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Mr Andrew Hall
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Dear Andrew,

RAIB Report: Locomotive failure near Winchfield

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 16 June 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 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 3 is **'Implementation on-going'**. 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 June 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 intent of this recommendation is that the design of the Bulleid small end should be reviewed to establish the benefit or otherwise of using a castellated nut.

West Coast Railways, in consultation with the Main Line Steam Locomotive Operators Association, the Bullied Pacific Locomotive Association and the Heritage Railway Association, should review the design of the small end joint on the Bulleid pacific locomotive to establish the safety benefits, and risk, of using a castellated nut. The results of this review should be shared with other owners of these locomotives.

Steps taken or being taken to address the recommendation

West Coast Railway

1. In its response of 26 November 2014 West Coast Railways provided:
 - an update on actions taken to close out this recommendation – See Annex B; and
 - a copy of Operating & Safety Matters issue 4 October 2014 – see Annex C.

The Heritage Railway Association

2. The HRA also provided a response to the recommendation; the following information was received on 22 September 2014:

The HRA believes there is little value in a specific design review due to the availability of the majority of the original drawings and the final British Railways updated versions thereof, however a general point emerges. The HRA will recommend to its members that when restoring or repairing rolling stock, particularly steam engines, that they ensure that the team involved includes sufficient members who can read engineering drawings and then proceed as follows:

- *Obtain copies of the relevant final British Railways or manufacturers updated drawings and processes where available and work with them; unless there are known shortcomings or more modern appropriate processes are known to be available.*
- *When no such drawings are available or more modern processes are known restorers should create drawing and documentation for all materials, items, processes and assemblies. Then get those designs, materials, methods, documentation and drawings reviewed and approved by a competent qualified engineer before starting any work. N.B. It is the*

responsibility of the team to get the documentation independently checked. This role is separate from that of any VAB who may be involved.

- *When repairing rolling stock that has run safely in service for a considerable period, restorers may account items or assemblies that do not comply with the relevant final British Railways or manufacturers updated drawings. Members should note those variations and consider having the item or assembly checked and approved by a competent qualified engineer if in any doubt as to their continued safe operation.*

ORR decision

3. Having reviewed these documents ORR is satisfied that West Coast Railways (WCR) has reviewed the design of the small end joint on the Bulleid pacific locomotive, although there is uncertainty as to whether this review focused on the safety benefits and risk of using a castellated nut. However, the solution adopted by WCR and the Heritage Railway Association (HRA) – referring operators back to original drawings and, where these don't exist or dated items or assemblies do not comply with relevant drawings, seeking approval from competent qualified engineers – resolves the safety risk that the recommendation intended to address.

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

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

Status: Implemented by alternative means

Recommendation 2

The intent of this recommendation is that the details of the design of cotters fitted to steam locomotives should be reviewed, to reduce the risk of failure arising from fatigue.

The Heritage Railway Association and the Main Line Steam Locomotive Operators Association should prepare guidance for their members on the design and manufacture of split cotters to encourage the use of best engineering practice. This may include considering:

- reference to the British Railways drawing SL-DN-K.569; or

- other methods of fabrication such as the use of folded strip, welded at the head, which is widely used in the industry.

Steps taken or being taken to address the recommendation

5. In its response of 22 September 2014 the HRA provided the following information:

The HRA will recommend to its members that:

- *Split cotters must not be formed by cutting the slot with a saw;*
- *Split cotters should not be re-used but should be destroyed after use;*
- *Replacement cotters to the original specification should be used where available;*
- *No change to the original design should be made until that change has been independently checked and approved by a competent qualified engineer.*
- *Replacement cotters for the majority of designs may be safely constructed from folded bar.*

6. The HRA included the above guidance in Issue 04 of its Operating and Safety Matters bulletin published in October 2014 – see Annex C.

ORR decision

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

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

Status: Implemented

Recommendation 3

The intent of this recommendation is that the maintenance arrangements for steam locomotives operated by West Coast Railway Company should be consistent and in accordance with the provisions of its safety management system.

West Coast Railway Company should review and improve its safety management system to take account of the need for assurance that the standards of maintenance work carried out on locomotives owned and/or operated by the company are

adequate, consistent and subject to monitoring and supervision independent of those doing the work.

Steps taken or being taken to address the recommendation

8. In its response of 28 August 2014 WCR provided the following information:

West Coast Railways will employ an additional engineer with specific responsibility for ensuring consistent standards of maintenance are as intended and in accordance with the relevant VMI and competence management system.

9. In its subsequent response of 26 November 2014 WCR indicated that this additional engineer has been employed – see item 3 of Annex B.

ORR decision

10. The recommendation required WCR to review and improve its safety management system to address any failing with the standards of maintenance work. The original response provided by WCR did not provide ORR with assurance that the role of the additional engineer included a review and revision of the WCR safety management system. However, since the SPAD incident at Wootton Bassett on 7 March 2015 involving the same operator ORR has taken action, including serving an improvement notice, to ensure that the WCR safety management system is being fully reviewed and revised and will meet the intention of this recommendation. We expect this review to be completed by 20 July 2015.

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

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

Status: Implementation on-going. ORR will advise RAIB when actions to address this recommendation have been completed.

Recommendation 4

The intent of this recommendation is that restorers of steam locomotives should be made aware of the need to thoroughly evaluate and risk assess design changes proposed or made during the restoration process, or subsequently.

The Heritage Railway Association and the Main Line Steam Locomotive Operators Association should bring this report to the attention of their members and invite them to consider thoroughly evaluating and risk assessing changes to the design of steam

locomotives that are made during restoration, overhaul or maintenance. The following should be considered:

- whether the purpose and function of the original design, and the reasons for making the change are fully understood;
- whether any additional risk will be introduced by the change; and
- any measures that may be needed (during overhaul, operation or maintenance) to reduce the risk associated with the change, and to assess its impact.

Steps taken or being taken to address the recommendation

12. In its response of 22 September 2014 the HRA provided the following information:

The HRA considers that by publishing its recommendations given to the responses to the previous two RAIB recommendations it adequately covers this.

ORR decision

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

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

Status: Implemented

West Coast Railway Company Action Plan				Circulation: PM, MG, RAIB, BC, JB, CB.											
Issue being addressed: Recommendation made by RAIB following an incident at <u>Winchfield</u> 23rd November 2013 where part of a steam locomotive motion became detached. (x's indicate degree of completion)															
Action / Milestones	Action By	Target Date	Progress %										Actual Date	Comments	
			10	20	30	40	50	60	70	80	90				
1. West Coast Railways, in consultation with the Main Line Steam Locomotive Operators Association, the <u>Bulleid</u> Pacific Locomotive Association and the Heritage Railway Association, should review the design of the small end joint on the <u>Bulleid</u> pacific locomotive to establish the safety benefits, and risk, of using a castellated nut. The results of this review should be shared with other owners of these locomotives (paragraph 119a).	BC	End Dec 14	x	x	x	x	x	x	x	x	x	x	x	Closed 21/11/14	Suitably experienced, qualified and willing group of persons identified – next meeting set for 27/08/2014 1 st meeting held, terms of reference agreed, objective agreed, meeting once a month agreed and target date agreed. Report produced & distributed to HRA members & wider
2. The Heritage Railway Association and the Main Line Steam Locomotive Operators Association should prepare guidance for their members on the design and manufacture of split cotters to encourage the use of best engineering practice. This may include considering: <ul style="list-style-type: none"> reference to the British Railways drawing SL-DN-K.569; or <u>other</u> methods of fabrication such as the use of folded strip, welded at the head, which is widely used in the industry. 	BC	End Dec 14	x	x	x	x	x	x	x	x	x	x	Closed 21/11/14	Suitably experienced, qualified and willing group of persons identified – next meeting set for 27/08/2014 1 st meeting held, terms of reference agreed, objective agreed, meeting once a month agreed and target date agreed. Report produced & distributed to HRA members & wider	

<p>3. West Coast Railway Company should review and improve its safety management system to take account of the need for assurance that the standards of maintenance work carried out on locomotives owned and/or operated by the company are adequate, consistent and subject to monitoring and supervision independent of those doing the work (paragraph 121a).</p>	<p>DS / PM</p>	<p>July 14</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>Closed 6/14</p>	<p>WCR will employ an additional engineer with specific responsibility for ensuring consistent standards of maintenance are as intended and in accordance with the relevant VMI and competence management system.</p> <p>C. Beet employed.</p>
<p>4. The Heritage Railway Association and the Main Line Steam Locomotive Operators Association should bring this report to the attention of their members and invite them to consider thoroughly evaluating and risk assessing changes to the design of steam locomotives that are made during restoration, overhaul or maintenance. The following should be considered:</p> <ul style="list-style-type: none"> • whether the purpose and function of the original design, and the reasons for making the change are fully understood; • whether any additional risk will be introduced by the change; and • any measures that may be needed (during overhaul, operation or maintenance) to reduce the risk associated with the change, and to assess its impact. 	<p>BC</p>	<p>Dec 2014</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>Closed 21/11/14</p>	<p>Suitably experienced, qualified and willing group of persons identified – next meeting set for 27/08/2014</p> <p>1st meeting held, terms of reference agreed, objective agreed, meeting once a month agreed and target date agreed.</p> <p>Report produced & distributed to HRA members & wider</p>

<p>5. (WCR recommendation 1) All cotters should be manufactured to drawing (see item 16) and renewed after being disturbed.</p>	<p>BC</p>	<p>April 1014</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>Closed 4/14</p>	<p>Prior to the main operating season and prior to individual movements following the incident all cotters will be checked and renewed as necessary.</p>
<p>6. (WCR recommendation 2) Gudgeon pin, castellated nut and cotter exam period must include checks for tightness especially after having been removed and re-fitted.</p>	<p>BC</p>	<p>Sept 2014</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>Closed 18/9/14</p>	<p>Addition to C exam All gudgeon pin cotters to be removed (and replaced with new) and gudgeon pin nut 'flogged up'. If <u>castellations</u> are out of line with cotter slot then back of nut to be machined off to bring slots in line. SR locos - nut to be 'flogged up' and new cotter fitted.</p>
<p>7. (WCR recommendation 3) Consideration should be given to whether a plain nut and cotter arrangement would be 'as originally' designed for the locomotive.</p>	<p>BC CB</p>	<p>Aug 2014</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>Closed 8/14</p>	<p>All gudgeon pin nuts on steam locomotive <u>Tangmere</u> have been replaced with new, manufactured to the original drawing.</p>
<p>8. (WCR recommendation 4) The OTMR equipment requires a full test prior to further operation of the vehicle.</p>	<p>MG</p>	<p>Mar 2014</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>Closed 3/14</p>	<p>New date on equipment fitted to <u>Tangmere</u> 04/2019</p>
<p>9. (WCR recommendation 5) Engineering Acceptance Certificates should be updated to reflect the current ownership and ECM. (This has been completed 01/14)</p>	<p>MG</p>	<p>Feb 2014</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>Closed 2/14</p>	<p>EA certificates for the fleet have been checked & <u>Tangmere's</u> has been re-issued with the correct data.</p>
<p>10. (WCR recommendation 6) Maintenance records for steam locomotive tasks that are additional to or arising from the examination regimes should include more detailed description of the tasks that have been performed.</p>	<p>BC</p>	<p>Feb 2014</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>x</p>	<p>Closed 3/14</p>	<p>Day book for maintenance introduced with regular surveillance check on effectiveness implemented.</p>
<p>Issue Date: 21/11/2014 Issue No. 5</p>														



Operating & Safety Matters

Issue 04 October 2014

Purpose

This newsletter is produced to focus on Operating and Safety issues that matter to all members.

Locomotive failure near Winchfield

All contacts should have received a copy of the RAIB Urgent Safety Advice following an incident involving locomotive Tangmere at Winchfield on 23 November 2013. While the train was travelling at about 40 mph, the right-hand connecting rod of the locomotive, former British Railways (Southern Region) 4-6-2 34067 'Tangmere', became detached at the leading end and dropped down.

The alert and the full report which has been published by RAIB should be brought to the attention of all Mechanical Engineering department heads. The full report is available at:

http://www.raib.gov.uk/publications/investigation_reports/reports_2014/report132014.cfm

Three of RAIB's recommendations were directed to HRA and other bodies. The HRA responses have been reviewed by the Operating & Safety committee of the HRA and by the other bodies to whom the recommendations were addressed.

Response to Recommendation ONE

The HRA believe there is little value in the specific design review due to the availability of the majority of the original drawings and the final British Railways updated versions thereof; however a general point emerges.

The HRA recommends that when members are restoring or repairing rolling stock, particularly steam engines, the duty holder should ensure that the team involved includes sufficient members who can read engineering drawings and then proceed as follows:

1. Obtain copies of the relevant final British Railways or manufacturers updated drawings and processes where available and work to them, unless there are known shortcomings or more modern appropriate processes are known to be available.
2. When no such drawings are available or more modern processes are known restorers should create drawing and documentation for all materials, items, processes and assemblies. The designs, materials, methods, documentation and drawings should then be reviewed and approved by a competent qualified engineer before starting any work. N.B. It is the responsibility of the team to get the documentation independently checked. This role is separate from that of any Vehicle Acceptance Body who may be involved and whose role is to verify that compliance.
3. When repairing rolling stock that has run safely in service for a considerable period, restorers may encounter items or assemblies that do not comply with the relevant final British Railways or manufacturers updated drawings. Members should note those variations and consider having the item or assembly checked and approved by a competent qualified engineer if in any doubt as to their continued safe operation.

Response to Recommendation TWO

The HRA recommends that the duty holder puts procedures in place to ensure that:

1. Split cotters are never formed by cutting the slot with a saw.
2. Split cotters are never re-used but destroyed after use
3. Replacement cotters to the original specification are used where available
4. No change to the original design is made until that change has been independently checked and approved by a competent qualified engineer.

N.B. Replacement cotters for the majority of designs may be safely constructed from folded bar.

Response to Recommendation FOUR

The HRA considers that by publishing its recommendations given to the responses to the previous two RAIB recommendations it adequately covers this.

Issued by Bill Hillier, Chairman HRA O&S Committee page 1 of 3 © Heritage Railway Association 2014

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