a road rail vehicle and the resulting collision in Queen Street High Level Tunnel, Glasgow

I write to report¹ on the consideration given and action taken in respect of recommendations 1, 2, 3 and 4 addressed to ORR in the above report, published on 17 July 2014.

Annex A to this letter provides details of the consideration given/action taken in respect of this recommendation. The status of recommendation 1 is '**Implemented by alternative means**' and the status of recommendations 2 and 3 is '**Implemented**'. We do not propose to take any further action in respect of these recommendations unless we become aware that any of the information provided becomes inaccurate, in which case I will write to you again.

The status of recommendation 4 is '**In progress**'. ORR will advise RAIB when further information is available regarding actions being taken to address this recommendation.

We will publish this response on the ORR website on 17 July 2015.

Yours sincerely,

Andrew Eyles

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

Recommendation 1

The intention of this recommendation is to ensure that Rexquote adopts a formalised approach to managing the quality of equipment that it manufactures or converts.

Rexquote should implement a quality assurance process commensurate with good practice in engineering safety management.

Development of the process should include, but not be limited to, consideration of the following measures:

- undertaking peer review or checking of design assumptions and design calculations;
- ensuring that the intended design performance of equipment is used as the basis for assessing the results of design validation testing;
- ensuring that maintenance procedures and the associated tests are consistent with the intended design performance of equipment;
- ensuring that the design of safety related systems, such as brakes, and of any associated maintenance processes, takes account of foreseeable degradation mechanisms, such as brake pad wear, the need for adjustments and environmental conditions; and
- formal certification by an external body.

Steps taken or being taken to address the recommendation

1. Rexquote has reconsidered its processes in the light of the incident and described the main features to ORR. In particular, it now engages the Notified Body (NOBO) for Mobile Elevating Work Platforms (MEWPS) at the design stage for conversion from road to road/rail function.
2. Rexquote provided the following information on 16 September 2014:

Rexquote review calculations within the design team, detailed FMEAs [Failure Mode and Effects Analysis] are carried out as part of our design process and our test regimes are more robust with expected outcomes communicated.

Subsequent to this incident Rexquote now specify minimum brake test figures which include an allowance for degradation between service / test intervals rather than giving the minimum required 'pass' figure. The amount of service and repair detail contained within Rexquote's manuals has increased and is now reviewed and scrutinised more thoroughly.

It has always been the case that every machine is certificated by an external VAB [Vehicle Acceptance Body].

3. On 4 November 2014 ORR wrote to Rexquote for an overview of its quality system and an explanation of its arrangements for conformity assessment and supply of an EC declaration of conformity in compliance with the Supply of Machinery (Safety) Regulations 2008 and European Standard BS EN 15746: 210 parts 1 and 2. Rexquote provide the following information on 7 January 2015:

Rexquote has for many years documented the specifications of machines as Rexquote build them, Rexquote keeps records of calculations and cross checking of same and very often the VAB check a selection of those calculations as part of the acceptance process. Rexquote has design specifications and revision notes kept as part of the design process in its records. Rexquote's checking and test procedures focus on performance testing as well as safety critical and operational control aspects.

As for roles and responsibilities, Rexquote has an Engineering Director, two mechanical design engineers and one electrical design engineer. The Engineering Director designs hydraulic systems and has responsibility for oversight of the electrical control system and mechanical design. With a limited team of qualified personnel it is not practical to revisit and cross check every design calculation and Rexquote relies on our testing regimes to ensure standards are met.

Products are built to specified engineering drawings for mechanical, electrical and hydraulic disciplines and tested to functionality procedures and performance levels specified in RIS1530PLT [Rail Industry Standard for Engineering Acceptance of On-Track Plant and Associated Equipment].

Each machine is subject to Failure mode and effects analysis (FMEA) as part of RIS1530PLT approval and as part of compliance with Supply of Machinery Regulations.

BS EN 15746 is very similar to RIS1530PLT with RIS1530PLT generally being more onerous. Rexquote use an external Notified Body to verify and certificate MEWPs for compliance with EN280 [Mobile elevating work platforms. Design calculations, Stability criteria, Construction, Safety, Examinations and tests] and has done so since the standard was in provisional format when first issued.

4. In response to further enquiries from ORR on 23 March 2015 about the potential use of a new test rig for parking-brake testing, Rexquote provided the following additional advice on 20 April 2015 as follows:

A revised bulletin was issued in June 2013 (RQB0038 i2).



This bulletin appears to have been understood well enough by personnel involved in adjusting and maintaining the brakes post incident as all the fleet

were checked, adjusted, tested to increased (above necessary minimum) pull figure and only a small number were found to need repairing or replacing in order to achieve the necessary performance. This design brake has now been removed and superseded on all the Z60 RR MEWPS with the advent of the NR requirement for 4 wheel brakes so the service instructions are no longer applicable.

The machine when supplied would have been issued with a manual stating periodicity of all checks as per the manual RQM20079.



Because Rexquote changes the use of machinery converted for use on rail, it has issued declarations of conformity for all machines it builds since the machinery directive came into force.

ORR Decision

5. ORR's is satisfied that Rexquote reviewed the circumstances of the accident carefully in advance of the RAIB report being published. Rexquote had already made a decision and actioned it, to involve the NoBo at the beginning of the design stage to convert lifting plant to road/rail use. This enables the NoBo to offer expert opinion on the modifications proposed.

6. Additionally, ORR has spoken to Interfleet Technology, the current VAB. Their engineer confirmed their arrangements as the VAB, which involves scrutiny of the technical file and an element of internal audit, including design. They might, for example ask for calculations associated with welded components.

7. Whilst Rexquote has not implemented a recognised quality assurance process as directed by the recommendation, we have explored the procedures that they have in place to ensure safety quality of design and production. We believe that the information supplied by them does include the main elements that we would wish to see and therefore consider that they have done what is reasonably practicable to comply with the intention of the recommendation. The implementation of Network Rail's revised OTP Converters and Manufacturers Audit Plan and protocol (see Recommendation 2) which has already assessed Rexquote's performance also enables this recommendation to be shown as implemented.

8. After reviewing information received ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Rexquote has:

- taken the recommendation into consideration and
- has taken action to implement it by other means.

Status: Implemented by alternative means.

Recommendation 2

The intention of this recommendation is to extend an existing RAIB recommendation relating to adequate quality assurance processes so that it covers all suppliers of rail plant used on Network Rail infrastructure, not only those who supply directly to Network Rail.

Network Rail should extend its process for auditing the engineering management system of rail plant suppliers (linked to Bradford Interchange Recommendation 4) so that it includes auditing the engineering safety management processes of all organisations manufacturing and/or converting rail plant likely to be used on Network Rail infrastructure.

Steps taken or being taken to address the recommendation

9. Following a meeting between ORR and Network Rail on 8 April 2015 Network Rail provided a further update on 28 April 2015 which confirmed that:

- *Network Rail has compiled a new audit protocol which has been reviewed by industry (M&EE) and published;*
- *The 2015 audit plan to deliver this recommendation is in place (copy attached at Annex C); and*
- *noting that Rexquote were the first organisation to be audited under the new arrangements (March 2015)*

ORR Decision

10. ORR notes that Network Rail has compiled an appropriate audit protocol which has been reviewed by the industry and published. A rolling programme of audit has also been developed. When implemented this will ensure that all organisations manufacturing and/or converting rail plant likely to be used on Network Rail infrastructure are audited over the next two years. As a priority, the audit of Rexquote has already been concluded.

11. After reviewing information received ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

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

Status: Implemented

Recommendation 3

The intention of this recommendation is to prevent RRVs running away with no lighting illuminated.

Network Rail, in conjunction with RSSB, should review the requirements for RRV lighting in standard RIS-1530-PLT, with the objective of reducing the risk of RRVs running away without active lights. This should include consideration of:

- requiring rail mode lighting to be activated when rail wheels start to be deployed (when on-tracking is taking place); and
- requiring all illuminated lights to remain lit on activation of engine stop or emergency stop controls.

Steps taken or being taken to address the recommendation

12. Following a meeting between ORR and Network Rail on 8th April Network Rail provided the following update on 28 April 2015:

A sub-group of the RSSB Plant Standards Committee undertook a 'HAZID' workshop to determine whether the activation of lights would be considered as a secondary warning system in the event of a RRV runaway. The group concluded that it was not practical to activate lighting in the event of the RRV running away. The group agreed that it was better to prevent the RRV running away in the first place. It was also agreed that guidance would be added to RIS-1530-PLT for the rail lighting to be activated and maintained from the start of the on-tracking process.

The above proposal was subsequently presented to the RSSB Plant Standards Committee in February 2015. The Committee supported the findings of the RRV HAZID workshop.

13. Network Rail is expecting to submit a formal closure statement by 31 Jan 2016

ORR Decision

14. ORR notes that Network Rail has taken steps to implement the recommendation and that a revised version of RIS-1530-PLT, which will address the two key considerations raised in the recommendation by requiring rail lighting to remain on at all times during the on-tracking process, has been circulated for consultation. It is planned to publish the revised RIS-1530-PLT by 31 January 2016.

15. After reviewing information received ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration but
- has taken action to implement it.

Status: Implemented.

Recommendation 4

The intention of this recommendation is to reduce the likelihood of RRV parking brakes being inadequate by improving the quality of RRV parking brake tests.

Network Rail, in conjunction with the M&EE Networking Group, should review and improve the requirements and guidance for testing of RRV parking brakes so that such tests reliably demonstrate that the brake will be effective in all foreseeable operating conditions. The review should include, but not be limited to, consideration of:

- demonstrating sufficient safety margins (including any related to uncertainties in the testing method);
- allowing for foreseeable degradation, such as brake pad wear;
- allowing for varying environmental conditions, including variations in contamination at the brake/wheel interface;
- ensuring that test methods used are repeatable and consistent; and
- testing to be carried out by RRV suppliers, users and maintainers.

Steps taken or being taken to address the recommendation

16. Following a meeting between ORR and Network Rail on 8 April 2015 provided a further update on 28 April 2015 providing:

Network Rail and the M&EE Networking Group have reviewed the industry standard Pull Test; significant inadequacies were found. The working group have developed and successfully trialled an improved test method; park brake holding torque is measured on each wheel individually.

COP0025 states that the supplier is responsible for selecting factors of safety sufficient to mitigate against foreseeable degraded modes and pad wear. In support of this, Network Rail Technical Services have undertaken tests to quantify the performance decrease associated to brake pad wear on the higher risk brake systems. Outputs of this testing have been used to critically review all Direct Rail Wheel Braking (DRWB) test regimes current at time of writing. Pre-use inspections are also critically reviewed. This report was distributed to relevant suppliers on 30/01/15 such that test regimes and pre-use inspections can be improved.

17. Network Rail to expecting to submit a formal closure statement by 1 August 2015

ORR Decision

18. An ORR inspector met with Network Rail on 8 April 2015 to discuss plans for addressing this recommendation. Whilst ORR is satisfied that the requirements and guidance for the testing of RRV parking brakes have been appropriately reviewed and that steps are being taken to improve them, Network Rail's latest advice did not

provide sufficient information to confirm that it has specifically considered all of the key issues specifically identified by the recommendation. ORR has sought further information from Network Rail in this respect.

19. After reviewing information received ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:

- taken the recommendation into consideration but
- has not yet demonstrated that it is taking sufficient action to implement it.

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