

## Recommendation(s) Status: Detachment of a cardan shaft at Durham station




This report is based on information provided to the RAIB by the relevant safety authority or public body.

The status of implementation of the recommendations, as reported to us, has been divided into six categories:

### Key to Recommendation Status

<b>Implemented:</b>	All actions to deliver the recommendation have been completed.
<b>Implemented by alternative means:</b>	The intent of the recommendation has been satisfied in a way that was not identified by the RAIB during the investigation.
<b>Implementation ongoing:</b>	Work to deliver the intent of the recommendation has been agreed and is in the process of being delivered.
<b>In-progress:</b>	The relevant safety authority has yet to be satisfied that an appropriate plan, with timescales, is in place to implement the recommendation; and work is in progress to provide this.
<b>Non-implementation:</b>	Regulation 12(2)(b)(iii) = recommendation considered and no implementation action to be taken.
<b>Awaiting response:</b>	Awaiting initial report from the relevant safety authority or public body on the status of the recommendation.

RAIB concerns on actions taken by organisations in response to recommendations are reflected in this report and are indicated by one of the following:

-  The red triangle shows recommendations where the RAIB has concerns that no actions have been taken in response to a recommendation.
-  The blue triangle shows recommendations where the RAIB has concerns that the actions taken, or proposed, are inappropriate or insufficient to address the risk identified during the investigation.
-  The white triangle shows recommendations where the RAIB notes substantive actions have been reported, but the RAIB still has concerns.

Note: The tables which follow, report the status of recommendations on 31 December 2015. In some other cases the end implementer has already sent information to the relevant safety authority about the actions it has taken, or proposes to take and the safety authority is considering whether it is satisfied that those actions and the associated timescales are accepted.

Number/ Date/ Report No/ Inv Title / Current Status	Safety Recommendation	Summary of current status (based on latest report from the relevant safety authority or public body)
<p>1            10/04/2011    12/2012</p> <p>Detachment of a cardan shaft at Durham station</p> <p>Status: Implemented</p>	<p>The objective of this recommendation is to ensure that the industry completes the work that has already started on reviewing the end float and alignment requirements, as well as the bearing fit as soon as possible and incorporates the relevant changes in a revised overhaul procedure. This recommendation also includes the need for the industry to review the performance of the oil pump particularly in light of the more recent incident at Plawsworth (paragraph 151).</p> <p>The owners of class 14x vehicles, in consultation with suppliers of overhaul services, should review the final drive design, design tolerances and the maintenance processes in respect of:</p> <ul style="list-style-type: none"> <li>• end float setting (paragraphs 154a and 154b);</li> <li>• input and pinion shafts alignment (paragraph 154c);</li> <li>• fit of the bearings in the housing bore (paragraph 155a); and</li> <li>• oil pump performance (paragraph 155d).</li> </ul> <p>Any required changes identified by the review should be suitably documented and incorporated in overhaul procedures. This recommendation applies to the modified design of the final drive (paragraph 159b).</p>	<p>The owners of class 14x vehicles, in consultation with suppliers of overhaul services have reported that they have taken actions in response to this recommendation.</p> <p>ORR proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
<p>2            10/04/2011    12/2012</p> <p>Detachment of a cardan shaft at Durham station</p> <p>Status: Implemented</p>	<p>The objective of this recommendation is to ensure that designers of railway equipment validate any changes to the design of safety critical components.</p> <p>The owners of class 14x vehicles should review the adequacy of their existing arrangements for ensuring that the suppliers of their equipment validate changes to the design of safety critical components (paragraphs 158c and 159b).</p>	<p>The owners of class 14x vehicles have reported that they have taken actions in response to this recommendation.</p> <p>Office of Rail Regulation (ORR) proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
<p>3            10/04/2011    12/2012</p> <p>Detachment of a cardan shaft at Durham station</p> <p>Status: Implemented</p>	<p>The objective of this recommendation is to ensure that Northern Rail has in place risk control measures to detect impending final drive failures before they occur.</p> <p>Northern Rail, in consultation with the owners of class 14x vehicles, should develop, validate and implement measure(s) to identify and prevent the onset of failure of a recently overhauled final drive so as to prevent complete failure where practicable (paragraphs 156 and 166).</p> <p>Note: the measure(s) implemented to address this recommendation may be appropriate to all class 14x final drives.</p>	<p>Northern Rail has reported that it has taken actions in response to this recommendation.</p> <p>Office of Rail Regulation (ORR) proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>

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<p>4            10/04/2011    12/2012</p> <p>Detachment of a cardan shaft at Durham station</p> <p>Status: Implemented</p>	<p>The objective of this recommendation is to ensure that key design information is made available to companies undertaking work on class 14x final drives.</p> <p>For class 14x vehicles, vehicle owners in consultation with operators should review whether the necessary technical information for the maintenance and overhaul information of the class 14x final drives is still available and if it is, they should arrange for it to be sourced. This information should be kept by the vehicle owners and made available to all existing and future operators, maintainers and overhaulers as relevant (paragraphs 158a and 158b).</p> <p>Note: the principle outlined in this recommendation may also apply to other traction and rolling stock equipment and other fleets of train.</p>	<p>Duty holders have reported that they were unable to source the original information for the final drives. However, the original equipment manufacturer provided guidance on the critical tolerances. The RAIB are concerned that the risk identified in the report been addressed.</p> <p>Office of Rail Regulation (ORR) proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
<p>5            10/04/2011    12/2012</p> <p>Detachment of a cardan shaft at Durham station</p> <p>Status: Implemented</p>	<p>The objective of this recommendation is to ensure that the final drives are tested in conditions representative of their operational duty before being released to the operator.</p> <p>The owners of class 14x vehicles should review the testing of the final drives after overhaul to confirm that it is done in conditions sufficiently representative of their operational duty and where appropriate amend the testing requirements accordingly. The following areas should be considered:</p> <ul style="list-style-type: none"> <li>I operational speed;</li> <li>I loading on the shafts; and</li> <li>I external environmental conditions (paragraph 155c).</li> </ul>	<p>The duty holders have responded that they have revised the arrangements for testing final drives after overhaul, this includes increasing the operating speed from 1455 to 2000 rpm. However, after consideration the industry has concluded that the testing conditions do not need to include the loading on the shafts or other external environmental factors, the reasons for this have been explained.</p> <p>Office of Rail Regulation (ORR) proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>
<p>6            10/04/2011    12/2012</p> <p>Detachment of a cardan shaft at Durham station</p> <p>Status: Implemented</p>	<p>The objective of this recommendation is to ensure that Northern Rail's plans for dealing with accidents and incidents are adequate.</p> <p>Northern Rail should complete the review of its procedures governing post-accident actions and implement any necessary changes to ensure that the risks to personnel and the environment from movement of damaged trains and trains with defective equipment is appropriately managed (paragraphs 159a and 167).</p>	<p>Northern Rail has reported that it has taken actions in response to this recommendation.</p> <p>Office of Rail Regulation (ORR) proposes to take no further action unless they become aware that the information provided becomes inaccurate.</p>