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

Dear Andrew,

RAIB Report: Derailment at Porthkerry, South Wales, 2 October 2014

I write to provide an update¹ on the action taken in respect of recommendations 1, 2 and 3 addressed to ORR in the above report, published on 6 August 2015.

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

We will publish this response on the ORR website on 11 September 2017.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'O Stewart', is written over a light blue horizontal line.

Oliver Stewart

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 to improve the processes for detecting VLS defects in rails to increase the likelihood of detection before they develop to the extent that they can cause rail failure.

Network Rail should review the methods it uses to verify suspected VLS type defects in rails and make improvements to increase the likelihood of their detection. The methods to be considered should include always using a U8 test when verifying VLS suspects, regardless of the extent of loss of rail bottom signal

ORR decision

1. Network Rail have taken comprehensive action to improve VLS detection and management, principally through revisions to standards NR/L2fTRK/055 and NR/L2fTRK/001/mod07, which cover the ultrasonic test procedures and the minimum actions for rail defects.
2. After reviewing the information provided ORR has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, Network Rail has:
 - has taken the recommendation into consideration; and
 - has taken action to implement it.

Status: Implemented.

Previously reported to RAIB

3. On 5 August 2016 ORR reported that it did not think Network Rail's initial response contained a sufficiently developed plan to address the risk of failure to detect and manage VLS faults the recommendations were trying to address. Following a meeting with Network Rail's Principal Engineer and Head of Track, a more developed set of outputs and timescales for achieving them were agreed.

Update

4. Following a timescale extension, Network Rail provided a closure statement on 3 July 2017 for all three of the Porthkerry recommendations. For recommendation 1 the closure statement stated:

The Chief Track & Lineside Engineer considers that the proposed changes will reduce the risk from VLS defects particularly where they may occur in pre-1976 rail with RCF.

The revised U8 procedure requires ultrasonic testers to be equipped with callipers to accurately measure any bulging in the head or web of the rail. They are also equipped with a small mirror to aid the inspection of the underside of the rail head for any cracking.

Additional information on the visual identification of VLS defects has also been included in the ultrasonic procedure U8 and incorporated into the training that accompanies this procedure.

The U 15 procedure has also been revised to provide clearer actions on the identification of loss of rail bottom signals and the need to investigate the cause of the loss of rail bottom to check that there are no internal defects within the body of the rail.

The existing minimum actions for VLS in NR/L2fTRK/001 module 7 have been updated to better control the risk from broken rails.

Minimum actions with prescribed removal timescales have been introduced to mandate the removal of VLS defects based on their length when measured using U8. This should enable the removal of VLS defects in a planned timescale before visible bulging or cracking is detected reducing the risk of a defect reaching a critical size.

More VLS defects should be removed earlier before they reach a critical size which should reduce the need for emergency actions requiring the imposition of a speed restriction and the risk of broken rails.

These changes should also reduce the critical need to identify the presence of a visible crack or widening more than 2mm that currently triggers an abrupt change in the minimum actions in the current standard.

Additional requirements and guidance have been added to the standard for the specific management of potential VLS defects in pre-1976 rail where RCF also exists. This requires additional ultrasonic inspection to be carried out to check for the presence of potential VLS defects where there is a loss of rail bottom signal detected in pre-1976 rail.

Actions have also been included requiring U8 testing to be undertaken to confirm that there are no internal defects before and grinding or reprofiling is undertaken to remove surface damage.

Where internal defects are detected new actions have been included to prevent grinding or reprofiling from being carried out to remove surface damage.

Recommendation 2

The intent of this recommendation is to improve the process for detection of surface breaking cracks from VLS defects which have been identified as being present in the rail.

Network Rail should improve the detection of surface breaking cracks and head spread. The methods to be considered should include the use of non-destructive test methods such as dye penetration or magnetic particle inspection to look for cracks, particularly at the upper fillet radius.

ORR decision

5. Network Rail have improved their detection of surface breaking cracks by making changes to the U8 and U15 inspection procedures. Network Rail have dismissed the use of Liquid Penetrant Testing (LPT) and Magnetic Particle Testing (MPT) as impracticable, which appear valid.

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

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

Status: Implemented.

Previously reported to RAIB

7. On 5 August 2016 ORR reported that (as with recommendation 1) it did not think Network Rail's initial response contained a sufficiently developed plan to address the risk associated with the recommendation. Following a meeting with Network Rail's Principal Engineer and Head of Track, a more developed set of outputs and timescales for achieving them was agreed.

Update

8. Network Rail's closure statement for recommendation 2 stated:

The Chief Track & Lineside Engineer considers that the proposed changes will reduce the risk from VLS defects where they may occur in pre-1976 rail with RCF and should help enable VLS defects to be removed before they reach a size when the identification surface breaking splits or significant bulging becomes more critical.

The potential length of VLS defects, the condition of rail surface, the rail shape particularly around the upper fillet radius and the need for the surfaces to be adequately cleaned and prepared makes the use of LPT and MPT impracticable unless localised areas can be identified. If these techniques are not performed correctly it can lead to a false impression that there are no defects present when actually the tests have not been performed effectively.

It is considered that the use of U8 ultrasonic technique to investigate pre-1976 rails with any indicated loss of railbottom signal is a more effective method that can be applied more reliably over longer lengths of rail to confirm the

presence of any internal defects. The US technique can be used to determine the continuous length of any cracking in the head and web of the rail which will then be used to classify VLS defects with revised minimum actions for removal based on their length.

The revised standard NR/L2ffRK/001 mod 7 mandates a requirement for U8 testing to be carried out on pre-1976 rail with a loss of rail bottom signal. This is required to confirm if there are any internal defects present before considering potential treatment of the RCF that may be present on the rail surface.

Where internal defects are detected with U8 they are now required to be classified based on their longitudinal length with revised actions specified for their removal. Whilst the U8 procedure is not suitable to identify whether VLS defects are surface breaking or not it can be used to accurately determine the continuous length of a VLS defect along the rail even with the presence of surface cracking.

As VLS defects develop it is often their length that changes significantly before the cracking starts to open up or propagate vertically to the upper or lower surface of the rail head.

Revised minimum actions have also been included in module 7 that are intended to specify the removal of VLS defects before they reach a critical size that requires immediate action and the risk of failure increases.

The effectiveness of the revised minimum actions will be monitored to further understand the relationship between the length of VLS defects and the risk of failure. They will be revised further if VLS defects are found to reach a critical size requiring immediate action before they are planned to be removed based upon their length.

The tools provided for operators carrying out testing have been revised to include callipers to measure bulging and a mirror to aid the identification of surface breaking cracks on the underside of the head and upper fillet radius.

In addition to this additional training and guidance has been included in the briefing and training for ultrasonic operators to aid the identification and classification of VLS defects. In addition to this the U8 procedure has been revised to provide additional guidance on the identification and classification including photographs highlighting the visible changes and tell-tale signs that can help with the earlier identification of VLS defects.

Recommendation 3

The intent of this recommendation is to control the risk arising from having rail that is liable to contain VLS defects in use in track.

Network Rail should assess the risk of having unidentified pre-1976 rail in use in track, in particular at sites where cascaded rail has been installed, and take measures to mitigate this risk

ORR decision

9. Network Rail appear to have taken comprehensive action to identify and mitigate the risk of pre-76 rail by changing the specification and management of cascaded rail, as well as improving inspection techniques for identifying surface cracks (as explained in the response to recommendations 1 and 2).

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

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

Status: Implemented.

Previously reported to RAIB

11. On 5 August 2016 ORR reported that the ORR panel was not confident from Network Rail's initial response that they had a reliable method to understand the volume and location of pre-1976 rail.

12. ORR held a meeting with Network Rail's Principal Engineer and Head of Track on 11 April 2016 to discuss the recommendations in the Porthkerry RAIB report. Network Rail have agreed to submit a revised plan by 13 May 2016, addressing ORR's concerns over the reliability of their proposed method for understanding the volume and location of pre-1976 rail.

Update

13. Network Rail's closure statement for recommendation 3 stated:

It is considered that the changes to standards covering inspection procedures, minimum actions, revisions to the specification and management of serviceable and cascaded rail along with improvements in the UTU operation and analysis should reduce the risk from having unidentified pre-1976 rail in track and the intent of this recommendation is closed.

The effectiveness of the changes introduced since the derailment in 2014 will be monitored and reviewed to make sure that intended improvements are delivered and the management of VLS defects is improved to reduce the risk of failure which last year only represented 1.1% of all broken rails.

Network Rail will continue to seek to better understand the cause of breaks and defects and initiate further changes to standards, inspection procedures, minimum actions and remediations to deliver future improvements in rail management.

