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10 December 2019



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

Dear Andrew,

RAIB Report: Class investigation into rail breaks on the East Coast Main Line

I write to provide an update¹ on the action taken in respect of recommendation 2 addressed to ORR in the above report, published on 13 November 2014.

The annex to this letter provides details of the action taken regarding the recommendation. The status of recommendation 2 is '**implemented**'.

We do not propose to take any further action in respect of the recommendation, unless we become aware that any of the information provided has become inaccurate, in which case I will write to you again.

We will publish this response on the ORR website on 11 December 2019.

Yours sincerely,

Oliver Stewart

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

Recommendation 2

This recommendation is intended to ensure that all parts of Network Rail obtain the maximum benefit from knowledge gained by work intended to reduce the risk of rail breaks on the East Coast Main Line and is a formalisation of a process which Network Rail states is already in progress.

Network Rail should review the actions already being taken to reduce the incidence of rail breaks on the East Coast Main Line (including those described in paragraphs 128 and 129) in order to identify whether similar actions would provide significant safety benefits elsewhere on its infrastructure. If such benefits are identified, Network Rail should modify its processes so that they are applied more widely (paragraph 123).

ORR decision

1. Network Rail have developed Reliability Centred Maintenance (RCM) as a consistent process for assessing track faults including rail breaks. Network Rail showed us an example of where enhanced risk based dip angle maintenance actions have been implemented in Bristol and lead to a reduction in rail breaks.
2. As this process is now well established ORR is content that the recommendation has been implemented.
3. After reviewing the information provided 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.

Previously reported to RAIB

4. On 10 November 2015 ORR reported the following:

ORR wrote to Network Rail requesting further information as to how the approach described in section b) Dip Angles (risk assessment using 4 criteria) are captured and incorporated into their SMS. This could be by incorporating it into NR/L2/TRK/001 module 11 as Network Rail stated in their February 2015 update.

ORR met with Network Rail on 6 October 2015 to review progress and agree further information required to demonstrate that Network Rail has addressed this recommendation. Network Rail accepted that further work is required to embed the new approach into their process, and will confirm in writing action taken being taken to achieve this

Update

5. Network Rail provided the following closure statements on 1 July 2015.



ECML REC 2
closure.pdf



20150701 ECML Rail
Breaks RAIB Rec 2 Cl

6. Network Rail stated in summary the following:

The considered response of the Professional Head [Track] is that though the sharing of lessons learned from initiatives being adopted across the network a corresponding reduction in the risk of rail breaks is being seen.

The sharing of good practice within existing governance frameworks and the adoption of new technology underpins a continuous improvement approach within the Track community.

It is against this background that it is considered the intent of this recommendation has been met and therefore considered CLOSED.

7. ORR wrote to Network Rail on 15 September 2015 with the following query on the closure statement:

Please provide further information as to how the approach you describe in section b) Dip Angles (risk assessment using 4 criteria) of your closure statement are captured and incorporated into your safety management system, by perhaps incorporating in NR/L2/TRK/001 module 11 as stated in your February 2015 update. This outstanding information relates to the outstanding questions posed in bullet points 2, 4 and 5 of our letter of 23 April 2015.

8. ORR wrote to Network Rail again on 3 May 2017 with the following:

You submitted a closure statement on 20 July 2015 which we subsequently declined and requested further information (15/09/2015), specifically referring to paragraph 2b of the statement (dip angle measurement).

Since then we have awaited a response to our request however, I do not believe we have received anything.

There was a meeting between ORR and NR RAIB recommendation handling teams in March 2016 and a written note of that meeting indicated that NR still considered this rec to be closed. This may explain the lack of response however, the rec actually remains open.

In order to progress this matter to closure we need a demonstration of how the controls as described in para 2b have been embedded into BAU across the routes, in particular;

- a. *Confirmation (with evidence) that the philosophy and criteria (bullets i – iv of para 2b) for enhanced dip-angle thresholds/actions have been effectively briefed to the RAMs and that*

- b. *Those philosophy/criteria contained within the closure statement are documented such that the information is readily accessible and immediately apparent to those who may be required to apply it in future (eg. during the consultation discussions in March 2015, NR proposed that ‘the assessment notes will be included in the next update of TRK 001 mod11).*

9. Network Rail provided the following documents on 21 October 2019:



ECML Rail Breaks
RAIB Recommendation



NR_L2_MTC_10662_
05.pdf



SMF_TK_0242
Bristol-Exeter Branch



NR_L2_MTC_10662.
pdf

Previously reported to RAIB

Recommendation 2

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Network Rail should review the actions already being taken to reduce the incidence of rail breaks on the East Coast Main Line (including those described in paragraphs 128 and 129) in order to identify whether similar actions would provide significant safety benefits elsewhere on its infrastructure. If such benefits are identified, Network Rail should modify its processes so that they are applied more widely (paragraph 123).

Steps taken or being taken to address the recommendation

1. On 19 February 2015, Network Rail provided the following information:

The benefits of adopting more onerous threshold limits in certain areas (high tonnage/high speed lines) have been identified and discussed by the Track Leadership Team (Professional Head, RAMs, Principal Engineers from the centre).

It has been agreed that it is not appropriate to mandate these tighter threshold limits nationally. Instead the RAMs will determine themselves where to apply these, by risk assessment, prompted if one of the following statements apply:

1. *There are High Axle Loads;*
2. *Line speed is 90mph or greater;*
3. *There are clusters of rail end failures;*
4. *The trend of broken rails within that Route (or part) is outside of normal margins.*

If (3) or (4) applies, there will be an immediate review undertaken. The assessment notes will be included in the next update of NR/L2/TRK/001/mod11.

Timescale: 30 June 2015

2. Network Rail provided a closure statement on 20 July 2015 containing the following additional information:

Network Rail, Professional Head [Track], has considered the intent of this recommendation by reviewing the management of dip angles, introduction of the Linear Decision Support tool (LADS) and the introduction of enhanced precursor information provided by Plain Line Pattern Recognition technology (PLPR). Consideration has also been given to the identification of lessons learned following a review of 2014/2015 broken rail performance indicators. This has been undertaken within Technical Services, part of the Safety, Technical & Engineering Directorate and involved subject matter engineering experts.

Network Rail has reviewed the actions already being taken to reduce the incidence of rail breaks on the East Coast Main Line in order to identify whether similar actions would provide significant safety benefits

elsewhere on its infrastructure. Consideration has focussed on four specific issues:

- a) NRIL21TRK/001/mod11, Track geometry - Inspections and minimum actions, (Issue 7; Sept 2014)
- b) Dip Angle Management
- c) Introduction of the Linear Asset Decision Support tool (LADS)
- d) Plain Line Pattern Recognition technology (PLPR)
- e) Review of 2014/2015 broken rail performance indicators

a) NRIL21TRK/001/mod11 , Track geometry - Inspections and minimum actions, (Issue 7 Sept 2014)

NR/L2fTRK/001/mod11 specifies, in relation to track geometry, the requirements for managing dip angles.

Section 8 specifically addresses the management of dip angles including the frequency of measurement and the minimum actions for dip angle exceedances.

b) Dip angle measurement

The management of 'Dip Angle Measurement' has been a key factor in the reduction of rail breaks nationally.

The benefits of adopting more onerous dip angle threshold limits in certain areas (high tonnage/high speed lines) have been identified and discussed as has the process for considering the roll out of enhanced actions at the Track Leadership Group meeting in September 2014.

It has been agreed that it is not appropriate to mandate these tighter threshold limits nationally. Instead the Route Asset Manager [Track] (RAM[T]) will determine themselves where to apply these, by risk assessment. The RAM[T], or their representative, would then have the freedom to consider the benefit of introducing tighter threshold limits and response requirements where:

- i. there are high axle loads
 - ii. linespeed is 90 mph or greater
 - iii. there are clusters of rail end defects
 - iv. the trend of broken rails within that Route (or part) are outside of normal margins
- i.e. where RAM[T] compare their own route statistics to other national and route statistics to understand if there are a greater level of rail issues on their route

Tighter threshold limits are only contemplated where at least one of the above situations applies; only where (iii) and/or (iv) apply would an immediate review be needed.

This aligns with the principles advocated within Business Critical Rules (BCR) allowing Routes to make local variations in BCR procedures where earlier intervention is of benefit.

c) Introduction of the Linear Asset Decision Support Tool (LADS)

The national roll out of Network Rails Linear Asset Decision Support Tool (LADS) was completed in 2014. LADS is a solution where linear asset information is aligned and visually represented in an interactive tool that aids decision making.

Manipulation of different sources of data is possible within the tool. Overlaying these different types helps to understand root causes. The tool can also enable searching by different asset types, for example Insulated Rail Joints. This means it is a quicker as well as more reliable means of establishing condition, deterioration and intervention at these locations.

Amongst many business benefits, in the management of the rail asset it is a key enabler for:

- *Understanding asset degradation; enhanced through the alignment of run-on-run data giving repeatability, providing more confidence in degradation analysis*
- *Assessing the effectiveness of interventions*

d) Plain Line Pattern Recognition Technology (PLPR)

Network Rail is implementing the OmniVision system to obtain a consistent and quantitative understanding of the asset condition.

The OmniVision system is fitted to the New Measurement Train (NMT) and four other infrastructure monitoring trains. All train consists also have track geometry measurement and ballast profile measurement systems.

The output data is being used to analyse the deterioration characteristics of the inspected assets and the risks associated with their condition profile.

The OmniVision system is being implemented in a number of phases:

- *Phase 1 - consists of implementation on CWR track with Pandrol PR, e and Re, Pandrol Fastclip or SHC fastenings.*

- *Subsequent phases - will be for use on jointed track and/or obsolescent fastening types*

To supplement and improve the decision making of the OmniVision system it is linked to an on train Track Geometry Measurement System (TGMS). The following diagram shows how the system links the two data sources:

In managing dip angles images are extracted and attached to geometry defects. The OmniVision system also uses enhanced dip angle thresholds than those stated in NR/I2/TRK/001/mod11 (Table 8) as follows:

- *Cat 1A, 1 and 2 > 10mrad*
- *Cat 3 and 4 > 15 mrad*
- *Cat 5 and 6 > 20 mrad*

These thresholds supports and enhances frontline management teams decision making for the earlier identification of component defects e.g. wet bed management, voiding , dip joints I welds , visible rail head defects, broken fishplates, rail pad and sleeper degradation to name but a few.

e) Review of 2014/2015 broken rail performance indicators

2014/2015 has seen a reduction in the number of broken rails compared to 2013/2014, 98 compared to 126, with the biggest reductions seen in primary, and in particular, secondary routes (see table below). A number of initiatives combined with the relatively mild winter resulted in this lowest number of broken rails on record:

- *The roll out of train based ultrasonic inspection on track categories 4 to 6 which carry lower speed and tonnage traffic; in the past the train based ultrasonic inspection has only covered higher speed and tonnage routes in track categories 1A to 3.*
- *A focus on actioning geometry faults at an earlier level*
- *A focus on earlier intervention at dipped joints on higher speed, higher tonnage track*
- *Targeted replacement of rail that has carried a higher cumulative tonnage*

Number of Broken Rails		2010/11	2011/12	2012/13	2013/14	2014/15
9.	<i>Primary</i>	13.87	14.65	15.97	16.59	17.52
	<i>Secondary</i>	19.49	20.42	21.49	22.42	23.23
	<i>Rural</i>	25.13	26.3	27.7	28.6	29.6
	Total	31.14	32.11	33.15	34.10	35.
36.	<i>Primary</i>	40.7	41.7	42.5	43.8	44.2

37. Scotland	Secondary	46.15	47.8	48.17	49.11	50.14
	Rural	52.0	53.2	54.3	55.0	56.1
	Total	58.	59.17	60.	61.	62.
63. 64. Network Total	Primary	66.94	67.72	68.102	69.67	70.54
	Secondary	72.64	73.50	74.66	75.53	76.37
	Rural	78.13	79.5	80.10	81.6	82.7
	Total	84.17	85.12	86.17	87.12	88.98

The average number of broken rails per year in CPS is currently 112, a 26% reduction compared to 151 in CP4 which is a 53% reduction on the CP3 average of 322 and a 74% reduction on 588, the average number of breaks per year in CP2. These improvements have been achieved despite a significant increase in the volume of traffic running on the network.

Summary

The considered response of the Professional Head [Track] is that though the sharing of lessons learned from initiatives being adopted across the network a corresponding reduction in the risk of rail breaks is being seen.

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It is against this background that it is considered the intent of this recommendation has been met and therefore considered CLOSED.

3. ORR wrote to Network Rail requesting further information as to how the approach described in section b) Dip Angles (risk assessment using 4 criteria) are captured and incorporated into their SMS. This could be by incorporating it into NR/L2/TRK/001 module 11 as Network Rail stated in their February 2015 update.
4. ORR met with Network Rail on 6 October 2015 to review progress and agree further information required to demonstrate that Network Rail has addressed this recommendation. Network Rail accepted that further work is required to embed the new approach into their process, and will confirm in writing action taken being taken to achieve this.

ORR decision

5. ORR, in reviewing the information received from Network Rail has concluded that, in accordance with the Railways (Accident Investigation and Reporting) Regulations 2005, it has:
 - taken the recommendation into consideration; and
 - is taking action to implement it

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