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15 December 2015

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

Dear Andrew,

RAIB Report: Partial failure of a structure inside Balcombe Tunnel, West Sussex

I write to provide an update[1] on the action taken in respect of recommendations 1, 2, 4, 7, 8 and 9 addressed to ORR in the above report, published on 15 August 2013.

The annex to this letter provides details of the action taken. The status of recommendations 1 and 4 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 2 is '**In progress**' and recommendations 7, 8 and 9 are '**Implementation ongoing**'. 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 18 December 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 identify fixings at risk of failure based on current knowledge.

Network Rail should, where failure could result in risk, identify where polyester resin anchors have been used to support structures (including overhead electrification and signalling equipment), and develop an appropriate regime to detect loose fixings including tactile testing where appropriate.

ORR Decision

1. The evidence provided indicates that Network Rail have identified relevant support structures within tunnels and put in place adequate regimes to detect loose fixings. This recommendation is therefore consider complied with in respect of support structures within tunnels.

2. Network Rail has argued that it is not reasonably practicable to extend this exercise to other structures (such as overhead electrification and signalling equipment.) Instead, structures examination standards have been amended to ensure that such fixings are identified and examined as part of the routine detailed examination regime. This approach is considered to be acceptable and proportionate to the risk; therefore the recommendation is regarded as implemented.

3. 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.*

Brief summary of what was previously reported on 12 December 2014

4. ORR was concerned with the phrase *'where practicable'* within the following Network Rail statement:

> *'Where an Ancillary Structure (such as an ESS (Equipment Support Structure)) is attached to a Structure, <u>where practicable</u> the connection and interface between them shall be included in detailed examinations of…'*

ORR was specifically concerned with the adequacy of inspecting hidden critical elements.

5. It was ORR's view that Network Rail had not fully met the recommendation to *'develop an appropriate regime to detect loose fixings including tactile testing where appropriate'.*

Update

6. On 23 April 2015 ORR sought an update on progress from Network Rail, particularly in relation to the detailed inspection of structures supported by polyester resin anchors. ORR noted that whilst discussions had been ongoing between ORR and Network Rail it remained unsatisfied with the proposed solution to address this issue.

7. On 18 May 2015 Network Rail provided the following update:

The Network Rail closure statement submitted in October 2014 detailed specific actions taken to address the risk of failure of support structures (i.e. additional equipment retrospectively installed post construction) regardless of the nature of fixing (i.e. mechanical or chemical). The actions taken targeted additional requirements for tunnels with complex and unusual subordinate structures and highlighted revised clauses within Network Rail's examination standards to ensure business as usual tactile examination of such fixings.

The reference to the specific conclusions within the RAIB report into the Stewarton incident, are not considered to be relevant for the adequate implementation of Balcombe RAIB rec 1. The specific failings highlighted in the Stewarton investigation, instigated the 'Hidden Critical Element' programme which is now business as usual. The HCE programme targets in-built construction details which fundamentally are not adequately examinable in within the scope of a normal detailed examination.

The detection of loose fixings to support structures has been confirmed within the scope of detailed examinations. It is unlikely that such retrospectively fitted fixings would be hidden within the construction details of the parent asset as such the number of occurrences of such items being deemed 'hidden critical elements' is low. The inclusion of their examination within the scope of a tactile detailed exam enables both the examination engineer and Network Rail Reviewing Engineer to evaluate the sufficiency of the examination and instigate additional mitigation, such as targeted additional examinations, additional testing or examination enabling works (such removal of cowls/cladding or covers as necessary) should they identify a deficiency in the adequacy of the exam leading to an inability to determine the condition of individual components.

In confirming the above, Network Rail believes it has identified where high risk structures are located on the Network and implemented appropriate additional management actions and highlighted changes its exam regime which will facilitate the identification of fixings at risk of failure and as such, have addressed the intent of the recommendation.

8. On 18 June 2015 ORR requested a copy of Network Rail's list of structures that could lead to a risk in the event of failure and an indication of which of the structures on the list use polyester resin anchors as far as Network Rail is aware. ORR also asked for an explanation of how this list had been developed and agreed. ORR also understood that Network Rail has amended its Tunnel Management Strategies (TMS) to include a generic form of words to address the examination and maintenance schemes of those structures at risk. Network Rail was asked to provide a copy of this generic wording.

9. On 28 July 2015 Network Rail provided a list of 19 tunnels (together with an example copy of the TMS addendum produced for inclusion in the TMS of any tunnel identified as having a complex subordinate structure), 4 of which have complex subordinate structures fixed using polyester resin:

TTH/139 – Bo Peep Tunnel

HDR/878 – Strood Tunnel

VTB3/132 – Balcombe Tunnel

MCJ1/28A – St Johns Wood Tunnel


Rec 1 - List of Tunnels with Complex


Rec 1 - Example TMS Appendix for Complex

10. Network Rail provided the following additional information:

The list of applicable tunnels was developed in consultation with route engineers using their asset knowledge to ascertain any tunnels with large/complex or unusual subordinate structures. This exercise was as determined in the original recommendation action plan, which was developed following a joint meeting with the ORR on 12th February of 2014 to agree suitable actions to meet the intention of the recommendation.

The relevant part of the action plan is as follow:

'Tunnels with ancillary structures similar to the failed structure at Balcombe will be identified. Appropriate management actions will be put in place to manage risk through the examination regime with specific examination and testing requirements identified with the tunnel management strategy. 'Similar structures' are defined as heavy structures within the confined environment of a tunnel where failure would put the operational railway at an intolerable risk, irrespective of the type of fixing used. Any similar structures found where installed ancillary components are singularly reliant on resin fixings with no apparent design redundancy will be highlighted for urgent management action'.

Finally, please find attached a copy of the Tunnel Management Strategy for VTB3/132 – Balcombe Tunnel. An extract of the TMS for MAS/61 – Cowburn Tunnel is also attached. The whole TMS cannot be sent due to its size. However, should you wish to review the TMS in its entirety, it was recently forwarded to Mervyn Carter of the ORR via a data stick or alternately, upon your request we will be able to supply a full copy via a data stick transfer.

Both examples include completed sections for additional management actions due to the presence of complex subordinate structures.

Recommendation 2

The purpose of this recommendation is to prevent the further use of polyester resin anchors where their long-term performance may compromise safety.

Network Rail should implement procedures to prevent the use of polyester resin anchors in circumstances where dampness or shrinkage may affect the safe performance of an asset.

ORR Decision

11. ORR agrees with Network Rail's argument that a blanket ban on polyester resin anchors is inappropriate and disproportionate and that such an approach would be outside of the requirements of this recommendation.

12. ORR considers that Network Rail should take action to ensure that these fixings are not used in circumstances where they might compromise safety. To address this Network Rail has taken the position that the issue of BS 8539 (post the Balcombe incident) resolves the recommendation because designers and engineers following its requirements would lead to the appropriate fixings being specified. Network Rail has, however, made no reference to compliance with this Standard in its Company Standards or Letters of Instruction. It is, however, referred to in the Shared Learning, which is essentially an historical document).

13. Assuming that the relevant text from BS 8539 is sufficient, and ORR has requested details of this from Network Rail, it remains our view that some further action is also required by Network Rail, to ensure that designers and engineers have regard to the Standard. A passive expectation that they will do so is considered unacceptable. This view is supported by the findings of a recent survey carried out by *New Civil Engineer*:

14. ORR also notes that Network Rail's IP electrification team has altered its drawings to refer to BS 8539, which represents good practice that should be followed by other relevant parts of the organisation.

15. ORR is currently reviewing the 'Balcombe Tunnel Rec 2 SDD Review Rev A', provided by Network Rail on 23 November 2015, and will provide a further update to RAIB in due course.

16. 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
- is taking action to implement it.

Status: *In Progress (from Implementation ongoing).* ORR will advise RAIB when actions to address this recommendation have been completed.

Brief summary of what was previously reported on 18 August 2014

17. ORR was satisfied that Network Rail was taking action to address the risk identified by the RAIB recommendation in an alternative way.

Update

18. On 23 April 2015 ORR wrote to Network Rail seeking confirmation of whether this recommendation had been implemented by the previously expected date of 31 August 2014.

19. On 18 May 2015 Network Rail provided the following update:

The actions to address this recommendation are still being progressed by Network Rail. Extensions of time (EOT) requests have been processed against this recommendation, the latest of which notes a closure date of 28th August 2015.

The latest EOT details progress made against the action plan including completed workshops and briefings held in conjunction with Infrastructure Projects and Works Delivery, published guidance on the investigation, specification and installation of post-installed anchors in masonry and concrete, and changes to design standards to mandate positive affirmation of the compatibility of specified materials.

In addition to the above, the latest EOT confirms that Network Rail has completed a review all civils and electrification Standard Design Details (SDD's). The review has concluded that no SDD's exist that are singularly reliant on resin, or that exhibit a lack of design redundancy. Consequently, no SDD's have been withdrawn as a result of the review. Confirmation is still being sought from disciplines other than Civils and Electrification, of the status of their review into their own SDDS's. The latest extension in the completion date to close this recommendation is to obtain this confirmation.

Finally the review of NR standards governing the design and specification of works, the assurance of onsite construction works and the completion of health and safety files is complete. The review noted sufficient clauses within current network rail standards to satisfy the intention of the recommendation.

20. On 18 June 2015 ORR asked Network Rail for its view on ORR's opinion that SDDs should specifically prevent the use of polyester resin anchors and whether any plans were in place to update the documents to reflect this position.

21. On 28 July 2015 Network Rail provided the following response:

The original recommendation action plan was developed following a joint meeting with the ORR on 12th February of 2014 to agree suitable actions to meet the intention of the recommendation. At this time, Network Rail had rejected recommendation No2 on the basis that it was thought the inference was to ban the use of polyester resin on the NR Network. The rejection of the rec was on the grounds that a blanket ban was an inappropriate and disproportionate response.

At the meeting with the ORR, Network Rail agreed to accept the recommendation on the basis that the intention could be met by undertaking steps to ensure the appropriate use of all types of fixing when designing and specifying works.

Network Rail believes that the 'specific and proactive' prevention of the use of polyester resin neither meets the intention of the rec (to prevent its inappropriate use) nor is based on sound civil engineering principles.

At the recommendation review meeting of 4 June, NR believes that it did not state that the provision of BS8539:2012 would prevent the use of resin anchors, but it does advocate and promote the appropriate use of any type of post installed fixing in masonry and concrete. Its use, in conjunction with appropriate site investigation, correct design and material specification, sufficient quality assurance of the installation (including appropriate inspection and testing) and determination of ongoing management and examination requirements would lead to the correct use of any type of fixing which would include polyester resin in suitable applications.

Network Rail has reviewed all civil engineering and electrification SDD's to ensure no standard design or detail includes the inappropriate use of resin. This action is as identified in the action plan developed following Network Rails meeting with the ORR in February 2014.

22. On 19 October 2015 NR provided the following closure statement:

Network Rail has completed the actions noted in the plan submitted to the ORR in February 2014 to address the intention of recommendation 2 from the RAIB report into the Balcombe Incident.

The recommendation action plan was developed following a joint meeting with the ORR on 12 February 2014 to agree suitable actions to meet the intention of the recommendation. At this time, Network Rail had rejected recommendation 2 on the basis that it was thought the inference was to ban the use of polyester resin on the Network Rail Network. The rejection of

the recommendation was on the grounds that a blanket ban was an inappropriate and disproportionate response which did not address the applicable fundamental underlying causes identified in the RAIB report.

Network Rail agreed to accept the recommendation on the basis that the intention could be met by undertaking steps to ensure the appropriate use of all types of fixing when designing and specifying works.

Actions undertaken:

Part A

IP Project Engineers and Works Delivery have been briefed on the relevant points of the Balcombe investigations and the guidelines and standards, published post the Balcombe Incident which should be used by designers when specifying the use of chemical fixings. (BS8539:2012). The agenda and minutes of the IP Buildings and Civils Discipline Review Group meeting held on 2 September 2014, together with the presentation delivered are provided for information.


IP Buildings and Civils Discipline Review Actic


NAT-000000-ECV-Sta ndards briefing agend


Chemical Anchors Balcombe RAIB Rec 2

Workshops were also scheduled between TS Structure Asset Management/ NR Infrastructure Projects and Network Ops to disseminate lessons learnt from this incident and the actions undertaken to address the recommendations arising from both the RAIB and Network Rail investigation.

Network Rail organised a specific topic briefing to be delivered by industry specialists on the correct specification, installation and ongoing management of structures with resin fixings. Graham Daws Associates and Orica Limited attend the Structures Community meeting of 12 March 2014 to discuss the correct use of chemical anchors. Minutes of this meeting and the presented information provided.


Structures Community Meeting M


Graham Daws Associates Orica Ltd p

Guidance has been placed in Safety Central highlighting that the use of chemical fixings in designs should comply with BS 8539: 2012. This standard has been published since the Balcombe incident and includes requirements for suitable and sufficient site investigation to be carried out to ensure that the correct fixings are specified, that designs take into account site specific conditions and that appropriate measures are undertaken to ensure quality control during installation of fixings. A copy of this Safety Central briefing is included with this closure statement for information.

Shared Learning
NRL14-04 designing ar

Part B

Confirmation has been received from gate keepers within the Civil Engineering, Electrification, Track, Switches & Crossings, Signalling, and Communications disciplines that reviews have been undertaken of all of their Standard Designs and Details (SDD's). No designs have been withdrawn or require amending under the context of this recommendation. Each gatekeeper completed the review of the designs within their own discipline, looking for SDD's where polyester resin fixings are specified but could be susceptible to shrinkage or damp /wet conditions i.e. where the anchor is acting substantially in tension or where there was insufficient design redundancy.

Part C

Network Rail reviewed the following standards governing the design and specification of works, the assurance of onsite construction works and the completion of health and safety file (and the need inform the management regime of the asset - i.e. adapt the Tunnel Management Strategy following works in a tunnel example). Where necessary, revisions have been made as detailed below:

- *NRIL2/INF/02202 reviewed but not revised. Existing clauses mandate that the COM Co-Ordinator and the asset maintainer agree on the content of the Asset Management Plan following such alterations or works. As Built drawings indicating these alterations are to be produced with evidence of their existence placed in the Health and Safety File;*
- *NR/L3/MTC/089 reviewed but not revised. Clauses confirm the content of the asset management plan, maintenance responsibilities and the maintenance requirements of new or novel products are specified;*
- *NRISP CIV1084 'The Management of Existing Tunnels' has been reviewed but not revised. This standard mandates a requirement to review and amend as necessary, Tunnel Management Strategies (TMS) when maintenance or other works are proposed or completed;*
- *NR Standard NR/L3/CIV/003 "Engineering Assurance of Building and Civil Engineering works" has been reviewed and revised by the publication of Letter of Instruction LI/349. The revision requires designers to make positive affirmation as to the compatibility of materials specified in designs and in consideration of their application. In conjunction with publication of LI/349, Design Forms NR/L3/CIV/003/F002 'Statement of Design Intent' and NR/L3/CIV/003/F003 'Certificate of Design and Check' have all been amended and republished to capture the designers' positive confirmation of materials compatibility.*


Letter of Instruction NR-BS-LI-349.pdf


NR_L2_CIV_003_F003 [1] Statement of Desig


Letter of Instruction NR-BS-LI-349.pdf

Summary

By providing guidance in accordance with BS 8539:2012, by ensuring that no standard designs and details are in use which utilise resin anchors predominantly in tension, subject to prolonged damp or wet conditions, or are lacking sufficient design redundancy, and by reviewing and revising standards and design proformas to ensure that materials are correctly specified, Network Rail has implement procedures to prevent the use of polyester resin anchors in circumstances where dampness or shrinkage may affect the safe performance of an asset. These completed actions prevent the further use of polyester resin anchors in circumstances where their long-term performance may compromise safety.

23. On 23 November 2015 Network Rail provided the following update:

The contents of British Standard BS8539:2012 is appropriate for the design of such installations as those within Balcombe Tunnel. The Standard also goes further to cross reference with European Technical Approvals guidelines (ETAg) for certain materials and design considerations.

In relation to prevention of re-occurrence of the Balcombe failure, the following clauses within the standard are of particular interest:-

- *4.1. Roles and Responsibilities of Designers, Suppliers, Specifiers, Installation Contractors and Testers*
- *5.2 – 5.5 Design Considerations*
- *7.3.6 Installation Aspects Specific to Resin Anchor Systems*
- *7.6. Installing Anchors in Masonry*
- *8 Supervision*
- *9 Testing*

24. Network Rail also provided a copy of ‘Balcombe Tunnel Rec 2 SDD Review Rev A’ which provides outputs from each of the individual disciplines that undertook a review of their Standard Design and Details.


Balcombe Tunnel Rec2 SDD Review Rev

Recommendation 4

The intention of this recommendation is to provide an effective asset management response when structure defects (or suspected defects) are reported.

Network Rail should review and, if necessary, modify the management arrangements that are now in place to provide an appropriate engineering response when structure defects are reported. This should include assessing the risk in the period prior to rectification, the means to verify that work requested has been carried out, and whether the reported defect is an indication of a wider problem.

ORR Decision

25. This recommendation is implemented in all respects, bar the roll-out of CSAMS (scheduled for mid-late 2016), which will provide additional recording functionality. ORR also notes that Network Rail has introduced interim arrangements to address the intent of the recommendation for the period prior to CSAMS implementation.

26. 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.*

Brief summary of what was previously reported on 18 August 2014

27. ORR reported to RAIB that Network Rail had completed its review of its current processes governing the arrangements for briefing of staff and contractors that are sent to investigate reported defects, but that the embedding of the changes identified as part of this review were dependent on the progress of existing asset management process improvement projects: CSAMS (Civils Strategic Asset Management System) and Business Critical Rules (BCR).

Update

28. On 23 April 2015 ORR wrote to Network Rail seeking confirmation of whether this recommendation had been implemented by the expected date of 7 November 2014.

29. On 18 May 2015 Network Rail provided the following update:

> *The actions to address this recommendation are still being progressed by Network Rail. An extension of time (EOT) request was processed against this recommendation, which notes a current closure date of 28th July 2015. This*

EOT noted that Network Rails actions would centre on the management response from the reporting of defects through its normal examination regime, addressing the recommendations intention to 'provide an effective asset management response when structures defects (or suspected defects) are reported'.

Network Rails closure actions are aligned to specific ongoing projects and initiatives which govern Network Rails management response to reported structural defects, namely: -

The development, implementation and roll out of the STE 1 competency framework. Originally programmed to be competed in November 2014, the competency framework has been developed and assessments of all route and central asset engineers is ingoing. As identified in a recent EOT specific to recommendation No. 5, competency assessments of all route based and central asset engineers is currently scheduled for completion by the end of June 2015.

An enhanced 5x5 risk scoring matrix has been developed, following the conclusion of a 'gauge repeatability and reproducibility' project to develop a matrix which produced more consistent risk scores. The developed scoring matrix has been validated following the completion of field trials on Scotland and LNW routes. The project will now commence with national roll out and a programme of associated training. The project concludes in January 2016 with republication of NR Standard NR/L3/CIV/006 Part 11A mandating use of the revised matrix.

Positive Nil Return against the reporting of the examination of individual components has been a requirement of all TCMI tunnel examinations since the implementation of the current version of TCMI in 2009. The latest (CP5) technical specific action adopts the philosophy of positive nil return for all structures examinations, mandating that pending CSAMS roll out examinations confirm that any elements not examined be clearly identified in the exam report. When implemented, CSAMS will provide functionality to record the examination status (Examined, Not Examined, Not Applicable, Not Included) against each minor element of the asset.

Works have commenced on a project to review and revise Network Rails end to end process for the control of works items arising from examinations, in response to recommendations made by previous National Rail Inspection Programme, the RAIB Report into falling material at Denmark Hill Station and Network Rails programme of engineering verifications. These works are targeting any necessary revisions to policy, process and standards to be completed by the end of calendar year 2015, although ultimately the Denmark Hill action plan will be completed on implementation of CSAMS in 2016.

TCMI version 16 – See response to Recommendation 8.

To facilitate the completion of the above initiatives a further EOT request will need to be processed against this recommendation, aligning its completion to the implementation of CSAMS, programmed for September 2016.

30. On 18 June 2015 ORR requested sight of a draft version of the updated NR Standard NR/L3/CIV/006 Part 11A which contains the enhanced 5X5 scoring matrix. ORR also asked, bearing in mind the lengthy and uncertain timescales associated with the implementation of CSAMS, for an indication of any interim actions that Network Rail is taking to mitigate this recommendation.

31. On 16 July 2015 Network Rail NR provided an update extending the timescale for completion of recommendation 4 to 24 February 2017, and on 28 July 2015 Network Rail provided a revised standard NR/L3/CIV/006 Part 11A (now issue 3) and the following additional information:

rec 4 - NR_L3_CIV_006_11A[

Appendix A of this document has been revised to include the enhanced 5x5 scoring matrix. This revision went live on the Network Rail standards intranet on 24th July 2015, available for use as a preview in advance of formal publication in September. By publishing as a preview, CIV006 Part 11A has been made available for use earlier than indicated in our previous response, as following successful completion of route based trials Network Rail has been able to accelerate the publication of the relevant part of NR/L3/CIV/006.

Interim actions which address the intention of this recommendation are as noted in our previous response, including;

STE1 Competency Assessment. Nationally assessments to all STE 1 asset engineers within the Route and Central structures teams are now complete. The results of this exercise will be collated and summarised and then utilised as supporting evidence for the closure of Balcombe RAIB Rec 5, currently programmed for 21st August 2015.

Positive Nil Return (PNR), is already included as part of the CP5 Examination Specification, (although full functionality for PNR reporting will be implemented as part of CSAMS). PNR is already business as usual for tunnel examinations.

CSAMS specific interim mitigation measures, are as noted in our previous response to Recommendation No 9, i.e. The 'Structures Dashboard' and tactical modules (Compliance Management, Asset Exam Bridging, HCE & Scour Databases) all of which are operational.

Recommendation 7

The intention of this recommendation is to provide adequate opportunities for examination and maintenance activities.

Network Rail should review, and if necessary amend, its processes to include adequate safeguards such that sufficient track access is provided for the examination needs of all structures in a manner commensurate with the risk they pose to railway safety.

ORR Decision

32. ORR notes the revised completion date proposed by Network Rail but, in view of the length of time this recommendation has been open, has written to Network Rail requesting that this new timescale be strictly adhered to.

33. 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
- is taking action to implement it by 29 January 2016.

Status: *Implementation ongoing.* ORR will advise RAIB when actions to address this recommendation have been completed.

Brief summary of what was previously reported on 18 August 2014

34. ORR reported to RAIB that Network Rail had developed a methodology for the determination of appropriate tunnel examinations in accordance with Network Rail's Balcombe Tunnel Formal Investigation Recommendation A8.1. This methodology was to be reviewed and applied to structures within the scope of this recommendation, therefore the closure of this RAIB recommendation was dependent on understanding the lessons learnt from developing and applying the methodology for tunnels. The lessons learnt from the Balcombe incident had been briefed to both structures mangers and examination teams. The requirements for specific management arrangements for complex ancillary structures in tunnels and guidance on determining tunnel examinations durations had been cascaded to Route Structures Teams.

Update

35. On 18 November 2014, Network Rail provided an update justifying an extension to the time scale and a change to its approach.

Original approach to closure

The original approach involved transferring the methodology for determining benchmark guidance for appropriate tunnel examination duration into other structure types. High risk structures were to be targeted first. This methodology would be used as a guide when planning access arrangements to conduct examinations on these structures.

The original approach also recognised that there would be a limitation on applying the methodology to long linear assets due to the inherent nature of the

tunnel methodology. A key performance indicator would be developed to monitor both variances in the suggested time for examinations from the guidance and when examinations will have been curtailed due to compromised access arrangements.

Reasons for a change in approach

Limiting the scope of the methodology to long linear assets due to the use of the existing tunnel methodology does not address the intent of applying the methodology to high risk structures. Visibility of curtailed examinations to all structure types is more appropriate as that will allow a risk based priority based across the structure type to be developed and bespoke guidance given for these. The methodology for long linear assets will not be appropriate to all structure types due to their specific forms.

Network Rail has been working with Amey PLC to evaluate a reporting system under development by Amey that will produce the requirements of the three recommendations covered in this justification paper.

This reporting system will allow access planning personal and examiners within Amey to report on compromised or potentially compromised examinations where access arrangements are less than required in terms of duration. This will be both at the planning and examination implementation stages.

The granularity of the reporting systems attributes will allow a more purposeful root cause analysis of the reasons for curtailment to be undertaken. Corrective actions from that root cause analysis will not only provide a more appropriate action towards closing these recommendations through addressing the risk of incomplete or compromised examinations due to access arrangements, but should also aid in reducing noncompliance of examination delivery generally.

Profiles of what type of assets are affected more than others will also emerge from this method of reporting.

It is suggested that this reporting system when, fully developed, should be a regular deliverable under the CEFA [Civil Examination Framework Agreements] contract to allow more effective asset management and will fulfil the requirement of a key performance indicator under these recommendations. It is also believed that this will provide valuable and objective data that can be used in the DRAM [Director Route Asset Management] community to understand the magnitude, reasons and implications of examination curtailment and how examination curtailment can be impacted by other asset owners within that community.

The extension of time is requested to allow for the completion of the development of this reporting system within Amey and embedment into both organisations. Network Rail will need to work closely with Amey to ensure that

the reporting system allows sufficient granularity for the root cause analysis to be undertaken.

An EOT [extension of time] is requested in line with the revised delivery programme noted below:

Present- 27 March 2015

Jointly with Amey PLC, develop a reporting system will allow access planning personal and examiners to report on compromised or potentially compromised examinations where access arrangements are less than required in terms of duration at both the planning and examination implementation stages.

30 March - 30 April 2015
Reviews output of reporting system, collate information on compromised exams and undertake route cause analysis.
04 May- 29 May 2015
Disseminate Exam curtailment information to DRAM Community and Network Operations Managers.
01June -12 June 2015
Produce Recommendation closure statement and gain TS approval of closure.
15 June- 26th June 2015
Submit closure statement to SSD for review and formal closure.
26 June 2015
Formal Closure of Recommendation.

36. On 23 April 2015 ORR wrote to Network Rail seeking confirmation that the revised implementation programme (as provided to ORR on 25 March 2015) is being adhered to and covers both Amey PLC and LNW Network Rail staff.

37. On 18 May 2015 Network Rail provided the following update:

Network Rail confirms that the work to address this recommendation remains on course for closure by 25th September 2015 i.e. as noted in the revised action plan/implementation programme provided to the ORR in March 2015.

We can confirm that any amendments to the process to provide improved track access for examinations will apply to the possession planning /track access process as a whole as such will be applicable to all parties requiring access for examinations regardless of whether that relates to internal NR examiners or our specialist suppliers.

38. On 18 June 2015 ORR sought confirmation that responsibility for this recommendation had been transferred to the Network Ops team as suggested at a joint Network Rail ORR workshop held on 4 June 2015.

39. On 26 June Network Rail provided an update extending the timescale for completion to 25 September 2015 and on 28 July 2015 provided the following update:

A working group has been established by Network Operations/the DRAM community, led by a nominated lead DRAM to review and improve the process of curtailed examinations and bring about improvements to the current number of non-compliance examinations. The identified actions to address the priority afforded to structural examinations within track possessions and implement changes to the track access process are being actioned by this group in conjunction with the Balcombe rec project team. Ownership of the recommendation and the responsibility for ensuring its intent is met remains with the current progress manager Colin Sims, who should be contacted should further information be required.

The current expected completion date for this recommendation remains as per our latest EOT, the 25th September 2015.

40. On 30 September 2015 Network Rail advised ORR of a timescale extension for completion to 29 January 2016.

Recommendation 8

The intention of this recommendation is to improve the effectiveness of Network Rail's examinations regime for structures within tunnels.

Network Rail should clarify arrangements, including its relationship with its contractors, for examining structures which are within tunnels, but are not fully encompassed by the normal tunnel management regime.

ORR Decision

41. 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
- is taking action to implement it by 11 March 2016.

Status: *Implementation ongoing.* ORR will advise RAIB when actions to address this recommendation have been completed.

Brief summary of what was previously reported on 18 August 2014

42. Ancillary structures in tunnels that present the greater risk to railway operations, should they fail, had been identified. Those structures whereby their complexity precludes them from being within the scope of current tunnel management processes had been identified for special management and examination processes. Tunnel Management Strategies were being updated in light of this for each affected tunnel. Required output actions identified were being progressed. This recommendation is in line with recommendation 1 but will

eventually incorporate the output of this recommendation into tunnel examination standards where it is believed they are not sufficiently robust in this context.

43. On 23 April 2015 ORR wrote to Network Rail seeking confirmation that the target completion date of 31 May 2014 for the update of all Tunnel Management Strategies had been met. On 18 May 2015 Network Rail provided the following update:

The original action plan noted that Tunnel Management Strategies (TMS's) would be updated in line with the action plan noted against RAIB recommendation No1. Please note this refers to the completed update of TMS's to incorporate specific management actions arising from the presence of 'similar' structures to the failed structure at Balcombe. ('Similar structures' were defined within the action plan as 'heavy structures within the confined environment of a tunnel where failure would put the operational railway at an intolerable risk, irrespective of the type of fixing used')

The submitted closure statement for RAIB rec 1 confirmed that all such TMS's (19No.) had been updated with addendums detailing specific management actions necessitated by the presence of the ancillary structures. Where applicable, revised TMS's have been issued to our examination framework contractor.

Work continues to address this recommendation and is currently programmed to achieve closure by 11th March 2016. This timescale is driven by a project to develop and implement a revised version of the tunnel condition marking reporting template, and publish associated standards revisions by the end of the calendar year 2015. (TCMI v16).

An EOT confirming the above was processed in April 2015 noting dependency for closure of this recommendation on the project to develop TCMI v16. The EOT also confirmed that as part of efforts to start to embed the future requirements of TCMI v16 reporting, updates of all TMS's will be undertaken.

44. On 18 June 2015 ORR requested that Network Rail provide, bearing in mind the lengthy and uncertain timescales associated with the implementation of CSAMS, an indication of any interim actions it is taking to mitigate this recommendation.

45. On 28 July 2015 Network Rail provided the following update:

As noted in the extension of time for this recommendation, interim measures identified pending close out of this recommendation on publication of TCMIv16 include: -

Tunnels with complex and unusual subordinate structures have been identified and specific management actions are now included in the respective tunnel management strategies.

A methodology has been developed to aid the planning of tunnel examinations, by providing guidance on expected exam durations.

Lessons learnt from the Balcombe incident have been disseminated to route asset management teams and examiners via briefing sessions and the publication of guidance.

The requirements of Network Rail's standards for the examination of structures have been reviewed and revised where necessary to remove ambiguity in the responsibility for examination.


rec 8 - Shared Learning - Balcombe F


rec 8 - Balcombe rec A8.10 - Awareness Bri


rec 8 - Balcombe - rec A8.11 - AMEY Awa

Specific clauses in the current CP5 technical specification have been identified which confirm the scope of tunnel examinations with regard to fixings and equipment support structures. (Noted below)

<u>Framework Agreement for the Provision of Civils Examination Services – December 2013</u>
<u>(CP 5 CEFA Technical Specification)</u>
6.5.7 -Both Detailed and Visual Examinations of Tunnels shall include any Equipment Support Structures (ESS) attached to the Tunnel Structure, unless agreed otherwise with Network Rail. Details of the "connection and interface" of the ESS components to the Tunnel shall be identified and recorded as required by NR/L3/CIV/006, Part 8-1, cl 5.1 and 6.1.
In advance of the publication of TCMIv16, our latest EOT notes that guidance is being produced to graphically illustrate the requirements for examination of 3No types 'retrofitted' structures within tunnels including complex subordinate structures, ancillary or equipment support structures, small/minor fixings. This guidance will be issued to all routes with a request to update all TMS's with details of retrofitted structures and the methodology for their examination. Copies of the guidance will be provided as soon as they are available.

46. On 23 November 2015 Network Rail provided the following update:

Network Rail remains on target to address this recommendation by 11 March 2016. Closure of this recommendation is dependent on roll out of version 16 of the Tunnel Condition Marking Index (TCMI) reporting template. The proposed TCMIv16 has been completed and is currently subject to the last scheduled field trials for final user acceptance and finalisation. Until field trials are concluded, and the need for any further revisions/ amendments ascertained, some risk remains in the programme. The March completion date includes some contingency to accommodate this, so currently Network Rail has no reason to believe the completion date is at risk at this time.

Recommendation 9

The intention of this recommendation is to improve the quality of information available to staff responsible for the management of structures including provision of information not required within the statutory Health and Safety File.

Network Rail should review, and if necessary improve, arrangements for recording, storing and retrieving data so that all relevant information is readily available to staff undertaking the examination, evaluation and maintenance of structures.

ORR Decision

47. 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
- is taking action to implement it by 24 February 2017.

Status: *Implementation ongoing.* ORR will advise RAIB when actions to address this recommendation have been completed.

Brief summary of what was previously reported on 18 August 2014

48. ORR reported that Network Rail's action plan to implement this recommendation notes that the intent of this recommendation will be addressed by the successful roll out of the CSAMS system.

Update

49. On 23 April 2015 ORR wrote to Network Rail seeking confirmation noting a planned completion date of 30 June 2015, please provide an update on what has been achieved so far and any changes to plans bearing in mind the likely delay to the implementation of CSAMS.

50. On 18 May 2015 Network Rail provided the following update:

> *Close out of this recommendation is still linked to the implementation of the Civils Strategic Asset Management Solution (CSAMS). An extension of time request will therefore need be submitted in advance of the current planned completion date of 30 June 2015 to align closure of this recommendation with the latest delivery programme i.e. September 2016.*
>
> *Interim measures identified in the action plan for this recommendation included the development of the structures dashboard, pending roll out of CSAMS. The structures dashboard has been developed and implemented to enhance the information available to structures managers. The Structures Dashboard is a system designed to act as a portal to all current structures databases which hold valid asset management information. These databases, include the current structures database, CARRS (Containing - Asset Headline Data, Examination*

Reports and Works Items), VeRA (Assessment Factors) Geogis (Line tonnage), HCE and Scour Databases (for evaluation of risk factors from hidden details and susceptibility to flooding or scour action), BCMI/TCMI (Bridge/Tunnel Condition Marking Index) and the Asset Exam Bridging Tool (Monitors compliance of the exam regime).

Network Rail has also developed modules which address the priority needs for CSAMS. These modules have been developed and implemented and are now business as usual.

They include: -

- *Compliance Management System – This monitors compliance against delivery, review and approval of examinations and provides real time reporting of our and our suppliers' performance.*
- *An interface with our suppliers own examination system to identify data disparity and inaccuracies between systems (The Asset Exam Bridge Tool).*
- *Scour Database – This provides a database of all NR Assets prone to scour action and uses a standard methodology to provide hazard rating for these structures enabling management actions to be implemented systemically.*
- *Hidden Critical Elements – provides a process for examining engineers to highlight asset components which cannot normally be examined and should be subject to specific additional examination.*
- *In addition, NR has also undertaken extensive data cleansing to identify discrepancies, omissions and errors in our asset data to enable the CSAMS system to be populated accurately.*
- *Ongoing work is being undertaken to refine the Bridge Condition Marking Index (BCMI) and develop further condition indices for culverts, retaining walls and footbridges.*

Network Rail intends to consolidate the above working modules, the data cleansing exercise and the developed condition indices into CSAMS ready for its implementation in 2016.

At the last structures liaison meeting it was agreed that CSAMS progress updates would be provided directly by the Network Rail ORBIS team via the regular Asset Information liaison meeting, with ongoing ad hoc updates as necessary at the structures liaison meeting.

51. On 26 June Network Rail provided an update extending the timescale for completion to 24 February 2017.